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Abstract

This paper examines the decision-making process of students from an economic perspective in order to understand what determines an individual's willingness to provide effort. Our theoretical model predicts that ability and job market prospects are positive determinants. Analyzing a novel dataset on thousands of German students, however, we instead find that ability has a significantly negative effect on effort. It seems that the marginal gain of increasing effort in terms of higher expected income after studying is lower for high-ability students compared to low-ability students. In regard to the second determinant, the evidence rejects a similar argument, according to which great job market prospects may impair student effort. Applying an instrumental variable approach based on official unemployment data on regional labor markets, we can confirm our prediction on the positive role of perceived employment prospects in actual student behavior.

Keywords: higher education, effort, study time, leisure, ability, labor market data

JEL Classification: I23, J22, J24

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1 Introduction

A major question for scientific research on human behavior is under what circumstances do individuals strive. The economic approach suggests that individuals provide high efforts whenever the expected benefits of an activity exceed the expected costs. However, we know little about the determinants of effort outside of experimental laboratories or about situations when individuals – instead of providing high efforts to maximize their economic gain – make the decision to simply lean back. Whereas individuals with particular potential and great prospects may in one case show high motivation to provide extraordinary performance, in the other case, a positive outlook may actually deter effort levels, as it is possible to benefit from reduced effort costs while still obtaining a satisfactory level of achievement. By focusing on students in the system of higher education, the aim of our paper is to study individual effort decisions, which allows us to not only shed light on the determinants of human behavior in this particular educational context, but also beyond.[1]

The decision situation faced by students in the system of higher education has a particular facet that makes it very interesting from an economic standpoint: Both the society and the individual student benefit from educational achievement. The more of it can be attained, the higher the individual labor market earnings are because of increased human capital (e.g. Wolpin, 1977, Kroch and Sjoblom, 1994, Chevalier et al., 2004), thereby fostering overall economic prosperity. To achieve exactly that, students can choose individual effort levels as a major determinant of educational outcome (e.g. Stinebrickner and Stinebrickner, 2008). This leads to a scenario in which students have incentives for putting high efforts into studying, benefiting both the economy and society. In reality, however, there are indications for lacking effort levels among students, such as declining amounts of time spent on studying (e.g. Babcock and Marks, 2011) and increasing study durations in numerous countries (e.g. Brunello and Winter-Ebmer, 2003, Bound et al., 2012, Garibaldi et al., 2012). This raises the question what the determinants of study behavior actually are, and how can it be made possible to identify the drivers of students' commitment to performing well in the education system.

While there is a sizable literature on the outcomes of studying, there are not many studies dealing with economic decision-making in terms of student effort in higher education. Many of the contributions to the research on educational achievement of university or college students focus on study outputs, such as grades, and analyze potential determinants, such as financial incen-

[1]Microeconomic models of individual effort decisions typically include assumptions on the role of an individual's potential, such as ability, without providing references to empirical evidence. This does not surprise, given a lack of studies that focus specifically on the question of how ability affects effort. While a lot of evidence on determinants of individual effort levels comes from economic laboratory experiments, researchers here oftentimes inspect mindless tasks to purposely render certain inputs like ability irrelevant. Economic researchers of field data often fall back on proxies like absenteeism (see e.g. Ichino and Riphahn, 2005, Chadi and Goerke, 2015), or hours worked (see Bell and Freeman, 2001), given the importance of effort and its determinants in a variety of different research contexts, as e.g. workers' performance in firms. Another option for researchers to gather evidence from the field is professional sports, which allows testing economic predictions on effort decisions in non-laboratory data (see e.g. Lackner et al., 2015).

tives (e.g. Angrist et al. (2009)) or working during school (e.g. Stinebrickner and Stinebrickner, 2003).[2] A few papers provide a combination of empirical analysis and theoretical modeling, in which the latter considers the important role of student effort as a contributor to academic success (see e.g. Löfgren and Ohlsson, 1999, Krohn and O'Connor, 2005, Bandiera et al., 2015).[3] One example in this context is a study by Oettinger (2002), who discusses how university students make strategic decisions on effort levels, for which he assumes that incentives to provide effort increase in ability. In their study on student performance, Leuven et al. (2010) also take the role of effort into account but mostly focus on passing rates and how student performance can be raised by financial incentives. In a similar vein, Michaelis and Schwanebeck (2016) analyzes theoretically how different examination rules affect the student's effort. Apart from that, we concur with the conclusion of Delaney et al. (2013) who see a clear lack of knowledge on student inputs, despite the high level of interest in explaining study outcomes. While these authors provide the first empirical investigation into the determinants of student behavior in the system of higher education using across-subject data, they leave out two determinants that we consider to be as important as they are unclear in their actual role for effort decisions: ability and labor market prospects. Intuitively, one could expect that the low-ability persons should provide extraordinarily high efforts to compensate their disadvantage. Meanwhile, high-ability types may also have strong incentives to provide extra effort, as they can benefit more from educational achievement. On the other hand, they could also use their promising situation to reduce effort when they are satisfied with a certain level of achievement. Similar arguments apply for job market prospects in general, which could also affect student behavior and help to explain lacking effort. Given the unclear relationships a priori, we provide the first comprehensive discussion, theoretically and empirically, on how these factors affect students' effort.

Beyond improving our understanding of human behavior in general and university students specifically by providing a theoretical model of student effort decisions, our study has several features through which we can contribute to and expand ongoing research. As one potentially important aspect, we expand the notion of the ways in which students can provide effort by considering multiple dimensions of it. Whereas previous educational studies often focus on study time measured via lecture attendance, the role of this factor in educational achievement appears to be unclear.[4] Given the heterogeneity of empirical findings in this context, we scrutinize whether study time is suf-

[2]Other indicators of study outputs in the context of higher education are graduation rates (e.g. Light and Strayer, 2000) and study durations (e.g. Gunnes et al., 2013).

[3]Note that there are also some studies discussing the importance of student effort for educational achievement among pupils before they enter higher education, such as Metcalfe et al. (2011) as well as De Fraja et al. (2010) who also point out a basic lack of research on the role of student effort.

[4]See Grave (2011) for a comprehensive study on the role of students' time allocation in educational achievement. While she finds overall rather positive relationships between the latter and both lecture attendance and self-study time for her data on German university students, Dolton et al. (2003) find a more positive role of attendance compared to self-study using data on Spanish university students, whereas Bratti and Staffolani (2013) find the opposite for Italian university students.

ficient for capturing individual effort and question the underlying assumption that investing the same amount of time means investing the same amount of effort. Arguably, any given hour spent in the library or in the lecture room may consist of only focused learning, but it may just as well consist of only idle daydreaming. We therefore propose a distinction into a quantitative and a qualitative dimension of effort in order to learn more about the complex factor that effort certainly is. While in our theoretical discussion we distinguish between study time (quantitative dimension) and learning intensity (qualitative dimension), we attempt to capture the quantitative component via comprehensive time-use data and the qualitative component via subjective data on self-assessed effort levels in our empirical investigation. To test theoretical predictions, we make use of data from a broadly conceived investigation of students in Germany's system of higher education, the National Educational Panel Study (NEPS). The students' cohort of the NEPS has not been used for similar purposes so far and allows us to inspect the role of ability, as an example, in ways not possible in most cross-subject datasets.

Regarding this key student input, we can exploit data from comprehensive competence testing of university students to establish a measure that allows us to inspect this determinant of university students' behavior without having to rely on proxies such as previous grades, which are likely affected by (past) effort decisions. This is a particular problem for any attempt to find out about the actual impact of individual ability on effort. Finally, we provide evidence on the direct effects of job market prospects on student effort, as the outlook on future earnings reflects the channel through which students take their economic gains of studying into account. We thereby elaborate on the work of Brunello et al. (2004) who argue that subjectively expected returns to education are a key determinant for university students' decision-making regarding educational attainment.[5]

In our theoretical modeling of student decision-making, we make some basic assumptions that conform to the previous literature. Students decide about both effort dimensions anticipating that higher effort is associated with a utility decline today, but improves educational achievements and hence increases expected income and utility after studying. Whether high-ability students provide less or more effort compared to low-ability students depends on two factors. First, considering each effort dimension separately, high-ability students have an incentive to increase effort, such as study time (at the expense of leisure), because this raises utility in the future, i.e. the substitution effect (SE). At the same time, however, high-ability students have an incentive to reduce effort because their high abilities per se ensure a relatively good educational achievement and thus a relatively high level of expected income, i.e. the income effect (IE). Second, the way both effort dimensions are interlinked does play a role. If they were complements, high-ability students that provide high learning intensity would also choose a high study time, compared to low-

[5]In a similar fashion, many researchers promote the use of subjective data on students' beliefs and expectations regarding the role of the labor market in student behavior, such as Betts (1996), Wolter (2000), Botelho and Pinto (2004), Webbink and Hartog (2004), Jensen (2010), Bonnard et al. (2014), Brodaty et al. (2014), Stinebrickner and Stinebrickner (2014), Huntington-Klein (2015).

ability students. If both dimensions were substitutes, however, high learning intensity would come at a price of lower study time and vice versa. These mechanisms also hold for our second determinant, i.e. job market prospects. To gain testable predictions, we assume that both the students' utility and educational production function are of a Cobb-Douglas type. This implies that a.) the SE dominates the IE and that b.) both effort dimensions are complements. As such, we expect that high-ability students provide higher effort (study time and learning intensity) compared to low-ability students. In addition, better job market prospects should increase the students' effort in both dimensions during academic studies.

