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Students' Wage Expectations in Germany – New Evidence considering Tax Adjusted Estimates

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Abstract
This paper uses a rich dataset derived from a three-year survey to gain insights about the informational background of University applicants. We analyze the extent to which students' expectations of their starting and future salary depend on different characteristics. More precisely, the paper investigates whether students with different backgrounds tend towards making larger or smaller "errors" when estimating salaries. The results point out that students' salary estimates are heterogeneous and that this variation is correlated with individual traits and chosen subjects. Overall, students substantially underestimate actual starting salaries by about 20 percent. However, a prime finding of this paper is that estimation errors are highly attributable to students' misconception of the German progressive income tax system. Correcting for the erroneous gross-net conversion, we find applicants to have a quite correct idea about what salaries to expect in the future. Overall, applicants' adjusted expectations are in line with labor market outcomes. However, expectations remain strongly correlated with personal traits.

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1 Introduction

A central assumption of human capital theory is that people select their ideal type and extent of schooling partly on the basis of pecuniary returns and costs of this decision. Thereby, education is pursued until the point where no further profit is achievable. This view rests upon the neoclassical economic assumption that people are able to correctly and rationally forecast the income streams of these alternative investments in education. Hence, ex ante (perceived) in contrast to ex post (realized) earnings affect the extent to which higher education will be pursued. However, it is questionable whether students have an accurate perception of how education influences future wages.

This paper analyzes students' expectations regarding future salaries. It is tested whether students have knowledge of their own potential salary as well as of salaries for average other students, both in the same field of study and in other disciplines. Thus, the aim of this paper is to evaluate students' ability to make accurate predictions of starting salaries. We examine whether students' estimates are representative for actual salaries observable in the labor market and whether the accuracy of such estimates is linked to fields of study and personal traits.

Our work is closely related to several recent research projects and ranges back until the 1990s. Van der Merwe (2011) and Menon (2008), e.g., find that students perceive a positive return to college education. Moreover, van der Merwe (2011) demonstrates that perceived rates of return vary by field of study. Betts (1996) carried out a survey at the University of California San Diego, examining the variation in students' beliefs about wages and further analyzing the accuracy of students' salary estimates in different fields. He found that there is a discernible variation in students' beliefs about wages and that these variations are related to personal traits.

In particular, Betts (1996) showed that senior students' estimates are significantly more accurate than those of first-year students. Moreover, students focused on information of wages in their own major discipline, and thereby, on information about younger workers. Overall, Betts (1996) questioned the assumption that students make schooling decision based on complete information about the labor market; however, he granted learning over time. Dominitz and Manski (1996) used a computer-based questionnaire in order to elicit not just point estimates, but also students' expected individual wage distributions. Therewith, they were able to examine students' individual uncertainties. They find a substantial variation across students who tend to be uncertain about their own future earnings; additionally, students overestimate the spread of current wages in the U.S. However, the estimate of the median male respondent is quite accurate. Wolter (2000) replicated the studies of Betts (1996) and Dominitz and Manski (1996) for students in Switzerland. In this study, variations in expectations can almost completely be explained by individual dispersion. Smith and Powell (1990) compared U.S. students' expectations of their own salary with salary estimates for their college peers. In sum, they found that students have a proper knowledge about future income streams. However, they detected a tendency of male students to self-enhance their own earnings, i.e., a proclivity to expect a higher than peer-average income. This tendency of (male) self-enhancement was confirmed by Chevalier et al. (2009)[1] and as well by Botelho and Pinto (2004) who also encouraged the conclusion of Betts (1996) that senior students possess more realistic information about average wages than first-year students.

Brunello et al. (2004) surveyed students from 26 different faculties in 10 European countries. They found that in addition to personal traits such as gender and year of study, also country

[1] In terms of academic ability, not future wages.

and university specific variables were correlated with students' wage expectations. In particular, the actual wage and the actual college wage premium in a country, whether the students' university has a formal admission procedure, and whether the university is public or private were significantly influential. Moreover, the study revealed that college graduates perceive a tradeoff between expected starting salaries and the expected college wage gain in ten years. Finally, there was no proof that the variation in expectations is correlated with the actual wage dispersion. However, the authors demonstrated that the variability of earnings expectations is correlated with the proportion of females and the proportion of students working on the side. The distinctive characteristic of the study of Webbink and Hartog (2004) is that they used Dutch panel data drawn from a longitudinal research project to gauge the accuracy of students' estimates. Hence, students' estimates could be compared to their own realizations instead of comparing them with a cross-section. In particular, they examined whether the structure of determinants for expectations and realization was identical. Webbink and Hartog (2004) found that the same variables that influence expectations also have an influence on students' realizations four years later. Thereby, the coefficients of expected earnings had, in general, the same sign and a similar size than the coefficients of realized earnings. Furthermore, the authors could not find variables, with the exception of the grade in "Science", which influenced differences between expected and realized earnings significantly. They concluded that, at the individual level, the structure of observable determinants for expectations and realizations are corresponding. Finally, Jerrim (2011) surveyed students from 69 institutions in the UK and analyzed differences in the accuracy of their expectations for their own starting salary by field of study, institution, year of study, and enrollment status. He observed that UK students significantly overestimated their starting salary. With the exception of Medicine students, this result held true regardless of students' field of study. The degree of overestimation was smaller for senior students relative to first-year students, and for students enrolled at pre-1992 institutions relative

to students who attend post-1992 institutions. However, part-time students' expectations were closer to actual wages compared to full-time students' expectations. Jerrim (2011) noted that students' lack of information is not necessarily the reason why students overestimated their future income. There is the possibility that students simply overestimated their academic ability, as suggested by Chevalier et al. (2009). In this case, students might self-enhance their own earnings above the earnings of an average student, although they have accurate knowledge about wages. The latter was found by Smith and Powell (1990); moreover, this finding was confirmed by Botelho and Pinto (2004). However, Jerrim (2011) suggests that students' missing knowledge of labor market wages is the most striking reason for the observed over-estimation. His conclusion is, i.a., based on the finding that senior students' expectations were more accurate. In that case, students might make their human capital choice without accurate knowledge about the associated future returns of that decision.

The results of these different studies point to the fact that students recognize the positive correlation of earnings and education. However, those results are mixed regarding the accurateness of students' wage perceptions. Moreover, students' estimates and expectations seem to substantially vary in respect to their fields of study and individual characteristics. Comparing students' expectations for themselves with estimates for average others, it appears noticeable that certain groups of students expect higher future income for themselves than others. While such issues have been analyzed in different settings across various countries, they have not been applied to German cases so far. In this paper, we use a rich dataset derived from a three-year survey to gain insights about the informational background of German University applicants.

While Dominitz and Manski (1996) and Wolter (2000) come up with a sample of just a little more than 100 observations, Smith and Powell (1990), Webbink and Hartog (2004), and Betts (1996) improve their datasets to about 400, 660, and 1,300 observations respectively. Our sample size of more than 2,000 students lies at the upper bound of research papers in that area.

With that rich of a dataset we analyze the extent to which students' expectations of their starting and future salary depend on different characteristics. More precisely, the paper investigates whether factors, like certain fields of study or personal traits, have an influence on students' wage expectations and whether students with different backgrounds tend towards making larger or smaller "errors" when estimating salaries. The results point out that students' salary estimates are heterogeneous and that this variation is correlated with individual traits and students' chosen subject. Thereby, students make larger or smaller estimation errors depending on their field of study and personal characteristics. Overall, students substantially underestimate actual starting salaries by about 20 percent. However, a prime finding of this paper is that estimation errors are highly attributable to students' misconception of the German progressive income tax system. We explicitly ask students about their understanding of the tax schedule and thereby are able to learn their "true" wage expectations and their corresponding estimation errors. Such important features are missing in former studies. Correcting for the erroneous gross-net conversion, we find applicants to have a quite correct idea about what salaries to expect in the future. This indicates that students are better aware of the net than of the gross income – a finding that is probably linked to a misunderstanding of a rather complicated (income) tax system. It further points out, that following studies inevitably should include a control for students' understanding of the tax code. By omitting that fact, wage expectation measures could be severely biased. Overall, applicants' adjusted expectations are in line with labor market outcomes. However, expectations remain strongly correlated with personal traits.

The paper proceeds as follows: Chapter 2 gives an overview of the sample and questionnaire at hand, shows first summary statistics, and explains where the data from actual salaries by field of study stems from. Chapter 3 elaborately explains the mistake students make when relating gross to net salaries and further provides our adjustment method for the students' (false) salary estimates. In Chapter 4 we present detailed descriptive evidence showing how big of an

influence our adjustment method has on student's estimates and how they converge to actual job market salaries. Throughout Chapter 5 we use these adjusted estimates when conducting our regression analysis; we examine the influence of students' personal traits on estimation errors. Chapter 6 concludes.

2 Data

2.1 Description of the Sample and Questionnaire

During the enrollment application process in 2010, 2011, and 2012, Saarland University, Germany, surveyed students on their beliefs about starting salaries. The first wave (2010) of the survey served to learn about administrative and organizational issues, the design of the survey, comprehensibility of questions, response rates etc. Based on these experiences, the survey was slightly edited and officially rolled out in summer of 2011 to gather a two-year data sample.

The questionnaire's URL was e-mailed to all prospective students who applied for a University place in 2011 or in 2012. Only students who submitted a full application within the application deadline were considered. In 2011, 500 students completed the questionnaire; in 2012, 1,561 students responded. Part of that increase is due to the fact that we were able to add two more subjects (Education and Medicine).[2] After excluding six responses of students who did not provide serious answers, the achieved sample size comprised 2,055 observations.

The questionnaire started with questions regarding the prospective students' field of study. It was asked for which degree (Bachelor, Master (consecutive), Master (non-consecutive), State Examination or other) and for which field of study the student has currently applied for. Students had to state whether they aspire to obtain an additional degree afterwards (Master, Second

[2] In 2011, this was not possible in consequence of administrative reasons.

State Examination, or a Doctoral Degree), and with which of those degrees they aim to earn their first salary.

In the second part of the questionnaire, students had to answer two different types of questions about monthly salaries. The first one asked students about expectations of their own monthly salary and about their estimates for average others who studied in the same field. In both cases, students should refer to the degree with which they intend (and hence, stated) to earn their first salary. These expectations/estimates should be reported for salaries at labor market entry and for salaries after five years on the job (hence, four separate questions). With these estimates, it is possible to test whether students expect different salaries for themselves than they estimate for average others (in the same field of study). From this point forward, they will be referred to as estimates of field related starting salaries for self (for others) and as estimates of field related salaries for self (for others) after five years. The second type of questions asked students about their estimates of average monthly salaries for other students in different fields of study (Business Administration, Law, Humanities, Natural Sciences, Medicine, Mathematics and Computer Science, as well as Education). In this case, estimates should be provided unconditional on degree (Bachelor, Master, etc.). Again, starting salaries and salaries after five years on the job should be reported (hence, 14 separate questions). According to Manski (1993), salary estimates for average others are useful to test the interviewees' knowledge of the labor market.

In the third part of the questionnaire, students had to provide information on their personal and family background as well as on their potential future income and profession. The following characteristics were considered: gender; age; work experience; final grade in secondary school; whether the student's mother or father have studied and, if so, in which major discipline; the student's intention concerning living at her parents' house while studying; whether the student

expects to receive "Bafoeg"[3] and, if so, how much; the school system in secondary school;[4] the federal state in which the student obtained her higher education entrance qualification; the importance of an above-average salary; the influence of income expectations on the student's higher education decision; the student's favorite branch of business and her work experience in this branch.

Last, students had to estimate net equivalents of given gross salaries (€1,500, €3,000 and €4,500). These estimates are needed in order to 1) test and control for the possibility that students have an inaccurate understanding of the German income tax system and 2) potentially correct students' salary estimates and re-evaluate their knowledge of future wages.

The questionnaire is provided in Table A 1 in the Appendix.

2.2 Summary Statistics

A description of students' background characteristics is given in Table 1.[5] Gender is fairly balanced in our dataset with 42.5% and 57.5% being male and female respectively. More than 60% of the surveyed University applicants are 20 years of age and younger. About one third ranges between 21 and 25, and only about 8% range between 26 and 50. Almost 80% of all applications do not have any work experience so far. Final grades from secondary school are

[3] The German "Bundesausbildungsförderungsgesetz" – short "BAföG" – is a Federal Law on Support in Education providing students from a "weaker financial background" with funding, specifically, with "affordable" student loans. For more information see: *http://www.bafoeg.bmbf.de/de/372.php accessed February 24, 2014*

[4] Until 2011, it was mandatory for students to complete 9 years in secondary school – so called "G9" high school system – in order to receive their general qualification for University entrance ("Abitur"). Since then, completing 8 years was sufficient – so called "G8" high school system.

[5] A further breakdown of students' background characteristics by year of data collection and corresponding comparison tests are available upon request. Such checks have been carried out for every summary shown subsequently. We could not find any significant difference between the 2011 and the 2012 data.

distributed quite as one would expect them to be. Note that 486 students did not report their final grade in secondary school. Only about 27% and 40% of the respondents' mothers and fathers did study respectively, i.e., the majority of applicants will – if accepted – be first-generation academics. About 60% of prospective students intended not to stay with their parents when attending University; about 12% were undecided. Note that 80 students did not indicate their intention of living at their parents' house while studying. When asking prospective students about Bafoeg, more than half of them answered they did not expect to receive this federal student loan. Slightly less than a quarter of surveyed people knew an approximate amount they would receive. Exactly 46% of the respondents came from a 9-year secondary school, 32% from a 8-year school, and 22% answered "other". If one takes a closer look at the Federal States in which the respective University applicant obtained her higher education entrance qualification, it becomes obvious that most people who apply to Saarland University attended school in the very same Federal State (Saarland) – more than 50%. The two states that appear next, with a relative frequency of about 13% and 10% respectively, are the states that geographically are closest to the state of Saarland.

