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Applying to college: Do information deficits lower the likelihood of college-eligible students from less-privileged families to pursue their college intentions? Evidence from a field experiment

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Abstract

Information deficits are considered an important source of why students from less-privileged families do not enroll in college, even when they are college-eligible and intend to go to college. In this paper, we examine whether correct and detailed information on the costs of and returns to higher education increases the likelihood of college applications of less-privileged high school graduates who expressed college intentions in their junior high school year. We employ an experimental design with a randomly assigned 25-minute information treatment about funding opportunities for, and returns to, higher education given at Berlin schools awarding university entrance qualifications. Our analyses show that our information treatment indeed substantially increases the likelihood of treated less-privileged students to apply to college. Our study indicates that our low-cost provision of financial information not only increased their college knowledge but also substantially changed their college application behavior, despite other existing barriers, like economic constraints.

1. Introduction

In many countries, growing parental educational aspirations and changes in educational policies over the last decades have resulted in an increasing proportion of college-eligible students from less-privileged families. But enrollment in higher education continues to strongly differ by social background (Breen et al. 2009; Pfeffer 2008; Shavit and Blossfeld 1993). Completing higher education, however, is important for getting access to higher occupational positions (Arum and Shavit 1995; Kerckhoff et al. 2001; Shavit and Müller 2000). Moreover, earnings differentials between individuals with tertiary and upper secondary education degree are quite substantial.¹ Thus, increasing the participation of less-privileged students in higher education could help reduce overall social inequality.

Studies show that less-privileged students, even when they are eligible for college and intend to go to college, are still less likely to apply to higher education than their peers from privileged families (see Engle 2007; Hanson 1994; Hossler et al. 1999; Hoxby and Turner 2013; Khattab 2015; Schneider and Franke 2014; Schneider and Saw 2016). Lack of college intentions² cannot explain their lower college application rates. Hence, the question remains what causes them to divert from their initial college plans. According to a rational choice perspective (Boudon 1974; Breen and Goldthorpe 1997), information on the costs of and returns to different educational pathways are important factors in educational decisions.

Although this information is widely available via the internet, for families without college

¹ In the U.S., for instance, adults holding a tertiary education degree earn about 68 percent more than those holding an upper secondary education degree and in Germany 58 percent more (OECD 2016, p. 125). More meaningful for Germany is the comparison within the group of those holding a university entrance qualification (*Abitur*): those who graduated from research universities and universities of applied sciences still earn about 31 and 20 percent, respectively, more than those with completed vocational training (Glocker and Storck 2014, p. 119).

² According to Hanson (1994, p. 159) educational intentions (or expectations) refer to “the education that individuals expect to achieve,” in contrast to educational aspirations, which refer to “the education that they hope to achieve.”

experience it is not easy to distinguish between reliable and unreliable sources of information (Hoxby and Turner 2013, p. 3). Thus, biased or missing information on the costs of and returns to higher education (hereafter: financial information deficits) might, at least partly, explain why less-privileged high school graduates with college intentions do not apply to college. Accordingly, policymakers in the U.S. and Germany, for example, believe that providing these students and their parents with information about college funding sources will increase their participation in higher education (BMBF 2010, p. 51; Scott-Clayton 2012).

In this paper, we investigate *whether financial information deficits indeed reduce the likelihood of less-privileged high school graduates with college intentions to apply to college*. Evidence for this explanation is still limited (for an overview, see Morgan 2010; Scott-Clayton 2012). Research for the Anglo-Saxon context shows that high school students, especially from less-privileged families, lack information on available financial aid (e.g., Horn et al. 2003) and substantially underestimate the returns to and overestimate the costs of higher education (e.g., Betts 1996; Oreopoulos and Dunn 2013; Usher 2005; Volle and Frederico 1997). On the one hand, these deficits may be particularly important for less-privileged students because they are often concerned about the financial costs of attending college (Morgan 2010, p. 212; see also Engle 2007; Erikson and Jonsson 1996; Hoxby and Turner 2013). On the other hand, even if they have comprehensive and correct information, lack of economic resources and parental support may be the major barriers preventing them from pursuing their college plans (e.g., Barone 2016). Yet, there is some evidence for the U.S. context that information deficits do matter (Berkner and Chavez 1997; Hoxby and Turner 2013; Vargas 2004). The U.S. context, however, is characterized by high study costs and high returns to higher education—therefore, financial information might be an important source for application decisions. In contrast, a recent study on Italy, where costs of and returns to higher education are lower, finds that providing correct and unbiased information did not influence

students' college intentions in their final high school year (Barone et al. 2016).³ They did not study students' educational decisions, like applications. Hence, we still lack evidence on the impact of information on less-privileged students' application behavior for countries with low costs of and lower returns to higher education, like Italy or Germany.

To fill this research gap, we conducted a panel study that included a field experiment in Berlin, Germany. We provided a randomized subsample of college-eligible students with research-based and uniform information on college-funding options and the returns to different postsecondary educational pathways. The information treatment consisted of a 25-minute presentation and was conducted one year before graduation from university-preparatory tracks; information on whether or not students applied to college was collected one year later.

We focus on *students with college intentions*⁴ one year before high school graduation for several reasons: First, we want to study the importance of information deficits for those who are “closest” to college application decisions in terms of eligibility and self-interest. Second, for this group, lower grades should reflect real differences in academic performance rather than anticipations of not enrolling in college. Third, at this advanced stage in their school career, students with college intentions may not have information deficits but rather lack financial resources or parental support. We therefore detect whether these students, too, have information deficits, and whether these deficits have any impact on their application decisions.

³ Tuitions fees at Italian universities do not exceed €3,000 and the average earnings differential between upper secondary educated and tertiary educated workers is 42 percent (OECD 2016, p. 125).

⁴ College intentions are operationalized by the response “I intend to attend college” to the question “Based on everything you know now, what type of education will you probably pursue after school?”

Our study on college applications among less-privileged students with college intentions in Germany contributes to the literature in important ways. In contrast to most studies, we investigate the effects of information deficits on students' application *decisions* instead of college intentions (a few weeks or months after the treatment).⁵ Although college intentions are positively correlated with actual decisions, not all students pursue their college plans; this is especially true for less-privileged students (e.g., Engle 2007; Hanson 1994; Sewell et al. 2004; Weiss and Steininger 2013). From a policy perspective, actual college enrollments are what matters in the end. We however deliberately choose to study college applications (as dependent variable), because they are a more straightforward measure of students' decisions to pursue their college plans than actual enrollments: Applications refer exclusively to their self-interest and are not confounded with selection criteria and administrative processes of higher education institutions, which also influence the chances of admission and thereby of enrollment (but which are not changeable by our information treatment). Moreover, different U.S. studies show that lower enrollment rates of less-privileged students are mainly caused by their application behavior rather than by admission decisions, and net of individual characteristics such as school performance (e.g., Hoxby and Avery 2013, p. 35f.; Koffman and Tienda 2008, p. 23).

Moreover, previous experimental studies often paid little attention to students' social background, although financial information deficits are assumed to be particular detrimental to college applications by less-privileged students. We therefore focus on *less-privileged students*. As indicator of social background we use parental education because it has the highest predictive power on children's educational outcomes among the social background characteristics (Buis 2013; Bukodi and Goldthorpe 2013; Ermisch and Francesconi, 2001).

⁵ Exceptions are the studies by Bettinger et al. (2012) and Hoxby and Turner (2013, 2015). In contrast to our study, they did not investigate information deficits on returns to higher education.

Students from less-privileged families are defined as those with neither parent holding a tertiary degree (non-college-educated parents).

Thus, the specified research questions of our experimental study are: among college-eligible and college-intending students with non-college-educated parents, *do informed (treated) students apply more often to college than their uninformed (non-treated) peers? Moreover, is our low-cost intervention of providing additional and correct information able to increase their college application rate?* Our results show that better information substantially increases the college application rate of less-privileged students with college intentions—indicating that the diversion from their initial college plans indeed results from information deficits about the costs of and returns to higher education. This finding for the German context supports the assumption that the information mechanism is universal: information deficits create barriers for less-privileged students to participate in higher education not only in countries with high study costs and returns, like the U.S., but also in countries with lower costs and returns, like Germany.

The paper is organized as follows: After presenting information on Germany's tertiary education system, we present our theoretical considerations. We then describe the experimental design of our study, the data, variables, and methods used. Afterwards we present the findings of our field experiment, followed by a discussion of the strengths and limitations of our study and some concluding considerations.

2. The German tertiary education system

In Germany, enrollment in bachelor's programs at research universities and universities of applied sciences requires a university entrance qualification: the *Abitur* or *Fachabitur*.⁶ Hence, the first major barrier for less-privileged children to eventually enter college is still the transition after elementary school (Neugebauer et al. 2013): The *Abitur* can be obtained at the *Gymnasium* that starts in grade 5 in most German states and in grade 7 in Berlin and Brandenburg. But most German states have established additional university-preparatory tracks at comprehensive schools and/or at vocational schools (e.g., the so-called “vocational *Gymnasium*” in Berlin or Baden-Württemberg). In 2014, about 34 percent of university entrance qualifications were obtained at vocational schools (National Education Report 2016, table D7-5web). Obtaining a university entrance qualification is therefore less socially stratified today than it was in the past (Schindler 2015).

In 2013, school leavers who graduated with an *Abitur* (including the *Fachabitur*, also hereafter) accounted for about 52 percent of the same-age population (National Education Report 2016, p. 296), but the proportion of first-year enrollments in BA programs was only 34 percent (National Education Report 2016, p. 277). One source of this discrepancy is that some students take one or more years off for internships, a voluntary social year, military service, travel, or work. Of those who obtained an *Abitur* in 2013, for instance, about 45 percent enrolled in college immediately; another 22 percent enrolled one year later.