The results from analyzing the NEPS data reject the prediction that ability positively affects effort levels. Instead, the evidence conforms to the notion that high-ability students use their advantage over the low-ability to obtain additional utility by having more leisure time. We find that the higher the ability is, the lower self-assessed effort levels and weekly self-study hours are. As the latter time-use factor predicts educational achievement in our data more strongly than the other activities, such as lecture attendance, this empirical result supports the picture of the 'lazy genius' who puts comparatively little effort into studying. Going back to our model, this speaks for a relatively strong IE and/or a relatively weak SE. Regarding job market prospects, we not only look at standard regression results but also apply an instrumental variable (IV) approach to address the potential reverse causality between effort and labor market prospects. To this aim, we make use of official unemployment data reflecting variations in regional labor market conditions. We merge the data using information on prospective jobs and university location. The results from applying this approach align with those from running standard regressions and suggest that great job prospects positively influence effort, which confirms our theoretical prediction. Vice versa, we interpret our finding in such a way that not having good prospects may frustrate students' motivation for putting in high efforts into studying, which may contribute to the phenomenon of prolonged study durations, as argued by other researchers (e.g. Aina et al., 2011). By substantiating this argument empirically, we can contribute to this particular discussion and establish policy implications.

The remainder of our paper is structured as follows. In section 2, we build our model and derive testable predictions. Our empirical analysis is conducted in section 3, while we discuss our findings in section 4. Section 5 concludes.

2 Theoretical Model

2.1 Set-up

We analyze the study behavior of an individual by using a two-period model. While being a student in the present period 1, the individual expects to enter the labor market in the future period 2 to earn income.

The individual's utility function is assumed to be:

$$U = V(I^1, L^1) - C(e) + \beta V(I^2, L^2), \qquad 0 < \beta \leq 1, \tag{1}$$

where I^1 (I^2) denotes income in period 1 (expected income in period 2), L^1 (L^2) represents leisure in period 1 (leisure in period 2) and β is the discount rate. We assume that sub-utility V increases in income and leisure at a decreasing rate. e measures the student's learning intensity. Intuitively, e indicates how diligent the student is and how hard s/he works during the time span that s/he has scheduled for studying. Learning intensity is associated with utility costs (or disutility) measured by C, which is increasing and convex, $C_e, C_{ee} > 0$, where subscripts denote partial derivatives.

Income in period 1 is assumed to be exogenously given, while leisure in period 1 reads $L^1(s) = T - s$. The endogenous variable s represents the time that the individual spends on academic studies. Given the (exogenous) time stock T, which also summarizes the time required for other activities besides studying (e.g. student employment), s determines the amount of leisure a student has. In the literature, study time is often considered as an effort indicator. In our setup, however, s constitutes only a quantitative dimension of effort, while its qualitative dimension is captured by the learning intensity e.

In period 2, expected income depends on the individual's achievement during academic studies (for a similar assumption see Löfgren and Ohlsson, 1999, De Fraja and Landeras, 2006, De Fraja et al., 2010). The student's achievement is typically represented by the educational production function (EPF). Following a large strand of literature on the determinants of study success (for an excellent review see Brewer and McEwan, 2010), we assume that the student's achievement positively depends on learning intensity e, study time s and the student's ability level a. The latter is time invariant and exogenously given. As such, an individual's ability level cannot be manipulated by putting in high efforts, which might be possible for alternative ability proxies such as grades obtained from previous schools.

The EPF can be formalized as:

$$Y = Y(e, s, a, X), \tag{2}$$

where the vector X captures all other factors that influence Y, for example family background or the quality of the university. Expected income in period 2 is thus given by:

$$I^2 = \delta Y(e, s, a, X), \qquad \delta \geq 0, \tag{3}$$

where δ captures the student's job market prospects. If these prospects are relatively good (bad), a given level of educational achievement implies a relatively high (low) value of expected income. In our theoretical modeling, we consider job market prospects as exogenous and thus independent of students' ability and effort decisions. Job market prospects vary between individuals due to objective factors (e.g. actual labor demand and the information thereof) but also because of subjective elements in the way that students process information. For instance, the same knowledge of labor market data may transform into different expectations in regard of future income. In addition, job market prospects may change over time, such that δ could increase or decrease dur-

ing academic studies. Note that future leisure L^2 is assumed as exogenously given.[6]

With these components at hands, we can rewrite the individual's utility function as:

$$U(s, e, \delta, a) = V(I^1, L^1(s)) - C(e) + \beta V(I^2(e, s, \delta, a)), L^2), \tag{4}$$

where we have suppressed some of the variables to save notation.

2.2 Optimization

At the beginning of period 1, the student decides about time allocation during academic studying, i.e. the student chooses how much time (of T) will be spent on studying s. The residual time is used for leisure and other (exogenous) activities. In addition, the student sets learning intensity e. Both decisions are made to maximize total utility U.

Differentiating (4) with respect to s implies:

$$U_s = - \underbrace{V_{L^1}(s)}_{\equiv MC_s(s)} + \underbrace{\beta V_{I^2}(s, e, \delta, a)\delta Y_s(e, s, a)}_{\equiv MG_s(e,s,a,\delta)} = 0, \tag{5}$$

where MC_s and MG_s denote the marginal costs and the marginal gains of an increase in study time, respectively. This implies that study time is chosen such that the utility decrease today (due to reduced leisure) is exactly offset by the utility increase in the future (due to improved educational achievements and thus raised expected income). Note that (5) pins down the utility maximizing study time for any given level of learning intensity, ability and labor market prospects: $\overline{s} = s(e, a, \delta)$.

The first-order condition with respect to learning intensity reads:

$$U_e = - \underbrace{C_e(e)}_{\equiv MC_e(e)} + \underbrace{\beta V_{I^2}(s, e, \delta, a)\delta Y_e(e, s, a)}_{\equiv MG_e(e,s,a,\delta)} = 0, \tag{6}$$

with MC_e and MG_e representing the marginal costs and the marginal gains of an increase in e, respectively. As a result, learning intensity is chosen such that the utility decrease today (due increased costs C) is balanced by the utility increase in the future (due to improved educational achievements and thus raised expected income). Note that (6) pins down utility maximizing learning intensity for any given level of study time, ability and labor market prospects: $\overline{e} = e(s, a, \delta)$.

By combining $\overline{s}$ and $\overline{e}$, we can determine utility maximizing study time and learning intensity as functions of exogenous parameters only: $s^* = s(a, \delta)$ and $e^* = e(a, \delta)$.[7]

[6] This assumption is made for simplification. It can be justified because working hours are predetermined in highly regulated labor markets such as in Germany.

[7] The second-order conditions for a maximum are given by $U_{ss} < 0$, $U_{ee} < 0$ and $|H| = U_{ss}U_{ee} - U_{se}U_{se} > 0$, where $|H|$ is the determinant of the Hesse-matrix. We assume that these conditions are fulfilled.

2.3 Comparative Static Analysis

How do the student's ability a and labor market prospects δ affect the student's effort choices, i.e. the utility maximizing study time and learning intensity? To answer this question theoretically, we conduct a comparative static exercise, i.e. we consider variations in δ and a.[8]

2.3.1 Abilities

Let us compare a high-ability student with a low-ability student. Totally differentiating (5) and (6) and rearranging the resulting expressions yield:

$$\frac{ds}{da} = -\underbrace{\frac{1}{U_{ss}}}_{<0}\left(U_{sa} + U_{se}(Y_{se})\frac{de}{da}\right), \tag{7}$$

$$\frac{de}{da} = -\underbrace{\frac{1}{U_{ee}}}_{<0}\left(U_{ea} + U_{se}(Y_{se})\frac{ds}{da}\right). \tag{8}$$

Partial derivatives read $U_{sa} = \beta\delta(V_{I^2I^2}\delta Y_a Y_s + V_{I^2}Y_{sa})$, $U_{ea} = \beta\delta(V_{I^2I^2}\delta Y_a Y_e + V_{I^2}Y_{ea})$ and $U_{se}(Y_{se}) = \beta\delta(V_{I^2I^2}\delta Y_e Y_s + V_{I^2}Y_{se})$.