Figure A 1 in the Appendix displays the absolute frequency distribution of the disciplines for which students have applied for. It demonstrates that approximately a quarter of the respondents seek to study in a business related field, followed by Psychology and Law Studies. Science of Sports ranks last. In between lie the fields Humanities, Natural Sciences, Education, Informatics, and Medicine. Recall that, due to administrative reasons, we did not survey students applying for Medicine and Education in 2011. Figure A 2 in the Appendix depicts the relative frequency distribution of gender for the several disciplines. It is recognizable that students who have applied for Humanities, Education, or Psychology are mainly female, whereas students who have applied for Medicine, Informatics, or Science of Sport are mainly male.

Students had to report how important they value an above average salary and how strongly their choice of a field of study has been influenced by their income expectations. For both questions, they had to choose between five categories on a scale from "Very Unimportant" ("Very Low") to "Very Important" ("Very Strong"). The ordinally scaled variables were converted to numerical equivalents on a scale from 1 to 5. Table A 2 and Table A 3 in the Appendix present the corresponding results. Students applying for Business or Law Studies attach the greatest importance to an above average salary with a mean of 3.63 and 3.58, respectively. Thereby, 61.9 percent of the students who applied for a business related field report that an above average salary is "Important" or "Very Important" for them. Prospective law students answer "Important" or "Very Important" in 58.5 percent of the cases. On the contrary, students applying for Psychology (mean of 2.94), Education (mean of 2.99), Science of Sport (mean of 3.02) or Humanities (mean of 3.05) attach the lowest importance to an above average salary. For example, solely 22.9 percent of the prospective Science of Sport students consider an above average salary as "Important" or "Very Important". Figure A 3 in the Appendix illustrates the above findings; it depicts the frequency distribution of the students' perceived importance of an above average salary by discipline for which they have applied for. As can be recognized by the size of the circles, most students state their attitude towards an above average salary as important or neutral. Thereby, the mode of business and law students is the category "Important". On the contrary, the mode of students' applying for the disciplines Humanities, Education, Psychology, or Science of Sport is the category "Neutral". Students applying for the disciplines Natural Sciences, Medicine, or Informatics answered "Important" and "Neutral" approximately equally often. The analyses of the influence of income expectations on the students' choice of a certain field of study, reported in Table A 4 and Table A 5 in the Appendix, produce similar results; the values are generally lower, though. Again, students applying for Business (mean of 2.93) or Law (mean of 2.72) studies report the highest influence, contrary

to students applying for Science of Sport (mean of 1.87) or Humanities (mean of 2.02). The graphical illustration is provided in Figure A 4 in the Appendix. The mode of business and law students is now the category “Neutral”. Students who applied for the disciplines Humanities, Psychology, or Science of Sport answer “Very low” the most. Again, students who applied for the disciplines Natural Sciences, Medicine, or Informatics, but also students applying for Education, are in between. They answer “Neutral” and “Very low” approximately equally often; interestingly, their mode is not the category “Low”, which would be in the middle of the two categories.

The vast majority of surveyed people applied for a Bachelor’s degree (60%), while about 28% and 13% applied for a State Exam and a Master’s degree respectively. When asked which degree they would finally go for, 52% answered Master’s and only about 6% would drop out with a Bachelor’s degree. Interestingly, more than one fifth of our sample states to aim for a doctoral degree. When asked with which of those degrees they would want to earn their first salary, the numbers change quite a bit. While numbers for Master’s degrees stay very stable (52.4%), those for Doctorate and Bachelor’s degrees dropped and jumped respectively. This means that while a lot of people finally want to receive a higher degree than a Bachelor’s, they think about starting their first job after obtaining this degree – still going for a higher degree in the meantime or later. Finally, answers on the favorite branch of business seem to be rather evenly distributed without any remarkable feature.

Table 1: Absolute and Relative Frequencies of Students' Background Characteristics

	Abs. Freq.	Rel. Freq.
Gender		
Male	873	42.5
Female	1182	57.5
Age		
From 16 to 20	1293	62.9
From 21 to 25	587	28.6
From 26 to 50	175	8.5
Work Experience		
No	1631	79.4
Yes	424	20.6
Grade		
Very Good	209	10.2
Good	883	43.0
Satisfactory	463	22.5
Sufficient	14	0.7
Missing	486	23.6
Mother Studied		
Don't Know	38	1.8
No	1467	71.4
Yes	550	26.8
Father Studied		
Don't Know	50	2.4
No	1201	58.4
Yes	804	39.1
Living at Parents' House		
Don't Know	254	12.4
No	1258	61.2
Yes	463	22.5
Missing	80	3.9
Bafoeg		
Don't Know	332	16.2
Not Specified	129	6.3
No	1113	54.2
Yes, Less Than €300	183	8.9
Yes, More Than €300	298	14.5
School System		
8-Year Sec. School	657	32.0
9-Year Sec. School	946	46.0
Other	452	22.0
Federal State		
Saarland	1049	51.0
Rheinland-Pfalz	271	13.2
Baden-Württemberg	211	10.3
Nordrhein-Westfalen	198	9.6
Bayern	70	3.4
Hessen	60	2.9
Northern States	113	5.5
Eastern States	83	4.0

Sample Size = 2055

	Abs. Freq.	Rel. Freq.
Imp. Above Avg. Salary		
Not at All	45	2.2
Very Unimportant	64	3.1
Unimportant	215	10.5
Neutral	809	39.4
Important	783	38.1
Very Important	139	6.8
Influence Income Exp.		
Not at All	329	16.0
Very Low	240	11.7
Low	368	17.9
Neutral	768	37.4
Strong	310	15.1
Very Strong	40	1.9
Degree Applied For		
State Exam	567	27.6
Bachelor	1215	59.1
Master	273	13.3
Highest Targeted Degree		
State Exam	84	4.1
2nd State Exam	341	16.6
Bachelor	118	5.7
Master	1069	52.0
Doctorate	443	21.6
Degree First Salary		
1st State Exam	195	9.5
2nd State Exam	318	15.5
Bachelor	332	16.2
Master	1076	52.4
Doctorate	134	6.5
Favorite Branch of Bus.		
Self-Employed	221	10.8
Consulting, Finance	324	15.8
Media, Market., Trade	249	12.1
Private Enterprise	220	10.7
Research	212	10.3
Medical Field	322	15.7
Civil Serv., Teaching	350	17.0
Don't Know	120	5.8
No Allocation	37	1.8

2.3 Data on Actual Salaries

Students' *estimates* of salaries are later compared to data on *actual* salaries. For this purpose, we are using data from the compensation consultancy PersonalMarkt which has the largest database of actual salaries for Germany at its disposal.[6] Their report of annual starting salaries for students in different fields of study was published on the internet platform gehalt.de.[7] An overview of the *actual salaries* in different fields of study (annual and calculated monthly salaries) is shown in Table A 6 in the Appendix. In order to account for the credibility of the used data, the reported salaries from PersonalMarkt are additionally compared to data reported by the management consultantcy Kienbaum[8] and to data reported by the Staufenbiel Institute[9]. The comparison shows that there are no considerable differences between the data from PersonalMarkt and the two other sources, suggesting that the data we use is reliable.[10]

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[6] PersonalMarkt Services GmbH provides a rich database including 1.6 million observations for salaries covering 260 professions over 60 branches. *http://www.personalmarkt.de/www/uu.home.jsp accessed December 24, 2012*

[7] Belonging to PersonalMarkt Services GmbH, gehalt.de publishes data, studies, and other information about salaries in Germany. *http://www.gehalt.de/news/Absolventengehaelter-Haeufig-falsche-Erwartungen-an-das-erste-Gehalt accessed December 24, 2012*

[8] Kienbaum Consultants International GmbH is one of the leading consultancies in Europe focusing on Executive Search, Human Resource Management, and Management Consulting. *http://www.kienbaum.de/Portaldata/3/Resources/documents/downloadcenter/vortraege/Vortrag_Christian_Naeser_Absolventenkongress_2012.pdf accessed July 18, 2013*

[9] Staufenbiel Institut GmbH is the leading provider for recruiting and marketing solutions in Germany offering various websites to support companies in recruiting young academics. *https://www.staufenbiel.de/career-club/gehaltszahlen.html accessed July 18, 2013*

[10] Concerning the data from the Staufenbiel Institute, the yearly salaries shown here were calculated as the mean of the reported salaries in each discipline.

3 Perceived Tax Burden – A Misconception

3.1 Ratio Between Net and Gross Estimates

Germany applies a progressive income tax system where the tax rate increases as the taxable base amount increases so that people with more income pay a higher percentage of that income in tax than do those with less income. Furthermore, employees have to pay social contributions (statutory pension insurance, health insurance, nursing care insurance, and unemployment insurance); thereby, the level of social contributions levied, again, depends on the gross salary. The tax burden of an employee thus results from the payable amount of taxes on her income and from her level of social contributions that she is required to pay. Consequently, the average tax burden of an employee also increases with an increasing income.

In order to survey students' understanding of the progressively rising tax burden, they were asked to provide estimates of net equivalents of given gross salaries (€1,500, €3,000 and €4,500).[11] The distribution (log distribution) of these net estimates is reported in Table A 7 (Table A 8) in the Appendix. Table 2 compares the estimates of net equivalents of given gross salaries with the actual net values. The latter have been determined by using the gross to net calculator provided by the internet platform staufenbiel.de,[12] assuming the following criteria: payroll year 2012, no children, tax class I, no tax allowances, church tax liability, and statutory health insurance with a contribution rate of 15.5 percent. Hence, the actual net salaries of the three queried gross salaries are as follows: €1,074 (net equivalent to a gross salary of €1,500), €1,842 (net equivalent to a gross salary of €3,000), and €2,548 (net equivalent to a gross salary

[11] Note that these questions were asked on the last page of the questionnaire where returning back to the salary estimates was no option. Therefore, the construction of the questionnaire ensures that there is no anchoring effect which could have influenced students' salary estimates.

[12] *http://www.staufenbiel.de/ratgeber-service/gehalt/brutto-netto-rechner.html accessed December 28, 2012*

of €4,500). These actual net salaries imply that the actual tax burden (in percent) of a gross salary of €1,500 is 0.284, that the actual tax burden of a gross salary of €3,000 is 0.386, and that the actual tax burden of a gross salary of €4,500 is 0.434.

Table 2: Comparison of Estimated and Actual Net Salaries

Gross Salary	Estimated Net Salary	Estimated Tax Burden	Actual Net Salary	Actual Tax Burden	Diff. Net Salary	Diff. Tax Burden
1,500	1,078	0.281	1,074	0.284	4	-0.002
3,000	2,197	0.268	1,842	0.386	355	-0.118
4,500	3,299	0.267	2,548	0.434	750	-0.167

Tax Burden = (Gross Salary - Net Salary) / Gross Salary
Diff. = Estimated - Actual

However, the mean estimates of the three net salaries imply an estimated tax burden of 0.281, 0.268, and 0.267 for a gross salary of €1,500, €3,000, and €4,500 respectively. Thus, on average, students do not perceive a progressive taxation of income at all. It rather seems that students expect a constant or even a slightly decreasing average tax burden for increasing gross salaries. Figure 1 illustrates this finding. There is no perceptible change of the slope at the three queried threshold values. In addition to the three mean estimated net equivalents of given gross salaries, the figure depicts the kernel density estimates of the distribution of the field related starting salary for self and the field related salary for self after five years. As demonstrated, the major part of the expected salaries for self is within the range or close to the queried gross salaries. Analyzing the other salary estimates (field related salary estimates for others and salary estimates for other students in different fields), the same finding applies.[13] Therefore, the estimates of net equivalents of given gross salaries do permit inferences to be drawn regarding the goodness of the salary estimates.

[13] Evidence is available upon request.

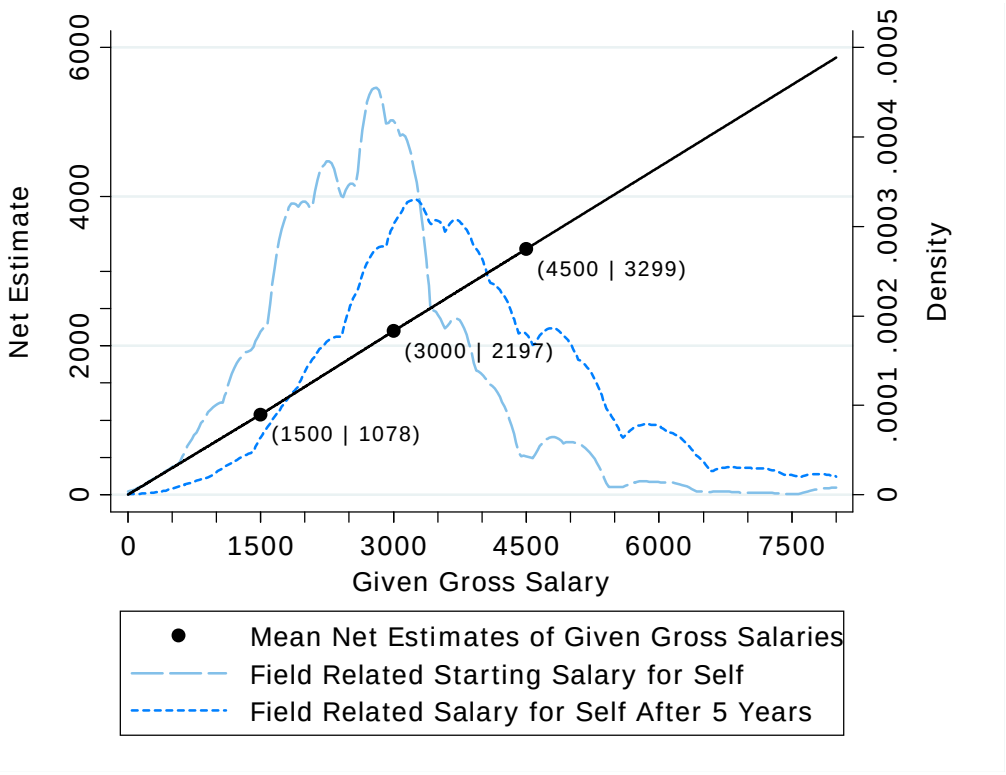

Figure 1: Illustration of the Three Mean Net Estimates of Given Gross Salaries

As shown in Table 3, solely the estimated net equivalent of a gross salary of €1,500 is in accordance with the actual net salary (mean estimate = €1,078, actual net salary = €1,074). The difference of €355 between the mean estimated and actual net salary of the given gross salary of €3,000 is statistically significant at the 1 percent significance level. The same applies for the difference of €750 between the mean estimated and actual net salary of the given gross salary of €4,500. The respective t-tests for the log values are shown in Table 4. Comparing the log net estimates with the log actual salaries strengthens the finding that differences for the given gross salaries of €3,000 and €4,500 are significant. However, for the log values, the log estimated net equivalent of a gross salary of €1,500 is even significantly smaller than the log actual net salary.