But even after several years, about 30 percent of eligible school leavers do not enter universities (National Education Report 2016, Table F2-7web). Most of them completed vocational education and training programs instead (National Education Report 2016, p. 105).

⁶ In recent years, enrolling in universities as “non-traditional students” (i.e., without an *Abitur* but a regular vocational training degree and some years of related work experience) is formally possible but rarely occurs in practice. Non-traditional students account for about 3.5 percent of all university students (National Education Report 2016, p. 128).

Some students work towards the *Abitur* primarily to have a competitive advantage in the high-quality segment of the apprenticeship market⁷ (see Hillmert and Jacob 2003; Jacob and Solga 2015; Powell and Solga 2011; Schindler and Lörz 2012). Yet vocational training attracts more less-privileged students—diverting them from higher education but providing a “safety net” in terms of low risks of unskilled work and unemployment (see Becker and Hecken 2009; Hillmert and Jacob 2003; Ishida et al. 1995; Mayer et al. 2007; Shavit and Müller 2000).

This diversion phenomenon is indicated by the following figures: About 82 percent of those with at least one college-educated parent enrolled in bachelor’s programs in 2012—compared to only about 61 percent of high school graduates with parents holding a vocational training degree, and only 70 percent of those with at least one parent holding a university of applied sciences degree, (National Education Report 2016, F2-5web). Parents holding university of applied sciences degrees often have prior training experience and/or are the first generation of upwardly mobile students in their family (Reimer and Pollak 2010).

These social differences in college attendance rates are surprising given that Germany’s tertiary education system is formally much less selective than it is in other countries. About half of all bachelor programs have open admissions policies (National Education Report 2016, p. 295). Enrollment in the other half is restricted by a so-called “*numerus clausus*,” that is, applicants have to surpass a certain grade average to gain admission (Herdin and Hachmeister 2014). This grade average depends on the supply-demand ratio of available slots in given fields and therefore sometimes includes even medium-performing students. In addition, prestige differences between German universities are much smaller than in higher education systems with elite institutions, like that of the U.S.⁸

⁷ They enroll, for instance, in financial service occupations (like bank or insurance clerks) or health occupations (like nurses and lab medical technicians) (Protsch and Solga 2016).

⁸ Difference in earnings and unemployment rates between graduates of research universities and universities of applied sciences are also small in the same field of study.

Moreover, higher education is tuition-free in Germany, and administrative fees are very low (less than €600 per year, including student tickets for public transportation).⁹ Lower-income students are eligible for federal means-tested financial aid, the *Bundesausbildungsförderungsgesetz* (BAföG), which is currently up to €670 per month (Destatis 2015a). In 2014, about 27 percent of students at the bachelor's and master's level received an average of about €450 per month of *BAföG* payments (Destatis 2015a, b).¹⁰

All in all, in Germany, administrative and financial barriers to higher education are rather low for college-eligible students and returns to tertiary education degrees are lower than in the U.S. but still substantial (see footnote 1). Nonetheless, a substantial share of high school graduates with non-college-educated parents does not apply to and enroll in tertiary education. In our study, we investigate now whether financial information deficits are one source of why they divert from tertiary education, albeit they intended to go to college.

3. Previous research and theoretical considerations

Studies for the U.S. observe that the likelihood of school leavers with college intentions to enter college varies between about 50 percent (Schneider and Saw 2016) and 82 percent (Hossler et al. 1999), depending, among other things, on the definition and time point of measurement of educational aspiration and intentions, or on the samples analyzed (see also Engle 2007). Moreover, even high-performing low-income students who intend to earn a college degree do not always enter college (Hanson 1994; Hoxby and Turner 2013). In the UK too, even among the students with college aspirations, college intentions, and high school attainment only 68 percent apply to college at the age of 17–18 (Khattab 2015, p. 733;

⁹ For more information, see <http://www.bachelor-studium.net/studiengebuehren-kosten.php>.

¹⁰ Half of that payment is a grant; the other half is an interest-free loan that has to be repaid later on a monthly basis.

analyses were not differentiated by social background). In Germany, high school graduates with non-college-educated and college-educated parents differ as well, both in the proportion of college intentions (72% vs. 83%) and in the proportion of college enrollment, immediately after school or planned in later years (66% vs. 80%) (Schneider and Franke 2014).

Why do not all students who expressed college intentions apply to college? The few existing qualitative and quantitative studies on this topic observe that information influences students' college plans (see overview in Morgan 2010). However, they only capture the quantity, and sometimes the content, but not the *quality* of information available to students (and parents). Thus, students who respond that they “are (well) informed” can still differ in the degree of how biased and comprehensive their information is. Experimental studies are not confounded by such quality differences, because here variation in the content and quality of information is exogenous to individual feelings of “being informed.” Some recent experimental studies for the Anglo-Saxon context confirm the survey results and show that correct financial information is associated with a higher stability of college intentions (e.g., McGuigan et al. 2012; Oreopoulos and Dunn 2013). In contrast, for the Italian context, Barone et al. (2016) do not find an effect of unbiased information on students' stability in college intentions.

Most of the existing studies examine only how information deficits impact on students' college intentions but not on their application behavior. When students answer questions about their educational expectations/intentions, “for some students, educational expectations may reflect their goals of achievement, while for others they may be a realistic assessment of their chances of being accepted, financing, and completing a four-year degree” (Goyette 2008, p. 477; Khattab 2015, p. 733). Thus, although college intentions close to the end of schooling are more serious than those expressed earlier in the educational career (Dumora 2004; Hanson 1994; Kerckhoff 1976), students may not be well informed when

answering the educational intention question. German data show that about 40 percent of college-intending students had not started their information search one year before graduation (Schneider and Franke 2014, p. 25, not differentiated by social background)—the time point of measuring college intentions in our study. Moreover, some students with non-college-educated parents may not have anticipated all potential barriers (e.g., financial constraints, cultural reservations of their parents against college). However, especially at the application stage, less-privileged students often need to defend their college plans against their parents and these barriers (see Bourdieu 1984; Engle 2007; Horn et al. 2003). This could explain why college intentions do not always translate into college applications.

Thus, the question remains whether providing additional and correct information can help increase the college application rate of students with non-college-educated parents. According to the rational choice approach (Breen and Goldthorpe 1997), educational decisions are not only influenced by economic resources and education-related information (as cultural resources), distributed within the family and via social networks (e.g., Davies and Guppy 1997; Erikson and Jonsson 1996; Stanton-Salazar and Dornbusch 1995), but also by the expected costs and benefits of higher education. Especially for students with non-college-educated parents, major barriers to pursuing their initial college plans may be that they lack economic resources to bear the costs and, at the same time, that they overestimate the costs of and underestimate the returns to higher education.¹¹

Research shows that all high school students substantially underestimate the future earnings premium of tertiary degrees (e.g., Usher 2005). This underestimation is largest, however, among less-privileged students (e.g., Betts 1996; Volle and Frederico 1997).

¹¹ Another barrier—not addressed by our (financial) information treatment—might be that students with non-college-educated parents have lower subjective success probabilities than students with college-educated parents with similar academic performance, because the latter have first-hand access to information about study requirements (Erikson and Jonsson 1996; Hossler et al. 1999).

Moreover, these students overestimate the costs of college attendance (e.g., Barone et al. 2016; Grodsky and Jones 2007; Horn et al. 2003; Oreopoulos and Dunn 2013; Usher 2005). This underestimation of returns and overestimation of costs is particularly important for less-privileged students because they are often concerned about the financial costs of attending college (e.g., Paulsen and St. John 2002; Volle and Frederico 1997). This concern also applies to Germany, although college costs are low (Lörz 2012; Schindler and Lörz 2012).

Furthermore, students with non-college-educated parents have more information on careers that do not require a college degree (e.g., apprenticeships in Germany) than their peers with two-college-educated parents. At the same time, they are often unaware of their information deficits on higher education, not knowing, for instance, that they overestimate costs and underestimate returns to higher education, and therefore do not seek more information (Morgan 2010, p. 83; see also Horn and Nunez 2000; Menon et al. 2007; Perna 2006; Slack et al. 2014). For example, although financial aid is available for lower-income students in many countries, these students are often not aware of its availability and/or regulations (e.g., Hossler and Stage 1992; Perna 2006; Horn et al. 2003).

Studies for the U.S. show that access to detailed information on financial aid encourages low-income students (and their parents) to opt for college (see Beattie 2002; Berkner and Chavez 1997; Davies and Guppy 1997; Perna 2005; Vargas 2004). The question remains, however, whether correct and more information provided by disinterested third parties could indeed help increase the likelihood of college-eligible and college-intending students with non-college-educated parents to apply to college. Such information may not compensate for parental information deficits because of a lack of emotional ties and trust (see Slack et al. 2014). Evidence from randomized field experiments with impersonal information treatments suggests, however, that students do correct their expectations regarding the returns to, and costs of, higher education when they receive detailed information (Jensen 2010;

McGuigan et al. 2012; Oreopoulos and Dunn 2013; Wiswall and Zafar 2011a, b). But does such a correction have the potential of making students with non-college-educated parents indeed more likely to apply to college? Morgan (2002) argues that exposure to better information on higher education might not only lead these students to make better choices but also to be more confident in their particular choice.

