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Abstract

This paper presents evidence from a large-scale study on gender differences in expected wages before labor market entry. Based on data for over 15,000 students, we document a significant and large gender gap in wage expectations that closely resembles actual wage differences, prevails across subgroups, and along the entire distribution. To understand the underlying causes and determinants, we relate expected wages to sorting into majors, industries, and occupations, child-rearing plans, perceived and actual ability, personality, perceived discrimination, and negotiation styles. Our findings indicate that sorting and negotiation styles affect the gender gap in wage expectations much more than prospective child-related labor force interruptions. Given the importance of wage expectations for labor market decisions, household bargaining, and wage setting, our results provide an explanation for persistent gender inequalities.

JEL-Codes: D810, D840, I210, I230, J130, J300.

Keywords: subjective wage expectations, gender gap, negotiation styles.

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1 Introduction

The gender gap in labor earnings ranges among the best documented facts in the empirical economic literature and is subject to regular policy debates[1]. Overall, the unconditional gap ranges from 5 to 35% across different OECD countries and in both absolute and relative terms it tends to be particularly large for individuals with a college degree or higher (OECD, 2015). Moreover, convergence in male-female wages remains slow despite sustained efforts towards achieving gender-based equality of opportunity.

A closely-related gender gap is the gap in *ex-ante* wage *expectations*, i.e., male-female differences in expectations about labor market returns *before* entering the labor market (see, e.g., Blau and Ferber (1991); Brunello, Lucifora, and Winter-Ebmer (2004) for initial and Reuben, Wiswall, and Zafar (2017) for more recent evidence). Such male-female gaps in labor market expectations are important as they potentially determine education and labor market choices, household bargaining, and wage setting. They are also an important component in financial decision-making, e.g., regarding the optimal choice of retirement and savings plans. Moreover, there may exist important feedback effects whereby expected wages drive actual wage differences (e.g., through wage negotiations), and actual observable wage disparities affect expectations, thus providing a rationale for persistent gender wage gaps.

The aim of this paper is to provide first encompassing and large-scale evidence on gender wage expectations, as well as investigating how they are affected by a substantial number of different factors using a single dataset and coherent framework. For this purpose, we have elicited wage expectations for counterfactual study trajectories among more than 15,000 German students from all regions, universities, study fields and over the entire prospective working life. In addition, the data contain elicited expectations about future labor force participation, working hours, child-rearing plans, and wage negotiations, as well as information on perceived and actual ability, personality, IQ, beliefs and preferences.

We provide two sets of results. In a first instance, we document a range of stylized facts about male-female wage expectations, including population-wide and subgroup-specific gaps in expected wages, distributional differences in ranks and levels, and differences in expected life-cycle wage trajectories. We show that the gender gap in expected wages is significant and large across all subgroups and along the entire distribution. Moreover, it is similar to the observed actual wage gap among recent

[1]For a recent summary of the literature, see Blau and Kahn (2017) and Kunze (2018).

graduates.[2] In terms of life-cycle wage developments, females expect flatter wage trajectories, with an initial gap of 14 percent increasing to 27 percent at the age of 55. The accumulated life-cycle gap in expected wages hence amounts to eighteen distributional ranks, or more than 500,000 Euros. In terms of magnitude, this "perceived return to being male" is close to the actual return of obtaining a university degree. In the second part, we provide comprehensive evidence on its determinants, both along the expected wage distribution and regarding expected life-cycle wage trajectories. In line with previous literature on expected and actual wage differences (Blau and Kahn, 2017; Bütikofer, Jensen, and Salvanes, 2018; Francesconi and Parey, 2018), we find that a large portion of the overall gap in expected wages relates to academic and occupational sorting patterns and a much smaller part to IQ, perceived or actual ability and personality traits. Contrary to the evidence for actual wages (Bertrand, Goldin, and Katz, 2010; Daniel, Lacuesta, and Rodríguez-Planas, 2013; Goldin and Katz, 2016; Kleven, Landais, and Søgaard, forthcoming) but in line with Kuziemko et al. (2018), child-related labor force interruptions prove largely unimportant for wage expectations, although a perceived wage penalty seems to exist for having children before the age of 30. Moreover, we provide first empirical evidence on the relationship between expected wages, initial wage claims, reservation wages and a novel measure of expected negotiation styles. While initial wage claims closely relate to expected wage outcomes, females envisage substantially less scope for wage negotiations than males. Differences in anticipated negotiation styles explain 13-14% of the gender gap and thus hold similar importance as differences in major choice or occupational sorting. Finally, we provide suggestive evidence that wage expectations are prospective- or preference-based rather than adaptive, as personal experiences of actual gender gaps in different labor markets or student jobs no not translate into relative wage expectations.

Our study thus contributes to a buoyant literature on wage expectations, which, pioneered by Manski (Dominitz and Manski, 1997; Manski, 2004), has repeatedly documented the importance of elicited expectations and beliefs for explaining education choices and labor market behaviors (e.g., Arcidiacono, Hotz, and Kang, 2012; Boneva and Rauh, 2017; Jensen, 2010; Kaufmann, 2014; Stinebrickner and Stinebrickner, 2014; Zafar, 2011). It also relates to a range of prior studies documenting the existence of a gender gap in ex-ante wage expectations in a number of specialized samples, i.e., containing information from students enrolled in particular colleges/universities or fields of study. These studies have separately identified several potential drivers

[2]Among German college graduates, the gender wage gap is 20% overall and reduces to 5-10% after accounting for a large number of controls (Destatis, 2014, 2017b; Francesconi and Parey, 2018). It is thus comparatively large.

of the gender gap in wage expectations, including differences in major choice, personality traits, and economic preferences (Reuben, Wiswall, and Zafar, 2017; Zambre, 2018).

In this paper, we move beyond the existing evidence in at least three respects. First, we present the first large-scale study on gender wage expectations, both in terms of sample size and scope, and regarding the range of available measures. The considerable size and diversity of our sample allows us to make claims about the overall magnitude of the gender gap in wage expectations, as well as exploring heterogeneities across study fields, aspired occupations, regional labor markets, and numerous background characteristics. Moreover, by asking about expected wages at three points in the future and for different study scenarios, we construct within-individual life-cycle wage trajectories to obtain expected differences in growth rates, relative ranks, and expected lifetime labor earnings. Second, our comprehensive data allow us to relate gender gaps in expected wages to a vast array of potential determinants in one coherent framework. Potential drivers include sorting into study fields and occupations, personality traits, perceived and actual ability, economics preferences, child-rearing plans and labor supply. Third, information about prospective wage negotiations permits us to document the importance of gender differences in anticipated wage negotiations and relate wage claims and negotiation strategies to expected wage outcomes. To the extent that wage negotiations are an important component of the wage-setting process, our results thus provide an important link between expected and actual wages, as well as an explanation why the gender gap in expected wages mirrors the gender gap in actual wages.