Table 3: One-Sample T-Test - Difference between Estimated and Actual Net Salary

	Obs.	Estimated Net Salary	Actual Net Salary	Diff.	SE
Gross Salary 1,500	2,047	1,078	1,074	4	6
Gross Salary 3,000	2,047	2,197	1,842	355***	12
Gross Salary 4,500	2,047	3,299	2,548	750***	18

Diff. = Estimated Net - Actual Net H0:
Diff. = 0
* p<0.1, ** p<0.05, *** p<0.01

Table 4: One-Sample T-Test - Difference between Log Estimated and Log Actual Net Salary

	Obs.	Log Estim. Net Salary	Log Actual Net Salary	Diff.	SE
Gross Salary 1500	2,047	6.96	6.98	-0.02***	0.00
Gross Salary 3000	2,047	7.67	7.52	0.15***	0.00
Gross Salary 4500	2,047	8.07	7.84	0.23***	0.01

Diff. = Estimated Net - Actual Net H0:
Diff. = 0
note: *** p<0.01, ** p<0.05, * p<0.1

3.2 Adjustment of Salary Estimates

The previous section suggests that students do not consider the progressive taxation of income. For the gross salary of €3,000 and the gross salary of €4,500 they significantly underestimate the actual tax burden. Recall that the questionnaire asked students to report gross estimates. Therefore, the underestimation presents a potential source of error for students' salary estimates. There exists the possibility that students possess solid knowledge about net salaries for themselves, for others in their field, and also for graduates in different fields of study, but fail to express the corresponding gross estimates. The consequence would be that the reported gross salaries are not representative for the actually known and possibly correct net salaries.

In order to control for this potential source of error, all salary estimates (estimates of field related salaries as well as estimates of salaries in different fields of study) are adjusted so that

the gross estimates are representative for the students' perceived net salaries. Thereby, the perceived net salaries can be estimated for each student by using her estimates of net equivalents for given gross salaries.

The process of the salary estimate adjustment can be divided into three different steps.

1) Computation of the perceived net estimate; where perceived net estimate refers to the net salary that a student associates with her gross salary estimate.
2) Identification of the actual (true) tax burden that is linked to the perceived net estimate.
3) Conversion of the perceived net estimate into the corresponding adjusted gross estimate.

Step 1):

In order to compute the perceived net estimates, a piecewise linear function was constructed for each student individually, using the student's three estimates of net equivalents of the given gross salaries.[14] The function assigns a perceived net estimate to each gross estimate; it is represented by the following formula:

[14] If the three estimates of net equivalents were greater than the corresponding gross salaries, it can be assumed that the student mixed up gross and net. Therefore, perceived net estimates were not computed, because it can further be assumed that the student has also reported net estimates of field related salaries and net estimates of salaries in different fields, instead of the queried gross estimates. Hence, the reported salary estimates are equal to perceived net estimates.

$$PercNetEst = \begin{cases} GrossEst * \left(1 - \frac{1500 - Net_{1500}}{1500}\right) & \text{if } GrossEst < 1500 \\ Net_{1500} + (GrossEst - 1500) * \frac{Net_{3000} - Net_{1500}}{1500} & \text{if } 1500 \leq GrossEst < 3000 \\ Net_{3000} + (GrossEst - 3000) * \frac{Net_{4500} - Net_{3000}}{1500} & \text{if } 3000 \leq GrossEst < 4500 \\ GrossEst * \left(1 - \frac{4500 - Net_{4500}}{4500}\right) & \text{if } GrossEst \geq 4500 \end{cases}$$

where *PercNetEst* is the student's perceived net estimate, *GrossEst* is the student's gross estimate (either an estimate of a field related salary or an estimate of a salary for an average other student in a specific field), and Net_{1500} is the estimate of the net equivalent of the given gross salary of €1,500 (Net_{3000} and Net_{4500}, accordingly).

Figure 2 displays the function for three randomly chosen net estimates, which are: €1,200 net for a gross salary of €1,500, €1,800 net for a gross salary of €3,000, and €2,025 net for a gross salary of €4,500.

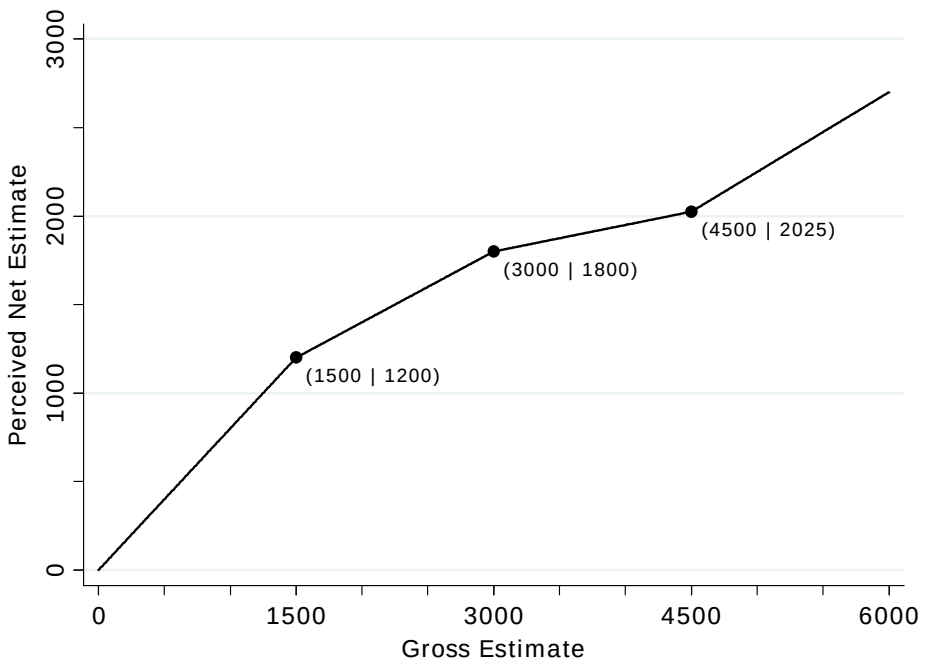

Figure 2: Example - Computation of the Perceived Net Estimates

The perceived average tax burden of a gross estimate can be calculated with the following function;[15] Figure 3 displays the related graph for the above listed net estimates:

$$PercTaxBur = \begin{cases} 1 - \dfrac{Net_{1500}}{1500} & \text{if } 1500 < GrossEst \\ 1 - \dfrac{Net_{1500} + (GrossEst - 1500) * \dfrac{Net_{3000} - Net_{1500}}{1500}}{\text{GrossNet}} & \text{if } 1500 \leq GrossEst \leq 3000 \\ 1 - \dfrac{Net_{3000} + (GrossEst - 3000) * \dfrac{Net_{4500} - Net_{3000}}{1500}}{GrossNet} & \text{if } 3000 \leq GrossEst \leq 4500 \\ 1 - \dfrac{Net_{4500}}{4500} & \text{if } GrossEst > 4500 \end{cases}$$

[15] The calculation of the perceived average tax burden is for information purposes only; it will not be used in subsequent calculations.

where *PercTaxBur* is the perceived average tax burden.

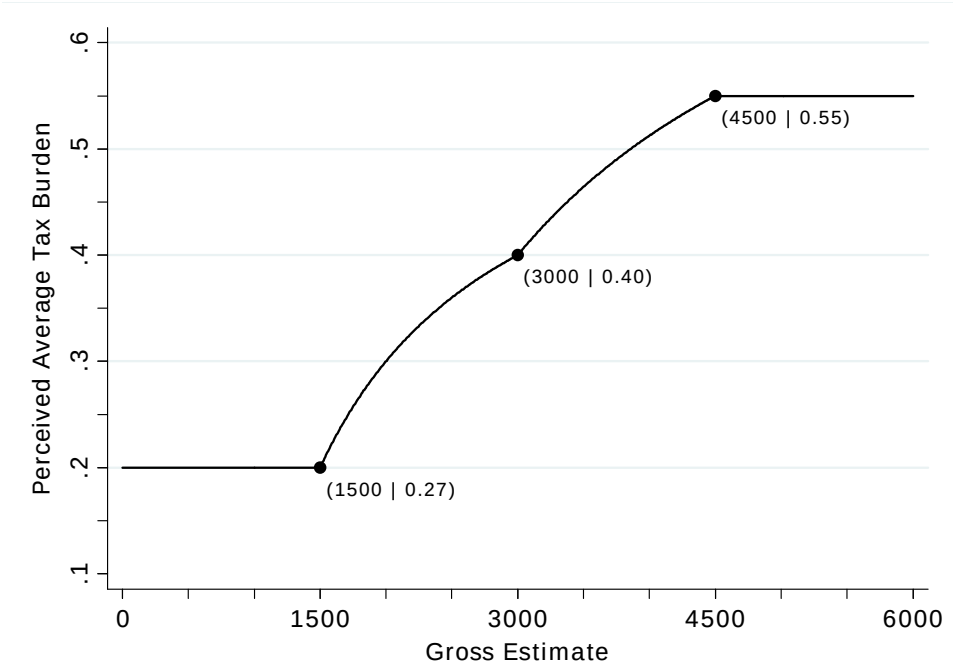

Figure 3: Example - Computation of the Perceived Average Tax Burden

Step 2):

In the next step, a function that assigns the actual (true) average tax burden to each of the previously calculated perceived net estimates is constructed. Therefore, the corresponding gross estimates to 48 net salaries between €750 net and €3,000 net were calculated, using the gross to net calculator provided by staufenbiel.de.[16] With the pairs of values obtained, it is possible to compute the actual average tax burden associated with each of the net salaries using the following formula:

$$ActTaxBur = \frac{GrossSal - NetSal}{GrossSal}$$

[16] *http://www.staufenbiel.de/ratgeber-service/gehalt/brutto-netto-rechner.html accessed December 28, 2012*

where *ActTaxBur* is the actual average tax burden. *GrossSal* and *NetSal* are pairs of gross salaries and corresponding net salaries.

We use *Least Squares* to estimate a function consisting of a linear combination of different terms for given pairs of values.[17] Therewith, the required function that assigns perceived net estimates to actual average tax burdens is estimated for net values between €750 and €3,000. For net values below €750, an actual average tax burden of 0.207 is assumed, for net values between €3,000 and €4,000, an actual average tax burden of 0.46 is assumed, and finally, for values above €4,000, an actual average tax burden of 0.47 is assumed. The resulting function is:

$$ActTaxBur = \begin{cases} 0.207 & \text{if } 750 < PercNetEst \\ -0.000095 * PercNetEst - 1.109043 + 0.178209 & \\ * \log(PercNetEst) + 0.007702 * \sqrt{PercNetEst} & \text{if } 750 \leq PercNetEst \leq 3000 \\ 0.46 & \text{if } 3000 < PercNetEs\ t \leq 4000 \\ 0.47 & \text{if } PercNetEst < 4000 \end{cases}$$

The graph of the function is illustrated in Figure 4.

[17] The following web page provides an online tool to apply this method: *http://www.arndt-bruenner.de/mathe/scripts/regr.htm accessed February, 2014*

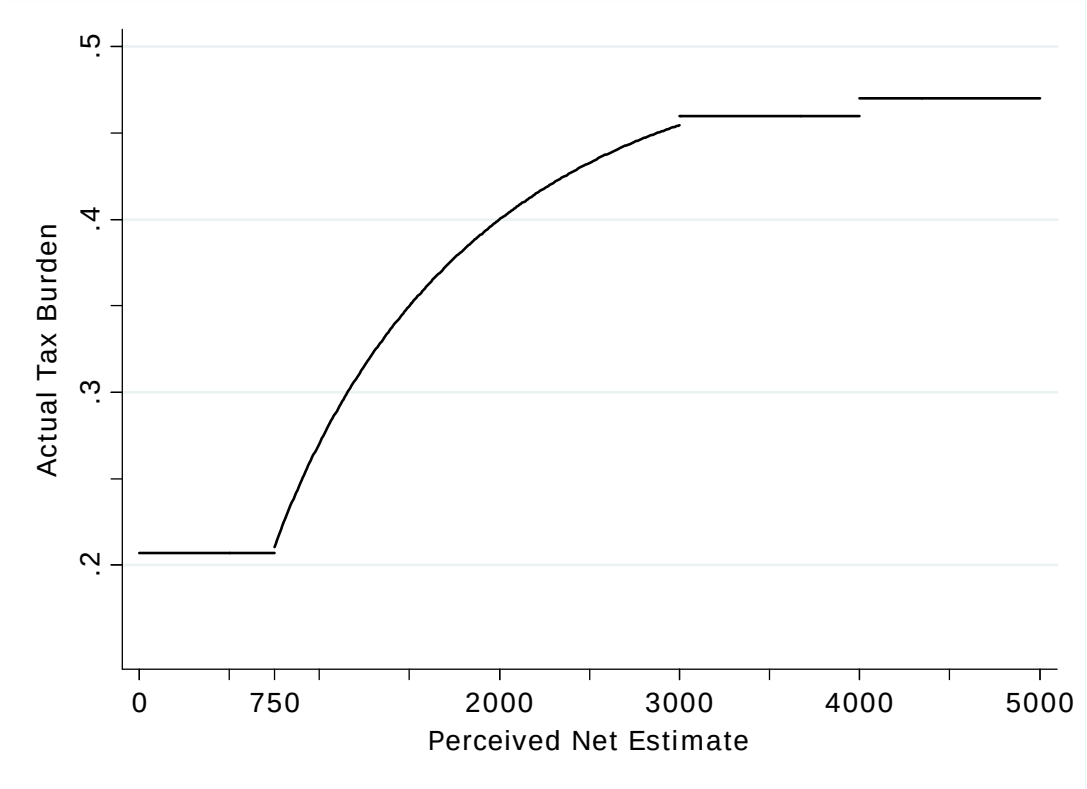

Figure 4: Computation of the Actual Tax Burden of the Perceived Net Estimates

Step 3):

Using the following formula, the adjusted gross estimates are calculated.[18]

$$AdjGrossEst = \frac{PercNetEst}{1 - ActTaxBur}$$

where *AdjGrossEst* is the adjusted gross salary estimate.