Based on these theoretical considerations and our experimental study design, we expect to find support for the following *hypothesis* concerning the impact of financial information (i.e., of our information treatment) on the application decision of college-eligible and college-intending *students with non-college-educated parents: Informed (treated) students are more likely to apply to college than uninformed (untreated) students.*

Though not the focus of our study, we also include privileged students. We differentiate between students with two parents holding a tertiary degree (two-college-educated parents) and those with only one parent holding a tertiary degree (one-college-educated parent). The situation of *students with one-college-educated parent* somewhat resembles the situation of those with non-college-educated parents: They have fewer economic resources than students with two-college-educated parents because of the existing earnings differentials by formal qualification presented in section 1 (see also section 5). Thus, having information on higher education costs may also increase their college applications. Moreover, in Germany, at least one of these students' parents has information on the vocational education and training system, and some of the college-educated parents are first-generation students who often hold double qualifications (first vocational training, then college, see section 2). They may therefore still misperceive the costs of and returns to higher education. We therefore also expect to find that informed students with one-college-educated parent are more likely to apply to college than their uninformed peers.

In contrast, biased expectations about the costs of and returns to higher education may have a smaller or no influence on the application decisions of *students with two-college-educated parents* presumably because of parents' status-maintenance motive, higher economic resources, and/or first-hand parental college information (Breen and Goldthorpe 1997, p. 283; Erikson and Jonsson 1996; Lörz 2012; Reimer and Pollak 2010). Consequently, our information treatment may have no or only a small effect on their application behavior.

The effectiveness of the information treatment, however, may not only differ by parental education but also by students' cognitive and noncognitive skills—for instance, grades, locus of control, and risk aversion. Students with lower grades lack more information (Hossler and Stage 1992, p. 447) and, at the same time, may need more (financial) information to increase their motivation to apply to college (Erikson and Jonsson 1996). Concerning internality-externality of locus of control as an important dimension of noncognitive skills (Rotter 1966), individuals with a higher extent of internality perceive their lives as being more contingent on their own behavior, whereas individuals with a higher extent of externality tend to attribute their lives to luck, fate, and chance (Maqsud 1983). Internality-externality of locus of control is an important determinant of attentiveness to information: Higher internality makes individuals more active in seeking information, whereas individuals with higher degrees of externality are more likely to be influenced by others, for instance, by information provided by third parties (Coleman and DeLeire 2003; Maqsud 1983; Rotter 1966; Seeman 1963). Given these considerations, students with lower grades and a higher degree of externality might therefore benefit more from additional information in terms of their college application decisions than students with higher grades and a lower degree of externality. Concerning *risk aversion*, Obermeier und Schneider (2015) show that higher risk aversion *only* affects the pro-college decisions of students from a lower

socio-economic background but not those of students from a higher socio-economic background.

These information-related mechanisms may particularly affect the educational decisions of less-privileged students because, on average, they have lower grades, higher degrees of externality in their perception of control, and higher levels of risk aversion than privileged students (e.g., Carton and Nowicki 1994; Jensen et al. 1990; Kelley 2008; Obermeier and Schneider 2015; Zwick and Green 2007). We therefore control for these differences.

Finally, in order to be more confident that our 25-minute face-to-face information treatment has indeed contributed to higher application rates—and not just to higher awareness of tertiary education among students as a result of having a face-to-face session in which college issues are discussed—we should find that treated students are indeed better informed about the specific issues that were discussed in the information treatment (i.e., knowledge on available financial aid and returns to higher education) than untreated students.

4. Data and methods

We conducted an experimental panel study—called “Berliner-Studienberechtigten-Panel” (short: Best Up)—that includes a randomized information treatment. We first detail our study (sample and experimental design), then describe the dependent, independent, and control variables, and conclude with information on the statistical methods used in our empirical analyses.

4.1 Data

Best Up is a panel study of Berlin students who attended 27 (of the 137) schools offering the possibility to obtain a university entrance qualification (*Abitur* or *Fachabitur*). Our sample covers the three major school types with university-preparatory tracks in Berlin: It consists of nine university-preparatory high schools (*Gymnasium*), nine comprehensive schools (*integrierte Sekundarschule mit gymnasialer Oberstufe*), and nine upper-level vocational high schools (*berufliches Gymnasium*).¹²

Our study focuses on students from less-privileged families. To obtain a sample with a meaningful number of observations for them, we first stratified Berlin's schools of the abovementioned types using (1) school type; (2) share of population aged 25 and older with low education (according to the international classification of education ISCED 0-2) per sub-district (ranging from 7% to 30% in Berlin); (3) cohort size one year prior to graduation; (4) share of students with migration background; and (5) share of female students as stratifying variables. Afterwards, potential schools were identified that are similar regarding the stratifying variables. Stratification was implemented using coarsened exact matching (CEM) (Iacus et al. 2009). To secure a high(er) number of less-privileged students in our sample, we restricted the sampling to sub-districts characterized by a relatively high share of less-educated adults. It is important to note, however, that residential segregation in Berlin, and Germany in general, is comparatively low. Heavily deprived neighborhoods (e.g., ghettos or slums), as known in other countries, do not (yet) exist in Berlin. With our sampling, we exclude three sub-districts (Zehlendorf, Steglitz, Wilmersdorf) in which the vast majority of

¹² Berlin is one of the two German states in which elementary school ends after grade six. However, 33 out of the 89 *Gymnasium schools* are allowed to enroll excellent students starting in grade five. In these schools, students with non-college-educated parents are likely to be underrepresented. They are therefore not included in our study. So-called *Berufskollegs* (another school type offering the possibility to obtain a college entrance qualification) are also excluded, because they require a completed education and vocational training degree before enrollment.

students at the *Gymnasium* come from two-college-educated and wealthy families.¹³ One advantage of this sampling restriction is that the sampled schools are quite similar (in terms of different characteristics), meaning our comparison between students is less confounded by the potential influence of social differences in school quality or curriculum (e.g., Hossler and Stage 1992, p. 436) and school milieus and peers (e.g., Garg et al. 2002, p. 91)—all factors that might also cause school differences in the provision of information. Restrictions are, however, that we probably overestimate the treatment effect for the group of students with two-college-educated parents as we only consider those who do not attend segregated higher-class schools, and that the sample size for students with two-college-educated parents is low, causing a potential problem of statistical power (see section 4.2 below). However, as our study focuses on less-privileged students, these restrictions are a minor concern.

Restricting our study to Berlin is another advantage. The city's universities enroll a high number of students (about 160,000 in 2012-13). In addition, we know that physical proximity to universities affects participation rates (e.g., Hossler and Stage 1992, p. 435; Spieß and Wrohlich 2010). Berlin has four research universities and 27 universities of applied sciences, all of them easily accessible by public transportation. Thus, our respondents have good conditions to pursue their college intentions—which reduces the risk of a confounding impact of long distances to universities or unequal distances to vocational training and higher education institutions. On the other hand, Berlin is also a very attractive city, and thus competition to get into many programs might be quite intense. However, about 57 percent of

¹³ Berlin is divided into 12 larger administrative districts and 23 sub-districts (12 in West Berlin and 11 in East Berlin) for about 4 million inhabitants. We conducted our study in West Berlin, including 9 of the 12 sub-districts. We excluded all East Berlin sub-districts (except for the vocational high schools, which are organized by occupational field rather than students' residence) to avoid confounding our results by potential differences in educational decision-making by East and West Berliners.

the study programs in Berlin have open admissions policies (National Education Report 2016, p. 295).

By excluding or reducing all of these confounding factors, our sample is ideal to test the *causal* impact of information on less-privileged students' decisions to pursue their college intentions (i.e., to apply to college). The effect size, however, is not representative of college-eligible school leavers in Berlin or in Germany. We therefore apply significance tests only for assessing the strength and the robustness of our estimates.

At each school, we surveyed students who were at the end of their junior year in May/June 2013 (i.e., one year before graduation; panel wave 1). The realized sample size is 1,578 (with a response rate of 60%). The students were re-interviewed three months after the initial survey, that is, at the beginning of the final school year (wave 2: August/September 2013), and shortly after their graduation in June 2014 and right after the deadline for applying to admission-restricted college programs (wave 3: July-September 2014). In our analyses, we mainly use wave 1 (measuring students' educational expectations) and wave 3 (measuring their application decisions).

Our analysis sample is a sub-sample of the total Best Up sample due to three restrictions. First, to answer our research questions, we only consider those students with college intentions in wave 1 ($n=1,185$, i.e., 75% of all participants in wave 1). We measured students' post-high-school intentions by asking the question: "Based on everything you know now: What type of education will you probably pursue after leaving school? If you are planning to do a voluntary social year, an internship, or the like when you finish school, please choose the type of education you will probably pursue afterwards."¹⁴ To answer this question, respondents could choose between different types of higher education institutions

¹⁴ We took this question from the German National Education Panel Study (NEPS, A49_T_Panel_2012©NEPS; see Stocké et al. 2011).

and different types of training programs, or they could select “neither college/university nor training.” *College intention* is defined as students choosing higher education institutions. Our treatment and control groups do not differ in this respect: College intentions were expressed by 73 percent of all treated students who participated in wave 1 and 76 percent of our control group ($p=0.455$).

Second, we excluded 128 cases with missing information on major individual-characteristic variables (college application, parental education, grade average, and locus of control), which leaves us with 627 students with non-college-educated parents and 430 peers with one- or two-college-educated parents.

Third, respondents had to participate at least in waves 1 and 3—otherwise college application decisions could not be detected. Thus, our *final analysis sample* consisted of 428 students with non-college-educated parents—the focus of our study—and 292 peers with one- or two-college-educated parents, respectively (i.e., for both groups, 68% of all respondents with college intentions in wave 1 and valid information). Issues of selective panel attrition will be discussed together with our experimental randomization (see section 4.2).

