

Herber, Stefanie P.; Kalinowski, Michael

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Non-take-up of Student Financial Aid: A Microsimulation for Germany

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Non-take-up of Student Financial Aid: A Microsimulation for Germany

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Abstract

This paper estimates the percentage of students who do not take up their federal need-based student financial aid entitlements and sheds light on determinants of this behavior. Against the background that educational mobility in Germany is low although extensive student financial aid for needy students is available, it is crucial to know whether students assert their claims for student aid at all. To investigate this, we set up a microsimulation model for the German Socio-Economic Panel Study 2002-2013 and estimate the respective aid amounts students would have received, had they filed an application for need-based aid. The results indicate that about 40% of the eligible low-income students do not take up their entitlements. We employ instrumental variable techniques and a sample selection model to consider several potential explanatory factors for this behavior. Our results suggest that non-take-up is inversely related to the level of benefits, though the elasticity is rather low. Apart from that, a shorter expected duration of benefit receipt is related to a higher non-take-up rate, whereas the possibility to draw upon older siblings' claiming experience when completing the complex application for aid is associated with higher probabilities to claim. Moreover, we find robust evidence that significantly more students socialized in the former socialist East Germany choose to take up student aid than similar West German students. Finally, in line with behavioral economic theory, debt aversion of highly impulsive and impatient students is associated with higher rates of non-take-up.

JEL: I22; I23; I24; I38

Keywords: non-take-up of social benefits; welfare program participation; federal student aid; student loans; microsimulation; behavioral economics; debt aversion; self-control

1 Introduction and background

Imagine you are a needy student and the government offers you about EUR 38,000 to finance your studies at the following conditions: Given your earnings five years after

finishing your studies are sufficiently high, you have to repay 20% of the present value in small rates over the next 20 years.¹ Would you accept the offer?

From a traditional economic perspective you definitely should claim the money. This paper shows, however, that about two fifths of the eligible German students turn down the offered means-tested student financial aid amounts, called “BAföG”. We draw upon rich household data from the German Socio-Economic Panel Study for the years 2002 to 2013 to calculate individual taxes and net incomes in a detailed microsimulation model. From this, we calculate the student financial aid amount non-claimants would have received to shed light on those who turn down the lucrative offers. We moreover give some insights into potential determinants of this seemingly irrational behavior.

Why is it important to study non-take-up of means-tested student financial aid? BAföG aims at reducing inequalities in educational opportunities for students from low-income families. Federal need-based aid would miss its targets if its construction prevented eligible students from claiming their benefits and consequently endangered their enrollment at university or fostered later drop out. Previous research shows indeed that, also for Germany where studying is relatively inexpensive, financial factors are related to students’ lower transition rates to university (Schindler and Reimer, 2010; Hübner, 2012) and the intergenerational educational mobility is low (OECD, 2014, p. 93). Moreover, students who decide in favor of studying but against taking up need-based aid have to spend a considerable time on working to earn their living. This is generally associated with a higher likelihood to prolong studying (Avdic and Gartell, 2015), dropping out without a degree (Triventi (2014) provides a review) and performing worse academically (Stinebrickner and Stinebrickner, 2003; Callender, 2008). Against the background that completing higher education goes in hand with a non-trivial monetary return, the so-called “sheepskin effect” (Heckman et al., 2006, e.g.), social inequalities can corroborate even if students make their way to university. Evidence on the existence of non-take-up or its low elasticity with respect to the benefits available would moreover contribute to explaining the low responsiveness of students’ university enrollments to higher student financial aid amounts in industrialized countries (Dynarski, 2002; Rubin, 2011; Steiner and Wrohlich, 2012). Last but not least, our results have consequences for researchers and policy makers wanting to anticipate or evaluate student financial reforms. As shown by Wiemers (2015), ignoring non-take-up when considering an increase in social assistance benefits leads to striking overestimation of the fiscal costs and the number of (factual) beneficiaries involved.

We contribute to two separate strands of literature on non-take-up: One large strand of literature investigates non-take-up of social benefits, especially social assistance,

¹ The numbers are in present values, calculated at an interest rate of 2%, see Grave and Sinning (2014).

unemployment, and pension benefits. This literature builds mainly on a straightforward utility maximization of consumers who take up as long as the expected benefits to do so exceed the anticipated claiming costs (Moffitt, 1983; Blundell et al., 1988; Anderson and Meyer, 1997).² Previous studies found that the benefits amount available as well as the anticipated duration (Anderson and Meyer, 1997) of support increase the probability that people take up. The counterweight to these encouraging factors are barriers especially introduced by high transaction costs associated with the claiming process, such as complex forms (Currie, 2004), but also information gaps (Strauss, 1977) and stigma costs (Weisbrod, 1970; Moffitt, 1983). The unifying feature of this literature is that benefit amounts have to be calculated for those who do not claim the benefits and for whom data on benefits received is naturally unavailable. Explaining non-take-up requires then finding suitable proxy variables for the expected costs and benefits of (not) taking up.

Although we stick, methodologically, to this strand of literature, we combine it with insights from a second, separate, strand concerned with debt-averse behavior and students' under-usage of student financial aid, mostly students loans.

So far, only few papers have investigated non-take-up of means-tested student financial aid. Among the related previous studies, Kofoed (2015) draws upon data from the National Center for Education Statistics. The dataset already contains imputed needs for students who did not file the Free Application for Federal Student Aid (FAFSA) needed to apply for most federal student aid programs in the US. He finds that about one fifth of eligible US-students fail to complete the FAFSA. Although a minor share of the non-takers receives financial assistance from elsewhere (King, 2006; Kofoed, 2015), students still forgo significant amounts of aid they would have been entitled to (Kofoed, 2015). His results are in line with previous descriptive evidence of King (2006). Bird and Castleman (2014) show that even after having completed the application process once, 20% of eligible first-semester Pell Grant recipients do not re-file the FAFSA in the subsequent year.

Existing US-studies do not account for the potential endogeneity likely to arise from omitted variables driving both the levels of means-tested benefits and the decision to claim the money. We contribute methodologically to this literature by addressing endogeneity with instrumental variable regression and a sample selection model. More specifically, we instrument the factual, means-tested benefit amount with the BAföG system's generosity and with an indicator for whether the student is independently funded. The latter implies that the student worked before enrolling and has higher current income or wealth to be deducted from the means-tested aid amount, but also that parents' income is not considered in the means test. Our sample selection model relies

² An extensive review of the literature is beyond the scope of this article. Currie (2004), Hernanz et al. (2004) and Finn and Goodship (2014) provide comprehensive reviews.

on the exclusion restriction that students having completed a vocational training before studying are more likely to earn high incomes when studying and selecting themselves out of the sample of eligible, needy students.

Apart from that, we are not aware of any study analyzing systematically why students forgo these substantial aid amounts. Previous studies provide, however, mixed evidence as to whether information constraints and complexity of the claiming process can explain non-take-up of student financial aid (Bettinger et al., 2012; Booij et al., 2012; Herber, 2015), while the results are heavily dependent on the design of the aid scheme.

Furthermore, non-take-up may be higher if student aid is provided as a loan but students are not inclined to bear the psychological costs of having debts (Field, 2009; Oosterbeek and van den Broek, 2009; Cho et al., 2015).³ This debt aversion is mainly driven by risk aversion and the fear to be unable to repay the loan, but also by cultural differences (Boatman et al., 2014). With respect to the zero interest loans studied in this paper, debt averse behavior is possible (and rational) for individuals who are willing to save but lack self-control to prevent overspending of the benefits amounts (Cadena and Keys, 2013).⁴

For the German case we are looking at here, only some descriptive insights from a broad survey of students hint at possible reasons why students do not file the application for BAföG (Middendorff et al., 2013, p. 312). Unfortunately, the data do not allow to distinguish between eligible and ineligible students so that it is not surprising that the most frequently reported reasons are high incomes of parents' or partners' (80%), high own incomes and assets (30%) and low anticipated benefits (14%). Yet, 25% of the students also name debt aversion as reason for why they did not file an application – information constraints are however not questioned.

Our study confirms the previous robust finding that longer expected duration of benefits receipt and higher benefits are an important factor of higher take-up rates. Nevertheless, the elasticity of the level of benefits with respect to the probability not to take up BAföG amounts is rather inelastic with an estimate of -0.41 . Furthermore, our analyses yield very robust evidence that students socialized by East German parents are considerably less likely to turn down the money, controlling for various characteristics of the students and their parents. Moreover, in line with findings from behavioral economics suggesting that students at risk to exert too little self-control to restrict their consumption to necessary expenditures (Thaler and Shefrin, 1981; Cadena and Keys, 2013), we detect

³ Note however that, contrary to BAföG, most loans are supplementary and not means-tested.

⁴ Cadena and Keys (2013) exploit that eligible US-students who have to pay for room and board and live off-campus can receive a part of the interest-free Stafford loan payed in cash rather than as a credit to their university account. The authors show that if students regard different assets as nonfungible and lack self-control to limit their expenses to prevent overspending, non-take-up can be a rational reaction to avoid overspending.

debt-averse behavior of students low in self-control and high in impatience. Last, being able to draw upon older siblings' experience with filing the aid applications is related to substantially lower non-take-up probabilities.

The rest of the paper proceeds as follows: After giving an overview of the German funding scheme BAFöG, we elaborate on potential explanations for non-take-up and suitable proxy variables, drawing upon the literature presented above and with an eye on the restrictions of our data. We define the non-take-up rate and outline the empirical models in section 4. A description of the data and the sample follows, before we present results in section 6 and robustness checks in section 7. We close with the discussion. The appendices provide more detailed information on the official calculation of the BAFöG benefits (section 9.1), how we simulate these benefits (section 9.2), and additional sensitivity analyses for our microsimulation model (section 9.3).

2 The German BAFöG scheme for higher education students

Need-based income-contingent aid as of the Federal Training Assistance Act, called “BAFöG”, was introduced in 1971 to provide equal educational opportunities to all students, irrespective of their social or financial background. While a special form of BAFöG is available under certain conditions for students at (higher) secondary schools, this paper is concerned only with the classical target group of BAFöG, namely students enrolled in higher education. For students in higher education, funding is generally provided for the student's standard period of studying and thought to support the costs of living and studying. BAFöG is the most common form of financial aid for higher education students in Germany: In 2014, BAFöG supported approximately 647,000 students in higher education at public expenses of about EUR 2.28 billion (Federal Statistical Office, 2015, p.32). Based on the most recently available official data of 2012 (German Bundestag, 2014), 66.7% of all students were generally eligible for BAFöG, i.e. they met the prerequisites to apply but might be rejected if not passing the means test. 28% of these generally eligible received funding – this equaled 17% of all enrolled students in Germany. As can be seen from figure 1, the shares of funded students by the generally eligible (upper line) and by the number of all students (lower line) show an upward trend since 1998. The line patterns reflect the BAFöG reforms of 2001, 2008 and 2010 (see tables 8 and 9 for details). The reforms increased the relative scope of BAFöG by raising basic allowances of incomes, i.e. the amounts excluded from the means test, and made BAFöG relatively more attractive by increasing the available aid amounts. Yet, the BAFöG scheme is neither indexed to the

development of incomes/assets nor inflation-adjusted so that reforms are rather used as readjustment to higher price and income levels.

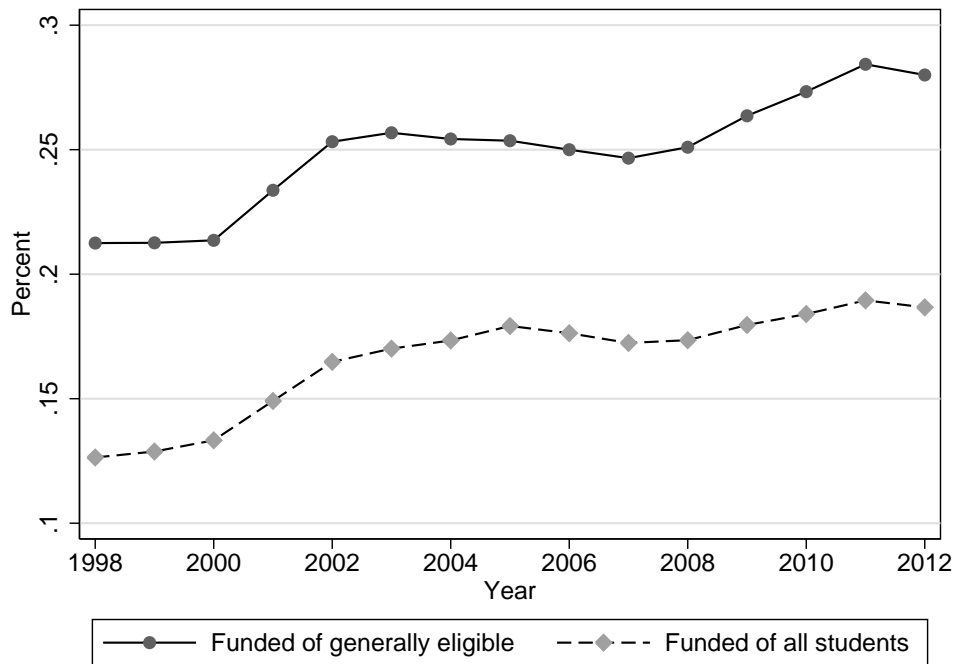


Figure 1:
Shares of students funded by BAföG as share of the generally eligible and all students in Germany

Notes: Own figure based on the numbers reported in German Bundestag (2014) and German Bundestag (2010).