The descriptive statistics of the adjusted gross estimates are presented in Table A 9 in the Appendix. Remarkably, each and every mean of the adjusted estimates is greater than the corresponding mean of the original estimates (compare Table 5 in Section 4.1). Starting salaries generally increased by approximately €500; salaries after five years typically increased by

[18] If a student estimated a gross salary of €400 or lower, the gross estimate was not adjusted since in Germany a salary of €400 per month falls below the level of the basic tax-free allowance and, furthermore, there is no obligation to pay social contributions in this case.

about €1,000. It seems that due to a lack of knowledge about the gross to net calculation, students provided lower gross salary estimates. After an adjustment of the provided estimates with the actual ratio of gross to net salaries, students' salary estimates increased considerably.

In the following, more detailed descriptive analyses will be used to shed light on student's perceived income conditional on fields of study and personal traits. Concurrently, we further show how the tax adjustment changes most of these estimation results. The final inferential analyses (Chapter 5) will solely rely on the adjusted estimates.

4 Descriptive Analysis

4.1 Salary Estimates

Table 5 presents the descriptive statistics of students' beliefs about salaries. It is noteworthy that all estimates of salaries after five years are bigger than the related starting salaries. This finding is in accordance with the literature. See, for example, Dominitz and Manski (1996) who found that students expect a higher income at age 40 compared to age 30, and Betts (1996) who showed that students estimate increasing wages with age.

Concerning *field related salaries*, differences between the expectations for self and the estimates for average others are nearly absent, both for salaries at labor market entry (€2,759 for self and €2,814 for others) and for salaries after five years (€4,003 for self and €3,980 for others). However, as could be further explored, differences exist between various groups of students, such as females and males. In short, the findings of Smith and Powell (1990) and Botelho and Pinto (2004) are confirmed. Male students show a propensity to self-enhance,

especially for salaries after five years. Female students, on the other hand, even underestimate salaries for themselves compared to peer-students in their respective field.[19]

Regarding estimates of *salaries in different fields*, students estimate the highest salaries for graduates in Medicine and Law, both at labor market entry and after five years. Precisely, the mean estimate of salaries in Medicine (Law) constitutes €3,197 (€2,978) at labor market entry and €4,996 (€4,515) after five years on the job. On the contrary, students estimate the lowest salaries for graduates in Humanities and Education. The estimated starting salary in Humanities (Education) is €2,187 (€2,500); the corresponding salary in Humanities (Education) after five years on the job is €3,053 (€3,393).

Table 5: Descriptive Statistics of Estimated Salaries

Estimated Salaries	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Field Related Starting Salaries								
For Self	2052	2759	1146	100	2700	10000	1.20	7.1
For Others	2049	2814	1138	100	2800	12000	1.29	8.7
Field Related Salaries After 5 Years								
For Self	2049	4003	2230	300	3500	60000	9.17	202.4
For Others	2048	3980	2260	700	3600	68000	12.47	324.1
Starting Salaries in Different Fields								
Business Admin.	1536	2660	1026	150	2500	15000	1.94	19.4
Law	1520	2978	1165	300	3000	12000	1.44	9.6
Humanities	1490	2187	869	300	2000	9000	1.36	9.2
Natural Sciences	1492	2734	994	400	2700	9000	0.76	5.4
Medicine	1529	3197	1362	400	3000	12500	1.55	9.3
Math., Comp. Sc.	1493	2897	1063	400	3000	8500	0.75	4.9
Education	1515	2500	862	450	2500	7800	0.66	4.7
Salaries After 5 Years in Different Fields								
Business Admin.	1527	3881	1699	700	3600	25000	3.46	32.0
Law	1513	4515	2621	600	4000	68000	11.40	244.6
Humanities	1486	3053	1252	700	3000	19000	2.92	25.9
Natural Sciences	1485	3859	1605	700	3500	26000	3.75	42.0
Medicine	1526	4996	2243	600	4600	32000	2.83	22.5
Math., Comp. Sc.	1491	4133	1900	600	4000	40000	6.37	100.8
Education	1512	3393	1583	700	3200	45000	13.05	324.0

[19] Detailed descriptive evidence is available upon request.

In order to allow for valid inferences, we would like to see the salary estimates to be normally distributed. However, Table 5 reveals a high kurtosis, ranging from 4.7 to 324.1, as well as a positive skewness, ranging from 0.75 to 13.05, for all kinds of salary estimates. The descriptive statistics of the corresponding *log salary estimates* are shown in Table 6. The transformation indeed leads to a reduction of the kurtosis, in particular for salaries after five years. For example, the kurtosis of the field related salary for self after five years decreases from 202.4 to 5.6. Moreover, in most cases, the log leads to a substantial reduction of the absolute value of skewness. The prior right-skewed salary estimates become slightly left-skewed and, overall, approximately normal.

Table 6: Descriptive Statistics of Log Estimated Salaries

Log Estimated Salaries	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Field Related Starting Salaries								
For Self	2052	7.83	0.46	4.61	7.90	9.21	-1.09	6.67
For Others	2049	7.85	0.45	4.61	7.94	9.39	-1.23	6.98
Field Related Salaries After 5 Years								
For Self	2049	8.20	0.43	5.70	8.16	11.00	-0.10	5.59
For Others	2048	8.20	0.42	6.55	8.19	11.13	-0.13	5.90
Starting Salaries in Different Fields								
Business Admin.	1536	7.81	0.41	5.01	7.82	9.62	-1.08	6.60
Law	1520	7.92	0.41	5.70	8.01	9.39	-0.73	5.07
Humanities	1490	7.61	0.42	5.70	7.60	9.10	-0.72	4.55
Natural Sciences	1492	7.84	0.40	5.99	7.90	9.10	-0.95	5.08
Medicine	1529	7.98	0.44	5.99	8.01	9.43	-0.74	5.01
Math., Comp. Sc.	1493	7.90	0.40	5.99	8.01	9.05	-0.83	4.60
Education	1515	7.76	0.38	6.11	7.82	8.96	-0.84	4.64
Salaries After 5 Years in Different Fields								
Business Admin.	1527	8.19	0.39	6.55	8.19	10.13	-0.09	4.91
Law	1513	8.33	0.39	6.40	8.29	11.13	0.34	6.56
Humanities	1486	7.95	0.37	6.55	8.01	9.85	-0.09	4.50
Natural Sciences	1485	8.19	0.37	6.55	8.16	10.17	-0.23	5.14
Medicine	1526	8.43	0.40	6.40	8.43	10.37	-0.07	4.73
Math., Comp. Sc.	1491	8.25	0.38	6.40	8.29	10.60	-0.09	5.60
Education	1512	8.07	0.33	6.55	8.07	10.71	0.08	7.47

In a next step, the variation of students' salary estimates is further explored. Table 7 shows the 0.1 and 0.9 quantiles of the salary estimates, the ratio of the 0.9 to the 0.1 quantile (0.9/0.1 ratio

henceforth), the mean, standard deviation, and the standard deviation divided by the mean (variation ratio henceforth). Among others, Betts (1996) and Wolter (2000) employ the 0.9/0.1 ratio and the variation ratio as measures of the estimates' heterogeneity. For both statistics, a higher value is associated with a higher variation in students' salary estimates. In accordance with Betts (1996), the variation in salary estimates for graduates in different fields reflects differences in students' information about actual salaries in each field.

Table 7: Magnitude of Variation in Students' Salary Estimates

Estimated Salaries	Obs.	p10	p90	p90/p10	Mean	SD	SD/Mean
Field Related Starting Salaries							
For Self	2052	1500	4000	2.67	2759	1146	0.42
For Others	2049	1500	4000	2.67	2814	1138	0.40
Field Related Salaries After 5 Years							
For Self	2049	2100	6000	2.86	4003	2230	0.56
For Others	2048	2200	6000	2.73	3980	2260	0.57
Starting Salaries in Different Fields							
Business Admin.	1536	1500	4000	2.67	2660	1026	0.39
Law	1520	1750	4000	2.29	2978	1165	0.39
Humanities	1490	1200	3000	2.50	2187	869	0.40
Natural Sciences	1492	1500	4000	2.67	2734	994	0.36
Medicine	1529	1800	5000	2.78	3197	1362	0.43
Math., Comp. Sc.	1493	1600	4000	2.50	2897	1063	0.37
Education	1515	1500	3500	2.33	2500	862	0.34
Salaries After 5 Years in Different Fields							
Business Admin.	1527	2300	6000	2.61	3881	1699	0.44
Law	1513	2500	6500	2.60	4515	2621	0.58
Humanities	1486	1800	4200	2.33	3053	1252	0.41
Natural Sciences	1485	2400	5500	2.29	3859	1605	0.42
Medicine	1526	2900	7500	2.59	4996	2243	0.45
Math., Comp. Sc.	1491	2500	6000	2.40	4133	1900	0.46
Education	1512	2200	4600	2.09	3393	1583	0.47

As demonstrated in Table 7, the variation ratio ranges from 0.34 for the starting salary in Education to 0.58 for the salary in Law after five years. Two characteristic patterns can be observed. First, the variation ratios of salaries after five years are greater than the corresponding values of starting salaries. Second, the values of field related salaries are, on average, greater than the values of salaries in different fields. The 0.9/0.1 ratio ranges from 2.09 for the estimated salary

in Education after five years to 2.86 for the field related salary for self after five years. Thereby, the ratios of salaries in different fields after five years are not consistently greater or smaller than the ratios of the corresponding starting salaries in different fields. Hence, they are not quite in line with the above findings. Nonetheless, the ratios of field related salaries after five years were greater than the ratios of the corresponding field related starting salaries; therefore, they support the above finding. Moreover, on average, the ratios of field related salaries, again, exceed the ratios of salaries in different fields. The finding that the variation in students' estimates of field related salaries is greater than the variation in students' estimates of salaries in different fields may be explained by the fact that students' estimates of field related salaries vary by the students' discipline they have applied for and by the degree with which they aim to earn their first salary. Perceptible differences in students' field related salaries could thus still be representative for the conditions on the labor market.

Table A 10 in the Appendix describes the corresponding results for estimates which were adjusted according to the methods pointed out in Section 3.2. Both the 0.9/0.1 ratio as well as the variation ratio are greater for every category of salary estimates. After the adjustment, the 0.9/0.1 ratio ranges from 2.60 to 3.82; the variation ratio ranges from 0.47 to 0.73. The higher variation in students' estimates of field related salaries compared to the variation in students' estimates of salaries in different fields maintains. Concerning the differences in variation between starting salaries and salaries after five years, the two statistics are at odds. The 0.9/0.1 ratios suggest a higher heterogeneity in starting salaries whereas the variation ratios indicate a higher heterogeneity in salaries after 5 years.

In Betts' (1996) sample, the 0.9/0.1 ratio is typically just below 2.0; the variation ratio ranges from 0.22 to 0.32 with an average of 0.28. In Wolter's (2000) sample, the author finds an even more homogeneous distribution of salary estimates. The spread of estimates measured by the 0.9/0.1 ratio is between 1.3 and 2.1; the variation ratio ranges from 0.13 to 0.23 with an average

of 0.2. This shows that both ratios are higher for the sample of prospective students of Saarland University when compared to analogous studies in the U.S. and in Switzerland. This still holds after a tax adjustment of the estimates.

4.2 Accuracy of the Mean Estimate for Self

In this section, the accuracy of students' estimates of field related starting salaries for self is evaluated. Manski (1993) classified expectations for own earnings as conditional since they depend on students' personal characteristics and abilities. Hence, these expectations are subjective and do not test students' knowledge of the labor market. Consequently, hereinafter, estimation errors will not be computed at the individual level. However, a comparison between students' mean estimates by discipline for which they have applied for and actual, field-specific salaries observed in the labor market can provide meaningful information. Possible patterns could be that, on average, students' expectations of their own earnings are lower, equal, or higher than the actual mean salary in their discipline.

Figure 5 compares the expectations of field related starting salaries for self, broken down by disciplines students have applied for, with the actual starting salaries in each discipline. The figure depicts the mean actual salaries together with the mean expectations and the 0.1 as well as the 0.9 quantiles of students' expectations. As pointed out in Section 2.3, data on actual starting salaries by discipline are drawn from the compensation consultancy PersonalMarkt.[20] Figure 5 visualizes that the means of students' expectations in each and every discipline are considerably lower than the actual salaries. Moreover, a high heterogeneity within and across students' expectations is observable. It can be shown that the observable differences between

[20] Since *PersonalMarkt* does not provide information on actual starting salaries in the discipline Science of Sport, students applying for this field (61 observations) are excluded in the following analyses.

mean expectations and actual salaries are significant at the 1 percent level in each discipline. Precisely, the differences in Natural Sciences (-€871), Education (-€797), Law Studies (-€784), and Medicine (-€730) are the greatest. The mean of expectations in Business Studies is closest to the actual salary with a difference of -€301.

In order to test whether the systematic underestimation of field related starting salaries for self is (also) due to an inaccurate understanding of the gross to net calculation, the previous analysis is conducted again, using adjusted salary estimates instead. Figure 6 illustrates corresponding results. The difference is extremely eye-catching. The gap between the mean of expectations and the actual salary considerably reduced in every discipline; in the field of Informatics as well as Psychology it virtually disappeared. A systematic under- or overestimation is no longer observable. In the fields of Medicine, Informatics, and Psychology, those – distinctly smaller – differences are no longer statistically significant. Overall, the differences range from €45 in Informatics to -€365 in Education.

In conclusion, the observable differences in Table 2 between the mean of expectations and actual salaries in different disciplines seem to be highly attributable to students' inaccurate understanding of the German income tax system. In particular, students, on average, associate too high net salaries with given gross salaries. After controlling for this issue by applying our adjustment function, differences between the mean of expectations and actual salaries sizable decrease in every discipline. Moreover, most of the significant differences are no longer existent.