4.2 Experimental design

We randomly assigned an information treatment to 9 schools—three schools per school type. However, because the treatment could not be carried out in one school, we treated only 8 schools.¹⁵ The remaining 19 schools serve as our control group. The almost equal proportions of students who expressed college intentions at wave 1 (see above) is an indicator of successful randomization at the school level.

¹⁵ The information treatment could not be conducted at one school, which was initially assigned as treatment school, owing to a miscommunication between the headmaster and the teaching staff. We therefore could only survey students in this school and assigned this school to the control group.

The treatment was conducted in a classroom setting, directly *after* students had completed the questionnaires in wave 1. It lasted for about 25 minutes and was given by researchers, who are perceived as credible authorities, thus enhancing students' trust in the information provided (see Kolsto 2001; Morgan 2010; Slack et al. 2014). It consisted of a 20-minute presentation on the earnings and unemployment risks of university graduates versus vocational training graduates for different fields of study and field-related apprenticeship programs, and information about funding opportunities to pay for college in Germany (e.g., *BAföG*, student loans, part-time work while studying, or merit-based scholarships/grants). The presentation was followed by a 3-minute film summarizing what was presented. Students were allowed to ask questions but did not use this opportunity very often.

As a baseline treatment, all respondents received a flyer with some general information on college attendance and a short list of websites on financial aid options (see appendix A). Thus, in line with the common approach in experimental research (see Box et al. 1978, p. 205; Rubin 1974, p. 689), we compare a treatment group that attended the information session with a control group that was only given a list of resources. As the control students did not get the actual information, they had to have enough self-interest to search for additional information on their own. Given the widespread internet use among young people, this baseline treatment leveled out potential differences in knowledge about where to find relevant information. By contrast, our information treatment tests the impact of personally presenting (or providing) relevant information to less-privileged students, regardless of their awareness of lacking information.

We assigned the information treatment randomly to schools instead of individuals. This randomization strategy, common in the field of education, has several advantages: First, potential spill-over effects between treatment and control groups *within* schools are not an issue. Spill-over effects *across* schools (because students from treatment and control schools

might meet outside the schools) cannot be completely ruled out. They are unlikely to occur, however, because (a) our sample includes schools in nine different (larger) sub-districts, (b) Berlin is less centralized (i.e., each sub-district has its own downtown and at least about 75,000 inhabitants), and (c) the highest number of selected schools within one sub-district is four. Second, because of the classroom setting, the experimental design has a rather high external validity compared to lab experiments. Third, this strategy also best simulates a potential policy measure.

In our analyses, 127 students with non-college-educated parents belong to the treatment group and 301 students to the control group. The group with one-college-educated parent has 54 treatment and 110 control students, and the group with two-college-educated parents 30 and 98, respectively. Descriptive information for the treatment and control samples by parental education are documented in tables B1, B2, and B3 in appendix B. These tables reveal that randomizing schools does not automatically result in a perfect randomization of students. Within the group of *students with non-college-educated parents*, we find that the distribution of some characteristics (statistical or substantial) is favorable for treated students (i.e., higher figural cognitive competences, grade average, feeling of being informed about higher education, and a slightly lower level of risk aversion), whereas on average lower perceived parental educational aspirations are unfavorable for them. Moreover, the share of students with a migration background is slightly higher in the treatment group. Given that migrants and their parents have rather high educational aspirations (see Kristen et al. 2008), this higher share might potentially bias the treatment effect. Due to some panel attrition between waves 1 and 3, original differences between treatment and control group increased for figural cognitive competences, grade averages, migration background, and perceived parental educational aspirations; differences decreased for the feeling of being poorly informed about vocational training and higher education (see table B1 in appendix B). For

students *with one- or two-college-educated parents*, we also find increasing and decreasing differences between the treatment and control group (see appendix tables B2 and B3).

Overall, the respondents who participated in waves 1 and 3 are a positively selective group compared to wave 1 (see appendix table B4). Thus, our estimates of the treatment effect seem to be rather conservative, because the effect displays the treatment-control difference between rather higher achieving and motivated students.

To handle distributional differences (due to sample attrition, item-nonresponse, and issues of randomization) between the treatment and control group as well as parental education groups, we include control variables in our analysis (see section 4.4) and use a reweighting strategy (for more details, see section 4.5).

4.3 Dependent and independent variables

Our dependent variable measures whether students pursue their college intentions by actually applying to college immediately after graduation (wave 3). Although some school leavers decide to enter college later, the timing of entry into higher education is an additional dimension of social inequality, because “later entry into college results in foregone earnings” (Weiss and Steininger 2013, p. 190). Furthermore, some studies have shown that delaying enrollment in higher education reduces the likelihood that students will ever go to college (Engle 2007, p. 29).

Application decisions are measured as a dummy variable with 1 for application to college programs (called “college application”) and 0 for application to vocational education and training programs or neither training nor higher education (called “no college application”). Higher education refers to all tertiary educational opportunities, including research universities, universities of applied sciences, and dual study programs (i.e., study

programs in which bachelor's programs are linked to firm-based training programs). By the time of wave 3, students had to have submitted applications to admissions-restricted bachelor's programs if they wanted to start their programs in the fall following their graduation. About half of the programs at German universities have an open admission policy. They do not require applications, meaning that students interested in one of these free-admission programs just enroll until the semester begins. Respondents enrolled in such programs (or with definite plans to do so) are assigned to the category "college application" (55 respondents). If respondents applied to both bachelor and vocational training programs, we classified them as "college application" (n=44). All other respondents are assigned to the category "no college application." Based on this definition among the students with non-college-educated parents, 291 respondents (68%) belong to the "college application" category and 137 respondents (32%) to "no college application" (in the total sample of 720 students: 69% and 31%, respectively).

Our main independent variable is participation in the *information treatment*, coded as 1 for the treatment group and 0 for the control group.

As mentioned above (see section 3), we use parental education as our indicator of students' social background. We define students from less-privileged families as those with neither parent holding a tertiary degree (non-college-educated parents)—the focus of our study.¹⁶ Moreover, we differentiate within the group of privileged students between those with only one parent holding a tertiary degree (one-college-educated parent) and those with both parents holding a tertiary degree (two-college-educated parents).

¹⁶ We assigned the 33 respondents who provided information for one parent only to the group of non- or one-college-educated parent, respectively. If students did not report on their parents' education, we use their parents' responses. Parents' response rate was too low (43.5%), to use the parents' questionnaire for all respondents.

To investigate whether our information treatment influenced students' knowledge of the costs and benefits of higher education we look at two questions. First, in wave 3 we asked respondents for six facts about the federal means-tested financial aid *BAföG* (see section 2) that were partly covered in our information treatment. Second, we use one question concerning relative returns to tertiary degrees compared to completed vocational education and training, adopted from a Canadian study (see appendix in Oreopoulos and Dunn 2013): “Over a lifetime, do you think that a person with a tertiary degree would earn less or more compared to someone who completed vocational education and training?”, with possible responses ranging from 1, “the person with the tertiary degree would earn much less,” to 7, “much more”. We asked this question twice: in wave 1 (pre-treatment) and wave 3.

4.4 Control variables

As discussed in section 3, to account for any potential bias of the effect of our information treatment owing to differences in students' cognitive and noncognitive skills, we control for these differences by including measurements conducted in wave 1. In our reweighting strategy (see section 4.2), we include the *average of grade points* on a scale from 15 (best) to 0 (fail) in students' two advanced courses in the fall/winter semester of their junior high school year. For *locus of control*, we used the 8-item measurement of the GSOEP Youth Questionnaire that contains two independent dimensions: internal and external locus of control (Weinhardt and Schupp 2011, pp. 30-37). An example of an external control item is “What a person achieves in life is above all a question of fate or luck.” We constructed a measure for externality of control by principal factor analysis, which revealed a 2-factor solution that replicates the two factors—internality and externality—in our data set. We then calculated the variable for externality of control by extracting rotated factor scores using the

regression method. Several studies using the same GSOEP items show that these items produced meaningful results (for examples, see Weinhardt and Schupp 2011, pp. 30-37).

We measured *risk aversion* with the question “How do you see yourself: Are you generally a risk-averse person, or willing to take risks?” (0 = I’m absolutely risk-averse to 10 = I’m very willing to take risks) taken from the GSOEP Youth Questionnaire (Weinhardt and Schupp 2011, p. 62). For construct and external validity of this item, see the studies by Dohmen et al. (2011) and Obermeier and Schneider (2015).

To further reduce potential biases caused by distributional differences between the treatment and control group in other potentially decision-related factors, we also consider the following variables: feeling of being informed about higher education, figural cognitive competences, migration background, and parental educational aspirations. For definitions and descriptive statistics for all variables, see tables B1, B2, and B3 in appendix B.

4.5 Methods

With perfect randomization, we would only need *t-tests* for outcome differences between the treatment and the control group (without control variables). Yet as section 4.2 has revealed, the randomization of schools and some selectivity in panel attrition resulted in not perfectly randomized groups at the individual level. Moreover, we have discussed several variables that could intervene into how and why information matters. We therefore adjust distributional differences by using a reweighting strategy. Its basic idea is to address the question: What would be the treatment effect if there were no distributional differences between groups *a* and *b*? We therefore weight group *b* in such a way that it matches the distribution of several variables *x* of group *a*. For obtaining the weights that “balance” the two groups with respect to the set of variables *x*, we use *entropy balancing* (Hainmueller 2012). This technique

reweights our data so that means and higher moments of a variable are matched in the two groups. It is especially appropriate for our small sample because the issue of not covering “statistical twins” does not arise, and is more effective than parametric probit approaches. Significance tests (and standard errors) are adjusted in the reweighted analyses.