The remainder of the paper is organized as follows. In the next section, we discuss the sample, questionnaire measures and construction of life-cycle wage trajectories. Section 3 documents male-female differences in wage expectations both for starting wages and over the life cycle. This section also shows that differences in expected wages relate to differences in actual wages. Section 4 then presents evidence on gender differences in a number of dimensions that have been shown to explain large parts of the variation in actual wage gaps. Most notably, we account for sorting into study fields and occupations, expectations about child-rearing responsibilities, and differences in negotiation patterns. Decomposition analyses assess the relative importance of these factors. Finally, section 5 concludes.

2 Data

This section reports on our sample and questionnaire measures. We start out by describing our sample and questionnaire measures of expected wages, labor supply and children, initial wage claims and reservation wages, sorting, and background characteristics. Then, we explain how we construct expected wage trajectories and measures of negotiation styles.

2.1 Sample

Our sample comprises 15,348 students and 1,155 recent graduates (since our focus is on student expectations, we will henceforth use the word "students"). All individuals were recruited as part of the German student study "Fachkraft 2030", surveyed in the second half of March 2015 (Seegers et al., 2016). In addition, a subsample of 12,734 students (82.97%) completed a supplementary psychological questionnaire comprising measures of personality traits, economic preferences, and IQ.

Students were contacted via the mailing list of a popular nationwide job board.[3] They were contacted via email and took part in an online questionnaire.[4] The sample closely compares to the overall population of German students in terms of region, university type, study fields, and likelihood to hold a student job (Seegers et al., 2016).

2.2 Measures

Individuals answered a comprehensive questionnaire regarding their own background and university enrollment, expectations about their course of studies, labor market expectations, expectations about child-rearing, and wage negotiation plans. They also provided information about expected future employment and student jobs. Finally, part of the sample completed a short IQ test, as well as a questionnaire about personality traits and preferences.

Wage expectations and realized wages. We asked subjects to indicate their expected yearly labor earnings in current Euros before taxes and at different points over the life cycle: (i) in their first job after graduation ($w^s_{i,st}$), (ii) at the age of 40 ($w^s_{i,40}$), and (iii) at the age of 55 ($w^s_{i,55}$). We chose these time points for several reasons. First,

[3]The job board jobmensa.de is operated by Studitemps GmbH and is the largest platform for student jobs.

[4]The questionnaire was filled in by 8% of contacted students. Participation was incentivized using Amazon vouchers amounting to 5,000 EUR (1 x € 1,000, 4 x € 250, 10 x € 100, 40 x € 50 vouchers).

starting wages are likely to be a natural reference point for many students and most related to their expected labor market negotiations. Starting wages are also most often elicited in the literature on wage expectations (Arcidiacono, Hotz, and Kang, 2012; Webbink and Hartog, 2004). Second, the age of 40 is the time when individuals will have likely completed their prospective family planning, such that child-related differences in expected wage trajectories should become apparent at this point. Third, the age of 55 is close to the time where wages peak but before early retirement sets in (Piopiunik, Kugler, and Wößmann, 2017).

We asked students to state these expected wages under three different scenarios, regarding their course of studies: (a) if they complete their current (*first*) studies ($w^f_{i,t}$), (b) if they change to their second most preferred *alternative* field of study ($w^a_{i,t}$), and (c) if they *dropout* and do not complete any further educational degree ($w^d_{i,t}$). Thus, given three scenarios (a)-(c), denoted by s, and three points over the life cycle (i)-(iii), denoted by t, we elicit a total of nine expected wages ($w^s_{i,t}$). In addition, we ask all individuals to state the probability of each of the respective scenarios materializing ($p^s_{i,t}$).

Assuming these scenarios to be mutually exclusive, i.e., that students either finish, change study fields or drop out, we can use the above information to construct our measure of *overall expected wages* as follows:

$$w_{i,t} = p^f_{i,t} w^f_{i,t} + p^a_{i,t} w^a_{i,t} + p^d_{i,t} w^d_{i,t} \quad \forall\, t \in \{st, 40, 55\}. \tag{1}$$

We reweight probabilities in cases where the stated probabilities add up to more than one hundred percent (7 percent). Moreover, we exclude individuals (less than 1%) who indicated implausible large expected wages of more than 1,000,000 EUR per year.

Our measure of *realized wages* are actual labor earnings before taxes reported by the graduates in our sample. All expected and actual labor earnings variables were winsorized at the 1% and 99% level. The mean level of expected starting wages in our student sample is 35,870 EUR per year (SD=16,093). The mean realized wage in the graduate sample amounts to 35,961 EUR per year (SD=25,093).

Labor supply and children. Our data contain several measures of expected labor supply and child-related career breaks. First, expected labor supply is captured by the expected number of weekly working hours. To match the information about expected wages, we asked for the expected number of weekly working hours at the same points in time, i.e., right after graduation ($h^s_{i,st}$), at the age of 40 ($h^s_{i,40}$), and at the age of

55 ($h^s_{i,55}$) for each of the three scenarios $s = f, a, d$.[5] Second, we elicited whether the students in our sample already have children and, if not, at what age they expect the birth of their first child. Third, we asked how many children students expect to have in total and how many months they are planning to stay home with each child.

Initial wage claims, reservation wages, and discrimination. Respondents were asked about the initial salary students would demand as they enter a wage negotiation (initial wage claim, $w_{i,I}$).[6] We also inquired about the lowest wage rate at which a student would be willing to accept a job after finishing her studies (reservation wage, $w_{i,R}$). Based on initial wage claims and reservation wages, we construct a measure of negotiation style (see section 2.4). Moreover, respondents stated whether they would expect to earn the same wage if they were a member of this opposite sex but with identical skills, characteristics, traits, and qualifications. If the answer is "no", we interpret this as an indicator of perceived gender discrimination.