Figure 5: Actual Salaries Compared to the Distribution of the Field Related Starting Salary for Self by Discipline Applied For

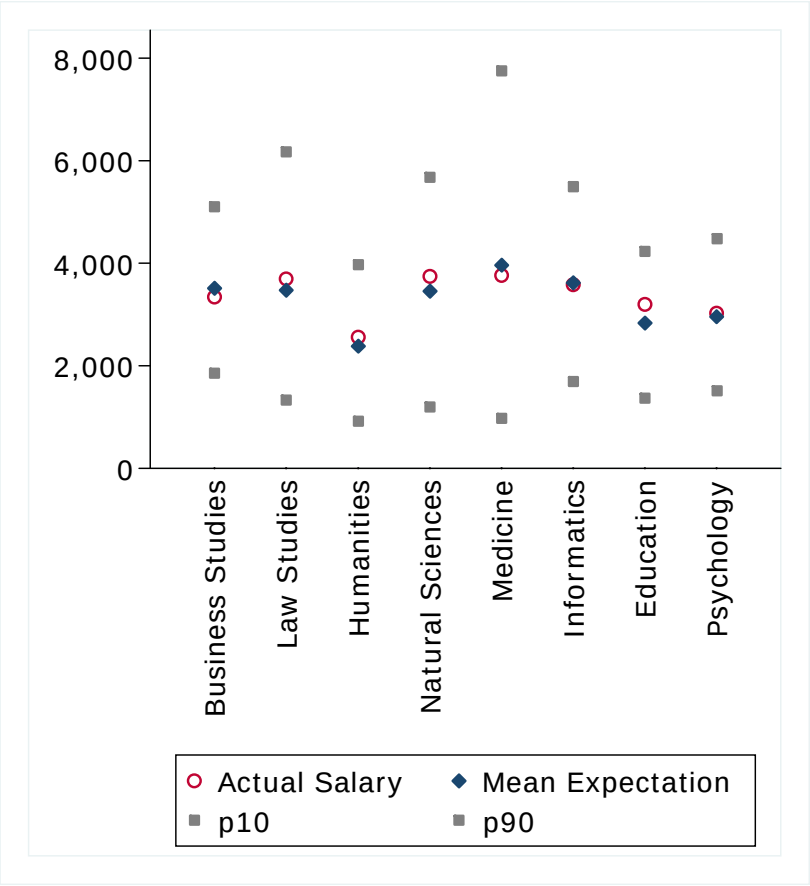

Figure 6: Actual Salaries Compared to the Distribution of the Field Related Starting Salary for Self by Discipline Applied For (Adjusted Estimates)

4.3 Estimation Errors of Starting Salaries in Different Fields

This section further examines errors in students' estimates of starting salaries in different fields of study. Precisely, mean signed errors of estimates are computed and analyzed.[21] The questionnaire asked students to estimate the starting salaries in different fields for average others rather than for themselves. Consequently, according to Manski (1993), these salaries are useful to test students' knowledge of the overall labor market. Estimation errors would raise doubt on students' information about salaries.

[21] In Chapter 5 we will use the logarithms of the absolute values of the percentage wage errors as the dependent variable of our regression model.

In accordance to Wolter (2000), the mean signed error (*MSE*) is defined as the percentage deviation of an estimate from its actual value. It can be formalized as follows:

$$MSE = \frac{Estimate - Actual}{Actual} * 100$$

In addition to the mean signed errors in each field of study, an "overall" mean signed error is calculated. The overall mean signed error of a student is the mean of the students' mean signed errors in fields of study for which she provided an estimate.[22] Summary statistics of the mean signed error are presented in Table A 11 in the Appendix (for adjusted salary estimates see Table A 12 in the Appendix). Observably, the mean signed errors in all fields of study are right-skewed with a skewness between 0.66 and 1.94 (for adjusted salary estimates between 1.21 and 2.13). Table 8 presents t-tests for the significance of the mean signed errors in each field of study. As might be expected, they are negative and highly significant. Students made the smallest[23] mean signed errors when estimating salaries in Humanities (-14.6 percent). On the contrary, the largest mean signed errors can be observed when students estimate the salaries in Natural Sciences (-26.9 percent). The overall mean signed error is -19.9 percent, which is a considerably larger value than comparable values found by Betts (1996) and by Wolter (2000). Betts (1996) identifies a mean signed error across all wage questions of -5.8 percent for students at the University of California, San Diego. Wolter (2000) ascertains a mean signed error, taking all expectations and estimates into account, of -5.3 percent for his sample of Swiss students.

---

[22] Recall that it was possible to omit a salary question and not report an estimate. Therefore, for instance, the overall mean signed error of a student who reported estimates of salaries in Business Administration, Law, and Medicine can be calculated as the sum of the MSE in Business Administration, the MSE in Law, and the MSE in Medicine divided by three.

[23] A smaller (larger) estimation error refers to an estimation error which is closer to (further away from) zero.

Table 8: One-Sample T-Test - Significance of the Mean Signed Errors in Different Fields

	Obs.	Mean	SE
Business Administration	1,536	-20.383***	0.784
Law	1,520	-19.457***	0.808
Humanities	1,490	-14.572***	0.879
Natural Sciences	1,492	-26.926***	0.688
Medicine	1,529	-15.115***	0.925
Mathematics & Comp. Sc.	1,493	-19.062***	0.768
Education	1,515	-21.815***	0.693
Overall	1,601	-19.877***	0.687

H0: Mean = 0

* p<0.1, ** p<0.05, *** p<0.01

For adjusted estimates, the t-tests for the significance of the mean signed errors are described in Table 9. The absolute value of the mean signed errors decreased sharply in each field of study. The largest mean signed error still is observable for estimates in Natural Sciences (-14.4 percent); the smallest mean signed error is observable for students' estimates in Medicine (3.2 percent). Noteworthy, the mean signed error in Medicine is even positive. After the adjustment, the overall mean signed error reduced to -6.3 percent, and therefore becomes very similar to the average mean signed errors found by Betts (1996) and Wolter (2000).

Table 9: One-Sample T-Test - Significance of the Mean Signed Errors in Different Fields (Adjusted Estimates)

	Obs.	Mean	SE
Business Administration	1,532	-8.096***	1.142
Law	1,516	-3.689***	1.259
Humanities	1,486	-6.021***	1.275
Natural Sciences	1,488	-14.447***	1.046
Medicine	1,524	3.182**	1.431
Mathematics & Comp. Sc.	1,489	-3.852***	1.196
Education	1,511	-10.888***	1.051
Overall	1,596	-6.268***	1.065

H0: Mean = 0

* p<0.1, ** p<0.05, *** p<0.01

Next, we go one step further and consider whether students who have applied for different disciplines differ in their knowledge about salaries conditional on fields of study. Figure 7 depicts the boxplots of students' overall mean signed error, broken down by the discipline they have applied for.[24]

Noteworthy, all boxes, representing 50 percent of the middle observations, are fully below the value of zero, with the exception of the box associated with the overall mean signed error of students who applied for Informatics. Moreover, outliers are primarily positive. For students applying in Education, no outliers are observable.

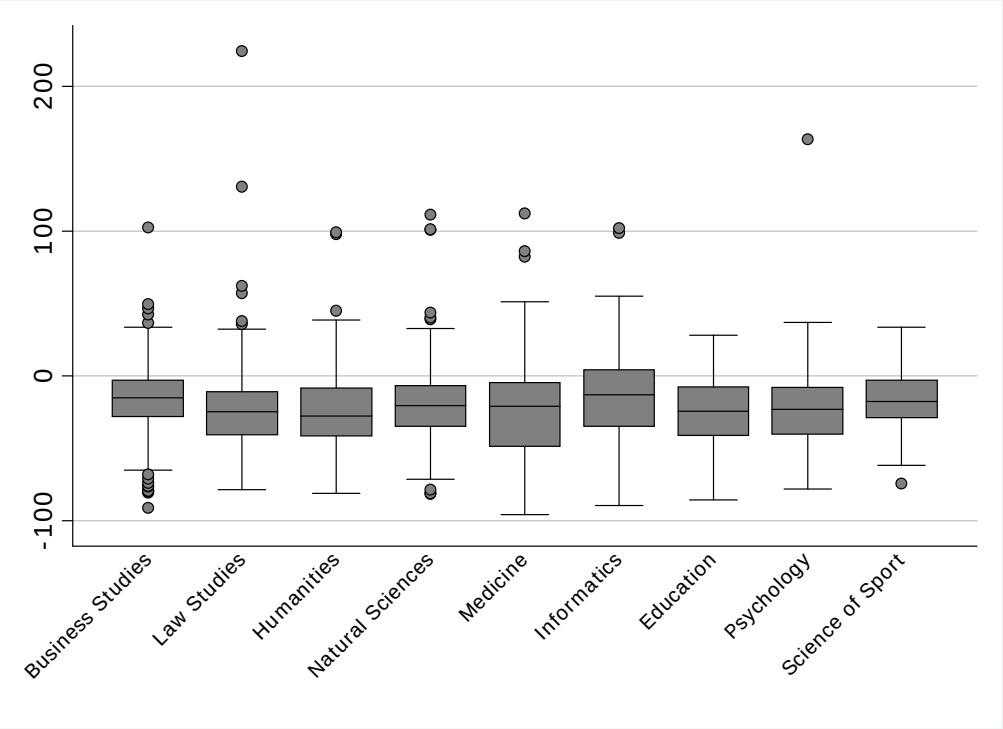

Figure 7: Distribution of the Overall Mean Signed Error by Discipline Applied For

[24] The boxes include the 0.25 and the 0.75 quantile as well as the median, whiskers, with the length of the whiskers computed as the interquartile range (0.75 quantile – 0.25 quantile) multiplied by 1.5, and outside values.

The equivalent figure, using adjusted salaries, is presented in Figure 8. Remarkably, after the adjustment, all boxes cover the value of zero. However, the medians of the mean signed errors are all below zero, still indicating a slight underestimation of the middle observation. We can virtually see, again, how much better estimates become as soon as we control for students' misconception of the tax system.

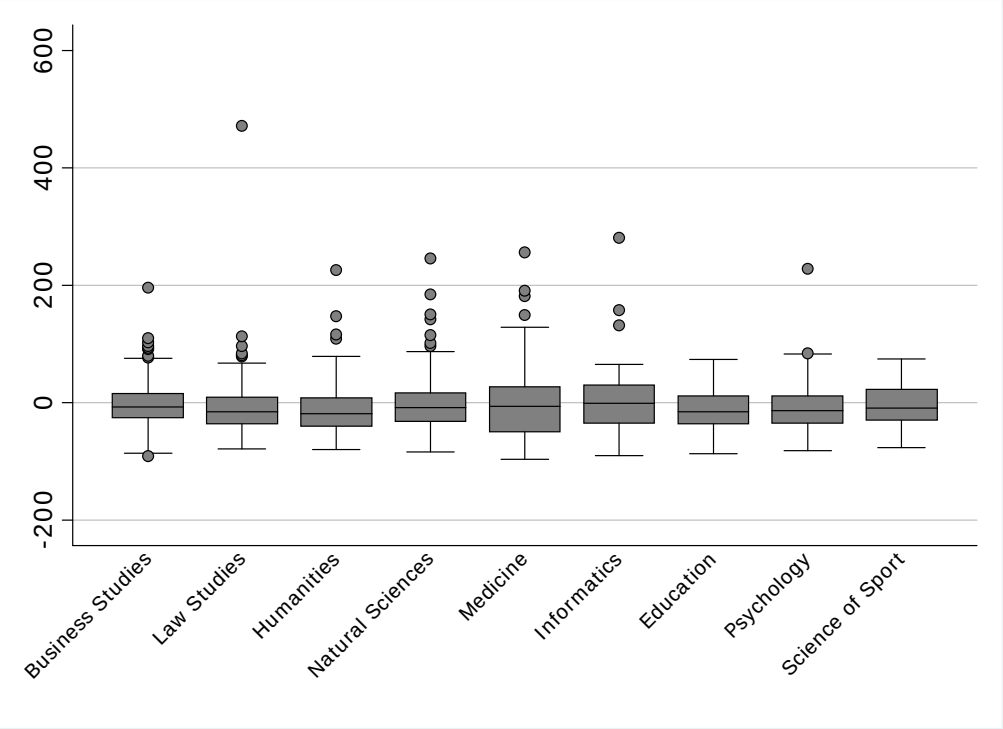

Figure 8: Distribution of the Overall Mean Signed Error by Discipline Applied For (Adjusted Estimates)

In order to further explore this phenomenon, see Table A 13 and Table A 14 in the Appendix. Table A 13 describes the mean signed errors in different fields, broken down by the discipline for which students have applied for. As recognizable, estimates of students who have applied for Informatics indicate the smallest overall mean signed errors (-14.3 percent), followed by students applying for Business Administration (-15.9 percent) and Natural Sciences (-17.2 percent). On the contrary, estimates of students applying for Humanities (-24.4 percent) and Education (-24.2 percent) show the largest estimation errors. After the adjustment of salary estimates the absolute values of mean signed errors of students in different disciplines decreased

considerably (see Table A 14). The smallest overall mean signed errors are observable for students who have applied for Natural Sciences (-0.58 percent) and Medicine (-1.97). Again, estimates of students who have applied for Education (-11.3 percent) or Humanities (-10.1 percent), but also estimates of students who have applied for Law Studies (10.42 percent) are associated with the largest mean signed errors.