Based on this technique, we reweight the control group of students with non-college-educated parents according to the treatment group of students with non-college-educated parents. Thereby we remove all important observed confounders due to imperfect randomization. Moreover, as table B5 (appendix B) shows, even in this rather positively selective group of students, students with non-college-educated parents have lower means of grade-point averages and externality of control than their peers with one- or two-college-educated parents.¹⁷ To ensure that the comparison by parental education is not biased by these and other differences, we also reweight the treatment and control groups of students with one- or two-college-educated parents according to the treatment group of students with non-college-educated parents.

Our reweighting does not address possible unobserved differences between the groups. Yet, in contrast to survey data, we have randomly assigned our treatment and control group, which already excludes some unobserved differences. In addition, as tables B 1-5 (appendix B) indicate, we have searched quite extensively for differences on observables (which are also sometimes proxies for unobservable characteristics), which are theoretically meaningful and are therefore included in our reweighting. The results of the reweighted analyses on several observable characteristics show that our findings are robust.

¹⁷ Risk aversion among respondents with non-college-educated parents is lower (and not higher) than for their schoolmates with two-college-educated parents, as displayed in tables B1-3 (appendix B). One has to keep in mind that we only consider students with two-college-educated parents who attended the same schools as students with non-college-educated parents.

To test for differences between the treatment and control group, we use *one-tailed t-tests* with standard errors clustered on the level of the schools. One-tailed tests are indicated because we assume that only positive or zero treatment effects are theoretically possible.

5. Results

Table 1 reveals that even in our group of students with college intentions and in the German context of comparatively low costs of higher education, more than 40 percent of the students with non-college-educated parents are concerned about financing participation in higher education. Furthermore, about one third of students with one-college-educated parent are concerned about such difficulties, compared to only about 21 percent of their schoolmates with two-college-educated parents (keep in mind that we rather overestimate the concerns of the latter, see section 4.1). These two results suggest that information about financial aid might be important, especially for students with non- and one-college-educated parent.

- Insert table 1 here -

Table 2 shows that only 64.4 percent of the control (uninformed) *students with non-college-educated parents* applied to college. Put differently, 35.6 percent of those college-eligible students with college intentions did not apply. This college intention-application gap is quite substantial.

Looking at the impact of our information treatment, we observe a remarkable difference between the treatment and the control group in the college application rates of students with non-college-educated parents (our treatment effect): The unadjusted college

application rate is about 11.9 percentage points higher for the treated than for the untreated.¹⁸ The effect size is substantial: Our information workshop increased their application rate by 18.4 percent ($11.9/64.4*100$) and reduced the intention-application gap by about one third ($11.9/35.6*100=33.4$). The remaining two thirds are caused by other reasons, most probably economic constraints (see e.g., Barone et al. 2016; Lörz 2012).

Table 2 also reports the adjusted treatment effect, using entropy balancing (see section 4.5). The treatment effect remains stable in terms of significance and size, when controlled for differences between the treatment and the control group. These results strongly support our hypothesis: Informed students with non-college-educated parents are more likely to apply to college than their uninformed peers.¹⁹

- Insert table 2 here -

We now report the results for the two other groups. As expected, the (adjusted) treatment effect for students with one-college-educated parent is positive and significant: Our information treatment increased their likelihood of applying to college by 17.4 percentage points. In contrast, our information treatment did not increase the college application rate of their schoolmates with two-college-educated parents—even for this rather conservative

¹⁸ Further analysis shows that the treatment effect is similar for male and female students (results available upon request).

¹⁹ Moreover, we modified the dependent variable to check whether the effect depends on the timing of college application. We additionally included those who did not apply to college directly after high school graduation but plan to do so after some other activity (except for vocational education and training) into the “college application” category. Even with this modified measurement, we find a substantial treatment effect of about 7 percentage points.

sample of students with two-college-educated parents.²⁰ Yet one has to note that the sample size for their treatment group might not have sufficient statistical power.

We also regressed parental education on the likelihood of applying to college (using the reweighted sub-samples): Among the control students, students with two-college-educated parents were significantly more likely to apply than students with non- or one-college-educated parent ($b=.11$, $p\text{-value}=0.002$, two-tailed test). In contrast, the effect of parental education was not significant for the treated students (which, again, might be due to the small sample size for treated students with two-college-educated parents).

Finally, we look for some indication of whether the treatment effect is related to topics discussed in the information session. Table 3 shows that respondents who participated in our information treatment indeed have more knowledge about *BAföG* (the financial aid option for students from lower-income families) than respondents in the control group: In the treatment group, about 16 percent of the students gave 5 to 6 correct answers, compared to only 7 percent in the control group; in addition, the proportion of students with no or only one correct answer is slightly lower in the treatment than in the control group. Moreover, students from all parental education groups profited from attending the information session: the proportion of correct answers is considerably higher among the treated students from all groups. The largest knowledge gap between treated and control students, however, emerged for students with two-college-educated parents; yet they were also least knowledgeable without attending the presentation, presumably because they need this knowledge least, as most of them are not eligible for this means-tested financial aid.

²⁰ When we include those who did not immediately apply to college but reported future college intentions, we also find a substantial treatment effect only for students with one-college-educated parent (of about 7 percentage points) but not for those with two-college-educated parents.

- Insert table 3 here -

Differentiated between the groups with and without college application, figure 1 reveals two interesting findings: First, within “college application” group, treated and control students differ remarkable and significantly in their knowledge about the means-tested financial aid option *BAföG*, whereas treated and control students without college application do not. This result indicates that applying to college (and, in doing so, maybe also applying for *BAföG*) is not sufficient for having better knowledge of *BAföG*. Second, the knowledge about this financial aid option differs quite substantially only *within* the treatment group: Those who applied to college had more knowledge than those who did not apply. Given that we measured this knowledge in wave 3 (i.e., after the application deadline), this difference seems to indicate that the additional knowledge about *BAföG* acquired in our information session (treatment) increased treated students’ likelihood of applying to college, whereas those treated students who did not apply to college did not absorb additional knowledge compared to the control group.

- Insert figure 1 here -

Table 4 indicates that the information on returns to higher education has also somewhat influenced treated students’ assessment of the relative lifetime earnings of university graduates compared to vocational training graduates: In wave 1, treated students with non-college-educated parents estimated the relative earnings to be much lower than they did in wave 3. In contrast, their untreated peers did not change their assessment in this time period. Treated students with one-college-educated parent, too, had some increase in their

assessment. Thus, earnings assessments of treated students with non- and one-college-educated parent differ from those with two-college-educated parents in wave 1 but not in wave 3 (after the treatment).

- Insert table 4 here -

Finally, table 5 indicates the importance of studying the impact of information deficits on *behavior* and not only on *expectations*. Similar to what Barone et al. (2016) found for Italy, we find that the information treatment did not change the college plans between the end of the junior high school year (pre-treatment) and the beginning of senior year (2-3 months after treatment). The fact that we do not find a treatment effect on college intentions but a significant and substantial treatment effect on application behavior corroborates the idea that although college intentions are a good predictor of students' application behavior, they do not measure actual behavior. Thus, information deficits can influence differently students' intentions and actual behavior.

- Insert table 5 here -

6. Discussion

We examined whether financial information deficits contribute to prevent less-privileged high school graduates with college intentions to apply to college; and whether our low-cost intervention is a means to increase their application rates. The results of our experimental study indicate that information deficits indeed quite substantially keep them from pursuing

their college intentions—regardless of cognitive and noncognitive skills. We also find an increase in the college application rate for students with one-college-educated parent, who also expressed financial concerns regarding college attendance more often than students with two-college-educated parents.

Our analyses also provide insights into the sources of these information deficits. We corroborate the finding by Morgan (2010) that less-privileged students *are often not aware* that they are lacking important and correct information. In our study, all respondents received a flyer pointing out sources of information on financial aid options for higher education (see appendix A). Thus, our control students could have answered the questions about the federal means-tested financial aid option *BAföG* as well as the treated students if they had visited the webpages listed on the flyer. The differences between treated and control students therefore impressively show that person-to-person communication is indeed necessary to distribute important knowledge about higher education to students with non-college-educated parents (even to those with college intentions)—otherwise, they remain unaware of their information deficits.

Our experimental design has some limitations. First, we did not vary the type of additional information—we only provided financial information. Hence, we do not know whether, for instance, information on success rates in higher education, which is another determinant of educational decisions in the rational choice framework (see Barone et al. 2016), would result in lower or higher shares of college applications than financial information, and whether this would also influence the college application rates of less-privileged students.

Second, our sample is not representative of Berlin or Germany, but it resembles the situation in Germany quite well, as shown by similarities in the college application rates of

our control group immediately after graduation (see table 1) and the overall German enrollment rates (after some years of graduation), reported in section 2.

Third, the sample size for students with two-college-educated parents is small, and the sample does not include all groups of these students (see section 4). Our comparison between groups of parental education therefore only provides some indication that information deficits might not distract these privileged students from applying to college.

Fourth, the sample size of our experimental panel study also prevented us from differentiating between students with and without a migration background. The treatment effect might be smaller for migrant students because of their higher educational aspirations compared to non-migrants with the same socioeconomic status, on the one hand, and less information about the German vocational education and training system in their family and peer networks—and thus less “diverting” knowledge from higher education—on the other (Kristen et al. 2008).

Finally, as in most experimental studies, we can conclude that the relative size of the impact of information deficits on the total gap between intention and application is quite substantial, but our analyses do not provide insights into the factors that explain the remaining gap.