Major and occupational sorting. Students in Germany are required to enroll for a particular field of studies when they first enter a teaching college or university. Hence, at the time of the survey, students have already selected study fields in line with their academic interests and occupational preferences. We elicited the current study field as a choice out of a list of fifteen majors. In addition, we asked respondents for their career aspirations. They could choose out of 429 pre-defined occupations or make use of a free text field. All indicated occupations were subsequently classified in terms of the ISCO-08 occupational classification reflecting job tasks as well as skills and occupational hierarchies.[7]

Personality traits, economic preferences, beliefs about ability, and IQ. Research in personality psychology and economics shows that males and females display sub-

[5]We also elicit the subjective probability of involuntary unemployment. However, similar to what has been found in the literature (e.g., Baker et al., 2018), we the reported expected probability of being unemployed is implausibly large in our sample for both males (25 percent at start and 15 percent at the age of 40) and females (32 percent at start and 19 percent at the age of 40) compared to employment rates of 93% for recent university graduates in Germany (Eurostat, 2018). We, therefore, do not use this variable in main part of the paper, acknowledging that this might lead to conservative estimates of the gender wage gap, as males report a 7 percent lower probability of involuntary unemployment at employment start and a 4 percent lower probability of involuntary unemployment at the age of 40.

[6]While not all jobs require wage negotiations, Hall and Krueger (2012) show that the incidence of wage negotiations is much higher for highly-educated individuals with college degrees compared to the general population. Moreover, it is common in Germany to state an initial wage claim when applying for a position.

[7]For evidence on the importance of tasks for the gender wage gap, see Stinebrickner, Stinebrickner, and Sullivan (2019).

stantial differences in personality traits, economic and social preferences, and beliefs about one's own ability (Schmitt et al., 2008; Borghans et al., 2009; Bertrand, 2011; Croson and Gneezy, 2009; Bian, Leslie, and Cimpian, 2017). Our data allow us to systematically account for these differences. In order to elicit beliefs about own ability, respondents marked their relative position in the distribution of students regarding their (a) perceived academic ability and (b) perceived work-related ability on a scale from 0 to 100. Four fifth of the sample additionally participated in a survey on personality, economic preferences, and IQ. First, we measured IQ based on ten items from a Raven-type Matrices IQ test (Raven and Court, 1998). Second, a student's Big Five personality traits (agreeableness, conscientiousness, emotional stability, extraversion and openness) were assessed using the 50 item IPIP test (Goldberg et al., 2006). Finally, to elicit altruism, impatience, positive and negative reciprocity, risk aversion and trust, we employed an experimentally-validated survey module (Falk et al., 2018). In the following, we use the term "Perceived/actual ability & personality" to refer to the set of these measures.

2.3 Wage trajectories and life-time labor earnings

We use elicited wage expectations to approximate lifetime wage trajectories as well as total lifetime labor earnings. For this purpose, we assume a standard Mincer-type earnings function where log-normally distributed wages are a quadratic function of potential experience:

$$\ln w_{i,t} = \alpha_i + \beta_i exp_{i,t} + \gamma_i exp_{i,t}^2. \tag{2}$$

Using the elicited information about wage expectations at three different points in time ($w_{i,st}$, $w_{i,40}$ and $w_{i,55}$), we can use equation (2) to determine the parameters α, β and γ for each individual separately. We then use the above relationship to calculate individual-specific expected wages for each year ($\widehat{w}_{i,t}\ \forall t \notin \{st, 40, 55\}$).[8]

Based on these expected wage calculations for each year of an individual's working life, lifetime earnings can be calculated as the sum of expected yearly earnings, i.e.,

$$\widehat{w}_{i,life} = \sum_{st}^{65} \widehat{w}_{i,t}, \tag{3}$$

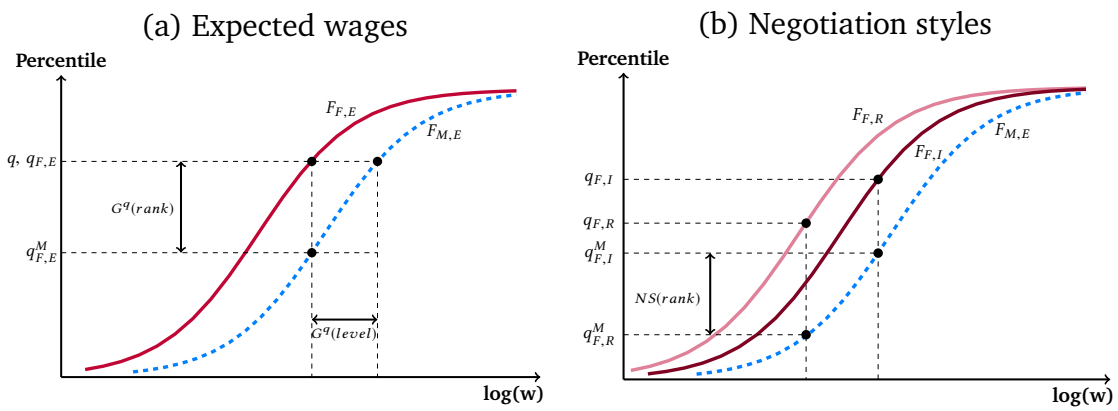
[8]Note that the expected starting year ($t = st$) differs across individuals. Since we know each individual's expected year of graduation as well as their age, we calculate $\widehat{w}_{i,t}$ for all years $t > st$. This implies that our sample changes during the initial prospective working period, i.e., up to the point where all students in our sample expect to have graduated (see also footnote 15).

where all expected wages are given in current Euros and we assume an average retirement age of 65 years.

2.4 Distributional differences and negotiation styles

Apart from analyzing gender differences at the mean, we investigate the *gender gap in terms of levels and ranks* along the entire expected wage distribution. While level differences are commonly analyzed (e.g., Francesconi and Parey, 2018), to the best of our knowledge gender gaps expressed in ranks have not been analyzed so far. Intuitively, a respective female takes up a different position (and rank) in the female expected wage distribution than in the distribution of male expected wages, whereby we compare the difference between these two rank measures. Accordingly, for each quantile $q_{F,E}$ of the female (log) expected wage distribution $F_{F,E}$, we compute the rank $q^M_{F,E}$ in the male distribution $F_{M,E}$ that corresponds to the same (log) wage level. The rank gap for a given quantile is then given by $G^q(rank) = q_{F,E} - q^M_{F,E}$ and the corresponding level gap by $G^q(level) = F^{-1}_M(q) - F^{-1}_F(q)$ (see also Bayer and Charles, 2018, for details on this methodology). We thus express male and female wages on the same underlying scale, namely in terms of the expected wage distribution of males. Panel (a) of Figure 1 illustrates both measures of the gender gap.