BAföG is designed as a grant-loan combination: Half of the amount is generally granted as a subsidy, the other half as a federal zero interest loan. The loan must be repaid within 20 years after a grace period of five years in installments of at least EUR 105 a month. BAföG provides insurance against default risks inasmuch as the repayment is capped at EUR 10,000 and its start can be delayed in case the claimant's monthly income does not exceed EUR 1,070 if he or she is single. The maximum repayment burden for students with very low incomes amounts therefore to 9.8%. This burden is in range with proportions of debt usually considered reasonable and bearable (Baum and Schwartz, 2006). Graduates repaying their loan upfront can moreover save money worth up to half of their debts. Grave and Sinning (2014) sum all direct (grant and loan cap) and indirect subsidies (subsidies of the interest rate). They calculate that students can receive subsidies

of up to EUR 30,381, i.e. about 80% of the total BAföG amount (Grave and Sinning, 2014, p. 112).⁵

Before the students' and parents' incomes are considered, students have to meet institutional and personal requirements to determine whether they are at all generally eligible: Students have to be enrolled in their first course of studies at higher education institutions, i.e. universities, universities of applied sciences, colleges for professional education or academies. To be generally eligible, students must moreover hold German citizenship or have prospects of permanent residence in Germany and, in general, have started their studies before they turn 30 (or 35 for consecutive programs). All students passing this eligibility check are generally eligible to receive funding. Whether they are also eligible for positive funding amounts is then assessed in a means test that proceeds in two steps:

First, the means test takes the students' levels of needs (see table 8) as a basis and deducts his or her own economic capabilities. Moreover, the economic capabilities of parents – if they have the legal obligation to support their children – or spouses/partners are assessed and deducted. If students are older than 30 or have been working for at least five years⁶ before enrolling at university, students are independently funded and parents' incomes are not considered for the BAföG calculation. Contrary to the US student financial aid system where students' expected expenses resulting from visiting a specific school are imposed, BAföG uses fixed amounts based on the students' living situation. Thus, students who are not living at the parents' home, have children or have to cover social security contributions themselves are considered to have additional needs which are addressed by (fixed) additions to the basic need levels. Until autumn 2016, the maximum BAföG amount offered to a student who has moved out from home, has no children but has to pay own social security contributions equals EUR 670. Consequently, the maximum BAföG amount corresponds roughly to the minimum subsistence level of a single person (German Bundestag, 2015, p. 8). Parents are required to support their offspring up to this maximum rate if the means test results in lower BAföG amounts. The maximum BAföG amount granted reduces to EUR 495 if the student is still living at home.

Second, own income and assets, but also the spouse's or parents' income exceeding the respective levels of allowances are deducted from these general lump-sum amounts, see section 9.1 for details. While students' current incomes and assets are relevant, the

⁵ The maximal subsidy cited here is based on the maximum monthly benefits of EUR 670, a repayment of EUR 105 a month, starting after the grace period, and given an interest rate of 2%. The upfront repayment implies another implicit subsidy of the interest rate, though upfront payment is not worthwhile for high BAföG amounts (Grave and Sinning, 2014, p. 113).

⁶ These five years of working experience may include having completed vocational training of up to three years prior to studying.

parents' or spouse's incomes as of the second last year's tax assessment enter the means test. Students can however request that their parents' or spouse's current income is used if this income is expected to be considerably lower than the second last year's income. The student can generally earn own income from a minor employment paying up to approximately EUR 400 a month without any deductions (see section 9.1). Higher earnings are subject to social insurance contributions, personal income tax, and require the student to opt out of the non-contributory dependents' co-insurance, so that most of the students work in jobs that usually pay about EUR 400 at a maximum (Middendorff et al., 2013, p. 395).

After accounting for the students' own and familial financial situation, the remaining amount is automatically cashed as an monthly upfront payment to the students' bank account. We refer to all students whose remaining funding amount is positive as "eligible" in the following.

In 2014, the average per person per month funding amount was EUR 448; 38% of the funded students received the respective maximum amounts given their living situation – most of them not living at home (Federal Statistical Office, 2015, p. 32).

3 Potential explanations for non-take up of BAföG

From a traditional economic perspective, the student is liquidity constrained, i.e. cannot borrow on the capital market because she cannot offer a collateral for human capital investments. She faces a problem of intertemporal choice where she decides whether or not to take-up BAföG. Given this choice, she maximizes utility from the study and repayment period. In the study period, she can consume both her own income and BAföG or invest it at the capital market to save at the market interest rate. After graduation, the student is constrained by her current income and the repayment of the interest-free loan.

The availability of BAföG during the study period relaxes her budget constraint by allowing her to borrow. Moreover, the subsidies shift her budget constraint outwards so that she can reach a higher indifference curve as long as her preferences are (weakly) monotone and non-satiated. It would therefore be rational for the student to accept the money. Even if she does neither want to spend nor invest BAföG at the capital market, she should keep the money at home and pay back the (not inflation-adjusted) loan component some years later.

The (seemingly) irrational non-take-up of BAföG might have different reasons. If we start from a rational choice perspective, we can model take-up as the student weighing claiming costs against benefits as has been widely done in the literature analyzing the non-take-up of other social benefits (Blundell et al., 1988; Anderson and Meyer, 1997; Riphahn,

2001; Whelan, 2010; Bruckmeier and Wiemers, 2012, e.g.). Unfortunately, available data sets lack direct measures of the determinants of non-take-up so that plausible proxies have to be found. We discuss suitable proxies and our hypotheses that can be investigated with the data at hand in the following.

3.1 Utility from claiming BAföG

Both the degree and duration of needs have been identified to positively influence the utility derived from social benefits (Moffitt, 1983; Anderson and Meyer, 1997; Hernanz et al., 2004, e.g.). In our case here, the probability not to claim BAföG might be higher if students are in higher semesters and closer to the completion of their studies, i.e. the expected duration of the receipt of BAföG is lower.

Moreover, in line with previous research, we proxy the degree of needs by the level of individual, means-tested benefits resulting from our simulation and expect that higher benefits decrease the probability to turn down BAföG, *ceteris paribus*. As long as the level of benefits is higher than the claiming costs, the student will take up BAföG.

As the student's factual costs of living are not accounted for by the BAföG calculation – apart from its lump-sum adjustment for whether the student lives at home –, we include further proxies associated with the students' level of needs. Student financial aid addresses a very homogeneous group of mainly childless, unmarried persons that is similar with respect to age, previous education and current living situation. Moreover, the BAföG calculation already takes into account contextual factors as the students' and parents' or partners' living situation and financial capabilities, so that we can restrict our proxies to the individual level. We add a dummy for whether students still live at home because this may decrease their financial need over and above its consideration of the students' place of living in the BAföG calculation. Furthermore, we include an indicator for whether the student lives in East Germany where rents⁷ – and therefore need, controlling for parents' income – are lower. To control for differences in living costs but also differences in availability (and accessibility) of minor employment, we also include a dummy for whether the student is living in a urban or rural area.

Like the expected family contribution in the US, the German law expects parents to support their dependent children with the amount of their incomes exceeding the respective thresholds (for more details c.f. section 9.1), so that we implicitly control for the parents' transfers to their children when we keep the amount of benefits constant. The official BAföG calculation takes parents' incomes in the second-last year as a default, unless students request using the current, lower, incomes. For that reason, very high current incomes might be associated with higher transfers to the offspring not reflected

⁷ See Federal Institute for Research on Building, Urban Affairs and Spatial Development (2013), p. 3.

in the BAföG amount. As a consequence, we add the log of parents' monthly current gross labor income in 2007-EUR.⁸

3.2 Disutility from claiming BAföG

While claiming costs are usually decomposed into information costs and stigma costs when investigating social assistance benefits (Riphahn, 2001; Whelan, 2010; Bruckmeier and Wiemers, 2012, e.g.), we doubt for various reasons that BAföG involves a social stigma comparable to that possibly felt by persons dependent on social assistance: College is seen as an investment in aspirant future labor market participants. The fact that students do not work (enough to fully finance themselves) is a productive and voluntary "joblessness" because they study full-time and are expected to contribute taxes on their later high incomes after finishing their studies. Moreover, the main calculation basis falls off the person who applied and receives aid so that the reasons for being eligible cannot be attributed to one party. Lastly, the BAföG status cannot be easily inferred from just knowing that someone is studying while the identification as being poor is a necessary feature of external stigma costs (Weisbrod, 1970).

Different preferences about the welfare state

Nevertheless, we hypothesize that the preferences and perceptions of the welfare state might be different for students socialized in families living in the former socialist German Democratic Republic (GDR) before 1989. Alesina and Fuchs-Schündeln (2007) have shown that socialism increased the East German's approval of redistribution and provision of social services. While the authors expect the large differences in preferences to prevail for one to two generations (20-40 years) after reunification, i.e. for the sample we consider here, others have shown that differences in social behavior are even more persistent (Brosig-Koch et al., 2011; Heineck and Süßmuth, 2013). Moreover, a recent report demonstrates that East Germans have stronger preferences for high levels of social security and equality and more frequently agree that the state is responsible to achieve these goals (DESTATIS et al., 2013, p. 370ff).

Therefore, we hypothesize that East German families are more likely to regard it as the state's responsibility to provide student financial aid. They should consequently find it more natural to take up the assistance they are eligible for than students without an East German background. If this were the case, students with parents living in the East

⁸ We are able to separate the level of benefits and the parents' monthly labor income because the BAföG calculation uses a special, non-deflated income measure. Owing to extensive means-testing and imposition of complex allowances and exemptions, labor income and BAföG benefits are non-linearly related.

before 1989 should show higher take up rates than similar children to West German parents socialized in an environment more focused on individual responsibility.

To investigate this hypothesis, we include a dummy for whether at least one parent⁹ was living in East Germany in 1989 and refer to this variable as “East German background” interchangeably.

Information constraints and complexity of claiming

Students must be aware of the existence of federal aid, be able to understand the aid scheme and file the application. A lack of knowledge and high complexity of claiming the benefits increases claiming costs. A large strand of the literature casts doubt on the assumption of perfectly informed students (Bettinger et al., 2012; Loyalka et al., 2013; Herber, 2015), emphasizes the complexity of federal aid applications (Dynarski and Scott-Clayton, 2006; Dynarski and Wiederspan, 2012) and shows that information deficits drive non-take-up of other social benefits (Coady et al., 2013).

Our expectations of the role of information constraints for the German case are ambiguous: On the one hand, BAföG is the only broad federal student aid scheme and administrated by the student service departments of the universities which makes BAföG a well-known funding source. Moreover, calculators to approximate the prospective benefits are available online (e.g. www.bafog-info.de or www.bafog-rechner.de/Rechner). On the other hand, students and their parents perceive the 170 questions of the BAföG application forms as confusing and hard to understand; the average time to file the application amounts to 4.5 - 5.5 hours (Bundeskanzleramt and Nationaler Normenkontrollrat, 2010, p. 41). Apart from that, students may have flawed expectations about their eligibility because the calculation of benefits and the means test is also very complex. In this regard, students might not even consider the possibility that they are eligible, especially if their parents' current labor incomes are high and they are unaware of the fact that the BAföG calculation uses parents' incomes two years ago.

To shed light on the competing mechanisms, we include an indicator for the parents' current labor income, arguing that a higher current labor income decreases not only the perceived level of needs as described in the last section but contributes to the misconception of eligibility. Families with higher current income should therefore show a lower probability to take up BAföG if high labor income and high misconception of benefits are correlated, over and above the fact that the need for additional resources is lower.

Moreover, we include an indicator for parents' college degree, assuming that parents with a college degree are, *ceteris paribus*, better informed about higher education, show higher levels of financial literacy and might have more resources to assist their children

⁹ In more than 98% of these cases, both parents were living together either in East or West Germany.

in filing the complex forms. The relationship between non-take-up of BAföG and parents' college degree should consequently be negative if a lack of information is important. In the same line of reasoning, we control for whether students can draw upon the assistance of older siblings who claimed BAföG themselves and are therefore well acquainted with the filing the forms.

Finally, different groups might lack awareness of the attractiveness of BAföG or the student financial aid system in general. First of all, migrants might suffer from (parents') language barriers or little (parental) knowledge about German student financial aid, making them less likely to file the application. Furthermore and contrary to the positive relationship between East German background and take-up described above, East Germans might equally well show higher non-take-up rates because they have gained less institutional experience with BAföG which was established in West Germany. They might moreover have trouble to file the application because East Germans still lag behind with respect to financial literacy (Bucher-Koenen and Lamla, 2014). If information gaps were more important than different welfare preferences, we would expect a higher NTU of students with East German background. The existence and direction of the overall effect of the East German background variable is therefore unclear.

Parents' experience with public transfers

If East German families or families with a migration background are more likely to be in contact with the public administration, for example because they receive other welfare benefits already or because they need to file applications for work and residence permits, an economies of scales argument will moderate the mechanisms described above: A closer contact to administration officers or receipt of other welfare benefits can result in economies of scale when getting informed and filing the applications for BAföG (Dorsett and Heady, 1991).

At the same time, parents' experiences with receiving public benefits may also capture a part of the intergenerational persistence of welfare receipt ("welfare trap"): It might be more socially acceptable for students to claim BAföG if they grew up in a family that received welfare benefits (see for example Black and Devereux (2011, p. 1530f) for a review).