To decompose the effects on the student's behavior, we first look at the effects on $\overline{s}$ and $\overline{e}$, where $de/da = 0$ and $ds/da = 0$ hold, respectively. The sign of $d\overline{s}/da$ ($d\overline{e}/da$) depends then on the sign of U_{sa} (U_{ea}). Intuitively, there are two countervailing effects. High-ability students have higher marginal gains from effort because of an increased expected income. Therefore, they substitute leisure against study time or increase learning intensity despite the associated rise of disutility. We call this the substitution effect (SE). Given the increased expected income, however, high-ability students also have an incentive to reduce study time (learning intensity) to keep the marginal gains from s (e) constant. We call this the income effect (IE). Which of these effects dominate is in general ambiguous.

The impact on s^* and e^* can be calculated by combining (7) and (8). This yields:

$$\frac{ds^*}{da} = \underbrace{\frac{1}{|H|}}_{>0}\left(U_{se}(Y_{se})\cdot U_{ea} - \underbrace{U_{ee}}_{<0}U_{sa}\right), \tag{9}$$

$$\frac{de^*}{da} = \underbrace{\frac{1}{|H|}}_{>0}\left(U_{se}(Y_{se})\cdot U_{sa} - \underbrace{U_{ss}}_{<0}U_{ea}\right). \tag{10}$$

Besides the SE and IE, the effect on study time and learning intensity is driven by the interrelatedness of both which is captured by Y_{se}. Suppose that high-ability students choose to increase study time (relative to a low-ability student). If both effort dimensions were complements, this implies,

[8] Since the student's ability is constant by definition, the results of the comparative static exercise should be interpreted as predictions of how individuals with different abilities, but otherwise identical characteristics, behave during academic studies.

ceteris paribus, that high-ability students will also learn with higher intensity. If, in contrast, s and e would be substitutes, increased study time would, ceteris paribus, come at a price of lower learning intensity. Given the general formulation of the EPF, we do not know the relationship between the two effort dimensions. As such, the effect on s^* and e^* is in general ambiguous.

2.3.2 Job market prospects

Suppose now that labor market prospects of the student improve, i.e. δ increases. We abstain from analyzing the effect on $\overline{s}$ and $\overline{e}$ and immediately compute the implications for s^* and e^*. Totally differentiating (5) and (6) implies:

$$\frac{ds^*}{d\delta} = \underbrace{\frac{1}{|H|}}_{>0} \left(U_{se}(Y_{se}) \cdot U_{e\delta} - \underbrace{U_{ee}}_{<0} U_{s\delta} \right), \tag{11}$$

$$\frac{de^*}{d\delta} = \underbrace{\frac{1}{|H|}}_{>0} \left(U_{se}(Y_{se}) \cdot U_{s\delta} - \underbrace{U_{ss}}_{<0} U_{e\delta} \right), \tag{12}$$

with $U_{s\delta} = \beta Y_s(V_{I^2 I^2} Y \delta + V_{I^2})$ and $U_{e\delta} = \beta Y_e(V_{I^2 I^2} Y \delta + V_{I^2})$.

This shows that the impact of improved labor market prospects on student's behavior depends also on a.) the interplay of SE and IE and b.) the interrelatedness of study time and learning intensity. The intuition is analog to the one described in the previous subsection. As a result, the consequences for s^* and e^* are in general ambiguous.

2.4 Predictions

To gain testable predictions, we have to choose an explicit formulation of the sub-utility function V and of the EPF Y. With respect to the former, we assume that the utility of income and leisure is described by a Cobb-Douglas function $V = I^{\alpha} L^{1-\alpha}$ with $0 < \alpha < 1$ (for a similar assumption see e.g. Mankiw, 1988). Regarding the latter, we follow the literature and assume that the EPF is given by $Y = e^{\gamma_1} s^{\gamma_2} a^{\omega}$, $0 < \gamma_1, \gamma_2 < 1$ and $\omega > 0$, which is also a Cobb-Douglas type function.[9]

These assumptions have two important implications. First, the SE will always dominate the IE, i.e. $U_{sa} > 0$, $U_{ea} > 0$, $U_{s\delta} > 0$ and $U_{e\delta} > 0$. Second, study time and learning intensity are complements, i.e. $Y_{se} > 0$. It is easy to show that $U_{se}(Y_{se}) > 0$ holds, too. Using (9), (10), (11) and (12), we then find:

Prediction 1 *High-ability students choose a higher study time (lower leisure) and provide more learning intensity compared to low-ability students.*

Prediction 2 *An improvement of labor market prospects raises study time and learning intensity.*

[9] Formalizing the EPF as a Cobb-Douglas function is a widely used assumption in the literature. See, for instance, Polachek et al. (1978), Gyimah-Brempong and Gyapong (1991) and Bishop and Wößmann (2004).

3 Empirical investigation

3.1 Data

To test our theoretical predictions empirically, we make use of data from the National Educational Panel Study (NEPS). This unique and novel survey dataset allows investigating important aspects in the context of higher education, such as the role of individual ability and job market prospects. To the best of our knowledge, we are the first to use this dataset to investigate the determinants of student effort. Apart from the cohort of university students that we focus on in this paper, the NEPS carries data of several other cohorts covering the life span from early childhood up to further education and lifelong learning. To carry out the work on data collection and research, the NEPS network consists of about twenty universities and research institutes from across Germany. We are not aware of any other projects of a similar scope investigating educational processes in Europe. For Germany in particular, where data protection rules rarely allow researchers to conduct representative analyses, such projects are extremely rare.

The NEPS data we use in this paper is the starting cohort 5 which provides representative data on freshman students starting in winter term 2010/2011.[10] Focusing on study beginners has the advantage from the perspective of our research aims that the effort decisions of those students are not affected by their own study success. Additionally, study dropouts are an ongoing problem not only in Germany but also in many other countries (see Light and Strayer, 2000, Di Pietro and Cutillo, 2008). In recent years, only three quarters of students completed their studies at German universities (OECD, 2013). We therefore ensure data representativeness by focusing on freshman students. Furthermore, the NEPS includes more than 200 institutions of higher education in Germany, so that our analysis is based on a representative nation-wide sample.

Our focus lies on the variables covering students' effort. For the quantity of effort, we analyze time use data. The NEPS offers detailed information on the average time allocation of each individual's daily activities. Specifically, students are asked about their time spent on self-study, lecture attendance, other study-oriented activities (e.g. commuting), working, household activities and childcare. Following the findings of Bratti and Staffolani (2013), we expect self-study to be the key quantitative effort variable, but we also examine the

[10] Whereas the NEPS project includes other starting cohorts, focusing on early childhood (cohort 1), kindergarten (cohort 2), lower secondary school (cohort 3), upper secondary school (cohort 4), and adults who are out of the education system (cohort 6), we focus on the fifth one on first-year students (doi:10.5157/NEPS:SC5:6.0.0). The data on these first-year university students was collected by the NEPS via telephone and online. Note that from 2008 to 2013, NEPS data was collected as part of the Framework Program for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research (BMBF). As of 2014, NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide network. For further information see Blossfeld et al. (2011).

role of lecture attendance.[11] The NEPS also provides information on study time during semester breaks, which adds to time use during the semester.

As in other empirical settings using data on university students (see e.g. Bonesrønning and Opstad, 2015), there is no exact measure of the qualitative dimension of student effort in the NEPS data. Yet, by means of a subjective assessment on individual effort levels, we are confident that we will capture differences in individual effort for a given learning intensity. As a proxy variable for the qualitative dimension of effort, we use information on how strongly each student agrees to the statement "I invest a lot of energy in being successful in my studies." Possible answers reach from "Does not apply" (1) to "Applies completely" (5) on a five-point scale. About two thirds of the students state values (3) and (4), while only a few report to invest very little or the maximum amount of energy. Note that we refer this variable as "self-assessed effort" in the following.

In the first part of the empirical analysis, we inspect the theoretical prediction on the role of ability in students' effort decisions. As an advantage of the NEPS towards alternative data sources, we benefit from the fact that the survey designers of the NEPS are particularly interested in measuring individual ability levels of each student. To do so, the NEPS conducted comprehensive competency tests which took place at the universities in spring 2011. Thousands of students participated on a voluntary basis and received 20 Euro as an incentive for participation. In consequence, data on ability is not provided for all participants of the NEPS surveys, which leads to a reduced sample size in the first part of our analysis. In turn, we can increase observation numbers in the second part of the analysis when we focus on a survey-based determinant of effort, while we make use of NEPS weights to foster representativeness of the data throughout our analyses. The three parts of the test include reading speed, reading competency and mathematical tests. The focus on those tests relies on the idea that reading and mathematical skills cover most of the required core competencies of present students. Quantitative analysis had become increasingly important also in social and human sciences, while an ambitious workload of reading is part of nearly every field of study. We standardize the variables of each test with a mean of zero and standard deviation of one to generate a comprehensive variable of all three competency tests.