Figure 1: Calculation of ranks in expected wages, initial wage claims, and reservation wages



Note: Panel (a) illustrates the decomposition of the gender gap in terms of ranks and levels. For a given quantile in the female expected wage distribution F_F (red, solid), the rank gap is defined as the difference between a given quantile and the quantile position that a respective female would assume in the male distribution $F_{M,E}$ (blue, dashed): $G^q(rank) = q_{F,E} - q^M_{F,E}$. Similarly, the level gap is defined as the expected wage difference between a male and a female both evaluated at the same quantile ($G^q(level) = F^{-1}_M(q) - F^{-1}_F(q)$). Panel (b) illustrates how ranks of initial wage claims (dark red, solid) and reservation wages (light red, solid) of females are calculated using the male (log) expected wage distribution $F_{M,E}$ (blue, dashed). Our measure of negotiation styles for individual i is given by the difference in ranks between her initial wage claim ($q^M_{i,g,I}$) and reservation wage ($q^M_{i,g,R}$): $NS_i(rank) = q^M_{i,g,I} - q^M_{i,g,R}$ with $g = F, M$ depending on individual i's gender.

Expanding on this idea, we construct a measure of *negotiation styles* that is well defined and comparable across genders. Such comparisons across different distributions are not trivial as they require some form of anchoring. To provide such an anchor, we express initial wage claims and reservation wages of both genders in terms of ranks of the male wage distribution (see panel (b) of Figure 1). Thus, given that the initial wage claim (reservation wage) of a given female in our sample lies on a certain quantile $q_{F,I}$ ($q_{F,R}$), we calculate the corresponding quantile in the male expected wage distribution F_M. Using this, we then determine the corresponding rank of initial wage claims and reservation wages with respect to the male wage distribution ($q^M_{F,I}$ and $q^M_{F,R}$). Next, we proceed analogously with the initial wage claims and reservation wages of males. In a second step, we then define the negotiation style of individual i as the difference between her transformed rank of initial wage claims and reservation wages, i.e., $NS_i(rank) = q^M_{i,g,I} - q^M_{i,g,R}$ with $g = F, M$ for females and males, respectively. Our measure of negotiation styles thus captures "boldness" in wage negotiations, namely how much more a respective individual is willing to ask for, when compared to her minimum acceptable wage. Note that despite being based on initial wage claims, this measure likely captures a general willingness to ask for a relatively higher wage, both initially and in later wage negotiations.

3 The gap in male-female wage expectations

This section first documents the gender gap in wage expectations across scenarios (current major, alternative major, dropout) and over the life cycle (starting, age 40, age 55). We also present the overall gap (weighted by scenario probabilities), distribution-wide differences, and differences in individual life-cycle wage trajectories. Finally, we provide evidence that wage expectations tend to be accurate on average, suggesting that the wage gap in expectations maps into actual wage differences.

3.1 The male-female gap in wage expectations

Panel A of Table 1 presents mean expected wages for each of the different scenarios (graduating in one's major, graduating with an alternative major, or dropping out) and at three points over the prospective working life. It shows that regardless of the scenario or age, all male-female differences in expected wages are statistically different from zero and substantial in size. Thus for example, while male students expect to earn on average 40,582 EUR after graduating from their current major, females expect a mere 85% of this amount (34,331 EUR). Moreover, the wage gap

increases at higher prospective ages and is more pronounced for the current major choice, where the lifetime gap in expected wages cumulates to almost 600,000 Euros. Besides, for both males and females, expected wages conditional on finishing the current major are higher compared to the starting wages of the alternative major or for dropping out of university.[9]

Table 1: Descriptive statistics of expected and actual gross annual wages in current Euros

	Summary statistics				
	Males	Females	Diff.	Ratio	N
A. By scenario (expected wages)					
Current major					
Starting	40,582	34,331	6,252	0.85	15,348
Age 40	61,475	47,514	13,961	0.77	15,348
Age 55	74,698	53,361	21,337	0.71	15,348
Lifetime	2,482,233	1,895,315	586,919	0.76	12,734
Probability to finish major	81	84	-3	1.04	15,348
Alternative major					
Starting	38,156	33,685	4,471	0.88	15,348
Age 40	53,225	43,665	9,559	0.82	15,348
Age 55	64,048	48,434	15,614	0.76	15,348
Lifetime	2,165,761	1,744,971	420,790	0.81	12,828
Probability to major change	9	7	1	0.86	15,348
Dropout					
Starting	27,017	24,326	2,690	0.90	15,348
Age 40	34,296	27,980	6,316	0.82	15,348
Age 55	38,892	30,276	8,616	0.78	15,348
Lifetime	1,369,630	1,132,489	237,141	0.83	12,828
Probability of college dropout	11	9	2	0.82	15,348
B. Overall (expected wages)					
Starting	39,076	33,434	5,642	0.86	15,348
Age 40	58,301	45,765	12,536	0.78	15,348
Age 55	70,518	51,291	19,227	0.73	15,348
Lifetime	2,356,291	1,830,322	525,969	0.78	12,734
C. Actual wages (graduates)					
Starting	38,728	33,945	4,783	0.88	1,155
Lifetime	2,621,885	1,904,946	716,939	0.73	825

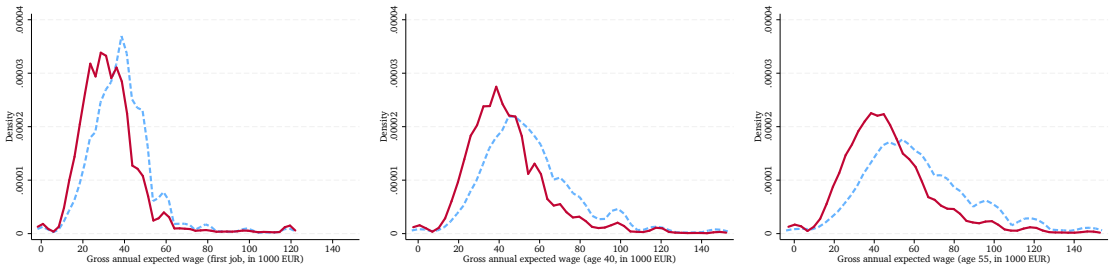
Note: Ratio refers to the ratio of female to male expected wages/probabilities. Lifetime wages are constructed based on equations (2) and (3). Lifetime wages of graduates are based on actual starting wages and wage expectations at the age of 40 and 55. All wages are winsorized at the 1% and 99% level.