7. Conclusions

This is the first experimental and longitudinal study that investigates whether financial information deficits prevent less-privileged students with college intentions to apply to college in a country with low college costs. Internationally, it is one of the very few experimental studies that examine the effects of additional information on the costs of and

returns to higher education on students' application behavior (Bettinger et al. 2012; Hoxby and Turner 2013, 2015).

Our results indicate that biased and lack of information on higher education among less-privileged students substantially contributes to their decisions to enroll in higher education, despite other barriers, such as financial constraints. Given the comparatively low costs of higher education in Germany, combined with substantial returns to tertiary degrees and the availability of an attractive educational alternative (Germany's apprenticeship system), our study supports the idea that information deficits are a *universal and substantial cause* of why a considerable share of college-eligible students from less-privileged families do not pursue their initial plan to attend college.

This conclusion is further supported by the fact that the German school system is highly stratified. According to Mare (1980, 1981), less-privileged students eligible for college *and* intending to attend college are a rather "positively selected" group in terms of academic performance, learning motivation, and parental support. As all of these factors are known to increase the likelihood of college application, our substantial treatment effect for these students strengthens the assertion that financial information deficits influence their decision-making at the end of high school.

We find similar results for students with one college-educated parent—a group that, like students with non-college-educated parents, is concerned about being able to finance their college plans. Our results for students with two college-educated parents seem to indicate that financial information deficits do not influence their college plans; however, future research has to corroborate this finding based on a larger sample size and a representative sample.

An important strength of our experimental study is that our findings are not confounded by differences in information quality and providers—confounders that typically

occur when having to rely on respondents' answers to survey questions on information. Moreover, we could also show that information deficits on costs of and returns to higher education can be reduced by providing less-privileged students with more and correct information.

The treatment effect might be larger in countries with higher relative returns to tertiary degrees. It might be lower, however, in countries where the costs of higher education are so high that less-privileged students cannot bear these costs, regardless of proper information and large returns to tertiary degrees, and where financial aid options are not sufficient to remedy this lack of economic resources. Thus, future comparative research should investigate the impact of information deficits on higher education decisions in different educational systems.

Finally, our study has an important policy implication: It may take as little as a low-cost information session in school to make a difference for college-eligible students from less-privileged families, at least in higher education contexts like Germany's: Face-to-face presentations of correct and detailed information (which may also raise student's awareness of the need to research further information on their own) help increase the likelihood of less-privileged students translating their college intentions into college applications—ultimately resulting in higher college enrollment rates. However, we have to qualify this statement: First, we focused on students with college intentions and provided our information treatment relatively late in their school career, one year before graduation from university-preparatory tracks. Further analyses on the development of college intentions between the junior and senior high school year show that at this late point, students *without* college intentions in junior year are rarely affected by the information treatment (Peter et al. 2016; Peter and Zambre 2016). So our treatment primarily serves to stabilize pre-existing college intentions. Second, the session was given by researchers (as disinterested and professional third parties),

an arrangement that is probably not feasible for a large-scale implementation. It would therefore be interesting for future research to investigate whether teachers trained for such an information session (as in Barone et al. 2016) would be able to achieve a similar impact.

Research ethics: Our research project was approved by the institute management and the data protection unit of the WZB – Berlin Social Science Center, and the Senate for Education, Youth, and Research of Berlin. All participants of the study gave their informed consent, except for the 25-minute information treatment (our experimental intervention).

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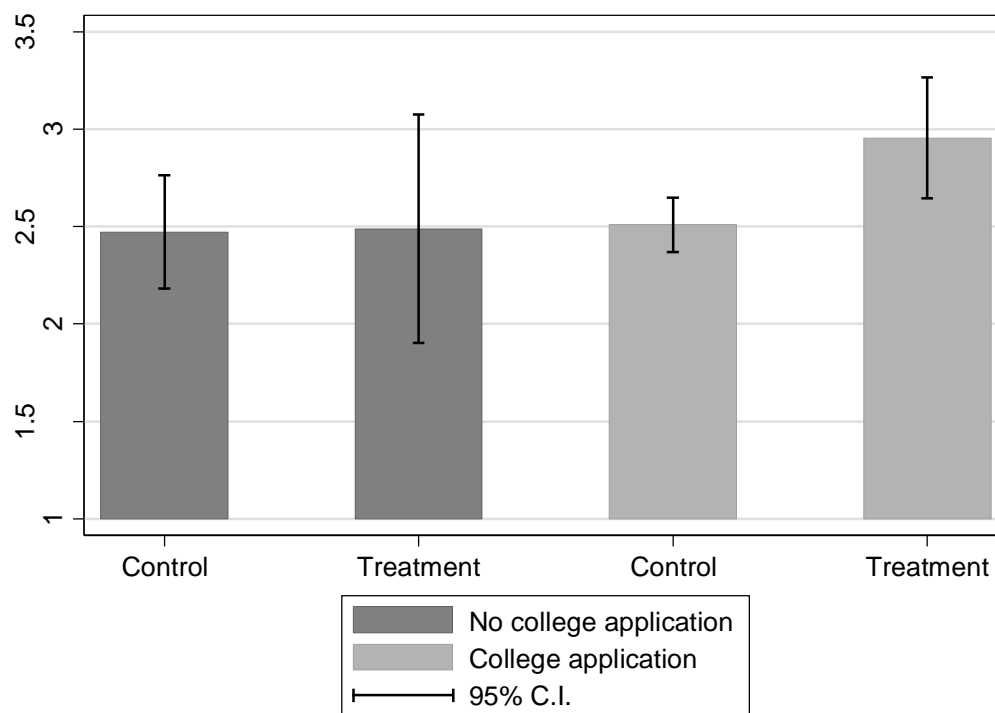
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Figure 1: BAFöG knowledge by treatment (average number of correct answers, measured at wave 3)



N = 637 instead of 720 (due to non-response to this question).

Significance tests of treatment-control differences (p-value, one-tailed test): group of “college application” = 0.006; “no college application” = 0.479; treatment group “college application vs. no college application” = 0.027.

Source: Best Up Study, analytical sample of all parental education groups (i.e., with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Table 1: Respondents’ assessment of the difficulties to finance college by parental education (in row percent, measured at wave 1)

	Very/difficult	Neither nor	Rather/easy
Non-college-educated parents	43.2	32.3	24.5
One-college-educated parent	32.1	32.1	35.8
Two-college-educated parents	21.4	33.3	45.2

“During college, various things need to be paid for (e.g., travel, housing, books, or administrative fees). How difficult would it be for you and your family to pay for such costs?” (Source: NEPS: Q_A40_T_First_2012©NEPS.

Source: Best Up Study, analytical sample (i.e., students with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Table 2: College application decisions by treatment and parental education (measured in wave 3, post-treatment)

	Treatment group (%)	Control group (%)	Unadjusted difference (treatment effect) (p-value)	Adjusted difference (treatment effect) (p-value)
Non-college-educated parents				
College application	76.4	64.4	11.9*	12.4**
No college application	23.6	35.6	(0.014)	(0.009)
<i>N</i>	127	301	428	414
One-college-educated parent				
College application	75.9	63.5	12.3	17.4*
No college application	24.1	36.4	(0.084)	(0.040)
<i>N</i>	54	110	164	161
Two-college-educated parents				
College application	66.7	74.5	-7.8	-11.2
No college application	33.3	25.5	(0.822)	(0.875)
<i>N</i>	30	98	128	124

Cluster corrected p-values: * $p < 0.05$, ** $p < 0.01$, one-tailed test.

Adjustments: grade point average, externality (locus of control), risk aversion, figural cognitive competencies, migration background, perceived parental college expectations, feeling of being informed about higher education, and differences between parental education groups (see section 5).

Source: Best Up Study, analytical sample (i.e., students with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Table 3: BAFöG knowledge by treatment and parental education (in percent of correct answers, measured at wave 3)

Number of correct answers	All	Treatment group			Control group			
		Non-college-educated	One-college-educated	Two-college-educated	All	Non-college-educated	One-college-educated	Two-college-educated
0-1	22.7	25.2	23.9	10.7	28.5	29.0	22.7	33.7
2-4	61.6	61.3	63.1	60.7	64.4	63.0	73.3	58.4
5-6	15.7	13.5	13.0	28.6	7.1	8.0	4.0	7.9

$N=637$ (instead of 720 due to non-response to this question).

p-value (one-tailed test): treatment vs. control group = 0.013;

p-values (two-tailed test): differences between parental education groups within treatment group = 0.119;

differences between parental education groups within control group = 0.749.

Source: Best Up Study, analysis sample (i.e., students with college expectation in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Table 4: Respondents' assessment of relative life time earnings of college/university graduates compared to those with completed vocation training by treatment and parental education (means of scale 1 = much less till 7 = much more)

	Treatment group	Control group	Treatment effect (difference)
Non-college-educated parents (n=381)			
Pre-treatment (wave 1)	4.88	4.78	
Post-treatment (wave 3)	5.14	4.88	
<i>Difference within groups</i>	<i>0.26</i>	<i>0.1</i>	<i>0.16 (p = 0.118)</i>
One-college-educated parent (n=148)			
Pre-treatment (wave 1)	4.96	4.57	
Post-treatment (wave 3)	5.17	4.78	
<i>Difference within groups</i>	<i>0.21</i>	<i>0.21</i>	<i>0.001 (p = 0.494)</i>
Two-college-educated parents (n=118)			
Pre-treatment (wave 1)	5.19	4.77	
Post-treatment (wave 3)	5.07	5.07	
<i>Difference within groups</i>	<i>-0.11</i>	<i>0.30</i>	<i>-0.41 (p = 0.078)</i>
Differences between non- and two-college-educated parents			
Pre-treatment (wave 1)	0.31	-0.01	
Post-treatment (wave 3)	-0.07	0.19	

N=647 instead of 720 (due to non-response to this question), one-tailed test.