To control for these mechanisms, we include a variable for whether someone in the parents' household received public transfers (except maternity benefits and student financial aid) in the previous year. Lacking data on parents' complete welfare receipt histories, we cannot disentangle to which extent our coefficient captures a short-run

scale effect or some part of a long-run preference.¹⁰ As both mechanisms point to the same direction, we can, however, hypothesize that parents' (successful) experience with filing forms decreases the likelihood that students reject BAföG if they are eligible.

Time inconsistent preferences, self-control and debt aversion

Above, we have implicitly assumed a constant exponential discount function resulting in dynamically consistent preferences. Or, in other words, the student's time preferences when deciding about whether or not to take up the aid amount equal those when deciding how to shift consumption between periods. Allowing for hyperbolic discounting relaxes this assumption and can create settings in which consumers wanted to behave patiently in the long-run but are tempted by the immediate gratification of the moment and choose impatiently (Berns et al., 2007, and references cited therein). While impulsivity is the contrary of self-control and associated with impulsive and impatient behavior (Duckworth and Kern, 2011, p. 259), "Self-control refers to the capacity for altering one's own responses, especially to bring them into line with standards such as ideals, values, morals, and social expectations, and to support the pursuit of long-term goals." (Baumeister et al., 2007, p. 351). Low self-control involves the susceptibility to succumb to impulses, a lack of thinking before acting, not finishing boring or difficult tasks and striving for exiting, possibly dangerous activities (Whiteside and Lynam, 2001).

Anticipating their own difficulty to spend the borrowed money reasonably as to limit unnecessary debt – or even anticipating that it might be tough to restrict themselves to pay back the loan after graduating –, sophisticated students might abstain from borrowing completely.

Following the "Economic Theory of Self-Control" (Thaler and Shefrin, 1981), we can think of the student being composed of two selves – one of the selves acting as a far-sighted planner and one as a myopic (low self-control) doer. The far-sighted planner might want to save a part of the benefits not necessarily needed to repay the loan faster. Foreseeing that they will not be able to save because they succumb to their impulses, students might rationally choose a "debt ethic" completely prohibiting to borrow (Thaler and Shefrin, 1981, p. 397). This debt aversion is then not at all irrational but "the logical conclusion of the desire to precommit one's future economic activity." (Strotz, 1955, p. 173). It can be indeed shown theoretically and empirically that if a sophisticated student is sufficiently impatient and her discount function is quasi-hyperbolic, she rejects an interest-free loan offer in order to limit her own overspending during the study period (Cadena, 2008; Keys, 2009).

¹⁰ In our case, the scale effects argument seems more plausible, however, because we have to restrict parents' welfare receipt to a single year, resulting usually in a downward biased degree of inter-generational persistence in welfare receipt (Page, 2004).

Consequently, we would expect present-biased sophisticated students low in self-control not to take out the money and spend it carelessly but rather show debt-averse behavior and turn down the aid offer completely. As we will discuss in more detail in chapter 5, we add two self-reported indicators of low self-control/high impulsivity and impatience and their interaction to our model to test for the existence of the effects elaborated on above. We expect that students are more likely to reject BAFöG if they are high both in impulsivity and impatience. Because the estimated impact of time preferences significantly depends on whether risk aversion is allowed for or not (Andersen et al., 2008), we also control for willingness to take risk, although we do not expect to find an independent effect of risk aversion due to the specific design of the BAFöG scheme.¹¹

4 Method

4.1 Definition of non-take-up

Defining a non-take-up rate as the share of students who do not take up the benefits available, although they are eligible, requires data on whether the student receives the benefits or not. As eligibility for BAFöG is unobservable, eligibility and the respective funding amounts the student would have received had she claimed the benefits must be determined in our microsimulation model.

Four situations can arise when we compare take-up and eligibility: 1. Students simulated as being eligible report funding (take-up), 2. students simulated as eligible do not report funding (non-take-up), 3. students simulated as ineligible report funding (misclassified), 4. students simulated as ineligible do not report funding. We are mainly interested in why eligible students do or do not claim (cases 1 and 2). Let E denote the number of students simulated as eligible to receive BAFöG and let T denote the number of those students who report funding in our data. Let upper bars of these variables represent the contrary, i.e. ineligible \bar{E} and no take-up of the benefit reported \bar{T} . The non-take-up rate (NTU) is then defined as the share of those who report not to take up the benefits though eligible, $(\bar{T} | E)$, to all eligible:

$$NTU = \frac{E - (T | E)}{E} = \frac{(\bar{T} | E)}{E}. \quad (1)$$

¹¹ We moreover tested whether our results were affected by omitted variable bias of personality traits that are also strongly associated with self-control (Whiteside and Lynam, 2001). As adding personality traits neither increases fit nor changes our results remarkably, we decided for the more parsimonious models in the following.

While NTU exploits the first two cases arising from our microsimulation model, we can confidently discard the fourth case as ineligible, non-claiming students are of no interest to us. Even with high-quality data, it is possible that we classify students as ineligible although they are in fact eligible (case 3). This happens when incomplete or erroneous survey information results in measurement errors. It is, however, also possible that students are classified erroneously as eligible by the public authorities, the administrative process and the students filling in the forms also not being devoid of errors.

We use the number of misclassified students to calculate the beta error rate defined as the share of the students classified as ineligible but reporting benefit receipt ($T | \bar{E}$), divided by the sum of all who report to take up the benefits:

$$\beta = \frac{(T | \bar{E})}{T}. \quad (2)$$

The beta error rate is often seen as a measure of quality of the simulation. This is somewhat misleading because a very detailed eligibility check and a precise calculation of the benefits with the data at hand (potentially containing measurement error) increase the beta error rate (Frick and Groh-Samberg, 2007). Nevertheless, we follow Bargain et al. (2012) and interpret NTU as the upper bound of the non-take-up rate because it ignores those students classified as ineligible by our simulation and calculate a lower bound of the NTU that subsumes misclassified cases under the eligible cases:

$$NTU_L = \frac{(\bar{T} | E)}{E + (T | \bar{E})}. \quad (3)$$

4.2 Baseline specification

We can model take up of eligible students in a standard binary choice model where the latent non-take up of BAföG is equal to one if the utility from claiming is larger than the claiming costs (or the utility from non-take-up) and equal to zero otherwise (Moffitt, 1983; Blundell et al., 1988). In our baseline specification, we run a straightforward pooled probit model and regress our dependent variable NTU on the controls discussed above plus time dummies, age and gender of the student. We use cluster robust standard errors to account for the fact that the similarity between observations of a single individual over time is higher than the similarity of observations between different individuals.¹²

¹² In addition to the models presented in the following, we also ran various panel data models. Although the results were mostly identical, we decided in favor of cross-sectional analyses because of the small sample size, the fact that we observe students only twice on average, and the resultant low within and between variation.

4.3 Endogeneity of the benefits amount

As students' labor income is deducted from their respective needs, students can influence their level of benefits by earning more or less. If unobserved variables like ability or motivation drive both the level of benefits by higher or lower earnings as well as the decision to file the complex application for BAföG, endogeneity of the level of benefits might bias our estimates. Although incentives to increase own incomes above the threshold of maximum allowances are low, we want to investigate the possibility that endogeneity of the level of benefits affects our results.

Thus, we estimate a pooled instrumental variable (IV) probit model with the structural equation

$$NTU^* = \mathbf{z}_1 \boldsymbol{\delta}_1 + \alpha b + u_1, \quad (4)$$

$$NTU = 1[NTU^* > 0], \quad (5)$$

and the reduced form for the level of benefits

$$b = \mathbf{z}_1 \boldsymbol{\delta}_{12} + \mathbf{z}_2 \boldsymbol{\delta}_{22} + u_2 = \mathbf{z} \boldsymbol{\delta}_2 + u_2. \quad (6)$$

We assume a bivariate normal distribution of the errors u_1, u_2 , independence between the errors and the explanatory variables \mathbf{z} (which includes our vector of instruments \mathbf{z}_2) and normality of our reduced form. If u_1 and u_2 are correlated, our baseline specification suffers from endogeneity. As $u_1|u_2 = \rho u_2 + \epsilon$ and $E(\epsilon|u_2) = 0$, we can formally test whether the benefits level b is exogenous by testing $H_0 : \rho = 0$. We estimate the set of equations by conditional maximum likelihood with clustered standard errors.

As a reference point, we also run a linear two-stage least-squares regression (TSLS) because TSLS requires less distributional assumptions, e.g. errors need not be multivariate normal. Because TSLS ignores the fact that NTU is binary, we again calculate heteroskedasticity-robust standard errors, accounting for the clustered nature and inherent heteroskedasticity of our pooled data.

Similar to McGarry (1996), Whelan (2010), Bruckmeier and Wiemers (2012) and Wiemers (2015), we instrument the level of benefits by the generosity of the system, i.e. the maximum amount of benefits available. Contrary to previous studies on the take-up of social assistance we can calculate *individual* exogenous maximum benefits amounts because we can exploit the fact that students' benefits do not only depend on their own, endogenous incomes but also on exogenous other features, such as parents' income or family situation. Individual exogenous maximum benefits are more powerful than general maximum amounts: Individual amounts exploit both variation between students due to different exogenous characteristics but also within students over time

because of changes in the parents' exogenous characteristics or reforms of the BAföG scheme. We calculate this individual maximum amount as follows: We take the maximum level of individual needs as a base value by assuming that the student is not living with her parents and is receiving the maximum rent subsidy. We keep all other factors that determine the student's needs (e.g. whether the student has to pay health insurance herself because she is older than 25 years or has own children) at their observed values as these are arguably not endogenous. From this, we deduct only the parents' or the spouse's allowable incomes – but not the student's own income or assets. The resulting maximum amounts are of course highly correlated with the factual amounts students receive but should, apart from that, not directly drive whether the student claims the money or not.

Our second instrument is an indicator for whether the student is independently funded. The relevance of this instrument exploits the fact that benefit levels and being independently funded are highly correlated: Independently funded students have had the possibility to accumulate higher incomes and assets likely to be deducted from the BAföG funding amounts.¹³ Yet, as the parents' income is not deducted, the direction of the effect of being independently funded on the expected level of benefits is, a priori, ambiguous. Exogeneity of the instrument requires that the students' funding state does not directly explain why they accept or reject the money if their income and assets are low enough to yield positive funding amounts.

4.4 Selection on eligibility

A last issue we address here is the possibility that students may self-select out of the sample by earning so much that they lose their eligibility to positive funding amounts. Ineligible students are not considered by the non-take-up rate defined above. If sample-selection was relevant, instrumental variable techniques could not account for endogeneity introduced by dropping out of the sample. Self-selection is a cause of concern as the decision to work and drop out is very likely to be non-random, and the same factors driving this decision might also be correlated with the take-up of the benefits. Picking up on the example delineated above, the unobserved motivation and ability of students might simultaneously determine the probability to earn very high additional incomes and the likelihood to successfully file the BAföG application – whereas the direction of this bias is a priori ambiguous. The respective level of benefits is simply reduced by the additional income in the example discussed in the last section, whereas students' income as considered here leads to a complete loss of eligibility.

¹³ The incomes reported by independent students in our sample are about 50% higher than the incomes reported by dependent students.

To take into account the incidental truncation caused by the endogenous choice of students' own incomes and assets, we specify a pooled Heckman-type binary response model (Van de Ven and van Praag, 1981):¹⁴

$$NTU = 1[\mathbf{x}_1\boldsymbol{\beta}_1 + \alpha b + u_1 > 0] \quad (7)$$

$$y_2 = 1[\mathbf{x}\boldsymbol{\delta}_2 + \alpha b + u_2 > 0], \quad (8)$$

where b represents again the level of benefits. The explanatory variables \mathbf{x}_1 are a subset of \mathbf{x} , the cluster-robust errors (u_1, u_2) are independent of \mathbf{x} and normally distributed with a mean of zero and variance of one and $\text{corr}(u_1, u_2) = \rho$. Equation (7) is the regression equation with NTU being the binary non-take-up of student financial aid equal to one if the eligible students do not take up their benefits and equal to zero if they do take up. The selection equation is represented by equation (8). y_2 is an indicator equal to one if the student's income and assets are below the *individual* threshold of eligibility and equal to zero if the student's income and assets are above the threshold so that she loses eligibility. The take-up decision NTU is only observed if $y_2 = 1$, i.e. if the student's income and assets are below its individual thresholds.

To calculate students' individual thresholds, we take the sample of students fulfilling the general eligibility criteria, including parents' or spouses' incomes, but irrespective of the students' own income and own assets. We calculate the threshold as the maximum amount a specific student can earn and hold as assets before her simulated benefit amount drops to zero and leads to her self-selection out of the sample. If this drop-out is systematically related to u_1 , the estimates of $\boldsymbol{\beta}_1$ might be inconsistent.

To identify our system of equations by more than functional form alone, we need at least one variable that is in \mathbf{x} but not in \mathbf{x}_1 . As our exclusion restriction, we use a dummy indicating whether the student completed any form of vocational training before studying. Having completed vocational training proxies labor market experience and implies a higher likelihood to have a job and to earn high incomes while studying. We have to assume that having completed vocational training influences the take-up decision only via the income-channel but does not directly explain (non-)take-up.