[9]This finding is consistent with recent evidence that students select into majors according to their perceived comparative advantage (Kirkeboen, Leuven, and Mogstad, 2016).

To simplify the analysis, we henceforth focus on overall expected wages, i.e., by taking into account the notion that with a certain probability students change majors or drop out as shown in equation (1). The resulting overall expected wage rates are presented in panel B of Table 1 and their respective distributions in Figures 2a to 2c. Again, the male-female gap in overall expected wages is statistically significant and large. At the beginning of their careers, male students expect to earn on average 39,076 EUR, while female students expect 33,434 EUR (86%). The difference in expectations increases until the age of 40, when most children will be born, and rises further until the age of 55, when wage trajectories tend to peak. Male students expect to earn 58,301 EUR at the age of 40 and 70,518 EUR at the age of 55, whereas females report wage expectations of 45,765 EUR (78%) and 51,291 EUR (73%). Over the life cycle, this gap in expectations cumulates to an average of more than half a million Euros. To put this number into perspective, the 525,969 EUR lifetime "expected return to being male" is close to the average lifetime return to obtaining a university degree (Piopiunik, Kugler, and Wößmann, 2017).[10]

Figure 2: Expected yearly gross wages

(a) Expected wage – First job (b) Expected wage – Age 40 (c) Expected wage – Age 55



Note: Figure 2a–2c present kernel densities of expected overall wages upon graduation (2a), at the age of 40 (2b), and at the age of 55 (2c) of female (red, solid) and male (blue, dashed) students in our sample. All expected wages are winsorized at the 1% and 99% level.

When looking at gender gaps in expectations by major, a similar pattern emerges. While substantial heterogeneity exists in terms of levels – humanities majors on average expect the lowest starting wages, while law students expect the highest – female students always expect to earn substantially less than their male counterparts and the gap in expected wages increases over the life cycle. However, the expected

[10]Lifetime returns in Piopiunik, Kugler, and Wößmann (2017) are discounted using a net discount rate of 1.5%. We thus approximate gross returns as 3568 EUR x 12 months x 37 years - 1891 EUR x 12 months x 45 years = 563,052 EUR using the numbers reported in Table 1 of their paper. Alternatively, we can apply the same discount rate of 1.5% to yearly expected incomes in our sample. Doing so results in a discounted expected lifetime earnings of 366,464 EUR compared to 387,431 EUR for the return to obtaining a university degree.

wage gap tends to be smaller in majors with a larger share of females (e.g., medical/health sciences, humanities) relative to majors mostly chosen by males (e.g. STEM, economics/business; see section A.3 for details). Consistent with Goldin (2014), we also observe smaller gender differences for occupations that are characterized by a linear hours-earnings relationship (e.g. teachers) compared to occupations with non-linear/convex hours-earnings profiles (e.g. lawyers), see section A.2 and Table A11 for results.

3.2 Gender gaps along the expected wage distribution in levels and ranks

In the previous section, we described the gender gap at the mean. However, there might also be important distributional heterogeneities if, e.g., most of the gap was driven by differences at the very top or bottom of the distribution. Regarding actual wages, distributional differences are indeed heterogeneous. In Germany, the actual gender gap varies across the wage distribution, and decreases for university graduates with rising wage levels (Antonczyk, Fitzenberger, and Sommerfeld, 2010; Francesconi and Parey, 2018).[11] In the following, we characterize the gap in wage expectations at different points of the expected wage distribution using quantile regressions in terms of both log levels and ranks.[12]. The analyses of levels and ranks correspond to two different thought experiments. First, level differences are informative about the absolute (percentage) gain in wages that a female at a certain quantile could expect to receive if she were male. Second, rank differences reveal how much lower a respective female ranks on the male wage distribution given her respective expected wage. In other terms, if the labor market was a competition with wages as a prize, then rank differences inform us about how much worse a female would expect to perform in that competition due to her gender.

Table 2 describes the gender gap at five points along the expected wage distribution, namely the 10th, 25th, 50th, 75th and 90th percentiles. The estimates in the first row of panel A show that the gender gap in levels for lower quantiles is larger than for higher quantiles, decreasing from about 24 to 11 percentage points. The gap in expectations thus mirrors the actual distributional wage gap among students (see Figure 4 in Francesconi and Parey, 2018). Panel B characterizes the gap using ranks

[11]These findings for Germany contrast evidence from Sweden and the United States, where gender gaps are more pronounced at the upper part of the wage distribution, and thus overall larger among college graduates (Albrecht, Björklund, and Vroman, 2003; Bertrand, Goldin, and Katz, 2010).

[12]Again, we use ranks of wages as measured in the male log wage distribution, following the approach introduced by Bayer and Charles (2018).

Table 2: Level and rank gaps

	Quantiles				
	10th	25th	50th	75th	90th
A. Level gap					
Female	-0.236	-0.221	-0.238	-0.138	-0.108
	(0.012)	(0.003)	(0.009)	(0.005)	(0.011)
Including controls					
+ Majors	-0.178	-0.148	-0.129	-0.137	-0.121
	(0.012)	(0.010)	(0.006)	(0.009)	(0.012)
+ IQ and personality	-0.156	-0.114	-0.103	-0.091	-0.071
	(0.017)	(0.012)	(0.009)	(0.010)	(0.014)
+ Perceived ability	-0.154	-0.108	-0.098	-0.082	-0.077
	(0.018)	(0.012)	(0.009)	(0.009)	(0.015)
B. Rank gap					
Female	-5.2	-12.6	-20.6	-19.1	-8.5
	(0.3)	(0.5)	(0.7)	(0.8)	(0.8)
Including controls					
+ Majors	-4.0	-8.1	-12.4	-13.7	-7.0
	(0.4)	(0.6)	(0.7)	(0.9)	(1.0)
+ IQ and personality	-3.9	-6.3	-10.3	-10.3	-5.3
	(0.5)	(0.7)	(0.9)	(1.1)	(1.3)
+ Perceived ability	-3.9	-6.4	-9.8	-9.5	-5.1
	(0.6)	(0.7)	(0.9)	(1.0)	(1.3)

Note: Each cell of this table reports the female coefficient that characterizes the gender differences for different quantiles. Panel A uses log expected wages as an outcome and thus reports level gaps, while panel B uses percentile ranks of expected wages measured in the expected wage distribution of males and therefore reports rank gaps as outlined in section 2.4. Ability measures comprise IQ and personality traits and perceived ability comprises the subjective position in the distribution of academic and job-related skills, respectively. Log gross annual wages are winsorized at the 1% and 99% level.