To inspect the role of students' future employment outlook as potential driver of differences in effort decisions, we exploit information on job market prospects. Part of the NEPS questionnaire is the following question: "And once you do complete the degree course, what are your chances of getting a good job?" Five answers are possible which reach from "very bad" (1) to "very good" (5). Only very few respondents (about 4 percent) state very bad or bad prospects (value 1 or 2). We build a dummy variable, which equals one if prospects are very good (5), which is the case for 30 percent of the sample. Beside data on these individual and subjective job prospects, our dataset provides further data on students' prospective jobs. This allows us

[11] Especially in the German context, there are certainly differences in the nature of these two activities, self-study and course attendance. Students may well attend classes but they are usually not required to pay attention to the lecturer and to take an active part in course lessons.

to more deeply analyze the impact of job prospects, as we merge the NEPS data with labor market data, differentiated by both occupation and region. As job market prospects are not necessarily exogenous like they are in our theoretical model, we make use of official unemployment statistics from the Federal Employment Agency for an instrumental variable (IV) approach, which we describe in more detail later on.

Apart from our main variables of interest, the NEPS offers a lot of data on students in Germany's system of higher education. This allows us to consider several control variables on important aspects of students' lives in our analysis. Specifically, we categorize the relevant information into socio-demographic background, school and living-related controls as well as university background and economic factors, where the latter category also includes regional information. We also consider possible measurement differences over time by using control variables for interview month throughout our analysis. Consideration of non-responses (i.e. missing values) to all those relevant survey items that we take into account in our analysis leads to a sample that includes more than 4400 students who all attended the competency test. Table A.1 shows the descriptive statistics of the variables used in our analysis.

To illustrate the available information on study-related time (i.e. self-study, attending classes and further study-oriented activities) and other activities, such as working, Figure A.1 shows the distribution of students' time use during the semester. The remaining share of the time not reflected in one of the survey items on time use offers us another variable of interest for our analyses. To this aim, we calculate students' free-time (including weekends and sleep) by adding all hours up and deduct that number from the weekly stock of (24 x 7 =) 168 hours. While this measure is obviously somewhat noisy, it certainly constitutes another opportunity to distinguish between those individuals who do a lot for their studies and those who rather enjoy the amenities of being a university student.

3.2 Student effort and ability

To investigate the role of the potential determinant of ability for student effort decisions, we exploit our continuous measure described in the previous section and first inspect its basic relationship to self-assessed effort levels. We run standard regression analyses and thereby consider relevant control variables in order to inspect whether the basic difference between high- and low-ability types in regards to their self-assessed effort levels is sensitive to some key characteristics. In a second step, we specifically focus on the quantitative dimension of effort and examine various time-use variables as outcomes.

The main finding of Table 1 is a significant and negative effect of ability on self-assessed effort that does not change much throughout the specifications.[12] Column 2 adds socio-demographic controls while column 3 additionally controls for living- and school-related variables. The effect remains strong when we consider all variables together, including university- and working related variables in column 4.

[12]For the complete regression table, see Appendix A.2. Note that the Appendix also contains extensive regression tables for the other analyses shown in the main part of the paper.

Table 1: Ability and (qualitative) student effort

	(1) Self-assessed effort	(2) Self-assessed effort	(3) Self-assessed effort	(4) Self-assessed effort
Ability	-0.076^{***}	-0.056^{**}	-0.053^{**}	-0.086^{***}
	(0.02)	(0.02)	(0.02)	(0.02)
Socio-demogr. controls		✓	✓	✓
School-/living-related controls			✓	✓
Work-/university-related controls				✓
Observations	4431	4431	4431	4431
Adj. R^2	0.005	0.019	0.023	0.046

OLS estimations; NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Additional control variables for the interview month are included in columns (2)-(4). Full results are reported in Table A.2.

As our outcome variable here may reflect not only the qualitative dimension of effort, as in our model, but also the quantitative dimension, we inspect what happens if we control for the latter using time-use data. The results hold, which is further evidence against our prediction. These results are available upon request, just like those from other sensitivity analyses that we mention in the following. In fact, while we prefer standard regression analyses in this part of the empirical investigation, we can also estimate an ordered probit model in order to take the ordinal scale of our dependent variable into account. The results do not change qualitatively when we consider this methodological point. We also come to the same conclusion, independent of whether we look at ability as a continuous variable or whether we use dummy variables for differences in ability. In regard to sample selection, we estimate a Heckman model in order to check whether the results are subject to a selection bias caused by the voluntary participation in the competency test. Our results hold when we apply such an approach. Furthermore, the results hold if we exclude students with a foreign mother tongue who might have a disadvantage in reading tests. With respect to study subjects, we are cautious in considering this factor directly in our analysis, since we believe that the subject is potentially endogenous because of self-selection related to our independent variable of interest. Specifically, students who are more able than others are likely to select themselves into certain subjects, in which they then may provide higher effort on average, making field of study a bad control variable. In order to assess the significance of subject differences for our analysis, we prefer analyzing an alternative effort indicator, which we define as the individual deviation from the average in each field of study according to the available 2 digit ISCED classification. While this alternative outcome variable considers differences in effort across subjects, the analysis of this subject-adjusted effort leads to the same finding on the negative impact of ability on effort. Note that we ensure having checked the robustness of all the results below in the subsequent analyses, using this subject-adjusted effort variable. Finally, the rich data allows adding controls for school history, such as which subjects students choose for their of school-exit-examinations, to our model, which does not change the results either.

Table 2: Ability and (quantitative) student effort

	(1) log(Self-study) (term)	(2) log(Self-study) (holidays)	(3) log(Attend classes)	(4) log(Free-time)
Ability	-0.034^{*}	-0.091^{***}	0.011	0.011^{+}
	(0.01)	(0.03)	(0.01)	(0.01)
Observations	4431	4431	4431	4431
Adj. R^2	0.052	0.065	0.047	0.059

OLS estimations; NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Full set of control variables is used in each column, as in column (4) of Table 1. Additional control variables for the interview month are included in each column. Full results are reported in Table A.3.

Next, we focus on the effect of ability on quantitative study efforts. Table 2 shows our findings for several potential indicators, for which we use the log of each time-use variable. We first find a negative effect of ability on self-study time, as our main outcome variable of interest here. The finding is the same, although with an even stronger effect size for the self-study time between terms. Arguably, this quantitative effort indicator could be even more telling, because in the holidays it is completely up to the individual student to decide whether to do something for the university or not. Using lecture attendance as a dependent variable in column 3, the estimation shows a slightly positive but statistically insignificant impact of ability. This aligns with the expectation that attendance does not reflect effort levels in the way that self-study does, and that many students may attend classes but their attendance does not necessarily reflect whether they are focused on learning and improving their academic achievement.[13] Finally, we regress our generated variable of students' free-time on ability. The result in column 4 shows that ability has a contrary effect in the sense that having higher ability implies enjoying more free-time, if we accept a significance level of 10%. While this illustrates very well the main finding of this empirical investigation, this free-time measure is certainly somewhat noisy, as it indirectly considers the heterogeneity in students' lives and the fact that some students have a child and others have a job in addition to studying. Overall, however, we conclude from our sensitivity analyses that the main finding of leisure-enjoying high-ability types holds, which clearly stands in contrast to our theoretical prediction.

3.3 Student effort and job market prospects

To empirically verify our second theoretical prediction, we begin this part of our investigation with standard regressions in the vein of the previous chapter. The determinant of student effort here is their job market prospects, for which we analyze subjective self-assessments. We make use of a dummy variable that distinguishes between students with very great job market prospects and those who do not report such a positive outlook.

The main finding of Table 3 is that subjective job prospects are positively linked to both effort dimensions, i.e. self-study time (during term) and self-

[13] In additional analyses, we examine the link between these different time-use variables and academic success (results available upon request), which broadly confirm this notion.

assessed effort levels. In contrast to our analysis of the impact of students' ability levels, this is in line with our theoretical considerations. However, while there is no reason to believe that students' current effort levels vice versa affect their ability levels (in a negative way), the potential problem of reverse causality is certainly an issue in the analysis presented in Table 3. One may argue that it is not the great prospects that spur effort but great prospects result from high efforts.

Table 3: Job market prospects and student effort

	(1) Self-assessed effort	(2) Self-assessed effort	(3) log(Self-study) (term)	(4) log(Self-study) (term)
Very good job prospects	0.157***	0.136***	0.098***	0.099***
	(0.03)	(0.03)	(0.02)	(0.02)
Socio-demogr. controls	✓	✓	✓	✓
School-/living-related controls	✓	✓	✓	✓
Work-/university-related controls		✓		✓
Observations	10233	10233	10233	10233
Adj. R^2	0.030	0.046	0.018	0.051

OLS estimations; NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Additional control variables for the interview month are included in each column. Full results are reported in Table A.4.