5 Data and variable construction

Our microsimulation, see section 9.2 for details, is based on the Socio-Economic Panel (SOEP v30), which is a representative micro data source for Germany and includes

¹⁴ Previous to our study, Kayser and Frick (2001) and Frick and Groh-Samberg (2007) used a Heckman-type approach to correct for sample selection into non-take-up of social assistance. Wilde and Kubis (2005) address the issue of sample selection in a simultaneous equation model.

detailed information on household and individual characteristics, as well as extensive information on income (Wagner et al., 2007). As the BAföG calculation was subject to several substantial structural changes between 2001 and 2002, making the system before and after 2001 difficult to compare, e.g. the unification of needs over Germany and changes in the regulation on additional need amounts, we restrict our analyses to the waves between 2002 and the most recent wave of 2013. Changes in the BAföG regulation induced by reforms induced between 2002 and 2013 are taken care of by our microsimulation model because we calculate the benefits on an annual basis and according to the law applicable in that year.

On the one hand, microsimulation requires high quality data on income and household composition. Analyzing the factors of non-take-up at the same time requires, on the other hand, also suitable proxy variables to be constructed from survey scales. Although the SOEP is generally well-suited for the purpose of microsimulation, not all questions to construct proxies are available for each and every year as we outline in the following.

5.1 Constructing the sample and variables

To construct our sample, we proceed in several steps and keep all students 1. surveyed between 2002 and 2013, 2. theoretically eligible for BAföG but not receiving any different student financial aid amounts and 3. for whom we have enough information to simulate the BAföG amounts. This includes information on the whole family of our students, i.e. parents, siblings and the students' partners if married or in a registered partnership. Yet, full information on the parents' incomes¹⁵ is only available for students raised in families drawn as a part of the SOEP – and where parents therefore answer the survey –, but not for cases where students have been drawn as a separate SOEP household after moving out. In order to keep the maximum number of cases for our descriptive analyses, we check whether the student is independently funded or whether the parents died, both cases implying that the parents' income is not relevant for the assessment of eligibility. If this was the case, we could keep the student in the sample, although parents' income information is unavailable.

This leaves us with a sample size of 7,849 observations of which 4,421 observations are theoretically eligible to receive BAföG and provide enough information on parents' income etc. Among the theoretically eligible, about 30% report to receive BAföG. 50% of all theoretically eligible cases do not receive BAföG in the SOEP and are also deemed ineligible for positive founding by our simulation. 24% both claim BAföG as reported in the data and are simulated as eligible. 21% are eligible as of our simulation but do

¹⁵ The SOEP provides readily imputed income measures so that we do not lose cases due to item non-response.

not claim the benefits. For most of the following descriptive analyses we focus on the groups simulated as eligible, irrespective of whether they took up BAföG or not, i.e. 1,524 observations. About 6% of all theoretically eligible observations are beta error observations allegedly claiming benefits but failing eligibility in our simulation. Some part of this simulation error may be explained by the fact that the SOEP contained only an aggregate measure for all forms of student financial aid before 2007 so that we are not able to distinguish between receivers of merit-based aid and those of need-based aid before 2007. Yet, less than 1% of all German students received merit-based aid before 2007 (Federal Ministry of Education and Research, 2014) so that this lack in distinction between BAföG and other aid should not be substantive. Accordingly, neither does the simulation quality differ significantly before and after 2007, nor does restricting the sample to the survey years of 2007-2013 affect our results much as we show in the robustness checks later (see section 7.3).

With respect to the sample used for our multivariate analyses, we face the issue that not all of the covariates needed in order to address the possible mechanisms as intended above are available for all years. Moreover, information on parents never questioned by the SOEP could not always be generated from the students' answers. The sample used for our multivariate analysis is therefore smaller (i.e. 986 observations).

In order to prevent a loss of too many observations, we combine responses by parents' and information by children about their parents to construct parental background information. More specifically, we use parents' answers to the question "Where did you live in 1989?" to derive students' East or West German background. If at least one parent indicates to have lived in the East during the fall of the wall, we set the dummy to one and to zero otherwise. The answer to this question is missing only if parents have never been part of the SOEP or were already dead at the time the question was asked. To prevent systematic missings of these cases, we fill the East Germany dummy with information on the students' own place of living at 1989 for students already born before 1989.

We face the same issue for the parents' educational degrees. After exploiting the parents' direct information on educational degrees, we substitute missings by using the childrens' information on parents' educational degrees, which is also available if the parents have never been surveyed.

Our indicator for whether the parental household received public transfers in the previous year is however unavailable if parents are not part of the SOEP. Accordingly, we can only replace missings as 0 if we know that both parents were already dead last year. All these missings due to the student being sampled as a new SOEP household and the parents never having been surveyed are however not systematically related to the factors of non-take-up.

We use survey measures to assess the students' time and risk preferences, all of them measured on a 11-point scale from 0 "not at all" to 10 "very much". The survey questions are worded as follows:

- Impulsivity: "Do you generally think things over for a long time before acting – in other words, are you not impulsive at all? Or do you generally act without thinking things over a long time – in other words, are you very impulsive?"
- Impatience:¹⁶ "Are you generally an impatient person, or someone who always shows great patience?"
- Willingness to take risk: "Are you generally willing to take risks, or do you try to avoid risks?"

Data on impulsivity and impatience were collected only in 2008 and 2013, data on willingness to take risks were collected in 2006 and between 2008-2013 so that we have to assume stability of the concepts over time.¹⁷ Mainly due to the fact that not all eligible students participated in one of the waves where these scales were questioned, our sample is reduced to 986 observations. Yet, again, the year when the student was part of the sample should not be systematically related to her non-take-up-behavior. We take the upper quartiles of our impulsivity and impatience scales to construct indicators of high impatience and high impulsivity, respectively.

5.2 Descriptives

Table 1 gives an overview over the weighted analytic sample in general (column 1) and by whether students forgo funding (column 2) or not (column 3). We stick to discussing overall averages, highlighting striking differences by non-take-up in the following.

On average, students are eligible for EUR 314 a month, and, surprisingly, the amount left on the table is only EUR 36 lower on average than the amount taken. Students in our sample are about 23 years old and about half of them is female. The average share of migrants in our sample is 18% and migrants are significantly more likely to forgo the benefits (weighted t-test $p < 0.05$). We can differentiate between scholarships and BAföG for three quarters of the sample and this share does not differ significantly by whether students turn down BAföG ($p > 0.1$). Most of those who take up live outside

¹⁶ This item was originally reversely coded with 0 representing "very impatient" and 10 "very patient". We reverse the scale to harmonize it with our other measures.

¹⁷ The concept of self-control is regarded as being stable over the course of life (Gottfredson and Hirschi, 1990; Arneklev et al., 2006) and recent evidence on the longitudinal stability of time preferences elicited in an experimental set-up shows that individual time preferences are also stable for most individuals (Meier and Sprenger, 2015). Harrison et al. (2005) find no significant changes in risk aversion when assessed 6 months later.

Table 1: Descriptive statistics by whether students take up BAföG or not

	All		Non-take-up		Take-up	
	Mean	(SD)	Mean	(SD)	Mean	(SD)
Simulated BAfoeG amount*	3.14	(1.39)	2.93	(1.35)	3.29	(1.40)
Age of Individual	23.20	(2.26)	23.05	(2.03)	23.30	(2.41)
Female	0.46	(0.50)	0.43	(0.50)	0.49	(0.50)
Student has direct migration background	0.18	(0.39)	0.22	(0.41)	0.16	(0.36)
Scholarship/BAfoeG can be separated	0.73	(0.44)	0.71	(0.46)	0.75	(0.43)
Living situation controls						
Student living in urban area	0.75	(0.43)	0.83	(0.37)	0.70	(0.46)
Student living at parents' home	0.67	(0.47)	0.80	(0.40)	0.58	(0.49)
Student lives in East Germany	0.17	(0.38)	0.14	(0.35)	0.19	(0.39)
Annual hours worked	197.79	(362.79)	234.16	(404.03)	171.88	(328.17)
Parent and sibling controls						
Parents' current gross labor income*	31.56	(25.13)	31.06	(19.99)	31.91	(28.24)
At least one parent holds college degree	0.40	(0.49)	0.35	(0.48)	0.43	(0.50)
Parents received social transfers	0.17	(0.38)	0.14	(0.35)	0.20	(0.40)
East German background	0.31	(0.46)	0.21	(0.41)	0.38	(0.49)
Older sibling claimed BAfoeG	0.14	(0.34)	0.09	(0.29)	0.17	(0.37)
Time-inconsistent preferences						
Willingness to take risks 0-low, 10-very high	5.33	(2.26)	5.27	(2.37)	5.38	(2.18)
Very impulsive	0.30	(0.46)	0.34	(0.47)	0.28	(0.45)
Very impatient	0.27	(0.44)	0.33	(0.47)	0.22	(0.42)
Observations	986		452		534	

Notes: SOEP 2002-2013, weighted. * = Deflated to base year 2007 and in hundreds of Euro.

their parents' home and in an urban area, whereas non-takers are much more likely to still live at their parents' home and in rural areas. 17% of the students currently live in East Germany. As can be seen from the numbers of working hours, students who do not take up BAföG work considerably more hours ($p < 0.01$) to support their living.

Remarkably however, students who take out the money do not come from families who are strikingly worse off financially, though non-takers are somewhat less likely to come from a family where at least one parent holds a college degree. While about one third of the parents lived in the former GDR in 1989, the descriptive difference between takers and non-takers is considerable: The percentage of students with East German background is two thirds higher in the group of those who claim the benefits and the difference is highly statistically significant. The same is true for older siblings as a potential source of support in filing the BAföG application: The share of claimants in the group of students with older siblings who have already claimed is twice the share of those who cannot draw upon older siblings' experiences ($p < 0.01$). Finally, the share of the students rating themselves as very impulsive and impatient is higher in the group of students who turn down the benefits, whereas the willingness to take risk does not differ significantly ($p > 0.1$).

6 Non-take-up of BAföG

6.1 Estimated rates of non-take-up

Figure 2 reveals that about two in five students do not claim BAföG although eligible; the non-take-up rates range between 36% (NTU_L) and 40% (NTU) on average. Reassuringly, both rates do not differ much so that the impact of potentially misclassified cases should be low.¹⁸

Moreover, we do not find statistically significant differences in the NTUs (and beta error) over time, which reassures us once more that the non-separability of BAföG and scholarships before 2007 is not an issue.¹⁹

To shed some more light on the relationships between our main variables, we plot the deflated BAföG amounts from our microsimulation against the deflated last year's monthly net household income of the respective parents (figure 3). To account for scale effects in consumption within the household, we use the modified OECD equivalence

¹⁸ As our sensitivity check in section 9.3 shows, very small plausible corrections of allowances similar to Frick and Groh-Samberg (2007) strongly decrease the beta error rate. As these manual modifications do not affect the regression results, we present the conservative results without any manual corrections only. Corrected results are available upon request.

¹⁹ We include separate year-dummies in all our regressions. Yet, we do not find evidence for a time-trend or statistically significant differences before and after 2007.

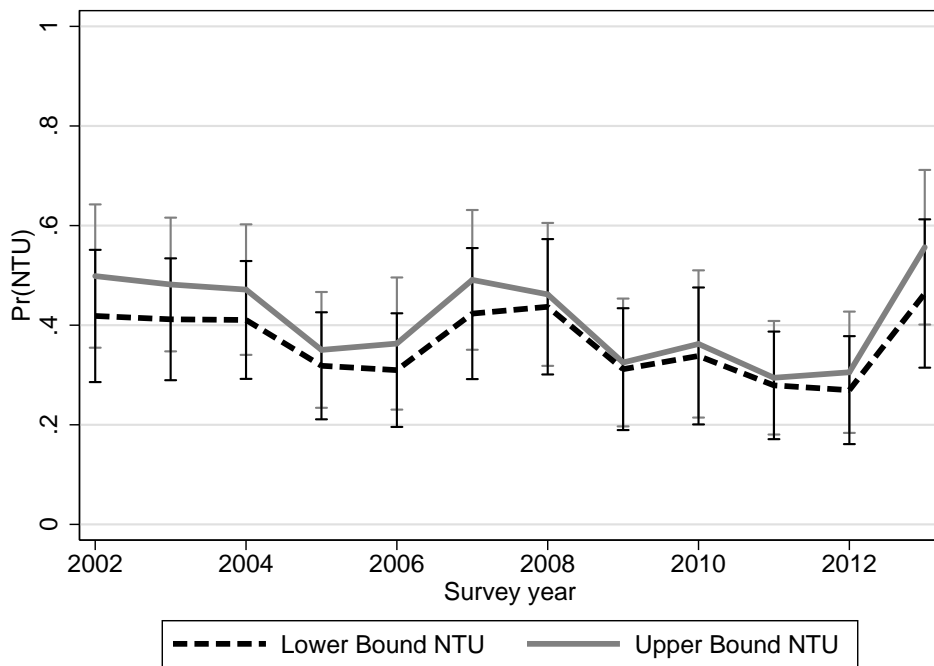


Figure 2:
The development of the upper and lower bound of the non-take-up rate of BAföG over time

Notes: SOEP data 2002-2013, weighted with individual weights, without further controls. The spikes indicate 95% confidence intervals.

scale. The simulated funding amounts for eligible students, i.e. students with positive amounts, are depicted in dark grey, the zero funding amounts for students fulfilling only the general criteria in light grey. As expected, the relationship between both variables is negative with students from more affluent families being eligible for lower or zero funding amounts. However, the variance in BAföG amounts over parents' equivalized income is high as it is not the income used for the BAföG calculation. All in all, our microsimulation model seems to work very well in calculating sensible BAföG amounts and yields results comparable to microsimulations from the SOEP-STSM (Steiner and Wrohlich, 2012, p. 130).