Finally, we can check whether students who have applied for a certain discipline do have specialized in acquiring information on salaries of graduates in this exact discipline. If so, the mean signed error in the field of study which is associated with the discipline for which the respective student has applied for should be lower for these students compared to other students who are not in the given discipline. Hence, e.g., the mean signed error in Business Administration should be smaller for students who have applied for Business Studies compared to students who have applied for another discipline. If this would be true, smaller mean signed errors would be observable on the diagonal from upper left to lower right in Table A 13. However, we cannot detect smaller errors on the diagonal. Therefore, the mean signed errors shown in Table A 13 cannot support the hypothesis that students estimate salaries in their own discipline more accurately than do students from other disciplines. Analyzing mean signed errors of adjusted estimates (Table A 14) does not change that conclusion. Nonetheless, the conclusion is at odds with the findings of Betts (1996), who established that students specialize in information acquisition in their own field. However, note that Betts (1996) surveyed undergraduate students who were in their first to fourth year in college; this study, though, surveyed students who have currently *applied* to University. Betts further ascertained that students learn about wages as they advance in their studies. Consequently, a reason why prospective Saarland University students do not estimate better salaries in the discipline for which they have applied for might be that they have not yet had the possibility to learn about salaries in their respective discipline through their experiences while attending University.

Overall, this evidence is in line with the analysis of students' salary estimates for *self*. Students' estimates of salaries in *different fields* are highly attributable to an inaccurate understanding of the interaction of gross and net salaries, i.e., the income tax system. This also and especially holds true if we condition our estimates on respective fields of study. Controlling for this tax issue, students still underestimate actual salaries. However, to a substantially lower degree so.

5 Regression Analysis – Log Absolute Percentage Errors

Even though we could show, by using a simple tax adjustment procedure, that student's estimation mistakes of future wages declined significantly, some amount of error still remains. In a final step, we want to determine what drives those errors. We therefore make use of our rich dataset conducting a regression analysis where we try to examine how the (remaining) variation in students' salary estimates can be explained by their personal traits. More precisely, we want to shed light on which characteristics have an influence on the size of students' adjusted estimation errors. We follow Betts (1996), who exemplifies that using the mean signed error as dependent variable could yield incorrect interpretations, since a positive coefficient of a regressor does not provide information on whether this regressor affects a higher positive or a smaller negative error. Therefore, the logarithm of the absolute value of the percentage error is used. For students' salary estimates in different fields, the log absolute percentage error can be computed as follows:

$$\text{L}og\ Absolute\ Perc.\ Error = \log\left(\left| \frac{Estimate - Actual}{Actual} * 100 \right| \right)$$

In order to allow for the investigation of students' general knowledge of salaries in different fields, rather than students' knowledge of salaries in one specific field, the overall log absolute percentage error of different fields is employed as the dependent variable of our regression

models. Thereby, for each observation, the overall log absolute percentage error of different fields refers to the mean of the log absolute percentage errors in fields for which the student provided an estimate.[25] [26]

Regression Equation and Explanatory Variables

The estimated regression equation is the following:

$$Y_i=\beta_0+\beta_1 D_i+\beta_2 X_{1i}+\beta_3 X_{2i}+\beta_4 X_{3i}+u_i$$

where Y is the log of the absolute percentage error of the overall starting salary in different fields (adjusted); D is a dummy variable taking the value of one if the observation was collected in 2012 and zero if the observation was collected in 2011; vector X_1 refers to variables capturing the student's personal background (gender, age, work experience, and the final grade of secondary school); vector X_2 refers to variables indicating the student's family background (mother/father studied, living at perents' house while studying, receiving "Bafoeg", the school system the student comes from, and the federal state where the student went to school before); vector X_3 refers to variables that consider the student's academic career (importance of an above average salary, discipline applied for, degree applied for, degree with which student aims to earn first salary, and her favorite branch of business); finally, u_i is a stochastic disturbance term.

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[25] Example: The overall log absolute percentage error of different fields for a student who reported estimates of starting salaries in Business Administration, Law, and Medicine (note that it is possible to omit salary questions and not report an estimate), would be computed as the sum of the log absolute percentage errors of the three estimates divided by 3.

[26] Considering descriptive statistics of the absolute percentage error and the log absolute percentage error, provided in Table A 15 and Table A 16 in the Appendix, respectively, it is recognizable that, after applying the logarithm, the absolute value of the skewness reduced from 5.12 for the overall absolute percentage error to 0.71 for the overall log absolute percentage error. Accordingly, the kurtosis reduced from 58.3 to 6.5. T-tests on significance, reported in Table A 17 in the Appendix, show that the overall log absolute percentage error as well as the log absolute percentage errors in every estimated discipline are significantly different from zero at the 1 percent significance level.

The regression output is presented Table 10. The regression is conducted using heteroscedastic robust standard errors. The table is structured in three separate regressions of the overall log absolute percentage error of students starting salary estimates. In the first column, the dependent variable is regressed on the variables capturing the students' personal background. In the second column, the variables indicating the students' family background are added. Finally, the variables capturing the students' academic career are included in the third column. A dummy variably referring to the year of data collection is added in each of the regressions. Note that this indicator's coefficient turns out to be statistically insignificant in all regressions; hence, concerns about combining the two waves of data cannot be justified.

Interestingly, female students make significantly larger estimation errors than male students. As already addressed, this might stem, i.a., from female students' higher underestimation of salaries. Recall that the analyzed estimates in this regression are estimates of salaries for average other students, rather than estimates for self. Therefore, the finding that female students make larger estimation errors shows that female students are less well informed about actual salaries than male students. Remarkably, the coefficient of females substantially declined compared to a regression where we would not adjust our estimates. Therefore, as also could be seen when looking at descriptive statistics on the mean signed error, female students make larger estimation errors than male students, but these larger errors are, to a big extent, attributable to female students' greater misconception of the gross to net calculation. Moreover, in two out of the three regressions based on adjusted salaries, the difference between male and female students' overall absolute percentage error is solely significant at the 10 percent significance level; where, without the adjustment, we find significance levels of 1 percent throughout all specifications. The coefficients of age and work experience suggest that older students as well as students who have already worked in their favorite branch of business make smaller estimation errors. These students might have had more time and opportunities to learn about the labor

market. However, including variables which capture the students' academic career, the effect of age and work experience declines. In all three regressions, work experience proved to be significant at least at the 5 percent significance level. The coefficient of age, though, turns insignificant when moving from specification (2) to specification (3). Interestingly, the influence of work experience on the students' estimation error is bigger compared to a regression with non-adjusted estimates. Like Betts (1996) or Webbink and Hartog (2004) we also controlled for students' grades, serving as a proxy for ability, since more able students might possess better information on salaries than less able students. The corresponding coefficients, even though they show the expected negative sign, remain statistically insignificant.

The influence of parents' educational status, e.g., former studies, on their children should potentially lead them to make smaller mistakes when giving future salary estimates. Here, though, the results seem somewhat puzzling. Whereas a higher educational level of the mother affects students' knowledge of salaries in a positive way, the father's educational level has the opposite effect. The coefficients are marginally significant or not significant at all. Smith and Powell (1990) show that the father's educational level is negatively correlated with the student's expectation while the mother's education had no effect at all. However, Brunello et al. (2004) state that the mother's educational level had a positive effect on expectations whereas the father's educational attainment was not significant. The same holds true for our analysis – at least in specification (2). Furthermore, in our analysis, students were asked about their intention concerning living at their parents' house while studying. Considering students who answered "No" as the reference group, the coefficients of students who answered that they "Don't Know" and the coefficients of students who answered "Yes" are negative; however, only the coefficients of the "Don't Know" group are significant (at the 1 percent level). Interestingly, students who "Don't Know" or did not specify whether they will receive "Bafoeg" make significantly larger errors than students who do not expect to receive "Bafoeg". This effect is considerably

larger compared to a regression with unadjusted estimates. Moreover, students who completed an eight-year or a nine-year secondary school clearly make smaller estimation errors than students from "other" school systems. However, only nine-year students show a highly significant effect which is stable over all specifications.

Considering variables which capture students' academic career, the following patterns emerge.[27] There is no evidence that students who value an above average salary more than others make smaller (or larger) absolute errors. Coefficients remain statistically insignificant. Having a look at disciplines for which students have applied for, we have to note that Humanities serves as the reference group. Students of any field seem to make a smaller mistake compared to that group. However, only the coefficient of students applying for Education turns marginally significant. Moreover, all coefficients of dummy variables capturing the academic degree for which students have currently applied for and the corresponding degree with which they aim to earn their first salary remain statistically insignificant.

[27] We do not report coefficients on the federal states in which students obtained their higher education entrance qualification. There is no statistical significant evidence of an influence on students' estimation errors. Moreover, we do not report coefficients on the favorite branch of business. In short, students whose favorite branch of business is Consulting and Finance make significantly smaller errors compared to the reference group of students who would like to be self-employed. All other dummies capturing the students' favorite branch of business are not statistically significant.

Table 10: Regressions of the Log Absolute Percentage Error of the Overall Starting Salary of Different Fields (Adjusted Estimates)

	Overall Starting Salary of Diff. Fields		
	(1)	(2)	(3)
Estimates Adjusted with the Actual Ratio of Net to Gross Salaries	Log Absolute Perc. Error	Log Absolute Perc. Error	Log Absolute Perc. Error
Data Collected in 2012	0.019	-0.013	0.008
	(0.042)	(0.044)	(0.053)
Female	0.081*	0.099**	0.092*
	(0.044)	(0.045)	(0.047)
Age	-0.015**	-0.017**	-0.012
	(0.007)	(0.008)	(0.009)
Work Experience	-0.145***	-0.135**	-0.121**
	(0.054)	(0.054)	(0.057)
Grade	-0.023	-0.028	-0.030
	(0.039)	(0.040)	(0.043)
Mother Studied		-0.094*	-0.092
		(0.057)	(0.059)
Father Studied		0.082	0.083
		(0.050)	(0.052)
Living at Parents' House (Ref. No)			
Don't Know		-0.129*	-0.132*
		(0.075)	(0.077)
Yes		-0.035	-0.017
		(0.064)	(0.066)
Bafoeg (Ref. No)			
Don't Know, Not Specif.		0.219***	0.212***
		(0.057)	(0.061)
Yes		0.018	-0.004
		(0.055)	(0.056)
School System (Ref. Other)			
8-Year Sec. Scool		-0.111	-0.120*
		(0.068)	(0.073)
9-Year Sec. Scool		-0.192***	-0.181***
		(0.057)	(0.059)
Imp. Above Avg. Salary			-0.002
			(0.027)
Discipline Applied For (Ref. Humanities)			
Business Studies			-0.138
			(0.097)
Law Studies			-0.401
			(0.285)
Natural Sciences			-0.102
			(0.132)
Medicine			-0.472
			(0.334)
Informatics			-0.088
			(0.150)
Education			-0.489*
			(0.281)
Psychology			-0.164
			(0.109)
Science of Sport			-0.115
			(0.159)
Degree Applied For (Ref. Bachelor)			

Master			-0.112
			(0.085)
Degree First Salary (Ref. Bachelor)			
Master			-0.102
			(0.072)
1st State Exam			-0.015
			(0.148)
2nd State Exam			-0.022
			(0.137)
Doctorate			0.076
			(0.112)
Constant	3.471***	3.641***	3.822***
	(0.162)	(0.207)	(0.274)
Observations	1269	1226	1201
R^2	0.02	0.05	0.08
Adjusted R^2	0.01	0.03	0.04
Federal State	No	Yes	Yes
Favorite Branch of Bus.	No	No	Yes

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

In addition to the regression of the log absolute percentage error of the overall starting salary of different fields, a regression in which all the starting salary questions in different fields are *pooled* is conducted and shown in Table A 18 in the Appendix. The difference compared to the regression model above is that here, each and every single estimation error is used a separate dependent variable.[28] To account for this difference, a dummy variable is added for each wage question and a random effect for each student is added to account for random differences in estimates between students. Again, adjusted estimates were used to compute the dependent variable. As can easily be observed, the regression results displayed in Table A 18 in the Appendix are very similar to those in Table 10 above. While some minor differences emerge (e.g., coefficients on "Age", "Father studied", "8 Year Secondary School", or "Discipline Applied For – Education") the overall picture stays the same. Basically, what matters to have a more precise wage perception is the students experience and her involvement in or examination of

[28] In contrast to the first regression where the dependent variable was an average over all estimation errors provided by a particular student, in the pooled model all those errors (analogous example: Business Administration, Law, and Medicine) enter the regression separately.

pecuniary affairs. Older students, students who spent more time in school, and students with more work know-how, i.e., more experienced people, as well as students knowing about Bafoeg or students who want to work in Consulting or Finance, i.e., more monetary involved people, are making considerably smaller mistakes when estimating future wages.

6 Summary and Conclusion

When analyzing the extent to which students' expectations of their starting and future salaries are precise and whether they depend on different characteristics, we find interesting patterns. In general, students' salary estimates seem very heterogeneous and this variation is correlated with personal traits and the chosen subject of study. On average, students substantially under-estimate actual starting salaries by about 20 percent. However, a core insight of this paper is that such estimation errors are highly attributable to students' misconception of the German income tax system. We show a possibility to correct for the erroneous gross-net conversion and consequently find applicants to have a quite correct idea about what salaries to expect in the future. Overall, applicants' adjusted expectations are in line with labor market outcomes. Hence, students indeed can predict wages, but they have not sufficient information about the tax system they will face once earning money. It should be obvious that it is imperative to have a proper understanding of how the tax system will affect ones financial situation once entering the job market. Studies of people's understanding of taxes and its implications on potential savings showed that with just a little extra effort at very low costs it is possible to educate people triggering desirable consequences (see, e.g., Chetty and Saez (2013)). Analogously, we should think about including seemingly difficult but practically extremely important topics – how taxes work and how they will heavily influence our future income streams – in early school curricula already. However, even though after correcting for this taxation misconception, wage

expectations still remain strongly correlated with personal traits. The bottom line is that students who spent more time in school, students with more work experience, students knowing about Bafoeg, or students aiming to work in high-income branches are making considerably smaller mistakes when estimating future wages. Finally, even though students might possess incomplete information and show heterogeneity in terms of future wages, on average, their expectations are quite close to actual labor market figures and can, therefore, be viewed as rational.

Appendix

Table A 1: Questionnaire

Page 1 of 5

Introduction

Dear applicant for a university place:

You have applied for a place at Saarland University in the upcoming winter semester, and we wish you good luck and every success with your application.

In connection with the beginning of your academic career, the Chair of Public Policy at Saarland University carries out an anonymous survey on study preferences, field of studies and salary expectations, as well as estimates of starting salaries in different fields.