as introduced in section 2.4, revealing a somewhat larger, hump-shaped difference.[13] While the difference between males and females is on average five ranks at the 10th percentile, it increases to 21 ranks at the median and decreases again to nine ranks at the 90th percentile. However, the smaller rank difference at the lower end of the wage distribution reflects a lack of mass in lower tail of the male wage distribution. We thus conclude that both level and rank differences indicate a somewhat smaller gap at the top end of the distribution compared to the rest. Apart from heterogeneities in sorting, this finding might suggest that women at the middle and lower end of the distribution are less confident regarding their perceived or actual abilities. Indeed, after major choice as well perceived and actual ability (IQ, preferences, and personality) are accounted for, the gender gap in wage expectations becomes

[13]This is in line with findings from Bayer and Charles (2018), who find that black-white gaps in earnings are more pronounced when analyzing them in terms of ranks rather than levels.

much more similar across quantiles.[14] The remaining gap is thus seems to accrue to male-female differences that exist along the entire distribution. Examples of such differences are child-rearing demands and negotiation preferences. Later in this paper, we will determine the relative importance of these factors.

3.3 Life-cycle trajectories in expected wages

The evidence presented in section 3.1 indicates that the gender gap in wage expectations increases with potential experience. To investigate the magnitude and relative importance of rising expected wage gaps over time, we use the three wage expectations (after graduation, at the age of 40, and at the age of 55) to fit individual-specific Mincerian wage trajectories as described in section 2.3. Figure 3a presents how male and female graduates expect earning trajectories to evolve over their respective lifetimes.[15] The figure reveals that the gender gap increases over time and this increase accelerates in the early-thirties when individuals start a family. Moreover, it increases until the age of 50 and stabilizes at 72% (i.e., females expect to earn 72% of the male wage at the age of 50). Expressed in terms of labor market experience, females need about nine years of prospective experience (from the age of 25 to 34) to reach the wage level that males expect to receive upon graduation (approx. 40,000 EUR). Males in turn expect to earn on average 49,000 EUR after nine years of experience, which is almost as high as the highest average wage level that females expect to earn throughout their entire careers (51,000 EUR at the age of 50).

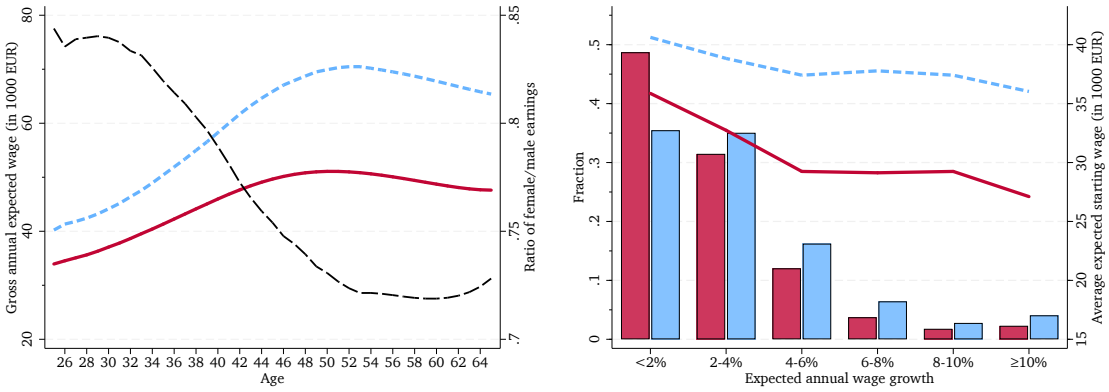
Figure 3b illustrates the distribution of annual wage growth by growth category (<2%, 2-4%, 4-6%, 6-8%, 8-10%, ≥10%). It shows that the vast majority of students expect annual wage growth rates of less than 4%. However, male students are more likely than females to expect larger growth rates. Thus, almost half of all female students expect their yearly wages to grow by less than 2%, compared to 35% of males. Moreover, students who expected high starting wages expect lower growth rates, and this pattern is more pronounced for females. Taken together, these patterns imply that expected wage trajectories of male and female students diverge over the life cycle. Nonetheless, while overall the gap in expected wages widens over the prospective

[14] See Table A1 for major-specific heterogeneities.

[15] Note that Figure 3a expresses all expected wages in terms of a respondent's age while Table 1 presents expected starting wages irrespective of age. As there are students who graduate in their late-twenties or early-thirties, the sample used for this figure thus changes at initial ages. At the age of 25, approximately 39% of all students expect to have graduated from university. At the age of 28, 72%, at 30 this share amounts to 85% and at the age of 32 to 92%. Approximately 98% of all students expect to have graduated from university by the age of 35.

Figure 3: Life-cycle wage trajectories and wage growth

(a) Expected wages over the life-cycle (b) Expected annual wage growth until age 40



Note: Figure 3a shows the evolution of wages over the life cycle (females: red, solid; males: blue, dashed), including the female-male ratio (black, long-dashed). Figure 3b presents the expected annual wage growth until the age of 40 (bars measured on the left axis) and average expected starting wages (lines measured on the right axis) in each wage growth category separately for female (red, left bars) and male (blue, right bars) students in our sample. All wages are winsorized at the 1% and 99% level.

life cycle at all parts of the expected starting wage distribution (see Figure 4a), rank differences persist or increase only slightly (Figure 4b).[16]

3.4 Comparing expected wages to actual wages

The above-described gender gap in wage expectations might translate into male-female differences in career decisions or family planning. Nonetheless, in terms of distributional concerns, fairness, and policy-making, its empirical relevance also depends on the extent to which these expectations translate into actual gender wage differences.