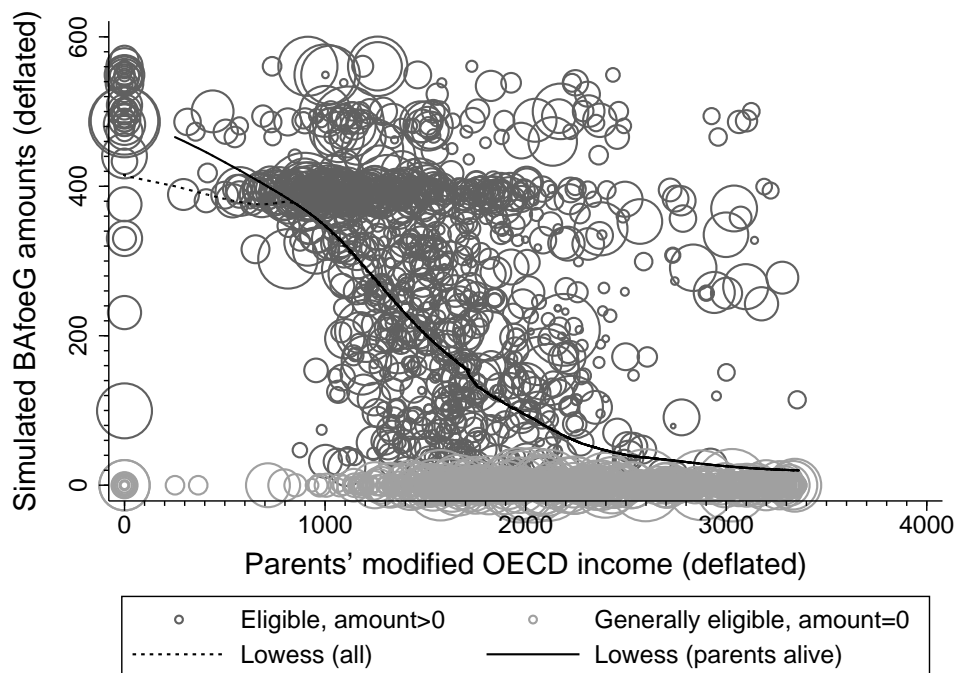


Figure 3:
Simulated amounts of BAföG benefits over parents' monthly household equivalized income

Notes: SOEP data 2002-2013, weighted with individual weights, without further controls. Parents' monthly equivalized household income (modified OECD-scale) is deflated to base year 2007 and presented here if it is below EUR 3728, i.e. mean plus one standard deviation of the equivalized household income. The equivalized household income is zero if both parents are deceased but the student is independently funded. The data are weighted so that the relative size of the circles indicate how much weight a respective observation, having been over- or underrepresented in the SOEP, receives. Larger circles indicate that the respective observation receives relatively more weight.

It is moreover informative to investigate which percentage of students is eligible by parents' income and whether eligible students from the lowest tail of the income distribution where benefits are high claim more often than eligible students from higher

income families where benefits are lower (see also Bargain et al. (2012)). Figure 4 shows the percentage of students eligible to positive funding amounts as of all generally eligible students, the average benefit amounts of eligible students and both NTUs up to the 80% percentile of their parents' household equivalized incomes in the previous year (modified OECD-equivalent). As can be seen from the grey dashed and dotted curves, BAföG is well targeted to the students from families with low income and/or many children. Accordingly, nearly all students up to the second decile of parents' equivalized income are eligible to positive funding of EUR 400 on average. The differences between the upper and the lower bound NTU are moreover negligible. Small differences are reassuring because they indicate a very low number of misclassified cases. After the third decile, the curves of the probability to be eligible and the average funding levels slope steeply downward until less than 20% of the students are eligible to an average amount of EUR 270 in the eighth decile. The non-take-up rates are, however, very stable over the whole range of parents' household incomes. More specifically, students from poorer families who are eligible to higher benefits are not more likely to take up than students from households with higher incomes and eligible to lower benefits. These results already suggest the limited contribution of parents' income and the level of funding available to explain why a large share of the students does not take up BAföG.

6.2 Factors of non-take-up

In this section, we want to investigate more closely why students turn down high subsidies. Table 2 gives an overview over coefficients and average marginal effects (AME) resulting from our multivariate analyses. We start with discussing the AMEs from the pooled probit model in column 1 first, and will later outline differences with respect to the IV probit (column 2), the TSLS model (column 3) and the Heckprobit model (column 4).

The average baseline predicted probability of a student not to take up BAföG is about 42% which is roughly in line with estimates from the literature on NTU of social assistance in Germany reviewed by Bruckmeier et al. (2013). For every EUR 100 of benefits available each month, the probability to turn down BAföG decreases by rather modest 4.4 percentage points (13.8%) on average. Accordingly, the elasticity of the level of benefits with respect to the NTU implies that an increase in BAföG by 10% decreases the probability not to take up by 4.6%.

To assess the economic significance of increases in the level of the benefits further, we calculated the AME of changing BAföG from the 5th to the 95th percentile, keeping all other variables at their observed values: On average, the probability not to take up BAföG decreases by roughly 20 percentage points from $\Pr(\text{NTU}=1)=0.54$ to $\Pr(\text{NTU}=1)=0.33$ when BAföG increases from EUR 48 to EUR 500 ($p < 0.05$).

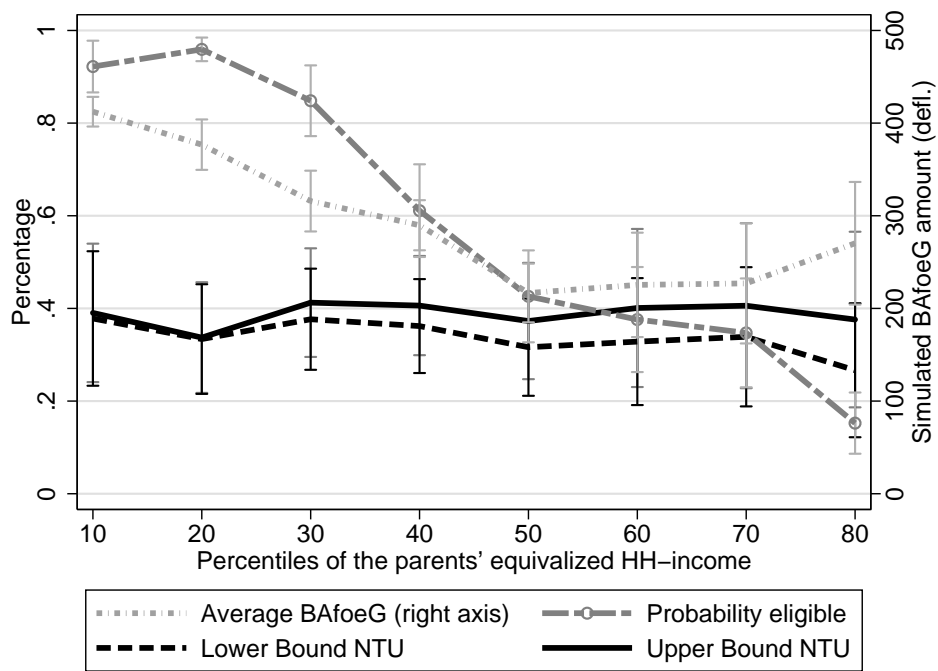


Figure 4:
 Non-take-up rate of BAföG and probability to be eligible by percentiles of the parents' equivalized household income

Notes: SOEP data 2002-2013, weighted with individual weights, without further controls and cluster-robust standard errors. Parents' monthly equivalized household income (modified OECD-scale) and the BAföG amount are deflated to base year 2007.

Table 2: Different specifications for the predicted probability not to take up BAföG, i.e. $\Pr(NTU = 1|\mathbf{X})$

	(1) Probit		(2) IV Probit		(3) TSLS	(4) Heckprobit	
	Coeff	AME	Coeff	AME	AME&Coeff	Coeff	AME
Simulated BAfoeG amount*	-0.137** (0.054)	-0.044** (0.017)	-0.150** (0.062)	-0.048** (0.019)	-0.048** (0.020)	-0.133** (0.053)	-0.043** (0.016)
Age (centered)	-0.003 (0.034)	-0.001 (0.011)	-0.002 (0.034)	-0.001 (0.011)	-0.001 (0.011)	0.017 (0.033)	0.005 (0.011)
Female	-0.095 (0.144)	-0.030 (0.046)	-0.096 (0.144)	-0.031 (0.046)	-0.037 (0.048)	-0.078 (0.139)	-0.025 (0.045)
Migration background	-0.108 (0.209)	-0.034 (0.066)	-0.104 (0.210)	-0.033 (0.066)	-0.038 (0.072)	-0.182 (0.203)	-0.058 (0.064)
Living situation controls							
Student living in urban area	0.607*** (0.163)	0.190*** (0.049)	0.607*** (0.163)	0.190*** (0.049)	0.203*** (0.052)	0.563*** (0.161)	0.180*** (0.050)
Student living at parents' home	0.838*** (0.195)	0.268*** (0.058)	0.834*** (0.195)	0.267*** (0.058)	0.283*** (0.062)	0.853*** (0.192)	0.277*** (0.057)
Student lives in East Germany	0.287 (0.234)	0.092 (0.074)	0.293 (0.234)	0.094 (0.074)	0.094 (0.073)	0.308 (0.234)	0.099 (0.073)
Parent and sibling controls							
Log parental gross labor income*	-0.031 (0.056)	-0.010 (0.018)	-0.036 (0.057)	-0.012 (0.018)	-0.011 (0.018)	-0.014 (0.055)	-0.005 (0.018)
Parent(s) have college degree	-0.132 (0.154)	-0.042 (0.049)	-0.137 (0.154)	-0.044 (0.049)	-0.041 (0.050)	-0.113 (0.149)	-0.037 (0.048)
Parents received social transfers	-0.265 (0.203)	-0.084 (0.063)	-0.260 (0.203)	-0.082 (0.063)	-0.085 (0.064)	-0.269 (0.198)	-0.086 (0.062)
East German background	-0.458** (0.203)	-0.148** (0.065)	-0.456** (0.204)	-0.147** (0.065)	-0.159** (0.062)	-0.523*** (0.202)	-0.170*** (0.065)
Older sibling claimed BAfoeG	-0.677*** (0.192)	-0.204*** (0.053)	-0.680*** (0.193)	-0.205*** (0.053)	-0.239*** (0.062)	-0.712*** (0.190)	-0.218*** (0.054)
Time-inconsistent preferences							
Willingness to take risks (std)	-0.096 (0.068)	-0.031 (0.022)	-0.095 (0.067)	-0.030 (0.021)	-0.033 (0.022)	-0.094 (0.066)	-0.031 (0.021)
Very impulsive	-0.098 (0.199)	0.032 (0.053)	-0.104 (0.198)	0.030 (0.053)	-0.027 (0.063)	-0.076 (0.194)	0.043 (0.053)
Very impatient	-0.005 (0.238)	0.068 (0.059)	-0.003 (0.238)	0.069 (0.059)	0.010 (0.079)	-0.060 (0.234)	0.056 (0.058)
Very impulsive × Very impatient	0.695** (0.353)		0.694* (0.354)		0.228* (0.116)	0.744** (0.345)	
Instruments (1st stage)							
Individual max. BAfoeG amount			0.934*** (0.022)		0.934*** (0.023)		
Independently funded			0.516*** (0.155)		0.512*** (0.157)		
Exclusion restriction (1st stage)							
Vocational training completed						-0.675*** (0.231)	
Year controls							
Observations	986		986		986	1041	
Baseline predicted probability	0.417		0.417		0.416	0.444	
corr(u1,u2)= ρ			0.041			-0.748	
Wald test ($\rho = 0$, p-value)			0.526			0.052	
Robust score test (p-value)					0.464		
Overidentification test (p-value)			0.728 [†]		0.353		

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors, clustered on the student level, in parentheses.

Notes: SOEP 2002-2013, weighted. * = Deflated to base year 2007 and in hundreds of Euro. [†] p-value from a J overidentification test on an unweighted, two-step version of the IV Probit without cluster robust standard errors; estimated with the weakiv package in Stata (Finlay et al., 2013).