Source: Best Up Study, analytical sample (i.e., students with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Table 5: College intentions measured in wave 2 (2-3 months after treatment) conditional on college intention in wave 1 (pre-treatment) by treatment and parental education

	Treatment group (%)	Control group (%)	Unadjusted difference (treatment effect) (p-value)	Adjusted difference (treatment effect) (p-value)
Non-college-educated parents				
Stable college intention	88.9	87.5	1.5	4.8
No college intention	11.0	12.5	(0.325)	(0.062)
<i>N</i>	<i>109</i>	<i>256</i>	<i>365</i>	<i>355</i>
One-college-educated parent				
Stable college intention	93.5	93.6	-0.1	0.5
No college intention	6.5	6.4	(0.507)	(0.439)
<i>N</i>	<i>46</i>	<i>93</i>	<i>139</i>	<i>136</i>
Two-college-educated parents				
Stable college intention	89.7	94.4	-4.8	-4.7
No college intention	10.3	5.6	(0.818)	(0.817)
<i>N</i>	<i>29</i>	<i>90</i>	<i>119</i>	<i>115</i>

Cluster corrected p-values: * p < 0.05, ** p < 0.01, one-tailed test.

Adjustments: grade point average, externality (locus of control), risk aversion, figural cognitive competencies, migration background, perceived parental college expectations, feeling of being informed about higher education, and differences between parental education groups (see section 5).

n = 606 (instead of 720 due to non-participation in wave 2), lower sample size for adjusted difference due to additional item non-response in control variables.

Source: Best Up Study, analytical sample (i.e., students with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Appendix A: Baseline treatment

Page 1

Informationen zur Zeit nach dem Abitur



Nach dem Abitur haben Sie vielfältige Möglichkeiten Ihren weiteren Bildungsweg zu gestalten. Ob Sie z.B. an einer Universität oder Fachhochschule ein Studium beginnen oder doch lieber eine Ausbildung bzw. ein duales Studium als Kombination aus beidem absolvieren möchten, bleibt Ihnen überlassen. Wichtig bei der Entscheidung ist die Berücksichtigung der eigenen Interessen und Fähigkeiten.

Tests wie der Abi-Powertest der Berufsinformationszentren (BIZ) können helfen, Ihre individuellen Stärken herauszufinden.

→ <https://powertest.abi.de>



Orientierung ...

Wie können Sie nun am besten den richtigen Weg finden? Die Beratungsangebote sind genauso umfangreich wie die Möglichkeiten. Wir haben Ihnen hier eine kleine Auswahl zusammengestellt.

<p style="text-align: center; color: orange;">... im Berufsinformationszentrum</p> <p>Neben persönlicher Beratung bieten die Berufsinformationszentren zu den vier Themenbereichen „Arbeit und Beruf“, „Ausbildung und Studium“, „Bewerbung“ und „Ausland“ Informationen in Form von Büchern und Informationsmappen.</p> <p>(Termine können Sie persönlich oder telefonisch vereinbaren www.arbeitsagentur.de)</p>	<p style="text-align: center; color: orange;">... im Internet</p> <p>Außerdem besteht die Möglichkeit auf den Internetseiten des BIZ einen Überblick über die unterschiedlichen Wege zur Berufsqualifizierung zu erhalten.</p> <ul style="list-style-type: none">→ www.abi.de→ www.studienwahl.de→ www.planet-beruf.de→ www.ba-auslandsvermittlung.de <p>Die Bildungspolitik ist in Deutschland von Bundesland zu Bundesland teils unterschiedlich. Daher lohnt es sich, je nach dem, in welchem Bundesland Sie Ihr Studium beginnen möchten, sich bundeslandspezifisch zu informieren, z.B. für Berlin auf www.studieren-in-bb.de/</p>	<p style="text-align: center; color: orange;">... auf Messen</p> <p>In Berlin finden jedes Jahr eine Reihe von Messen statt, auf denen Sie auf neue Ideen kommen können oder sich konkret zu Ihrem gewünschten Weg informieren können.</p> <ul style="list-style-type: none">→ Stuzubi: www.stuzubi.de→ Einstieg: www.einstieg.com→ Study World→ u.v.m.
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Informationen zusammengestellt im April 2013 durch:  **WZB**
Wissenschaftszentrum Berlin für Sozialforschung

Page 2

An der Hochschule

Sollten Sie sich für ein Studium an einer Hochschule oder Fachhochschule entscheiden, werden viele neue Eindrücke auf Sie zukommen.

Die meisten Hochschulen und Fachhochschulen bieten daher Informationstage für zukünftige Studierende an. Auch die jeweiligen Studierendenberatungen stehen Ihnen offen.

Die Studentenwerke unterstützen Sie bei den Herausforderungen, die mit der Aufnahme eines Studiums zusammenhängen, wie die Wohnungs- oder Jobsuche, das Ausfüllen eines BAföG-Antrages etc.

→ www.studentenwerk-berlin.de

Tipps & Tricks zur Studienbewerbung

Bewerbung direkt an der Hochschule:

Für die meisten Studienfächer können Sie sich direkt an der gewünschten Hochschule bewerben. Allerdings können sie an jeder Hochschule höchstens drei Studienfächer wählen.

Im Allgemeinen werden Sie sich zunächst über Onlineformulare auf der Internetseite der Hochschule bewerben, die sie dann an das jeweilige Sekretariat senden. Für die Zulassung zu manchen Studiengängen müssen Sie zusätzliche Aufgaben erfüllen, z.B. eine Mappe einreichen, an einem Gespräch oder einem Test teilnehmen. Bei Fragen können Sie sich jederzeit bei der Studienberatung der ausgewählten Hochschule melden.

Wichtig ist es die Bewerbungsfristen und Zulassungsvoraussetzungen zu beachten. Normalerweise endet die Bewerbungsfrist für das Wintersemester am 15. Juli. Zudem erhöhen Sie Ihre Chancen einen Studienplatz für Ihr Wahlstudienfach zu bekommen, wenn Sie sich auch außerhalb von Berlin bewerben.

Bewerbung bei der Stiftung für Hochschulzulassung:

Die Studienplätze für die Fachrichtungen Medizin, Tiermedizin, Zahnmedizin und Pharmazie werden von einer Zentralstelle zugewiesen. Das Bewerbungsformular finden Sie unter

→ www.hochschulstart.de

Finanzierungsmöglichkeiten

Oft kreisen sich die ersten Gedanken zur Weiterbildung um die Kosten. Doch sowohl für ein Studium, als auch für berufliche Ausbildungen gibt es Möglichkeiten zur finanziellen Unterstützung. Inwieweit Sie diese nutzen können, erfahren Sie auf den folgenden Homepages.

→ www.bafoeg.bmbf.de

→ www.mystipendium.de

→ www.studienkredit.de

Auszug aus einer der genannten Internetseiten:



Was es sonst noch gibt

Zusätzlich zu den offiziellen Stellen können auch der Austausch mit Studierenden bzw. deren Erfahrungen eine wertvolle Informationsquelle für Ihre Entscheidung sein.

→ <http://blogs.dw.de/bildungswege/>

→ www.arbeiterkind.de/



Appendix B: Descriptive information

Appendix Table B1: Students with non-college-educated parents—descriptive information of treatment and control groups (pre-treatment, wave 1)

Variables	Treatment group (n=127)	Control group (n=301)	p-value	N
Mean (std dev) of verbal cognitive competences ^{a)}	9.6 (2.83)	9.4 (2.94)	0.745	427
Mean (std dev) of figural cognitive competences ^{a)}	11.3 (2.92)	10.5 (2.83)	0.061	425
Mean (std dev) of risk aversion	5.6 (2.23)	5.8 (2.17)	0.212	425
Mean (std dev) of grade averages, one year before graduation	9.7 (2.07)	9.3 (2.16)	0.175	428
Mean (std dev) of external locus of control	0.07 (1.02)	0.05 (0.99)	0.910	428
Migration background				426
No parent with migration background	38.9 %	45.3 %	0.683	(185)
At least one parent with migration background	61.1 %	54.7 %		(241)
Gender				428
Female	60.6 %	58.5 %	0.728	(253)
Male	39.4 %	41.5 %		(175)
Educational expectations of friends				427
Vocational education & training (VET) program	37.8 %	41.7 %	0.507	(173)
College attendance	62.2 %	58.3 %		(254)
Perceived parental educational aspirations (highest degree they would wish for their children)				421
VET degree	22.4 %	16.2 %	0.299	(76)
College/university degree	77.6 %	83.8 %		(345)
Presence and subjective assessment of usefulness of a school subject on “career guidance and vocational				

orientation”				416
Not offered	32.5 %	40.7 %	0.372	(159)
Offered, not useful	24.4 %	24.2 %	0.531	(101)
Offered, partly useful	19.5 %	20.1 %	0.354	(83)
Offered, useful	23.6 %	15.0 %	0.191	(73)
Self-reported level of information: How well do you [respondent] feel informed about VET system?				411
(Very) poorly informed	31.1 %	34.3 %	0.585	(137)
Neither well nor poorly informed	38.7 %	36.3 %	0.455	(152)
(Very) well informed	30.3 %	29.5 %	0.897	(122)
How well do you [respondent] feel informed about higher education system?				421
(Very) poorly informed	22.4 %	33.3 %	0.045*	(128)
Neither well nor poorly informed	34.4 %	29.3 %	0.281	(129)
(Very) well informed	43.2 %	37.3 %	0.281	(164)

Cluster corrected p-values: * $p < 0.05$, two-tailed test; std dev = standard deviation

^{a)} So called Intelligence-Structure-Test IST 2000R (Amthauer et al. 2001).