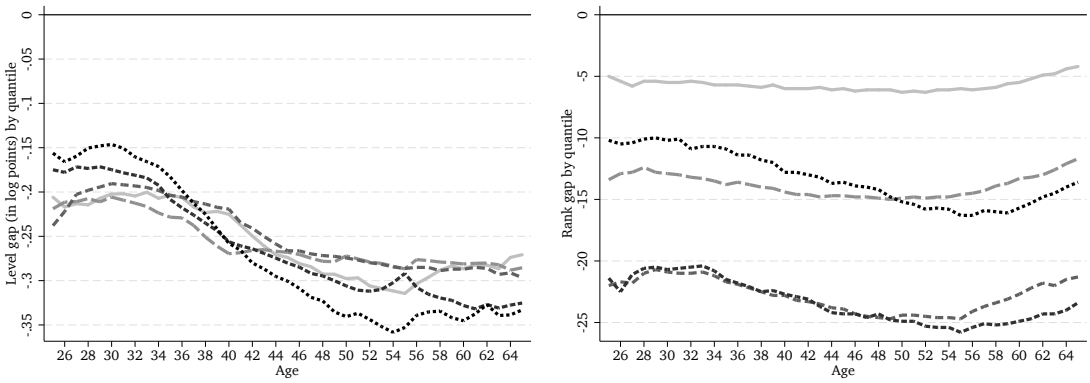
Several pieces of evidence suggest that this is indeed the case. First, follow-up surveys on graduates who were initially surveyed about their wage expectations during college show a close relation between the expectations and later realizations (Webbink and Hartog, 2004; Wiswall and Zafar, 2018a).[17] Second, the wage gap in expectations that we observe mimics the actual (conditional and unconditional) wage gap in Germany, as well as the fact that women experience much flatter life-cycle wage profiles (Francesconi and Parey, 2018; Destatis, 2017b). Thus, for example Francesconi and Parey (2018) report an overall actual gap among recent university

[16]Figure A1 in the Appendix also confirms that the ranks in the starting wage distribution are highly correlated with ranks at the age of 40 and 55.

[17]See also Attanasio and Kaufmann (2014); Filippin and Ichino (2005); Schweri and Hartog (2017) for evidence that expectations predict subsequent real-life outcomes.

Figure 4: Rank and level gaps over the life-cycle for different initial quantiles

(a) Level gap (b) Rank gap



Note: This figure presents the evolution of the wage gap measured in levels ranks for females starting at the 10th (very light, solid), 25th (light, long-dashed), 50th (medium, dashed), 75th (dark, short-dashed), and 90th (very dark, dotted) percentile of their wage distribution over the life cycle. Gaps are estimated using quantile regressions at each age, similar to Table 2.

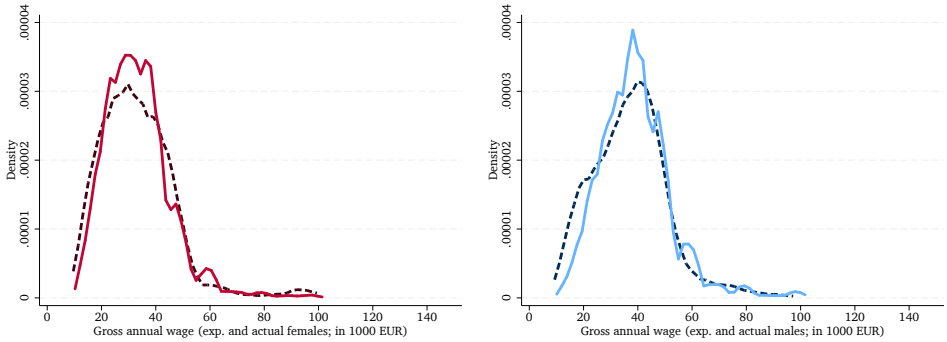
graduates in Germany of 19.1%, while we find one of 15.5% in expectations. Besides, they report an actual gap of 10.5% among economics majors, whereas the gap in expectations among economics majors in our sample amounts to 10.45%. Third, the gender gap in starting wage expectations and the gender gap among recent graduates in our data are almost identical, and the same holds true for respective wage levels. Male recent graduates earn 38,728 EUR on average, and students in our sample expect to earn 39,076 EUR upon entry into the labor market (see Table 1). The corresponding values for female graduates and students are 33,945 EUR and 33,434 EUR, respectively. Finally, we find that the respective distributions overlap (see Figure 5), aside from slightly more mass at the lower end of the distribution among recent graduates. By comparing log (expected) wages of graduates and students in a regression framework (see Appendix Table A12), we can show that any of the observed differences stem from non-standard employment relationships (e.g., internships, part-time work). After controlling for gender, field of study, and working hours, there are no differences between expected and actual wages.

The empirical similarity of wage expectations and actual wages thus suggests that expectations reflect the expected outcome of (future) wage setting (Table A2 shows compelling evidence that this is indeed the case) and that women tend to anticipate lower wages mostly due to factors related to their gender. In the following, we will investigate this claim by shedding particular light on the relative importance

of preference-based occupational sorting, child-related career breaks, and wage negotiation styles.

Figure 5: Comparison of expected and actual wages

(a) Females (b) Males



Note: These figures present kernel densities of expected overall wages of female (red, solid; Figure 5a) and male (blue, solid; Figure 5b) students in our sample as well as the same distributions for actual wages of graduates (darker colors, dashed). All wages are winsorized at the 1% and 99% level.

4 Explaining the gender gap in wage expectations

In this section, we examine the relative importance of several potential drivers of the gender gap in wage expectations. Alongside differential sorting into majors and occupations as well as differences in perceived/actual ability and personality traits or economic preferences, we focus in particular on the respective roles of anticipated child-rearing responsibilities and expected negotiation styles. For these factors to drive the gender gap in wage expectations documented in section 3.1, two conditions need to be met: first, they need to differ across genders, and second, they need to matter for wage expectations. Sections 4.1 and 4.2 thus proceed by documenting male-female differences in child-rearing plans and wage negotiation patterns, respectively. Finally, section 4.3 presents regression and decomposition analyses to explore the relative importance of these and other potential divers for the gap in wage expectations.

4.1 Expected child rearing responsibilities

Biological and social differences in child-bearing and -rearing responsibilities are an important factor in explaining male-female differences in labor market outcomes (Bertrand, Goldin, and Katz, 2010; Daniel, Lacuesta, and Rodríguez-Planas, 2013;

Goldin and Katz, 2016; Kleven, Landais, and Søgaard, forthcoming). First, women who intend to have children may select into occupations with flatter earnings profiles or linear pay structures, i.e., in anticipation of child-related wage penalties (Blau and Ferber, 1991; Goldin and Katz, 2016). Moreover, different fertility preferences, for example if women wanted more children or children at an earlier point in time, may affect a woman's household bargaining position regarding her child-rearing responsibilities and prospective labor market attachment. Second, career breaks in the form of parental leave may lead to a reduction in human capital, work-related networks, and experience, inducing females with children to earn lower relative (expected) wages afterwards (Albrecht et al., 1999). Third, reduced working hours among women with children may exert an additional penalty in (expected) female wages, especially if long hours relate to promotions or increasing marginal returns (Angelov, Johansson, and Lindahl, 2016; Goldin, 2014).