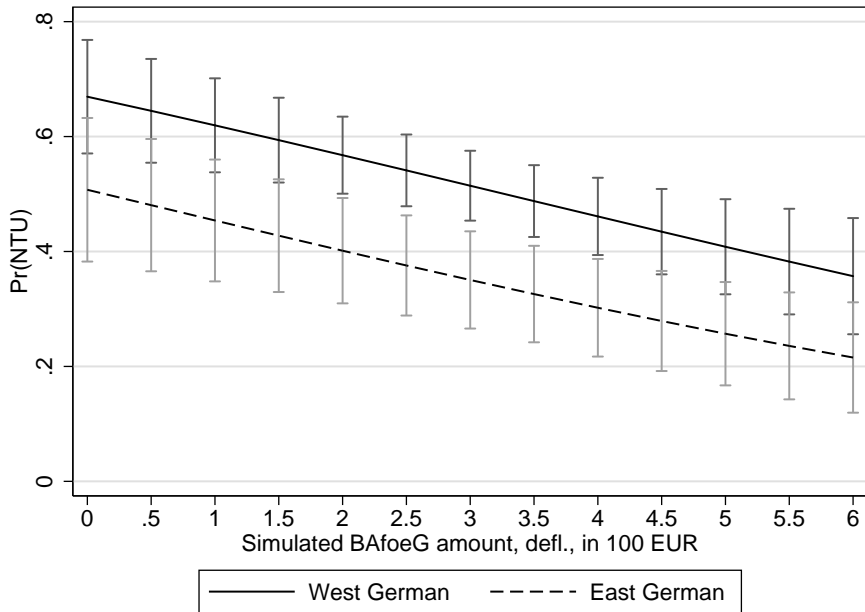
The controls for the students' living situation reveal that students living in urban areas with, presumably, more employment opportunities are about 19 percentage points more likely not to claim BAföG. Those who profit from low living costs because they live at their parents' homes are 27 percentage points more likely not to take up BAföG, whereas living in East Germany does not significantly affect NTU, although the coefficient points to the expected direction.

Investigating our proxies for information constraints and parents receipt of welfare benefits reveals, first, that students from families where another social transfer has been claimed in the previous year are less likely to forgo BAföG funding, but the effect is not statistically significantly different from zero. Secondly, although neither having migration background nor parents' educational and financial situation affect the students' take up decision significantly, having an older sibling who has claimed BAföG before decreases non-take-up by 20 percentage points. The latter suggests that support in managing the complex paperwork involved when claiming BAföG is beneficial.

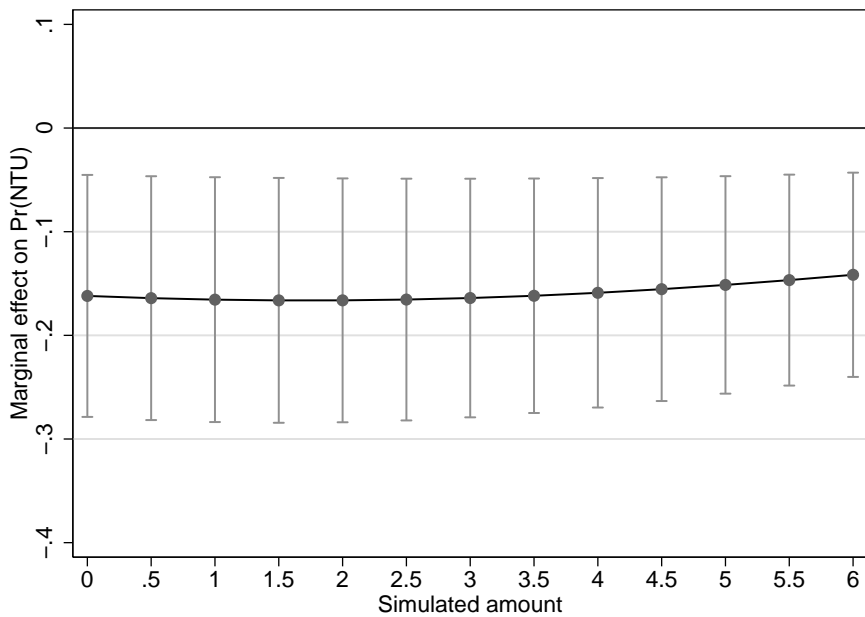
Moreover, there is strong support for our hypothesis that non-take up differs between students socialized in East and those socialized in West Germany. On average, students with an East-German background are about 15 percentage points less likely to reject the money, *ceteris paribus*. We observe that this gap in non-take-up is stable and statistically significantly different from zero over the whole range of possible funding amounts (cf. figure 5).²⁰ We closer investigate the robustness of this finding in section 7.

With respect to the importance of time-inconsistent preferences, we find a statistically significant interaction of impulsivity and impatience in the expected direction of self-commitment to avoid overspending. In table 3, we show the predicted probabilities of NTU for high and low levels of impulsivity and impatience, keeping all other variables at their observed values. The predicted probabilities of students who are high in impatience and low in impulsivity or vice versa do not differ significantly. Impatient students who are very impulsive at the same time are however about 23 percentage points more likely to reject the same benefits amount than are impulsive but patient students. This difference is highly statistically significant. We find a symmetrical effect of about 20 percentage points for impatient students when we vary the level of impulsivity. The large double difference of about 23 percentage points (which represents the size of the interaction effect in terms of AMEs) is also statistically significantly different from zero ($p < 0.05$) and in line with the sign and significance we find for the interaction effect in terms of our Probit coefficients. To ensure that the effect is meaningful over the whole range of BAföG amounts, we calculated contrasts for every level of the BAföG amount as shown

²⁰ The gap is robust to introducing an interaction between East German background and parents' incomes to our model, although this results in a high degree of multicollinearity.



(a) Predicted probabilities



(b) Marginal effect

Figure 5:
Impact of socialization on non-take-up of BAföG by simulated benefits and by whether parents lived in East or West Germany in 1989

Notes: SOEP 2002-2013, weighted with individual weights. The spikes indicate 95% confidence intervals. Predicted probabilities were calculated from the probit regression in table 2, column 1. All other variables were held at their observed values.

in figure 6a. The difference is large and statistically different from zero at $p < 0.05$ over the whole range of the BAföG benefits as displayed in figure 6b. All in all, our results yield strong evidence for the hypothesis that students with self-control problems restrict their future funding sources as to avoid overspending. As expected, willingness to take risks is not associated with non-take-up.

Table 3: Predicted probabilities for non-take-up of BAföG by different levels of the students' impulsivity and impatience

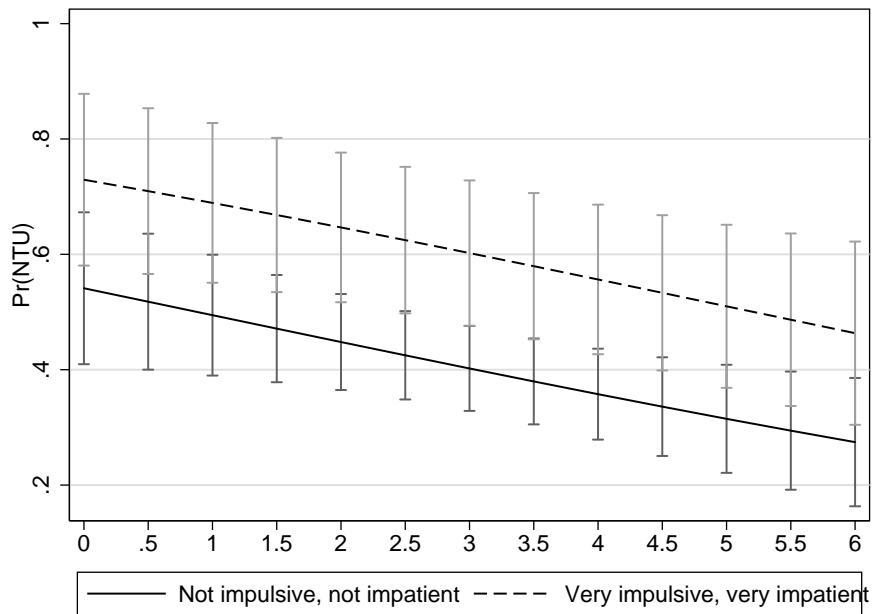
		Very impulsive		Difference
		No	Yes	
Very impatient	No	0.397*** (0.037)	0.366*** (0.058)	-0.032 (0.064)
	Yes	0.396*** (0.078)	0.594*** (0.064)	0.199** (0.095)
	Difference	-0.002 (0.077)	0.229*** (0.083)	0.230** (0.116)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Unconditional, cluster-robust standard errors in parentheses.

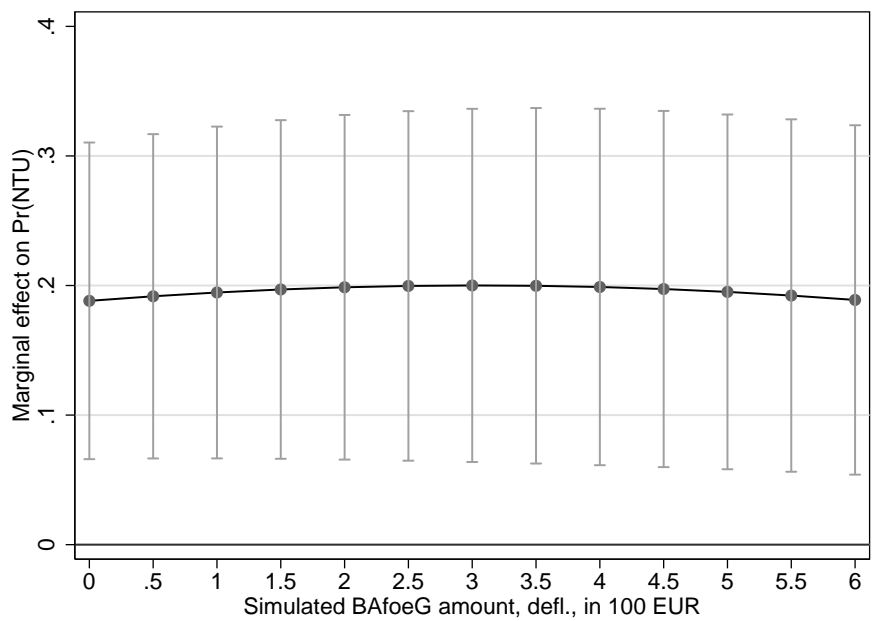
Notes: SOEP 2002-2013, weighted. Predicted probabilities of the Probit in table 2, col. 1. All other variables were kept at their observed values.

The second and third columns in table 2 present the results from running instrumental variable regressions for the Probit (col. 2) and the linear probability model case (col. 3), using the individual maximum benefits amount and an indicator for whether the student is independently funded as instruments. As indicated by the Wald test of exogeneity and Wooldridge (1995)'s robust score test, we do not find evidence for potential endogeneity of the benefits amount both in the non-linear and the linear model. In line with this and against the background that our correlation in the errors (u_1, u_2) in the IV probit is very low, our results are, by and large, unaffected by whether we account for the potential endogeneity of the benefits amount or not. As IV Probit and TSLS are also very similar, the somewhat stronger distributional assumptions of the IV Probit do not harm our results. Reassuringly, the first stage coefficients and p-values reported at the bottom of the table indicate that both instruments are very strong – as does a Shea's Adjusted Partial R-squared of .80 from the first stage of the TSLS.²¹ Because our model is overidentified, we can conditionally test the exogeneity assumption with an overidentification test. As

²¹ It is not straightforward how to test for weak instruments in pooled non-linear models with cluster-robust standard errors and weighted data because there is no clear cut-off for non-linear models to guide us when to reject the hypothesis of weak instruments. Yet, a Kleibergen-Paap Wald F statistic of 1376.11 from our weighted TSLS with cluster-robust standard errors greatly exceeds the Stock and Yogo (2005) critical values of $F=19.93$ for a relative bias of 10% and provides additional evidence that the instruments are relevant.



(a) Predicted probabilities



(b) Marginal effect

Figure 6:
Impact of impulsiveness and impatience on non-take-up of BAföG by the simulated benefit amount

Notes: SOEP 2002-2013, weighted with individual weights. The spikes indicate 95% confidence intervals. Predicted probabilities were calculated from the probit regression in table 2, column 1. All other variables were held at their observed values.

reported at the bottom of table 2, we cannot reject the hypothesis that the additional instrument is exogenous.

We check whether our specification in column 1 is affected by self-selection in column 4 where we report results from our Probit sample selection model. Only few students dropped out of our sample because they had too much assets or income. Nevertheless, our hypothesis that the errors of regression and selection equation are not correlated is rejected at $p = 0.05$. The correlation of the errors (u_1, u_2) is moreover negative as is the highly statistically significant exclusion restriction, suggesting that students who completed vocational training before studying have a lower probability to remain in our sample of eligible. Although we find evidence that sample selection is an issue, the resulting AMEs, especially for the benefits level, are very similar to those from the straightforward Probit model – presumably because the number of selected cases is low: The predicted probability to turn down BAföG slightly increases to 44%, and the elasticity of the average non-take-up probability with respect to a 10% increase in the benefits slightly reduces to 4.1%. The impact of East German background, siblings' claiming experience and debt aversion is somewhat more pronounced.

Taken together, our results suggest that most students stay roughly within the thresholds used for assessment of BAföG eligibility and family insurance so that we find no evidence for endogeneity of the benefits amount if we restrict our sample to students eligible for funding after own incomes are deducted. Nevertheless, some students are likely to earn so much that they lose their complete eligibility and select themselves out of the sample. This sample-selection should be accounted for, so that the Heckprobit model results in our preferred specification.

We run separate analyses to investigate the effect of the duration of benefits as including this variable reduces our sample again.²² As expected, the relationship between expected length of benefit receipt (i.e. low value of academic year) and non-take-up is positive, but slightly decreasing as we consider only students in the eligible semester range (table 4): The more advanced the student is in her studies, the higher the probability that she does not take up the benefits because the period in which the claiming costs pay off is shorter.

²² The microsimulation accounts for the fact that only students in a certain range of semesters are eligible to receive BAföG. We keep observations with missing information on the year of enrollment in higher education in our sample used for the previous analyses if students report to claim BAföG, assuming that they should accordingly still fall into the eligible range of semesters. Inclusion of these observations does not affect our results.