Source: Best Up Study, analytical sample of students with non-college-educated parents (i.e., with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Appendix Table B2: Students with one-college-educated parent—descriptive information of treatment and control groups (pre-treatment, wave 1)

Variables	Treatment group (n=54)	Control group (n=110)	p-value	N (164)
Mean (std dev) of verbal cognitive competences ^{a)}	10.1 (2.80)	9.7 (2.90)	0.551	164
Mean (std dev) of figural cognitive competences ^{a)}	11.1 (2.41)	11.3 (2.81)	0.781	164
Mean (std dev) of risk aversion	5.9 (2.42)	5.5 (2.11)	0.422	165
Mean (std dev) of grade averages, one year before graduation	9.3 (2.20)	9.4 (2.28)	0.747	164
Mean (std dev) of external locus of control	0.07 (1.06)	-0.03 (1.06)	0.549	164
Migration background				163
No parent with migration background	46.3 %	56.9 %	0.424	(87)
At least one parent with migration background	53.7 %	43.1 %		(76)
Gender				164
Female	59.3 %	63.6 %	0.576	(102)
Male	40.7 %	36.4 %		(62)
Educational expectations of friends				165
Vocational education & training (VET) program	32.1 %	37.3 %	0.592	(58)
College attendance	67.9 %	62.7 %		(105)
Perceived parental educational aspirations (highest degree they would wish for their children)				163
VET degree	17.0 %	10.9 %	0.344	(21)
College/university degree	83.0 %	89.1 %		(142)
Presence and subjective assessment of usefulness of a school subject on “career guidance and vocational orientation”				158
Not offered	28.9 %	43.4 %	0.176	(61)
Offered, not useful	19.2 %	28.3 %	0.033*	(40)
Offered, partly useful	23.1 %	17.0 %	0.806	(30)
Offered, useful	28.9 %	11.3 %	0.024*	(27)
Self-reported level of information:				

How well do you [respondent] feel informed about VET system?				162
(Very) poorly informed	27.8 %	33.3 %	0.508	(51)
Neither well nor poorly informed	29.6 %	29.6 %	1.000	(48)
(Very) well informed	42.6 %	37.0 %	0.492	(63)
How well do you [respondent] feel informed about higher education system?				164
(Very) poorly informed	24.1 %	26.4 %	0.789	(42)
Neither well nor poorly informed	29.6 %	33.6 %	0.535	(53)
(Very) well informed	46.3 %	40.0 %	0.391	(69)

Cluster corrected p-values: * $p < 0.05$, two-tailed test; std dev = standard deviation.

^{a)} So called Intelligence-Structure-Test IST 2000R (Amthauer et al. 2001).

Source: Best Up Study, analytical sample of schoolmates with one-college-educated parent (i.e., with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Appendix Table B3: Students with two-college-educated parents—descriptive information of treatment and control groups (pre-treatment, wave 1)

Variables	Treatment group (n=30)	Control group (n=98)	p-value	N (128)
Mean (std dev) of verbal cognitive competences ^{a)}	11.3 (2.78)	11.3 (2.68)	0.998	128
Mean (std dev) of figural cognitive competences ^{a)}	11.0 (2.28)	11.2 (2.86)	0.599	128
Mean (std dev) of risk aversion	5.1 (1.63)	5.6 (2.41)	0.118	128
Mean (std dev) of grade averages, one year before graduation	10.4 (1.84)	10.5 (2.12)	0.838	128
Mean (std dev) of external locus of control	-0.07 (0.83)	-0.24 (0.09)	0.290	128
Migration background				127
No parent with migration background	43.3 %	60.8 %	0.261	(72)
At least one parent with migration background	56.7 %	39.2 %		(55)
Gender				128
Female	56.7 %	55.1 %	0.918	(57)
Male	43.3 %	44.9 %		(71)
Educational expectations of friends				127
Vocational education & training (VET) program	36.7 %	30.9 %	0.451	(41)
College attendance	63.3 %	69.1 %		(86)
Perceived parental educational aspirations (highest degree they would wish for their children)				125
VET degree	16.7 %	12.6 %	0.472	(17)
College/university degree	83.3 %	87.4 %		(108)
Presence and subjective assessment of usefulness of a school subject on “career guidance and vocational orientation”				121
Not offered	42.9 %	48.4 %	0.556	(57)
Offered, not useful	21.4 %	26.9 %	0.369	(31)
Offered, partly useful	7.1 %	13.9 %	0.131	(15)
Offered, useful	28.6 %	10.8 %	0.013*	(18)
Self-reported level of information:				
How well do you [respondent] feel informed about VET system?				126
(Very) poorly informed	30.0 %	45.8 %	0.137	(53)
Neither well nor poorly informed	36.7 %	30.2 %	0.531	(40)
(Very) well informed	33.3 %	24.0 %	0.511	(33)
How well do you [respondent] feel informed about				

higher education system?				128
(Very) poorly informed	26.7 %	30.6 %	0.582	(38)
Neither well nor poorly informed	30.0 %	34.7 %	0.537	(43)
(Very) well informed	43.3 %	34.7 %	0.443	(47)

Cluster corrected p-values: * $p < 0.05$, two-tailed test; std dev = standard deviation.

^{a)} So called Intelligence-Structure-Test IST 2000R (Amthauer et al. 2001).

Source: Best Up Study, analytical sample of schoolmates with two-college-educated parents (i.e., with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.

Appendix Table B4: Differences in characteristics of treatment and control groups between the total sample participating in wave 1 and the sub-sample participating in wave 1 and 3 (analytical sample), by parental education

Variables	Non-college-educated parents	One-college-educated parent	Two-college-educated parents
Mean (std dev) of verbal cognitive competences ^{a)}	-0.070 (+/+*)	0.250 (+/-)	-0.382 (+/+)
Mean (std dev) of figural cognitive competences ^{a)}	0.224 (+*/+)	-0.087 (+/+)	-0.089 (+/+)
Mean (std dev) of risk aversion	0.070 (-/+)	-0.122 (-*/-*)	0.466 (-*/-*)
Mean (std dev) of grade averages, one year before graduation	0.143 (+*/+*)	-0.126 (+/-)	-0.192 (+*/+*)
Mean (std dev) of external locus of control	0.004 (-/-)	-0.010 (-/+)	0.181 (+/-*)
Migration background ^{b)}			
At least one parents with migration background	3.73 (-/-*)	-7.84 (-/+)	-2.67 (-/-)
Gender ^{b)}			
Female	1.00 (-/+)	1.98 (+/+*)	0.88 (+/+)
Educational expectations of friends ^{b)}			
College attendance	-0.16 (+/+*)	4.87 (+/+)	-2.23 (+/+)
Perceived parental educational aspirations ^{b)} (highest degree they would wish for their children)			
College/university degree	1.87 (-/-)	1.80 (+/+)	3.53 (-/+)
Self-reported level of information ^{b)} :			
How well do you [respondent] feel informed about VET system?			
(Very) poorly informed	-2.98 (+/-)	2.60 (-/+)	.21 (-/-)
Neither well nor poorly informed	0.58 (+/+)	2.95 (+/-)	-0.59 (-/-)
(Very) well informed	-3.56 (-/+)	-0.28 (-/+)	0.80 (+/+)
How well do you [respondent] feel informed about higher education system? ^{b)}			
(Very) poorly informed	-2.08 (+/-)	0.31 (+/+)	1.91 (-/-)
Neither well nor poorly informed	-3.50 (-/-)	1.83 (+/+)	4.66 (-/+)
(Very) well informed	1.43 (+/+)	1.49 (-/-)	6.58 (+/-)
N (participation in wave 1)	627	250	178
N (participation in wave 1 and 3)	428	164	128

Absolute differences = |treatment – control, total sample wave 1| - |treatment – control, analytical sample|; positive differences indicate larger treatment-control-group differences in our analytical sample than the total sample of wave 1; negative differences indicate smaller differences in analytical sample than total sample of wave 1.

In parenthesis: + = participants in wave 3 showed higher values, - = participants in wave 3 showed lower values than non-participants in wave 3. First = treatment, second = control group.

* $p < 0.05$, two-tailed test.

^{a)} So called Intelligence-Structure-Test IST 2000R (Amthauer et al. 2001).

^{b)} In percentage points.

Source: Best Up Study, sample of students with college intentions in wave 1, no missing values in central variables; own calculations.

Appendix Table B5: Means of grade-point averages and externality of control by parental education

	Non-college- educated parents	<i>Diff.</i>	One-college- educated parent	<i>Diff.</i>	Two-college- educated parents
Mean grade averages	9.39 (.169)	-1.10** (.196)	9.39 (.258)	-1.11** (.296)	10.50 (.201)
Mean of locus of control	0.06 (.059)	0.26* (.086)	-0.003 (.073)	0.21 (.106)	-0.20 (.060)

Measured at wave 1 (one year before graduation). N = 720.

Cluster corrected standard errors in parentheses; * p < 0.05; ** p < 0.001, two-tailed test.

Diff. = Difference to students with two-college-educated parents.

Source: Best Up Study, analytical sample (i.e., students with college intentions in wave 1, no missing values in central variables, and participation in waves 1 and 3); own calculations.