Please fill in the questionnaire truthfully and completely. In case you have forgotten an entry, you will be notified automatically. If you do not make any entry for 30 minutes, the dataset will be deleted. Then, you are allowed to restart the survey.

As a matter of course, your data will be collected anonymously and will not be passed on to third parties. Nonetheless, we need some personal data such as your age, because due to statistical reasons, these pieces of information are of great importance. Under no circumstances, the answers to the questionnaire will be used to draw a connection to your identity.

Using the button "Next", you can navigate to the next page. Your input is then saved.

Next

Page 2 of 5

Your Course of Studies

For which field of study have you applied?
If you have applied for a major and minor field of study, please declare your major.

○ Bachelor ▼
○ Master (consecutive) ▼
○ Master (non-consecutive) ▼
○ State Examination ▼
○ Other ▼

Do you wish to pursue another degree after your current study program? (*Multiple answers are permitted*)

☐ Master ☐ 2nd State Examination ☐ Doctorate

With which degree do you intend to earn your first salary?

○ Bachelor ○ Master ○ 1st State Exam ○ 2nd State Exam ○ Doctorate

Next

Page 3 of 5

Estimated Starting Salaries

In the following, please estimate different starting salaries as well as salaries after five years of work experience. Thereby, please do always provide a monthly gross estimate in whole numbers (no commas, points, or spaces).

Note: All deductions, such as income tax, church tax, solidarity surcharge, contributions to the statutory pension insurance, health insurance, nursing care insurance, and unemployment insurance, are made from the gross salary. The remaining salary is called net salary, and is monthly paid out to the employee.

Please estimate the monthly average gross salary for other students who are majoring in the field of study for which you have applied for, assuming the degree with which you stated to earn your first salary.

At labor market entry
After five years of work experience

Please estimate your own monthly gross salary after your graduation.

At labor market entry
After five years of work experience

Next

Estimated Starting Salaries

Please estimate the monthly average gross salary for other students who majored in the following fields of study. Please make your decision regardless of the students' degree (Bachelor, Master, etc.)

Business Administration	At labor market entry	
	After five years of work experience	
Law	At labor market entry	
	After five years of work experience	
Humanities	At labor market entry	
	After five years of work experience	
Natural Sciences	At labor market entry	
	After five years of work experience	
Medicine	At labor market entry	
	After five years of work experience	
Mathematics and Computer Science	At labor market entry	
	After five years of work experience	
Education	At labor market entry	
	After five years of work experience	

Next

Personal Data

Information on personal background

Gender	○ Male	○ Female	
Age	☐ Years		
In which federal state did you obtain your higher education entrance qualification?	▼		
What was your school system in secondary school?	▼		
Final grade	☐		
Has your mother studied?	○ Yes	○ No	○ Don't Know
If so, which major discipline?	☐		
Has your father studied?	○ Yes	○ No	○ Don't Know
If so, which major discipline?	☐		
Do you intend to live at your parents' house while studying?	○ Yes	○ No	○ Don't Know
Indicate whether you expect to receive Bafoeg, and if so, how much.	▼		

Information on your future salary

To what extent has your choice of field of study been influenced by your income expectations?	▼	
How important do you value an above average salary?	▼	

Information on your future occupation

In which branch of business would you like to work?	▼	
If you declared "Other", please specify your targeted branch of business:	☐	
Do you have any work experience in your targeted branch of business?	○ Yes	○ No
If so, how much?	☐ Months	

Please estimate the net equivalents of the following gross salaries:

Gross Salary	Net Salary
€1,500	☐
€3,000	☐
€4,500	☐

Confirm

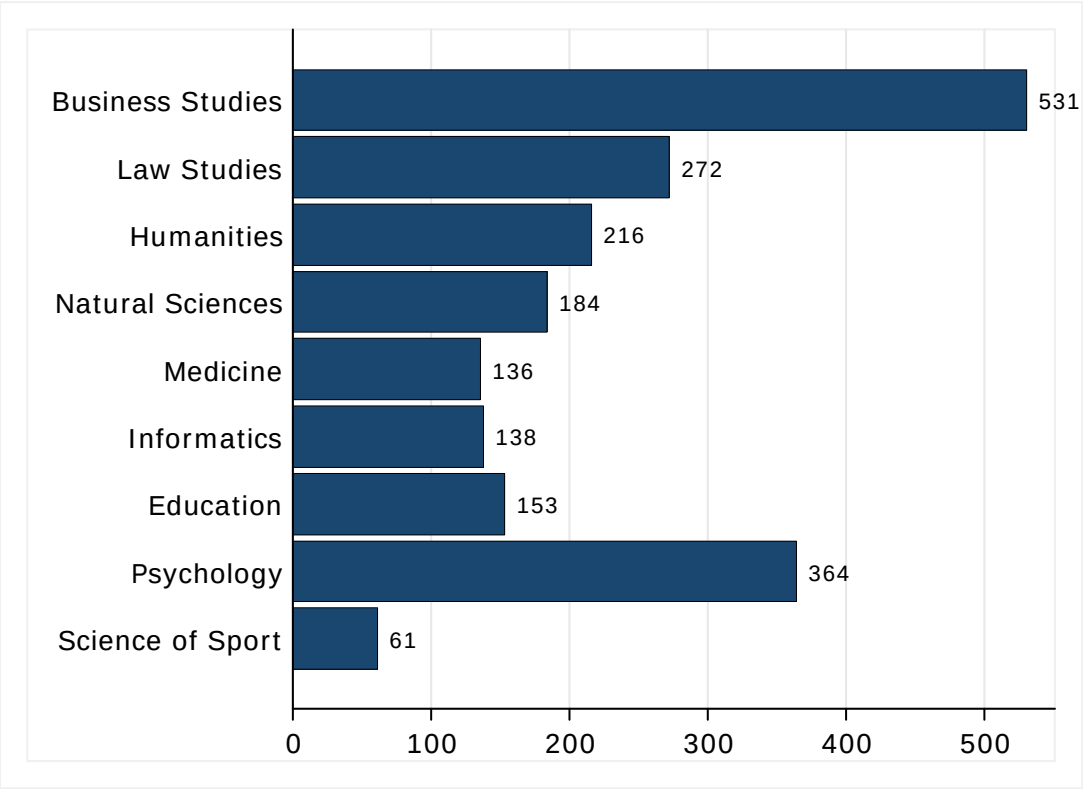

Figure A 1: Absolute Frequency Distribution of Discipline Applied For

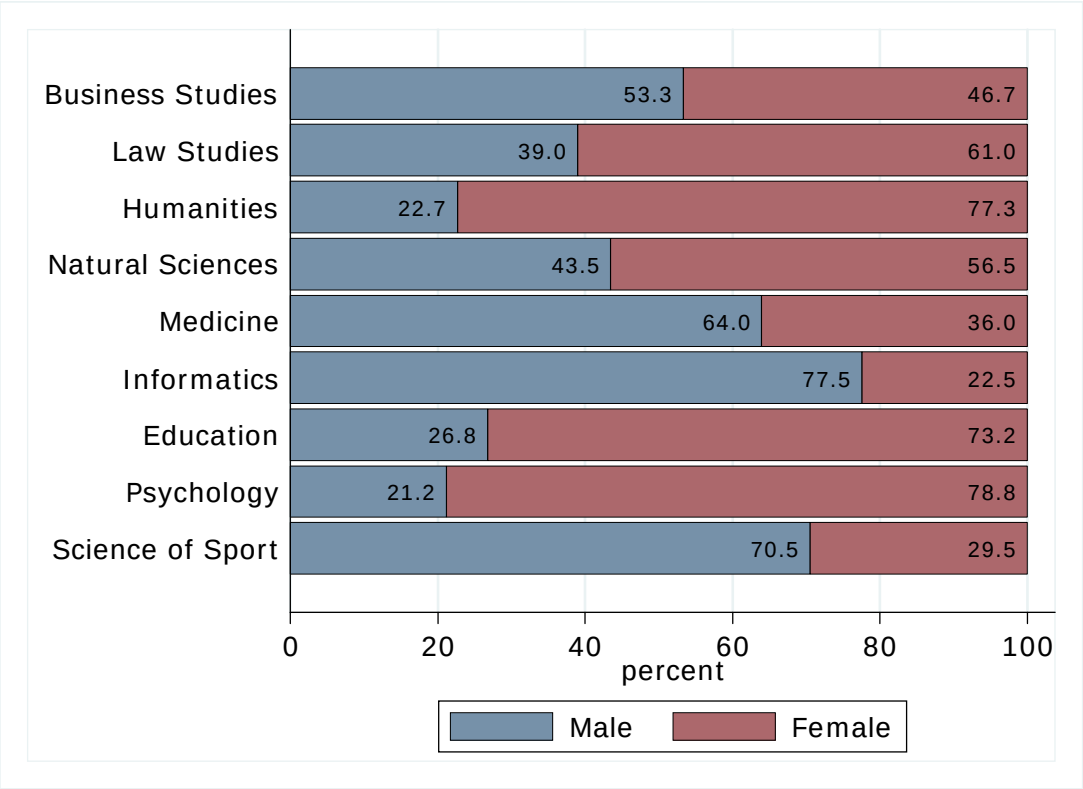

Figure A 2: Relative Frequency Distribution of Gender by Discipline Applied For

Table A 2: Descriptive Statistics of the Importance of an Above Average Salary by Discipline Applied For

	Importance of an Above Average Salary							
Discipline Applied For	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Business Studies	531	3.63	0.81	1.0	4.0	5.0	-0.64	3.78
Law Studies	272	3.58	0.79	1.0	4.0	5.0	-0.62	3.92
Humanities	216	3.05	0.95	1.0	3.0	5.0	-0.35	2.97
Natural Sciences	184	3.16	0.96	1.0	3.0	5.0	-0.39	2.77
Medicine	136	3.46	1.04	1.0	3.5	5.0	-0.54	3.14
Informatics	138	3.39	0.99	1.0	4.0	5.0	-0.84	3.56
Education	153	2.99	0.93	1.0	3.0	5.0	-0.43	3.19
Psychology	364	2.94	0.91	1.0	3.0	5.0	-0.48	2.78
Science of Sport	61	3.02	0.76	1.0	3.0	5.0	-0.25	3.56
Total	2055	3.31	0.94	1.0	3.0	5.0	-0.53	3.20

Influence on a Scale from 1 (Very Unimportant) to 5 (Very Important)

Table A 3: Frequency Distribution of the Importance of an Above Average Salary by Discipline Applied For

	Importance of an Above Average Salary				
Discipline Applied For	Very Un-important	Unimportant	Neutral	Important	Very Im-portant
Business Studies	9	31	162	273	56
	[1.7]	[5.8]	[30.5]	[51.4]	[10.5]
Law Studies	5	14	94	136	23
	[1.8]	[5.1]	[34.6]	[50.0]	[8.5]
Humanities	17	32	100	58	9
	[7.9]	[14.8]	[46.3]	[26.9]	[4.2]
Natural Sciences	11	30	71	63	9
	[6.0]	[16.3]	[38.6]	[34.2]	[4.9]
Medicine	9	8	51	47	21
	[6.6]	[5.9]	[37.5]	[34.6]	[15.4]
Informatics	11	7	48	61	11
	[8.0]	[5.1]	[34.8]	[44.2]	[8.0]
Education	14	19	79	36	5
	[9.2]	[12.4]	[51.6]	[23.5]	[3.3]
Psychology	31	64	169	96	4
	[8.5]	[17.6]	[46.4]	[26.4]	[1.1]
Science of Sport	2	10	35	13	1
	[3.3]	[16.4]	[57.4]	[21.3]	[1.6]

Relative Frequencies by Rows in Brackets

Figure A 3: Illustration of the Frequency Distribution of the Importance of an Above Average Salary by Discipline Applied For

Table A 4: Descriptive Statistics of the Influence of Income Expectations on the Students' Choice of a Study Field by Discipline Applied For

	Influence of Income Expectations							
Discipline Applied For	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Business Studies	531	2.93	1.01	1.0	3.0	5.0	-0.51	2.70
Law Studies	272	2.72	1.03	1.0	3.0	5.0	-0.33	2.13
Humanities	216	2.02	1.06	1.0	2.0	5.0	0.65	2.61
Natural Sciences	184	2.21	1.00	1.0	2.0	4.0	0.07	1.71
Medicine	136	2.63	1.30	1.0	3.0	5.0	0.12	1.93
Informatics	138	2.26	1.07	1.0	2.0	5.0	0.33	2.27
Education	153	2.37	1.11	1.0	3.0	5.0	0.12	1.98
Psychology	364	2.10	1.00	1.0	2.0	5.0	0.38	2.09
Science of Sport	61	1.87	0.94	1.0	2.0	4.0	0.51	1.86
Total	2055	2.46	1.10	1.0	3.0	5.0	0.05	1.99

Influence on a Scale from 1 (Very Low) to 5 (Very Strong)

Table A 5: Frequency Distribution of the Influence of Income Expectations on the Students' Choice of a Study Field by Discipline Applied For

	Influence of Income Expectations				
Discipline Applied For	Very Low	Low	Neutral	Strong	Very Strong
Business Studies	72	60	247	139	13
	[13.6]	[11.3]	[46.5]	[26.2]	[2.4]
Law Studies	47	50	109	64	2
	[17.3]	[18.4]	[40.1]	[23.5]	[0.7]
Humanities	94	43	65	9	5
	[43.5]	[19.9]	[30.1]	[4.2]	[2.3]
Natural Sciences	62	37	70	15	0
	[33.7]	[20.1]	[38.0]	[8.2]	[0.0]
Medicine	41	14	47	22	12

	[30.1]	[10.3]	[34.6]	[16.2]	[8.8]
Informatics	44	32	47	12	3
	[31.9]	[23.2]	[34.1]	[8.7]	[2.2]
Education	48	25	58	19	3
	[31.4]	[16.3]	[37.9]	[12.4]	[2.0]
Psychology	132	94	108	28	2
	[36.3]	[25.8]	[29.7]	[7.7]	[0.5]
Science of Sport	29	13	17	2	0
	[47.5]	[21.3]	[27.9]	[3.3]	[0.0]