To check the direction of the effect of perceived job market prospects on effort levels, we employ an IV approach for which we use labor market data. The idea in the following is that variation in labor market conditions in the region where the university is located is a) effectively influencing perceptions of one's own future employment outlook and b) plausibly determined exogenously and thus not dependent on effort decisions of students at the university. Based on this exogeneity assumption, we continue by identifying the relevant labor market segment of each student. To do so, we exploit available information on the most common career aspiration for each field of study in the NEPS data. These career aspirations are measured on a standard classification of occupations (KldB1988) which allows us to merge the NEPS data with employment statistics from Germany's Federal Employment Agency at the industry level. As these industry-specific statistics are available at the regional level (German federal states), we can merge the employment statistics with our NEPS data based on the occupation identifier and the federal state where the university is located. This procedure yields a large number of cells (= industry × region), for which we can attach information on varying labor market conditions to the NEPS data. As our IV, we use actual numbers of additional unemployed persons from employment to unemployment within each regional industry sector divided by overall employment numbers per cell. This weighted inflow from employment to unemployment varies between 0 and 20 percentage points with a mean of 1.3 and a median of 0.8 percentage points. In a last step, we multiply this inflow variable with 100 and take the square root in order to consider outliers. We expect our instrument "unemployment inflow" to decrease students' perceived job prospects during their studying. Since most students were

interviewed at the end of the first term and we are particularly interested in job prospects (and the effect on effort) during the term, we use unemployment data from October to December 2010 and relate them to employment data of September 2010. Additional robustness checks show that our results does not depend on choosing those time points.

In terms of methodology, we prefer a procedure proposed by Wooldridge (2002) for potentially endogenous binary variables over the standard linear probability model. Hence, in the first stage, we estimate a probit model for very good job prospects, which includes our labor market data as an instrument and calculate predicted values. In the second stage, we include these predictions as an instrument in standard two-stage least-squares regressions. Employing this procedure, statistical significance tests yield asymptotically valid results (Wooldridge, 2002).

Table 4: Job market prospects and student effort (IV estimations)

	(1) Very good job prospects	(2) Self-assessed effort	(3) log(Self-study) (term)
Unemployment inflow	−0.628***		
	(0.05)		
Very good job prospects		0.606***	0.351***
		(0.13)	(0.09)
Observations	10233	10233	10233

IV-2SLS Wooldridge procedure estimations. First stage (probit) estimations in column (1), second stage (IV) estimations in columns (2) and (3); NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Full set of control variables is used in each column, as in columns (2) and (4) of Table 3. Additional control variables for the interview month are included in each column. Full results are reported in Table A.5.

The IV results in Table 4 substantiate the idea that there is a positive effect of job market prospects on effort levels. This holds for both of our effort variables, the subjective assessment and the key time-use variable of self-study. Column 1 contains our estimations from the first stage, which confirms our expectations regarding the impact of our instrument on job prospects. Our instrument has the expected sign and is statistically significant. Thanks to the exogenous nature of the regional unemployment data, a direct impact of the employment outlook on student behavior appears to be present in both cases.

The findings are qualitatively similar when we run a standard linear IV model and cluster at the cell level (results are shown in Table A.6 in the appendix). The first stage regressions again show that our instrumental variable has a strong effect on job market expectations, which ensures sufficient instrumental power (the F statistic is 34.66). Given the ordinal nature of one of our two effort variables, we conduct another sensitivity check for self-assessed effort and confirm the finding of a significantly positive impact of great employment prospects by using bivariate ordered probit (see Sajaia, 2008). In further checks, we restrict the sample in different ways. For instance, we exclude students from our sample who reported having earned 60 credit points or more, which may stand in conflict with their assumed freshman status. We also can exploit the information on interview dates by excluding observations from students who were interviewed late during the NEPS fieldwork. These restrictions, however, do not change our results in a qualitative way.

We conclude from this analysis that our prediction on the role of future employment prospects for student effort decisions appears empirically correct. Students with the perception of a great job market outlook do not lean back like high-ability types do, but instead provide high efforts. We discuss both of our two main empirical findings against the background of our theoretical consideration and in the light of the educational background at hand in the subsequent chapter.

4 Discussion

Our empirical findings on the impact of labor market prospects on student behavior are in line with our theoretical prediction. Accordingly, having a great outlook on future earnings positively influences current effort levels. From a policy perspective, this appears to be a convenient finding, even if happiness researchers are correct in arguing that individuals to some extent overestimate the utility of future income (see e.g. Easterlin, 2001, Frey et al., 2007). However, this finding vice versa implies that bad labor market prospects could reduce effort levels at universities. Our evidence thus substantiates an idea that some researchers have put forth, such as Aina et al. (2011) who consider weak job prospects as an explanation for long study durations at Italian universities. In a similar fashion, van der Klaauw and van Vuuren (2010) argue that low labor market returns to academic performance explain the phenomenon of lacking ambition among Dutch students. It appears that we can empirically verify the important role of the labor market in student behavior for another country.[14]

In regard to how well theoretical predictions and empirical evidence are in line with each other, the picture is certainly different with respect to our prediction on the role of ability in student effort decisions. Since there are not many examples in economic research in which the evidence reveals lacking effort among high-ability individuals, we first go back to our model in order to explain the finding of the 'lazy genius'. Since both effort dimensions decline in ability, we can conclude that study time and learning intensity are complements. The theoretical reasoning then suggests that the IE (SE) of high-ability students is relatively strong (weak) compared to the one of low-ability students. This could be because the future marginal utility gain of putting high effort is relatively low for high-ability students since their high abilities per se ensure a high level of educational achievement and thus a high level of expected income after studying. It is then rational for those students to reduce efforts because this is associated with a marginal utility gain during academic studies (e.g. students can increase leisure) which does not come at the expense of a high re-

[14] Also see Kahn (2010) who provides empirical evidence for the US on how bad labor market conditions during graduation negatively affect students' labor market outcomes later on.

duction of future utility gains. This cast some doubts about the Cobb-Douglas specification of the EPF (where the SE always dominates the IE).[15]

Besides this interpretation, it might also be the case that some assumptions of the model fail. For example, it could be simply not true that individuals benefit from raising their future income levels. Furthermore, it could be that it just makes no sense to put in a lot of effort into studies, as it is not worth it. Students may doubt that their final degrees and the grades obtained at the end of their studies are key to labor market success in the future. Phenomena like grade inflation could play a role in explaining why students are reluctant with their effort if they expect that the informative power of their educational success is not very effective.[16] Note, however, that there are good reasons for schools of higher education to do everything possible to avoid the reduction of value of the degrees that they give to students, as pointed out by Ehlers and Schwager (2016).

As long as the assumption holds that students benefit from acquiring human capital when performing well at the university, there is certainly a social problem when high-ability types do not get the maximum possible out of the education system due to their reduced effort levels. Surely, one may question previous studies in favor of human-capital theory and instead argue that whatever is achieved in the system of higher education is in itself not necessarily relevant for one's potential to perform well in the labor market.[17] Yet, even if that were true, lacking efforts of students would still be a problem given that educational policy-makers are concerned about fast studying and consider long study durations to be a problem, at least in systems of higher education that are to large extent taxpayer-funded. Vice versa, one might argue that the phenomenon of the lazy genius' is probably less likely to appear in systems of higher education with sizable tuition fees, such as in the UK . Be it as it may, from the individual student's perspective, even if there were no human capital effect for income levels, educational achievement should work as a signal to potential employers. In this context, Arcidiacono et al. (2010) argue that graduation helps reveal ability to the labor market and thereby affect earnings, according to which the high-ability benefit in particular from successful studying. Thus, the finding of little effort among high-ability types remains intriguing, especially since we find that students with better job market prospects are indeed motivated to put greater efforts into studying.

Apart from these interpretations of our findings, it could also be that there are other aspects at play in our empirical analysis. For instance, analyzing effort based on subjective self-assessments might be susceptible to measurement issues. One could argue that high-ability types generally report lower effort levels, as their reference point is different. In the course of their studies,

[15]The importance of the SE and IE in students decision making is also pointed out by Bandiera et al. (2015). In this study, the authors assume that students do not know their own ability and analyze how feedback of their performances affect students' effort (in quantitative terms). If students receive the signal that they are high-ability types, they provide higher effort if the SE dominates the IE (similar to our study), which the authors refer to as a slacker-effect (in an earlier version of the paper).

[16]See Grant (2007) for a comprehensive discussion on the informative value of grades.