Table 4: Effect of duration of Bafög benefit receipt on the probability, not to claim Bafög $\Pr(NTU = 1|\mathbf{X})$

	(1) Probit		(2) Heckprobit	
	Coeff	AME	Coeff	AME
Simulated BAfoeG amount*	-0.151*** (0.058)	-0.049*** (0.018)	-0.145** (0.058)	-0.047** (0.018)
Female	-0.086 (0.147)	-0.028 (0.048)	-0.076 (0.142)	-0.025 (0.046)
Migration background	-0.084 (0.217)	-0.027 (0.069)	-0.147 (0.209)	-0.047 (0.067)
Academic year	0.376*** (0.116)	0.044*** (0.016)	0.342*** (0.112)	0.042*** (0.015)
Academic year ²	-0.047*** (0.016)		-0.042*** (0.016)	
Living situation controls				
Student living in urban area	0.574*** (0.167)	0.183*** (0.052)	0.522*** (0.163)	0.169*** (0.052)
Student living at parents' home	0.856*** (0.188)	0.277*** (0.056)	0.830*** (0.184)	0.273*** (0.056)
Student lives in East Germany	0.282 (0.243)	0.090 (0.077)	0.304 (0.240)	0.097 (0.075)
Parent and sibling controls				
Log parental gross labor income*	-0.041 (0.056)	-0.013 (0.018)	-0.028 (0.054)	-0.009 (0.018)
Parent(s) have college degree	-0.133 (0.163)	-0.043 (0.053)	-0.105 (0.155)	-0.034 (0.050)
Parents received social transfers	-0.264 (0.213)	-0.085 (0.067)	-0.281 (0.207)	-0.091 (0.066)
East German background	-0.465** (0.209)	-0.151** (0.068)	-0.528*** (0.205)	-0.174*** (0.068)
Older sibling claimed BAfoeG	-0.663*** (0.201)	-0.205*** (0.057)	-0.700*** (0.199)	-0.220*** (0.058)
Time-inconsistent preferences				
Willingness to take risks (std)	-0.052 (0.070)	-0.017 (0.022)	-0.048 (0.068)	-0.016 (0.022)
Very impulsive	-0.066 (0.201)	0.027 (0.055)	-0.051 (0.196)	0.036 (0.054)
Very impatient	0.031 (0.245)	0.063 (0.061)	-0.021 (0.241)	0.052 (0.060)
Very impulsive × Very impatient	0.530 (0.356)		0.590* (0.348)	
Exclusion restriction (1st stage)				
Vocational training completed			-0.903*** (0.203)	
Observations	944		998	
Baseline predicted probability	0.442		0.470	
corr(u1,u2)= ρ			-0.844	
Wald test ($\rho = 0$, p-value)			0.057	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors, clustered on the student level, in parentheses.

Notes: SOEP 2002-2013, weighted. * = Deflated to base year 2007 and in hundreds of Euro.

7 Robustness checks

7.1 Different welfare preferences

It might be possible that the stable difference in NTU between students socialized in the East and in the West might be a masked difference in scale effects or the “welfare trap” as East and West Germans differ significantly in their experience with claiming other social benefits. Therefore, we add an interaction between our East German background variable and the social benefits dummy to our preferred models, the Probit and the Heckprobit specification. The results are displayed in table 10 in the appendix. We again report predicted probabilities with their respective differences in table 5. Table 5 highlights that the AME of the interaction effect amounts to -0.15 and is not statistically significant from zero (as are the coefficients of the interactions in table 10) and that the effect of having a social transfer does not affect the students differently. In fact, table 5 indicates that non-take-up probabilities differ significantly between students with East and West German background, irrespective of whether their families were on welfare last year or not.²³

Table 5: Predicted probabilities for non-take-up of BAföG by the students’ East German background and whether parents received other social transfers last year

		Other social transfer		Difference
		No	Yes	
East German Background	No	0.501*** (0.042)	0.482*** (0.090)	-0.020 (0.089)
	Yes	0.366*** (0.057)	0.196*** (0.074)	-0.170** (0.081)
Difference		-0.135* (0.069)	-0.286** (0.117)	-0.150 (0.120)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Unconditional, cluster-robust standard errors in parentheses.

Notes: SOEP 2002-2013, weighted. Predicted probabilities of the Heckprobit in table 10, col. 2. All other variables were kept at their observed values.

7.2 Parents’ financial support

As already described above, the official BAföG calculation uses parents second-last year’s incomes, unless students request to use parents’ current incomes. Our microsimulation model is therefore based on the assumption that students request an update to current

²³ Although we find indication that having been “on welfare” exerts an additional decreasing effect on NTU in for those with East German background, we cannot reject the hypothesis that the respective differences are statistically significantly different from zero.

incomes if these are lower, i.e. we use the minimum of parents' incomes in the current and the second-last year to calculate the potential BAföG benefits. If some parents' incomes grow very fast and if parents use the additional income to support their children financially, we may overestimate the students' needs and therefore the importance of the level of BAföG benefits. This biases our results only if the factors of income growth are not controlled for by the socio-economic covariates in our model, and if the income growth is related to an disproportional increase of the direct transfers to the offspring.

We add an indicator for whether parents supported the student financially to columns 1 and 2 of table 6 and have to accept to lose one observation due to item non-response on this variable. The indicator is not statistically significantly different from zero and does not affect the other coefficients much.

7.3 Different simulation quality

To rule out the possibility that our evidence of non-take-up is simply resulting from poorer data quality for some cases, we construct indicators for whether parents' income is imputed by the SOEP and whether students, parents or partners round their gross income to EUR 100. As table shown in the first two columns of table 7, these indicators are not statistically significantly different from zero and provide hence no evidence that different simulation quality might bias our estimates.

Columns three and four of table 7 investigate whether the estimates differ when we restrict our sample to those for whom we can differentiate between merit-based scholarship receipt and BAföG receipt, i.e. we limit the sample to those surveyed after 2006. Our point estimates are, overall, similar to those from the full sample. We find, however, no evidence for a significant sample selection bias – most probably because the number of cases with self-selection is too low.

7.4 Further robustness checks

We want to mention briefly that our results are also robust to several other robustness checks (results available upon request):

First, until August 2015, students who were only preliminarily accepted for their consecutive studies, e.g. because their Bachelor's thesis was not completed by the time of applying for their Master's, faced problems to receive BAföG without interruptions. The number of students in our sample who are enrolled in consecutive programs is very low. Exclusion of these cases does not affect our results.

Second, the introduction and abolition of tuition fees of up to EUR 500 per semester at several German universities in some federal states falls into our time window. BAföG

Table 6: Robustness check: Parents' financial support does not impact on non-take-up of BAföG

	(1)		(2)	
	Probit		Heckprobit	
	Coeff	AME	Coeff	AME
Simulated BAfoeG amount*	-0.128** (0.052)	-0.041** (0.016)	-0.127** (0.051)	-0.041** (0.016)
Age (centered)	-0.006 (0.033)	-0.002 (0.011)	0.014 (0.033)	0.005 (0.011)
Female	-0.087 (0.144)	-0.028 (0.046)	-0.072 (0.140)	-0.023 (0.045)
Migration background	-0.094 (0.211)	-0.030 (0.066)	-0.170 (0.204)	-0.054 (0.064)
Living situation controls				
Student living in urban area	0.620*** (0.164)	0.194*** (0.049)	0.575*** (0.161)	0.183*** (0.049)
Student living at parents' home	0.908*** (0.206)	0.288*** (0.059)	0.909*** (0.205)	0.293*** (0.060)
Student lives in East Germany	0.279 (0.235)	0.089 (0.074)	0.301 (0.234)	0.096 (0.074)
Parent and sibling controls				
Log parental gross labor income*	-0.037 (0.056)	-0.012 (0.018)	-0.019 (0.055)	-0.006 (0.018)
Parent(s) have college degree	-0.128 (0.154)	-0.041 (0.049)	-0.109 (0.148)	-0.035 (0.048)
Parents received social transfers	-0.268 (0.205)	-0.085 (0.063)	-0.273 (0.200)	-0.087 (0.063)
East German background	-0.458** (0.204)	-0.147** (0.065)	-0.521*** (0.201)	-0.170*** (0.065)
Older sibling claimed BAfoeG	-0.693*** (0.191)	-0.208*** (0.053)	-0.724*** (0.190)	-0.221*** (0.053)
Parents' financial support last year	0.161 (0.147)	0.051 (0.046)	0.127 (0.146)	0.041 (0.046)
Time-inconsistent preferences				
Willingness to take risks (std)	-0.103 (0.067)	-0.033 (0.021)	-0.100 (0.065)	-0.032 (0.021)
Very impulsive	-0.099 (0.198)	0.032 (0.053)	-0.077 (0.194)	0.043 (0.053)
Very impatient	-0.001 (0.237)	0.070 (0.059)	-0.056 (0.233)	0.058 (0.058)
Very impulsive × Very impatient	0.693** (0.353)		0.743** (0.344)	
Exclusion restriction (1st stage)				
Vocational training completed			-0.708*** (0.235)	
Year controls				
Observations	✓		✓	
Baseline predicted probability	985		1040	
corr(u1,u2)= ρ	0.416		0.443	
Wald test ($\rho = 0$, p-value)			-0.753	
			0.039	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors, clustered on the student level, in parentheses.

Notes: SOEP, weighted. * = Deflated to base year 2007 and in hundreds of Euro.

Table 7: Robustness check: Missing data and simulation quality does not impact on non-take-up of BAföG

	Full sample				After 2006			
	(1)		(2)		(3)		(4)	
	Probit		Heckprobit		Probit		Heckprobit	
	Coeff	AME	Coeff	AME	Coeff	AME	Coeff	AME
Simulated BAfoeG amount*	-0.133**	-0.042**	-0.129**	-0.042**	-0.115*	-0.037*	-0.116*	-0.037*
	(0.054)	(0.017)	(0.053)	(0.016)	(0.067)	(0.021)	(0.067)	(0.021)
Age (centered)	-0.005	-0.002	0.016	0.005	0.007	0.002	0.020	0.006
	(0.034)	(0.011)	(0.033)	(0.011)	(0.045)	(0.014)	(0.048)	(0.015)
Female	-0.095	-0.030	-0.081	-0.026	-0.019	-0.006	0.006	0.002
	(0.145)	(0.046)	(0.140)	(0.045)	(0.180)	(0.057)	(0.179)	(0.057)
Migration background	-0.113	-0.036	-0.189	-0.060	-0.095	-0.030	-0.139	-0.044
	(0.209)	(0.066)	(0.203)	(0.064)	(0.253)	(0.079)	(0.245)	(0.076)
Living situation controls								
Student living in urban area	0.635***	0.198***	0.580***	0.184***	0.656***	0.200***	0.627***	0.193***
	(0.161)	(0.048)	(0.159)	(0.049)	(0.195)	(0.056)	(0.205)	(0.059)
Student living at parents' home	0.831***	0.266***	0.841***	0.273***	0.799***	0.254***	0.834***	0.267***
	(0.195)	(0.058)	(0.192)	(0.058)	(0.248)	(0.073)	(0.251)	(0.075)
Student lives in East Germany	0.313	0.100	0.330	0.105	0.576**	0.183**	0.595**	0.187**
	(0.234)	(0.074)	(0.232)	(0.073)	(0.278)	(0.085)	(0.281)	(0.084)
Parent and sibling controls								
Log parental gross labor income*	-0.045	-0.014	-0.028	-0.009	-0.056	-0.018	-0.045	-0.014
	(0.056)	(0.018)	(0.055)	(0.018)	(0.080)	(0.025)	(0.081)	(0.026)
Parent(s) have college degree	-0.130	-0.042	-0.110	-0.036	-0.070	-0.022	-0.066	-0.021
	(0.154)	(0.049)	(0.148)	(0.048)	(0.193)	(0.061)	(0.190)	(0.060)
Parents received social transfers	-0.273	-0.086	-0.273	-0.087	-0.400	-0.123	-0.393	-0.122
	(0.203)	(0.063)	(0.197)	(0.062)	(0.267)	(0.079)	(0.265)	(0.079)
East German background	-0.471**	-0.151**	-0.537***	-0.175***	-0.560**	-0.175**	-0.597**	-0.188**
	(0.204)	(0.065)	(0.201)	(0.065)	(0.235)	(0.072)	(0.237)	(0.073)
Older sibling claimed BAfoeG	-0.689***	-0.207***	-0.727***	-0.222***	-0.646***	-0.192***	-0.683***	-0.204***
	(0.195)	(0.054)	(0.192)	(0.054)	(0.228)	(0.062)	(0.228)	(0.063)
Data-quality indicators								
Parents' income imputed	0.070	0.023	0.060	0.019				
	(0.059)	(0.019)	(0.058)	(0.019)				
Gross income rounded	0.088	0.028	0.110	0.035				
	(0.128)	(0.041)	(0.125)	(0.040)				
Time-inconsistent preferences								
Willingness to take risks (std)	-0.097	-0.031	-0.095	-0.031	-0.126	-0.040	-0.127	-0.040
	(0.068)	(0.022)	(0.066)	(0.021)	(0.079)	(0.025)	(0.078)	(0.025)
Very impulsive	-0.117	0.028	-0.092	0.039	-0.220	-0.002	-0.206	0.005
	(0.200)	(0.053)	(0.195)	(0.052)	(0.236)	(0.062)	(0.239)	(0.064)
Very impatient	-0.010	0.070	-0.067	0.056	0.058	0.099	0.022	0.093
	(0.241)	(0.059)	(0.235)	(0.058)	(0.277)	(0.073)	(0.274)	(0.072)
Very impulsive × Very impatient	0.720**		0.764**		0.784*		0.829**	
	(0.355)		(0.345)		(0.425)		(0.421)	
Exclusion restriction (1st stage)								
Vocational training completed			-0.723***				-0.848***	
			(0.227)				(0.308)	
Year controls								
Observations	✓		✓					
Baseline predicted probability	986		1041		625		659	
corr(u1,u2)= ρ	0.417		0.444		0.401		0.422	
Wald test ($\rho = 0$, p-value)			-0.789				-0.460	
			0.042				0.533	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors, clustered on the student level, in parentheses.

recipients were, generally, also obliged to pay the fees and their parents were expected to increase their financial support accordingly if possible. Evidence on whether the introduction of the fees had an effect is mixed (Hübner, 2012; Bruckmeier and Wigger, 2014). We construct an indicator based on the students' place of living in a certain year and merge information from federal amendments indicating which federal state introduced tuition fees in which year. The indicator is not statistically significantly different from zero and its inclusion does not affect our results.