Relative Frequencies by Rows in Brackets

Figure A 4: Illustration of the Frequency Distribution of the Influence of Income Expectations on the Students' Choice of a Study Field by Discipline Applied For

Table A 6: Actual Salaries by Field of Study

	PersonalMarkt		Kienbaum		Staufenbiel	
Discipline	Year	Month	Year	Month	Year	Month
Business Administration	41,763	3,341	43,000	3,440	40,744	3,260
Law	46,208	3,697	45,000	3,600	43,458	3,477
Humanities	31,998	2,560	40,500	3,240	31,980	2,558
Natural Sciences	46,765	3,741	43,900	3,512	45,653	3,652
Medicine	47,080	3,766	41,500	3,320	-	-
Mathematics & Comp. Sc.	44,737	3,579	42,900	3,432	40,362	3,229
Education	39,962	3,197	-	-	-	-
Psychology	37,815	3,025	41,500	3,320	-	-
Science of Sport	31,998	2,560	-	-	-	-

Table A 7: Descriptive Statistics of Net Estimates for Given Gross Salaries

Given Gross Salary	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
1500	2047	1078	287	300	1000	4000	3.72	24.3
3000	2047	2197	535	1000	2100	6200	2.78	16.8
4500	2047	3299	833	1200	3200	10000	2.13	13.1

Table A 8: Descriptive Statistics of Log Net Estimates for Given Gross Salaries

Given Gross Salary	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
1500	2047	6.96	0.21	5.70	6.91	8.29	1.34	10.09
3000	2047	7.67	0.21	6.91	7.65	8.73	0.99	6.63
4500	2047	8.07	0.23	7.09	8.07	9.21	0.54	4.75

Table A 9: Descriptive Statistics of Estimated Salaries (Adjusted Estimates)

Estimated Salaries	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Field Related Starting Salaries								
For Self	2041	3253	1737	100	3039	16771	1.80	10.2
For Others	2038	3345	1746	100	3123	21132	1.96	13.6
Field Related Salaries After 5 Years								
For Self	2038	5070	3562	300	4481	105660	12.31	319.2
For Others	2037	5055	3709	420	4546	119748	15.73	457.0
Starting Salaries in Different Fields								
Business Admin.	1532	3070	1493	150	2915	18868	2.00	15.1
Law	1516	3561	1812	300	3333	21132	1.90	12.4
Humanities	1486	2406	1258	300	2242	13208	2.11	14.0
Natural Sciences	1488	3201	1510	400	2990	14717	1.23	7.0
Medicine	1524	3886	2104	404	3545	18868	1.77	9.7
Math., Comp. Sc.	1489	3441	1652	400	3263	13208	1.21	6.1
Education	1511	2849	1306	412	2642	10377	1.26	6.3
Salaries After 5 Years in Different Fields								
Business Admin.	1523	4846	2524	420	4408	31447	3.06	23.9
Law	1509	5803	4253	504	5107	119748	14.09	350.3
Humanities	1482	3655	1945	631	3333	28679	3.40	30.8
Natural Sciences	1481	4840	2462	504	4408	34717	3.35	31.3
Medicine	1521	6489	3444	681	5926	48302	3.05	25.0
Math., Comp. Sc.	1487	5237	2839	605	4743	46960	4.82	57.5
Education	1508	4147	2286	647	3816	56604	9.51	195.6

Table A 10: Magnitude of Variation in Students' Salary Estimates (Adjusted Estimates)

Estimated Salaries	Obs.	p10	p90	p90/p10	Mean	SD	SD/Mean
Field Related Starting Salaries							
For Self	2041	1371	5209	3.80	3253	1737	0.53
For Others	2038	1442	5501	3.82	3345	1746	0.52
Field Related Salaries After 5 Years							
For Self	2038	2308	8050	3.49	5070	3562	0.70
For Others	2037	2394	7966	3.33	5055	3709	0.73
Starting Salaries in Different Fields							
Business Admin.	1532	1477	4772	3.23	3070	1493	0.49
Law	1516	1732	5761	3.33	3561	1812	0.51
Humanities	1486	1031	3902	3.79	2406	1258	0.52
Natural Sciences	1488	1477	5173	3.50	3201	1510	0.47
Medicine	1524	1732	6296	3.63	3886	2104	0.54
Math., Comp. Sc.	1489	1549	5501	3.55	3441	1652	0.48
Education	1511	1371	4408	3.22	2849	1306	0.46
Salaries After 5 Years in Different Fields							
Business Admin.	1523	2507	7407	2.95	4846	2524	0.52
Law	1509	2915	8805	3.02	5803	4253	0.73
Humanities	1482	1826	5761	3.16	3655	1945	0.53
Natural Sciences	1481	2507	7407	2.95	4840	2462	0.51
Medicine	1521	3333	10084	3.03	6489	3444	0.53
Math., Comp. Sc.	1487	2710	8176	3.02	5237	2839	0.54
Education	1508	2374	6173	2.60	4147	2286	0.55

Table A 11: Descriptive Statistics of the Mean Signed Errors in Different Fields

Estimated Field	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Business Admin.	1536	-20.4	30.7	-95.5	-25.2	349.0	1.94	19.38
Law	1520	-19.5	31.5	-91.9	-18.9	224.6	1.44	9.63
Humanities	1490	-14.6	33.9	-88.3	-21.9	251.6	1.36	9.24
Natural Sciences	1492	-26.9	26.6	-89.3	-27.8	140.6	0.76	5.40
Medicine	1529	-15.1	36.2	-89.4	-20.3	231.9	1.55	9.35
Math., Comp. Sc.	1493	-19.1	29.7	-88.8	-16.2	137.5	0.75	4.91
Education	1515	-21.8	27.0	-85.9	-21.8	144.0	0.66	4.70
Overall	1601	-19.9	27.5	-95.5	-20.3	224.6	1.19	10.19

Table A 12: Descriptive Statistics of the Mean Signed Errors in Different Fields (Adjusted Estimates)

Estimated Field	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Business Admin.	1532	-8.1	44.7	-95.5	-12.8	464.7	2.00	15.06
Law	1516	-3.7	49.0	-91.9	-9.8	471.6	1.90	12.39
Humanities	1486	-6.0	49.1	-88.3	-12.4	415.9	2.11	14.00
Natural Sciences	1488	-14.4	40.4	-89.3	-20.1	293.4	1.23	7.05
Medicine	1524	3.2	55.9	-89.3	-5.9	401.0	1.77	9.69
Math., Comp. Sc.	1489	-3.9	46.2	-88.8	-8.8	269.0	1.21	6.13
Education	1511	-10.9	40.8	-87.1	-17.4	224.6	1.26	6.31
Overall	1596	-6.3	42.5	-95.5	-10.6	471.6	2.13	17.48

Table A 13: Mean Signed Errors in Different Fields by Discipline Applied For

Disc. Applied For	BA	Law	Hum	Nat	Med	Mat	Edu	Overall
Business Studies	-15.18	-17.17	-9.69	-23.30	-10.87	-14.35	-17.80	-15.86
Law Studies	-25.20	-21.66	-19.44	-31.06	-17.95	-22.71	-26.64	-22.64
Humanities	-24.68	-21.56	-20.76	-29.68	-21.16	-24.55	-26.08	-24.44
Natural Sciences	-17.41	-13.47	-13.92	-22.83	-11.05	-15.51	-19.24	-17.18
Medicine	-26.24	-18.21	-6.97	-31.31	-17.26	-21.46	-20.03	-22.66
Informatics	-17.52	-12.28	-4.09	-20.73	-8.61	-11.33	-17.67	-14.34
Education	-28.13	-28.67	-16.31	-30.20	-23.77	-22.43	-22.43	-24.24
Psychology	-20.84	-23.07	-20.75	-29.22	-17.27	-22.27	-25.72	-22.65
Science of Sport	-20.32	-16.98	-9.63	-28.97	-13.14	-23.33	-16.06	-18.02

Table A 14: Mean Signed Errors in Different Fields by Discipline Applied For (Adjusted Estimates)

Disc. Applied For	BA	Law	Hum	Nat	Med	Mat	Edu	Overall
Business Studies	-4.08	-4.84	-2.99	-12.48	4.42	-0.81	-8.68	-4.55
Law Studies	-15.21	-7.12	-13.25	-20.24	-2.06	-9.62	-17.86	-10.42
Humanities	-11.67	-3.04	-12.41	-16.12	-2.71	-8.90	-14.58	-10.13
Natural Sciences	-1.53	6.60	-2.60	-6.61	11.99	3.50	-5.98	-0.58
Medicine	-11.18	5.13	11.39	-16.98	9.42	-1.80	-3.72	-1.97
Informatics	-2.75	7.10	11.13	-3.88	13.48	8.88	-4.77	2.58
Education	-17.04	-14.24	-7.75	-17.26	-5.59	-5.94	-8.90	-11.13
Psychology	-8.28	-7.50	-13.70	-17.23	1.40	-7.56	-15.18	-9.46
Science of Sport	-6.02	1.13	2.50	-16.11	6.08	-9.77	-1.14	-2.96

Table A 15: Descriptive Statistics of the Absolute Percentage Error in Different Fields (Adjusted Estimates)

Estimated Field	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Business Admin.	1532	33.93	30.17	0.24	29.77	464.74	3.92	39.61
Law	1516	36.23	33.21	0.06	29.07	471.60	3.59	32.01
Humanities	1486	36.53	33.41	0.03	30.20	415.92	3.98	35.12
Natural Sciences	1488	34.41	25.56	0.38	29.38	293.40	1.87	13.55
Medicine	1524	40.21	38.90	0.18	31.64	401.01	3.27	21.95
Math., Comp. Sc.	1489	35.27	30.00	0.15	28.07	269.03	2.14	12.03
Education	1511	33.14	26.22	0.09	29.05	224.60	1.87	10.15
Overall	1596	36.18	27.16	0.18	30.46	471.60	5.12	58.31

Table A 16: Descriptive Statistics of the Log Absolute Percentage Error in Different Fields (Adjusted Estimates)

Estimated Field	Obs.	Mean	SD	Min	Median	Max	Skew.	Kurt.
Business Admin.	1532	3.03	1.32	-1.44	3.39	6.14	-1.85	6.85
Law	1516	3.18	1.05	-2.80	3.37	6.16	-1.08	5.09
Humanities	1486	3.17	1.10	-3.43	3.41	6.03	-1.34	5.70
Natural Sciences	1488	3.17	1.06	-0.97	3.38	5.68	-1.54	6.09
Medicine	1524	3.20	1.23	-1.69	3.45	5.99	-1.68	7.35
Math., Comp. Sc.	1489	3.15	1.05	-1.90	3.33	5.59	-1.07	4.66
Education	1511	3.09	1.12	-2.40	3.37	5.41	-1.62	7.06
Overall	1596	3.14	0.78	-1.69	3.16	6.16	-0.71	6.48

Table A 17: One-Sample T-Test - Significance of the Log Absolute Percentage Error in Different Fields (Adjusted Estimates)

	Obs.	Mean	SE
Business Administration	1,532	3.030***	0.034
Law	1,516	3.175***	0.027
Humanities	1,486	3.174***	0.029
Natural Sciences	1,488	3.166***	0.027
Medicine	1,524	3.204***	0.032
Mathematics & Comp. Sc.	1,489	3.151***	0.027
Education	1,511	3.092***	0.029
Overall	1,596	3.142***	0.019

H0: Mean = 0

* p<0.1, ** p<0.05, *** p<0.01

Table A 18: Regression of the Log Absolute Percentage Error of the Pooled Starting Salary of Different Fields (Adjusted Estimates)

	Pooled Starting Salaries of Diff. Fields		
	(1)	(2)	(3)
Estimates Adjusted with the Actual Ratio of Net to Gross Salaries	Log Absolute Perc. Error	Log Absolute Perc. Error	Log Absolute Perc. Error
Data Collected in 2012	0.021	-0.008	0.015
	(0.042)	(0.044)	(0.054)
Female	0.068	0.085**	0.083*
	(0.042)	(0.043)	(0.046)
Age	-0.018***	-0.019***	-0.014*
	(0.006)	(0.007)	(0.007)
Work Experience	-0.149***	-0.141***	-0.133**
	(0.053)	(0.053)	(0.055)
Grade	-0.019	-0.024	-0.028
	(0.036)	(0.037)	(0.041)
Mother Studied		-0.077	-0.073
		(0.054)	(0.055)
Father Studied		0.092*	0.093*
		(0.050)	(0.051)
Living at Parents' House (Ref. No)			
Don't Know		-0.133*	-0.138**
		(0.069)	(0.070)
Yes		-0.064	-0.050
		(0.062)	(0.063)
Bafoeg (Ref. No)			
Don't Know, Not Specif.		0.206***	0.193***
		(0.057)	(0.059)
Yes		0.003	-0.019
		(0.052)	(0.053)
School System (Ref. Other)			
8-Year Sec. School		-0.069	-0.074
		(0.067)	(0.069)
9-Year Sec. School		-0.163***	-0.146**
		(0.057)	(0.059)

Imp. Above Avg. Salary			0.005
			(0.024)
Discipline Applied For (Ref. Humanities)			
Business Studies			-0.136
			(0.094)
Law Studies			-0.109
			(0.142)
Natural Sciences			-0.088
			(0.122)
Medicine			-0.139
			(0.182)
Informatics			-0.057
			(0.131)
Education			-0.208
			(0.156)
Psychology			-0.148
			(0.102)
Science of Sport			-0.108
			(0.152)
Degree Applied For (Ref. Bachelor)			
Master			-0.112
			(0.082)
Degree First Salary (Ref. Bachelor)			
Master			-0.149**
			(0.066)
1st State Exam			-0.023
			(0.135)
2nd State Exam			-0.011
			(0.129)
Doctorate			0.027
			(0.107)
Constant	3.549***	3.695***	3.881***
	(0.145)	(0.187)	(0.245)
Observations	8454	8165	7998
Number of Individuals	1269	1226	1201
R-Squared Within	0.00	0.01	0.01
R-Squared Between	0.02	0.05	0.07
R-Squared Overall	0.01	0.03	0.04
Federal State	No	Yes	Yes
Favorite Branch of Bus.	No	No	Yes

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

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