[17]See e.g. Bedard (2001) and Frazis (2002) for more skeptical views on the human capital argument.

they have different social contacts at the university and compare themselves to other students with high ability rather than to those with low ability. Yet, several aspects speak against this. First, we rely on data from the outset of the individuals' studying. In this phase, the fresh study starters are not segregated according to their ability yet, which reduces the likelihood of peer effects in self-reporting.[18] Second, if peer effects led to reduced self-assessed effort levels, while the effort levels of the high-ability types were actually higher than those of the low-able, one would expect a narrowing of the gap between the two groups, not a complete reversal. Third, any effect of ability on self-reports is hampered by the fact that students are not necessarily fully informed about their actual ability levels.[19] Lastly, the fact that we observe a rather similar picture in both self-assessed effort and the amount of time students spend on self-studying conforms to our interpretation. In the case of the latter, we again observe that high-ability students report doing less for their studies in regard to the key factor self-study time, which is a variable that is arguably rather objective. We conclude from these considerations that the empirical findings are valid and do not result from giving special attention to subjective data in our investigation.

5 Conclusion

The aim of our paper is to improve the understanding of human behavior and the decision-making of individuals concerning their willingness to provide effort. The background of students in higher education is particular useful for this purpose, as we believe we have a very suitable scenario for economic decision-making. Students are aware of the strong impact of one's own effort on individual achievement and they should know about the implications of educational output for their own economic future. Furthermore, students are relatively free to make effort decisions concerning both the intensity of studying and the time that they invest. Arguably, this holds in particular for the country we look at, Germany, in which the freedom of choice may have facilitated the problem of excessive study durations. Faced with this particular concern of policy-makers, our investigation is even more worthwhile, as we may contribute to a better understanding of the reasons behind a potential economic and social problem.

We start our paper by building a simple model of students' decision-making, where we consider both quality and quantity of effort. High-ability students have an incentive to substitute leisure against study time because this comes along with a higher educational achievement and thus higher expected income after studying. A similar line of reasoning holds for students with great job

[18] A relevant phenomenon in this context is the orientation week at German schools of higher education where the freshmen get into social groups through a randomization procedure (Girard et al., 2015). For the first year or even longer, German students typically stay together during lectures, when learning and in their non-university life. In consequence, not only work willingness but also the ability levels of their 'random' friends are typically very heterogeneous for German students, at least in the outset of their studies.

[19] See Gary-Bobo and Trannoy (2008) for a discussion of students with imperfect knowledge of their ability. Also see Stinebrickner and Stinebrickner (2014) who provide empirical evidence on how students misperceive their ability to perform well.

market prospects. Using standards assumptions, our model predicts that high-ability students provide higher effort than low-ability students do and that good job market prospects increase effort. In contrast, our empirical analysis reveals that high-ability individuals reduce their effort levels, i.e. they choose less study time (and more leisure time) and report lower effort levels in a self-assessment. Our theory can explain this intriguing result, as high-ability students seem to have strong incentives to reduce effort because their high abilities per se ensure relatively good educational achievement and thus a relatively high level of expected income. We are not aware of similar evidence on the role of ability in individual effort decisions, whether in education research or outside of it. Given this evidence and our explanation, one may argue that a substitution of study time by non-study activities may emerge out of the opportunity that high-ability types have and the notion that young individuals may benefit from leisure in particular ways. With respect to our second theoretical prediction, we find robust evidence in favor of the theoretical argument, according to which students put in more effort the better the labor market prospects. This rejects the idea that individuals with great prospects due to exogenous reasons also 'lean back', similar to the phenomenon observed for high-ability types. Instead, in the absence of great employment expectations, we find that individuals tend to slow down their efforts in the system of higher education, which may provide another explanation for the problem of prolonged study durations, which is a key topic for educational policy-makers throughout many European counties.

While negative external effects of adverse labor market conditions for student behavior constitute a finding with high policy relevance, the other finding on the role of ability also refers to the potential problem of lacking excellence, which seems to be prevalent in German system of higher education. Interestingly, German policy-makers have tried to address this issue in recent years via policy intervention. Our study suggests to first clarify what allows the 'lazy genius' phenomenon to appear at universities in Germany (and probably elsewhere) before implementing monetary measures or similar extrinsic incentives. This concern is particularly relevant, given that previous studies often show those attempts to not be very effective in manipulating student effort. Future research may enlighten our understanding of student behavior further and answer the question when do talented individuals choose to strive.

A Appendix

A.1 Figures

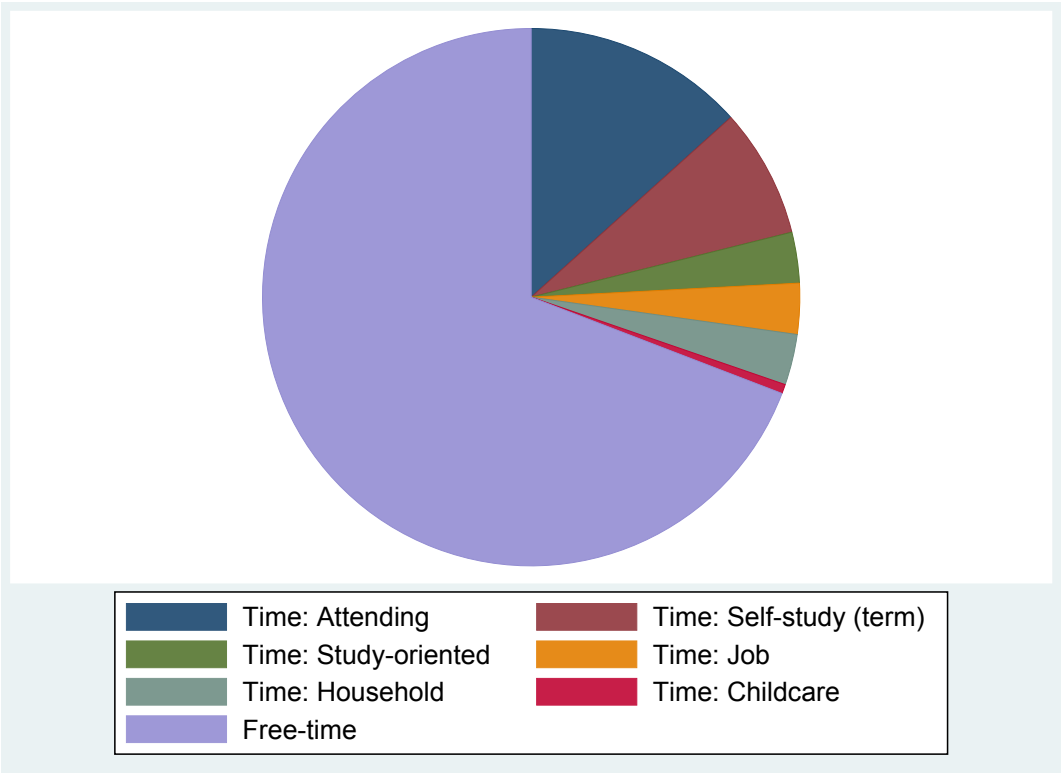

Figure A.1: Students' time allocation
Source: NEPS. Note that free-time includes sleep and weekends.

A.2 Tables

Table A.1: Descriptive Statistics

	mean	sd	min	max
Self-assessed effort	3.584	1.010	1.0	5.0
Time: Self-study (term)	13.261	9.225	0.0	90.0
Time: Self-study (holi.)	12.420	14.859	0.0	99.0
Time: Attending	22.884	7.045	0.0	60.0
Time: Study-oriented	5.139	4.231	0.0	90.0
Time: Job	3.807	5.650	0.0	45.0
Time: Household	4.544	3.453	0.0	35.0
Time: Childcare	0.352	3.754	0.0	99.0
Woman	0.557	0.497	0.0	1.0
Age	21.519	2.290	18.0	38.9
Migration	0.076	0.266	0.0	1.0
Foreign citizenship	0.024	0.152	0.0	1.0
Foreign mother tongue	0.055	0.228	0.0	1.0
School years (father)	14.808	2.532	9.0	18.0
School years (mother)	14.370	2.434	9.0	18.0
No partner	0.451	0.498	0.0	1.0
Partner, living apart	0.421	0.494	0.0	1.0
Partner, living together	0.129	0.335	0.0	1.0
Children in household	0.010	0.101	0.0	1.0
Single person household	0.281	0.449	0.0	1.0
Living with parents	0.238	0.426	0.0	1.0
Living in dorm	0.132	0.339	0.0	1.0
Living in rented flat	0.587	0.492	0.0	1.0
Living in own flat	0.010	0.102	0.0	1.0
Repeated high school year	0.112	0.315	0.0	1.0
Gymnasium	0.771	0.420	0.0	1.0
Nontraditional A levels	0.020	0.141	0.0	1.0
U of Applied Science	0.331	0.471	0.0	1.0
Teaching track	0.104	0.305	0.0	1.0
Change of subject	0.076	0.264	0.0	1.0
Enjoyment of studying	4.387	0.726	1.0	5.0
Region: North	0.133	0.340	0.0	1.0
Region: West	0.187	0.390	0.0	1.0
Region: South	0.402	0.490	0.0	1.0
Region: East	0.277	0.448	0.0	1.0
Working	0.478	0.500	0.0	1.0
Income	898.305	677.609	0.0	10870.0
Funding: Family	0.743	0.437	0.0	1.0
Funding: Bafoeg	0.332	0.471	0.0	1.0
Funding: Bank loan	0.031	0.174	0.0	1.0
Funding: Earnings	0.564	0.496	0.0	1.0
Funding: Apprentice pay	0.050	0.218	0.0	1.0
Funding: Own resources	0.250	0.433	0.0	1.0
Funding: Gov. benefits	0.312	0.463	0.0	1.0
Funding: Scholarship	0.058	0.233	0.0	1.0
Funding: Other	0.014	0.117	0.0	1.0
Funding: Third parties	0.650	0.477	0.0	1.0
Job prospects	4.081	0.799	1.0	5.0
Ability	0.000	1.000	-4.9	4.1
Observations	4431			

NEPS weights used.