Finally, we investigate different specifications of our model. Adding further variables to our models in table 2 (student married, age squared, parents' relationship, student receives parental financial support, student has siblings, parents had debts last year, Big Five personality traits, desired age of economic independence as reported at age 17) neither increases model fit nor provides any indication of potential omitted variable bias, so that we report the most parsimonious model only. Moreover, using a broader measure for the parents' income such as the parents' household net income does not affect the results. Last, we find no indication of enough non-linearity in the data to justify higher order polynomials of the BAföG amount.

8 Discussion

This paper investigates which share of eligible students do not take up the German student financial aid, BAföG, and provides insights into the explanatory factors of non-take-up. We explicitly account for endogeneity of the level of benefits and students selecting themselves out of the group of eligible. Although the combination of a grant and zero interest loan is very lucrative and classical economics would expect students to claim the aid amounts, about two fifths of the students forgo funding. Students are more likely to claim the benefits if the expected duration of funding is high. Moreover, increasing the level of benefits by 10% reduces the probability of non-take-up by about 4.1% on average when sample selection is taken into account. The probability of non-take-up is therefore relatively inelastic with respect to the level of benefits, though our estimate is about one third higher than those found for non-take-up of social assistance in Germany (Anderson and Meyer, 1997; Riphahn, 2001). Because of the existence of non-take-up and its rather low benefit-level elasticity, our findings provide a novel explanation for low university enrollment elasticities with respect to the level of student financial aid found by previous studies (Baumgartner and Steiner, 2005, 2006; Steiner and Wrohlich, 2012).

We test hypotheses on various factors related to non-take-up behavior and find that students socialized in the former socialist East where people still have stronger preferences for high levels of social security and equality, are considerably less likely to

forgo the benefits – irrespective of whether parents claimed other welfare benefits in the previous year. At the same time, students with siblings who already claimed the benefits and are hence acquainted with the formalities of claiming are more than 20 percentage points less likely not to take up the benefits. Debt aversion, to the contrary, is strongly associated with higher probabilities of non-take-up.

Like most other studies investigating non-take-up of social benefits, we have to rely on survey data to draw upon information of both eligible and ineligible students and to be able to shed light on the reasons for non-take up. The use of survey data is however associated with some well-known limitations such as measurement error or small sample sizes for specific subgroups.²⁴

Furthermore, as general interest survey data usually lacks direct measures for the reasons to reject social benefits, we have to base our analyses on proxy variables that generally yield conflicting expectations about the theoretical direction of the effects (Becker and Hauser, 2003, p. 149f) or do not allow to disentangle competing explanations. Although we carefully account for potential endogeneity arising from students' endogenous choices of their incomes – and do therefore implicitly incorporate unobserved differences in, e.g. abilities or motivation –, we cannot rule out that some degree of omitted variable bias remains. More specifically, further research is moreover needed to assess whether other behavioral economics explanations for students' non-take-up of BAföG do also matter, for example procrastination, mental accounting or framing effects/prospect theory, see Boatman et al. (2014) for an overview over the last two channels.

Due to our restricted sample size and the low within- and between-variation, we restrict our analyses to pooled cross-sections. To the best of our knowledge, sufficiently rich data sets allowing to account for unobserved heterogeneity between students in a panel-design are not yet available. We consider it as an interesting avenue for future research to rerun our analyses in a longitudinal design once appropriate data is available. In case this data would also include repeated measures of the real incomes and assets or allow to merge external income data from the German Microcensus or the sample survey of income and expenditure, for example, future studies should also account for measurement error as done by e.g. Hernandez and Pudney (2007).

Up to now, we can nevertheless conclude that a significant share of students does not claim the student financial aid available. Non-take-up is potentially detrimental to intergenerational educational mobility if these students prolong their time to degree, graduate with worse grades or fail to graduate completely due to financial hardship or

²⁴ See Hernanz et al. (2004) for an extensive overview over (dis-)advantages of various data sources for the analysis of non-take-up.

because they have to invest too much time into working instead of studying as suggested by previous literature.

Our results suggest that take-up is not easily increased by simply increasing the level of benefits. Against the background that we find strong evidence for debt aversion resulting from students' fear to spend the money they intended to save, a policy implication would rather be to provide only the grant component of BAföG as a default. Students should be enabled to actively request the loan component when filing the forms as to minimize the share of debt averse students shying away of student financial aid completely because half of it is provided as zero interest loan.

In view of the fact that the recent BAföG reform going to become effective in autumn 2016 opens up the possibility to file BAföG applications online, a direct electronic transfer of the parents' income tax information would facilitate the administrative processes and decrease the opportunity costs to claim BAföG.

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9 Appendix

9.1 BAföG calculation

Income considered relevant for the calculation of BAföG is generally defined as the sum of all positive earnings according to § 2 sect. 1 and 2 of the Income Tax Act: incomes from agriculture and forestry, income from industrial or commercial activities, income from self-employment, employment income, income from investment of capital, rental income and other income such as life annuities or income from private sales business. Further income as of § 21 sect. 2a and 3 BAföG (earnings taxable outside Germany) must

be added; public-sponsored scholarships of up to EUR 300 (e.g. Deutschlandstipendium) are exempt from these deductions.

To calculate the parents' or spouse's/registered partner's income measure relevant for BAföG (§ 21 and § 24 BAföG), the persons' gross positive earnings are reduced by a lump-sum for work related expenses²⁵, payed taxes such as income tax, church tax, solidarity surcharge, old age percentage reductions (§ 21 sect. 1 BAföG) and by flat-rate social security benefits (§ 21 sect. 2 BAföG). Some forms of grant-aided privately funded pension schemes might also be subtracted.²⁶

The resulting income measure is neither gross nor net income, but the persons' "income relevant for BAföG". It is important to emphasize that only the parents'/spouses' and students' incomes are considered in the calculation of the income relevant for BAföG. Incomes of step parents, children and other dependents of the parents are only reducing parents' allowances for children who are not theoretically eligible for BAföG (§ 23 sect. 3 BAföG). The parents' income relevant for BAföG is added before the basic allowances as of table 9 are subtracted. After that, parents are granted an additional allowance equal to half of the income relevant for BAföG plus another 5% for each dependent not theoretically eligible for BAföG. Parents are expected to be able to use this monetary amount to support their offspring financially. Therefore, the remaining parents' income relevant for BAföG is divided by the number of dependents who are potentially eligible to receive BAföG.

Both the students' earnings and assets are relevant for the calculation of BAföG. The students' maximum earnings without deductions are calculated as follows (§ 21 and § 23 BAföG). Starting point of the calculation is the students' gross income for the respective year BAföG is claimed for. From this, EUR 1,000 of income-related expenses are subtracted. Second, a certain percentage is deduced as a flat-rate amount. The percentage depends on whether the student is compulsorily insured as a student or as an employee in the retirement insurance and on the type of employment. The default is compulsory insurance as a student or as a student working in a job with compulsory insurance, resulting in a flat-rate percentage of 21.3%. Third, to calculate monthly amounts, the remaining amount is divided by 12 months. Last, the respective exempt amounts, depending on the students' living situation (e.g. EUR 255, see 9), are deducted. The maximum gross income to be earned without deductions is therefore EUR 4,884 a year or EUR 407 a month if the

²⁵ In case the actual work related expenses exceed the general lump-sum amounts of currently EUR 1,000, the full amount of work related expenses can be deducted. The same is true for the student.

²⁶ Having said this, parents' or spouse's assets are per se not relevant, but only the income/interest accruing from it. This is different for the students' own assets: The student is expected to use every euro of assets above EUR 5,200 to finance her studies.

student is in a minor employment – other than that, the student loses his or her family insurance.

To calculate the students' respective BAföG amount, the sum of needs is calculated. From this, the levels of parents' and the student's own disallowances (including also the students' assets above EUR 5,200) are deducted. The resulting amount is the level of monthly benefits to be cashed.

Table 8: Level of needs 2002-2015

Level of needs	2010-2015	2008-2010	2002-2008
Basic need			
Students in higher education	373	366	333
Additional amounts			
to cover living expenses if living at home	49	48	44
to cover living expenses if not living at home	224	146	133
health insurance	62	50/54	47
care insurance	11	9/10	8
first child (below age 10)	113	113	–
further children (below age 10)	85	85	–

Notes: Amounts are in euro and per month. *Source:* Own table based on Rothe and Blanke (2015) .

Table 9: Basic allowance of incomes and assets between 2002 and 2015

Basic allowances of... (in EUR)	2010-2015	2008-2010	2002-2008
...parents' or spouse's / partner's income			
cohabiting and married or in a registered same-sex partnership	1,605	1,555	1,440
single parent, not cohabiting	1,070	1,040	520
additional allowance for step-parent	535	520	480
additional allowance for children and other dependents not eligible for BAföG	485	470	435
...own income			
earned income	255	255	112-215
married or in a registered same-sex partnership and spouse not eligible for BAföG	535	520	480
with children / dependants not eligible for BAföG (each)	485	470	435
orphan's pension	125	120	112
case of hardship	205	205	205
...own assets (per year)			
for the claimant	5,200	5,200	5,200
for the spouse / partner	1,800	1,800	1,800
for each child	1,800	1,800	1,800

Notes: Amounts are in euro and per month (if not indicated otherwise). Source: Own table based on Rothe and Blanke (2015).

9.2 The microsimulation model

This section is currently in writing.

9.3 Reduction of beta error

This section is currently in writing.

10 Additional tables

Table 10: Robustness of East German background effect

	(1)		(2)	
	Probit		Heckprobit	
	Coeff	AME	Coeff	AME
Simulated BAfoeG amount*	-0.138** (0.054)	-0.044** (0.017)	-0.134** (0.052)	-0.043** (0.016)
Age (centered)	-0.007 (0.034)	-0.002 (0.011)	0.013 (0.034)	0.004 (0.011)
Female	-0.110 (0.143)	-0.035 (0.046)	-0.093 (0.138)	-0.030 (0.045)
Migration background	-0.115 (0.206)	-0.036 (0.064)	-0.188 (0.199)	-0.060 (0.062)
Living situation controls				
Student living in urban area	0.605*** (0.162)	0.189*** (0.049)	0.561*** (0.160)	0.178*** (0.049)
Student living at parents' home	0.839*** (0.194)	0.268*** (0.058)	0.853*** (0.191)	0.276*** (0.057)
Student lives in East Germany	0.252 (0.232)	0.081 (0.073)	0.275 (0.232)	0.088 (0.073)
Parent and sibling controls				
Log parental gross labor income*	-0.030 (0.055)	-0.010 (0.018)	-0.013 (0.054)	-0.004 (0.017)
Parent(s) have college degree	-0.127 (0.151)	-0.041 (0.048)	-0.108 (0.146)	-0.035 (0.047)
Parents received social transfers	-0.043 (0.272)	-0.061 (0.066)	-0.058 (0.263)	-0.065 (0.065)
East German background	-0.338 (0.212)	-0.139 (0.065)	-0.409* (0.210)	-0.162* (0.066)
Older sibling claimed BAfoeG	-0.702*** (0.194)	-0.210*** (0.053)	-0.735*** (0.192)	-0.224*** (0.054)
East Germany × Social transfer last year	-0.572 (0.420)		-0.546 (0.411)	
Time-inconsistent preferences				
Willingness to take risks (std)	-0.102 (0.068)	-0.032 (0.021)	-0.100 (0.066)	-0.032 (0.021)
Very impulsive	-0.101 (0.197)	0.028 (0.052)	-0.080 (0.193)	0.039 (0.052)
Very impatient	0.002 (0.236)	0.067 (0.058)	-0.053 (0.232)	0.055 (0.057)
Interaction effects				
Very impulsive × Very impatient	0.655* (0.349)		0.707** (0.341)	
Exclusion restriction (1st stage)				
Vocational training completed			-0.681*** (0.231)	
Year controls				
Observations	✓		✓	
Baseline predicted probability	986		1041	
corr(u1,u2)= ρ	0.457		0.475	
Wald test ($\rho = 0$)			-0.750	
Joint sig. of East German (p-value)			0.047	
	0.028		0.019	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors, clustered on the student level, in parentheses.

Notes: SOEP 2002-2013, weighted. * = Deflated to base year 2007 and in hundreds of Euro.