Table A.2: Ability and (qualitative) student effort

	(1) Self-assessed effort	(2) Self-assessed effort	(3) Self-assessed effort	(4) Self-assessed effort
Ability	−0.076***	−0.056**	−0.053**	−0.086***
	(0.02)	(0.02)	(0.02)	(0.02)
Woman		0.151***	0.158***	0.172***
		(0.04)	(0.04)	(0.04)
Age		0.017*	0.017+	0.028**
		(0.01)	(0.01)	(0.01)
Migration		−0.060	−0.070	−0.056
		(0.12)	(0.12)	(0.12)
Foreign citizenship		0.077	0.089	0.019
		(0.19)	(0.19)	(0.19)
Foreign mother tongue		0.000	0.018	0.053
		(0.14)	(0.14)	(0.14)
School years (father)		0.010	0.012	0.008
		(0.01)	(0.01)	(0.01)
School years (mother)		−0.018+	−0.017+	−0.020*
		(0.01)	(0.01)	(0.01)
Partner, living apart		0.170***	0.174***	0.161***
		(0.04)	(0.04)	(0.04)
Partner, living together		0.135*	0.202***	0.199***
		(0.06)	(0.06)	(0.06)
Children in household			−0.127	−0.116
			(0.27)	(0.28)
Single person household			0.093*	0.082+
			(0.04)	(0.04)
Living with parents			0.038	0.072
			(0.11)	(0.11)
Living in dorm			0.034	0.064
			(0.11)	(0.11)
Living in rented flat			−0.091	−0.049
			(0.11)	(0.10)
Living in own flat			−0.075	−0.078
			(0.22)	(0.21)
Repeated high school year			−0.104+	−0.099+
			(0.06)	(0.06)
Gymnasium			−0.024	−0.069
			(0.05)	(0.05)
Nontraditional A levels			0.217+	0.178
			(0.13)	(0.12)
U of Applied Science				−0.179***
				(0.05)
Teaching track				−0.036
				(0.04)
Change of subject				0.009
				(0.06)
Enjoyment of studying				0.129***
				(0.03)
Region: West				0.038
				(0.06)
Region: South				−0.009
				(0.06)
Region: East				−0.094
				(0.06)
Working				−0.036
				(0.04)
Log-Income				−0.005
				(0.03)
Source of Funding				✓
Interview month		✓	✓	✓
Observations	4431	4431	4431	4431
Adj. R^2	0.005	0.019	0.023	0.046

OLS estimations; NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.3: Ability and (quantitative) student effort

	(1) log(Self-study) (term)	(2) log(Self-study) (holidays)	(3) log(Attend classes)	(4) log(Free-time)
Ability	−0.034*	−0.091***	0.011	0.011+
	(0.01)	(0.03)	(0.01)	(0.01)
Woman	0.090***	−0.020	−0.013	−0.020***
	(0.03)	(0.05)	(0.01)	(0.01)
Age	0.015*	0.034**	−0.008*	−0.004*
	(0.01)	(0.01)	(0.00)	(0.00)
Migration	−0.176*	−0.002	−0.053	0.011
	(0.07)	(0.16)	(0.04)	(0.02)
Foreign citizenship	0.019	−0.081	−0.028	0.017
	(0.11)	(0.24)	(0.07)	(0.04)
Foreign mother tongue	0.178*	−0.020	0.124**	−0.064*
	(0.09)	(0.19)	(0.05)	(0.03)
School years (father)	0.013*	0.013	0.001	−0.003
	(0.01)	(0.01)	(0.00)	(0.00)
School years (mother)	0.007	0.011	0.001	0.000
	(0.01)	(0.01)	(0.00)	(0.00)
Partner, living apart	−0.033	−0.046	0.015	0.004
	(0.03)	(0.05)	(0.01)	(0.01)
Partner, living together	0.007	−0.158*	0.005	−0.017+
	(0.04)	(0.08)	(0.02)	(0.01)
Children in household	−0.309	0.132	0.107*	−0.287***
	(0.22)	(0.26)	(0.05)	(0.08)
Single person household	0.030	0.094	0.007	−0.005
	(0.03)	(0.06)	(0.01)	(0.01)
Living with parents	−0.047	0.091	−0.020	−0.005
	(0.08)	(0.16)	(0.03)	(0.02)
Living in dorm	−0.006	−0.049	0.017	0.012
	(0.08)	(0.16)	(0.03)	(0.02)
Living in rented flat	−0.037	−0.067	−0.031	0.015
	(0.08)	(0.15)	(0.03)	(0.02)
Living in own flat	−0.041	0.566*	−0.022	−0.026
	(0.17)	(0.24)	(0.05)	(0.03)
Repeated high school year	−0.012	−0.061	−0.018	0.016
	(0.04)	(0.08)	(0.02)	(0.01)
Gymnasium	−0.055	−0.080	−0.029+	0.020+
	(0.04)	(0.07)	(0.02)	(0.01)
Nontraditional A levels	0.016	0.066	0.005	0.015
	(0.08)	(0.18)	(0.04)	(0.02)
U of Applied Science	−0.304***	−0.518***	0.078***	0.025**
	(0.04)	(0.07)	(0.02)	(0.01)
Teaching track	−0.017	−0.114*	0.045***	−0.002
	(0.03)	(0.05)	(0.01)	(0.01)
Change of subject	−0.031	−0.087	−0.002	0.016
	(0.04)	(0.08)	(0.02)	(0.01)
Enjoyment of studying	0.034+	0.095**	0.012	−0.002
	(0.02)	(0.03)	(0.01)	(0.00)
Region: West	0.018	0.016	−0.039+	−0.007
	(0.04)	(0.09)	(0.02)	(0.01)
Region: South	−0.075+	−0.314***	0.008	0.013
	(0.04)	(0.08)	(0.02)	(0.01)
Region: East	−0.050	−0.316***	−0.007	−0.012
	(0.04)	(0.08)	(0.02)	(0.01)
Working	−0.056*	−0.055	−0.009	−0.011*
	(0.03)	(0.05)	(0.01)	(0.01)
Log-Income	−0.029	−0.028	−0.002	−0.003
	(0.02)	(0.04)	(0.01)	(0.00)
Source of Funding	✓	✓	✓	✓
Interview month	✓	✓	✓	✓
Observations	4431	4431	4431	4431
Adj. R^2	0.052	0.065	0.047	0.059

OLS estimations; NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.4: Job market prospects and student effort

	(1) Self-assessed effort	(2) Self-assessed effort	(3) log(Self-study) (term)	(4) log(Self-study) (term)
Very good job prospects	0.157***	0.136***	0.098***	0.099***
	(0.03)	(0.03)	(0.02)	(0.02)
Woman	0.249***	0.252***	0.094***	0.085***
	(0.02)	(0.02)	(0.02)	(0.02)
Age	0.014*	0.020***	0.015***	0.021***
	(0.01)	(0.01)	(0.00)	(0.00)
Migration	−0.009	0.008	−0.026	0.001
	(0.07)	(0.07)	(0.05)	(0.05)
Foreign citizenship	−0.093	−0.099	−0.119	−0.154+
	(0.11)	(0.11)	(0.09)	(0.09)
Foreign mother tongue	0.085	0.082	0.041	0.016
	(0.09)	(0.09)	(0.07)	(0.07)
School years (father)	0.002	−0.000	0.007+	0.003
	(0.01)	(0.01)	(0.00)	(0.00)
School years (mother)	−0.015*	−0.014*	0.011*	0.008+
	(0.01)	(0.01)	(0.00)	(0.00)
Partner, living apart	0.132***	0.131***	−0.041*	−0.033+
	(0.03)	(0.03)	(0.02)	(0.02)
Partner, living together	0.197***	0.200***	−0.043	−0.040
	(0.04)	(0.04)	(0.03)	(0.03)
Children in household	−0.093	−0.108	−0.130	−0.173*
	(0.12)	(0.12)	(0.09)	(0.08)
Single person household	0.075*	0.065*	0.057*	0.044+
	(0.03)	(0.03)	(0.02)	(0.02)
Living with parents	−0.033	−0.012	−0.048	−0.028
	(0.08)	(0.08)	(0.06)	(0.06)
Living in dorm	0.035	0.045	0.061	0.043
	(0.08)	(0.08)	(0.06)	(0.06)
Living in rented flat	−0.105	−0.079	−0.001	−0.019
	(0.08)	(0.08)	(0.06)	(0.06)
Living in own flat	−0.173	−0.172	0.086	0.070
	(0.11)	(0.11)	(0.09)	(0.09)
Repeated high school year	−0.109**	−0.097**	−0.020	−0.013
	(0.04)	(0.04)	(0.03)	(0.03)
Gymnasium	−0.029	−0.053	0.031	−0.060*
	(0.03)	(0.03)	(0.02)	(0.03)
Nontraditional A levels	0.181*	0.157*	0.077	0.051
	(0.07)	(0.07)	(0.05)	(0.05)
U of Applied Science		−0.078*		−0.264***
		(0.03)		(0.02)
Teaching track		−0.002		−0.003
		(0.02)		(0.02)
Change of subject		0.015		0.010
		(0.04)		(0.03)
Enjoyment of studying		0.117***		0.051***
		(0.02)		(0.01)
Region: West		0.012		−0.011
		(0.04)		(0.03)
Region: South		−0.022		−0.079**
		(0.04)		(0.03)
Region: East		−0.121**		−0.063*
		(0.04)		(0.03)
Working		−0.031		−0.024
		(0.03)		(0.02)
Log-Income		−0.009		0.007
		(0.02)		(0.02)
Source of Funding		✓		✓
Interview month	✓	✓	✓	✓
Observations	10233	10233	10233	10233
Adj. R^2	0.030	0.046	0.018	0.051

OLS estimations; NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.5: Job market prospects and student effort (IV estimations)

	(1) Very good job prospects 1st stage	(2) Self-assessed effort 2nd stage	(3) log(Self-study (term)) 2nd stage
Unemployment inflow	−0.628***		
	(0.05)		
Very good job prospects		0.606***	0.351***
		(0.13)	(0.09)
Woman	−0.526***	0.355***	0.140***
	(0.03)	(0.04)	(0.03)
Age	−0.007	0.022***	0.022***
	(0.01)	(0.01)	(0.00)
Migration	0.023	0.001	−0.003
	(0.10)	(0.07)	(0.05)
Foreign citizenship	−0.218	−0.069	−0.138
	(0.15)	(0.12)	(0.09)
Foreign mother tongue	−0.047	0.089	0.020
	(0.12)	(0.09)	(0.07)
School years (father)	0.011	−0.002	0.003
	(0.01)	(0.01)	(0.00)
School years (mother)	0.001	−0.014*	0.008+
	(0.01)	(0.01)	(0.00)
Partner, living apart	0.027	0.124***	−0.037+
	(0.04)	(0.03)	(0.02)
Partner, living together	0.025	0.191***	−0.044
	(0.06)	(0.04)	(0.03)
Children in household	0.206	−0.138	−0.189*
	(0.14)	(0.12)	(0.08)
Single person household	−0.055	0.070*	0.047*
	(0.04)	(0.03)	(0.02)
Living with parents	−0.032	−0.017	−0.031
	(0.10)	(0.08)	(0.06)
Living in dorm	−0.016	0.034	0.037
	(0.10)	(0.08)	(0.06)
Living in rented flat	−0.059	−0.079	−0.019
	(0.10)	(0.08)	(0.06)
Living in own flat	0.159	−0.203+	0.054
	(0.15)	(0.12)	(0.09)
Repeated high school year	−0.068	−0.082*	−0.006
	(0.05)	(0.04)	(0.03)
Gymnasium	0.027	−0.054	−0.060*
	(0.05)	(0.03)	(0.03)
Nontraditional A levels	0.024	0.161*	0.053
	(0.10)	(0.07)	(0.05)
U of Applied Science	0.016	−0.084**	−0.267***
	(0.04)	(0.03)	(0.02)
Teaching track	−0.416***	0.012	0.004
	(0.04)	(0.03)	(0.02)
Change of subject	−0.051	0.026	0.016
	(0.06)	(0.04)	(0.03)
Enjoyment of studying	0.114***	0.101***	0.043***
	(0.02)	(0.02)	(0.01)
Region: West	−0.228***	0.046	0.007
	(0.06)	(0.04)	(0.03)
Region: South	−0.316***	0.009	−0.062*
	(0.05)	(0.04)	(0.03)
Region: East	−0.051	−0.091*	−0.046
	(0.06)	(0.04)	(0.03)
Working	0.012	−0.032	−0.024
	(0.04)	(0.03)	(0.02)
Log-Income	0.038	−0.015	0.004
	(0.02)	(0.02)	(0.02)
Source of Funding	✓	✓	✓
Interview month	✓	✓	✓
Observations	10233	10233	10233

IV-2SLS Wooldridge procedure estimations. First stage (probit) estimations in column (1), second stage (IV) estimations in columns (2) and (3); NEPS weights used; robust standard errors in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.6: Job market prospects and student effort (IV) - Robustness check

	(1) Very good job prospects 1st stage	(2) Self-assessed effort 2nd stage	(3) log(Self-study (term)) 2nd stage
Unemployment inflow	−0.180***		
	(0.03)		
Very good job prospects		0.660***	0.336*
		(0.20)	(0.17)
Woman	−0.178***	0.367***	0.137***
	(0.02)	(0.05)	(0.04)
Age	−0.003	0.022**	0.022***
	(0.00)	(0.01)	(0.01)
Migration	0.010	0.000	−0.003
	(0.03)	(0.07)	(0.05)
Foreign citizenship	−0.065	−0.066	−0.139
	(0.04)	(0.12)	(0.09)
Foreign mother tongue	−0.018	0.090	0.020
	(0.04)	(0.10)	(0.06)
School years (father)	0.003	−0.002	0.003
	(0.00)	(0.01)	(0.00)
School years (mother)	0.001	−0.014*	0.008+
	(0.00)	(0.01)	(0.00)
Partner, living apart	0.009	0.123***	−0.037+
	(0.01)	(0.03)	(0.02)
Partner, living together	0.008	0.190***	−0.044
	(0.02)	(0.04)	(0.03)
Children in household	0.064	−0.142	−0.188*
	(0.05)	(0.11)	(0.08)
Single person household	−0.019	0.070*	0.047*
	(0.01)	(0.03)	(0.02)
Living with parents	−0.009	−0.018	−0.031
	(0.03)	(0.07)	(0.06)
Living in dorm	0.002	0.033	0.037
	(0.03)	(0.08)	(0.06)
Living in rented flat	−0.014	−0.079	−0.019
	(0.03)	(0.07)	(0.06)
Living in own flat	0.055	−0.206+	0.055
	(0.04)	(0.12)	(0.08)
Repeated high school year	−0.023	−0.081*	−0.006
	(0.02)	(0.04)	(0.03)
Gymnasium	0.009	−0.054	−0.060*
	(0.01)	(0.03)	(0.03)
Nontraditional A levels	0.003	0.161*	0.053
	(0.03)	(0.07)	(0.05)
U of Applied Science	0.007	−0.084*	−0.267***
	(0.02)	(0.04)	(0.04)
Teaching track	−0.130***	0.013	0.004
	(0.04)	(0.05)	(0.04)
Change of subject	−0.015	0.027	0.016
	(0.02)	(0.04)	(0.03)
Enjoyment of studying	0.037***	0.100***	0.044**
	(0.01)	(0.02)	(0.01)
Region: West	−0.076+	0.050	0.006
	(0.04)	(0.06)	(0.06)
Region: South	−0.103**	0.013	−0.063
	(0.03)	(0.05)	(0.06)
Region: East	−0.020	−0.088+	−0.047
	(0.04)	(0.05)	(0.06)
Working	0.004	−0.032	−0.024
	(0.01)	(0.03)	(0.02)
Log-Income	0.012	−0.016	0.004
	(0.01)	(0.02)	(0.02)
Source of Funding	✓	✓	✓
Interview month	✓	✓	✓
Observations	10233	10233	10233
F statistic		34.660	34.660

Standard IV-2SLS estimations. First stage estimations in column (1), second stage (IV) estimations in columns (2) and (3); NEPS weights used; robust standard errors clustered at the cell level in parentheses $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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