Table 3: Summary statistics on family planning

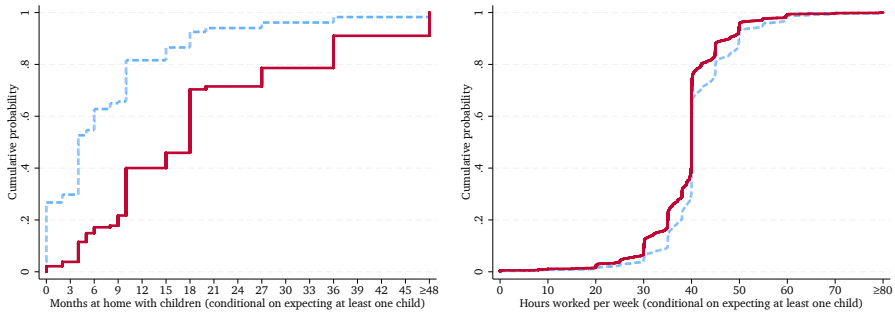
	Males	Females	Diff.	N
A. All respondents				
Wants to have children	0.88	0.87	0.02	15,348
Already has at least one child	0.03	0.02	0.01	15,256
Exp. working hours per week (age 40)	41.04	39.20	1.85	15,348
B. Conditional on wanting at least one child				
Age at birth of first child	30.59	29.38	1.21	13,370
Early parent (before age 30)	0.54	0.71	-0.16	13,427
Exp. number of children	2.27	2.20	0.07	13,427
Expected months at home per child	4.87	9.65	-4.78	11,666
Exp. working hours per week (age 40)	41.04	39.01	2.03	13,427

Note: Panel A presents information on family planning and labor supply for all students in the sample, while panel B conditions on those respondents who want to have at least one child.

Table 3 summarizes male-female differences in fertility preferences, expected child-related career breaks, and expected weekly working hours. Regarding fertility preferences, the differences across genders are minor. 87% of females and 88% of males want to have children and conditional on parenthood, whereby both genders prefer to have on average around 2.2 children. However, women expect to have children about one year earlier than men and a much larger fraction (71% versus 54%) would like to have children before turning 30 years old. This age difference matches reality to the extent that males tend to be at least one year older in three quarters of all couples (German microcensus, 2010). Larger differences emerge when it comes to child-related career breaks. Males expect to stay home for around 5 months per child as opposed to females, who estimate that they will stay home for around 10

Figure 6: CDFs of expected time at home with kids and working hours

(a) Expected time home with kids (b) Expected hours worked per week



Note: This figure presents cumulative distribution functions of (a) time spent at home with children (career break) and (b) hours worked per week at the age of 40 conditional on expecting at least one child for both female (red, solid) and male (blue, dashed) students in our sample.

months with each child (see also Figure 6b). Expected differences in working hours at the age of 40 are again minor. The average expected number of working hours at the age of 40 among all individuals (panel A of Table 3) is almost identical to that for individuals who expect to have children (panel B of Table 3 and Figure 6b) and there is no significant difference if we restrict the sample to individuals with and without (expectant) children. Arguably, the age of 40 might be too late to capture a reduction in working times among individuals who expect to have children in their late-twenties. However, even among individuals who plan to have children in their late-thirties we do not find significant differences.

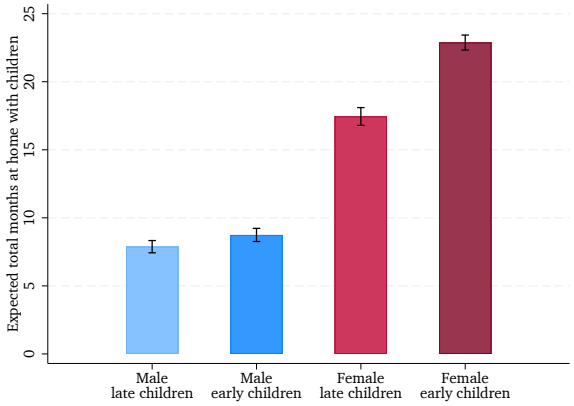
Figure 7 reveals that both males and females who expect to have children early, i.e. before the age of 30, expect longer career breaks and are also planning to work fewer hours. Young prospective parents thus seem to (rationally) anticipate less time-consuming careers. Nonetheless, as can be seen in panel (c) of Figure 7, females expect a wage penalty of 1,514 EUR for early parenthood (p-value < 0.01), while for males there is no difference (premium of 324 EUR, p-value $= 0.42$).

Some of the above expectations regarding fertility and time with children diverge from what we observe for current cohorts. Thus, for example, while only 13% of the women in our sample expect to remain childless, we see in current cohorts that 28% of women with an academic degree have no children at the age of 45 (Destatis, 2013). Moreover, women plan to interrupt their careers on average for 9.7 months for each child, but most expect to work full-time again at the age of 40. Among current cohorts, we observe that women with academic degrees interrupt their careers on average for 19 months (4 months for males) and only 32% of college-educated women with children under the age of 18 years work full time (Fabian et al., 2013; Destatis,

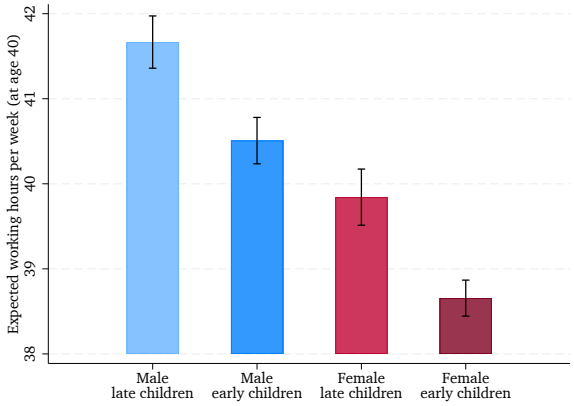
2017a). By contrast, males expect and realize almost no child-related interruptions or working-time reductions. In this sense, our findings are much in line with recent evidence presented in Kuziemko et al. (2018) showing that women underestimate the impact of motherhood on their future labor supply. Nonetheless, given that the students in our sample represent *future* cohorts of parents, it is somewhat difficult to distinguish false expectations from fundamental changes in child-rearing choices.

Figure 7: Expected time at home with children, expected working hours, and expected wages for younger and older parents

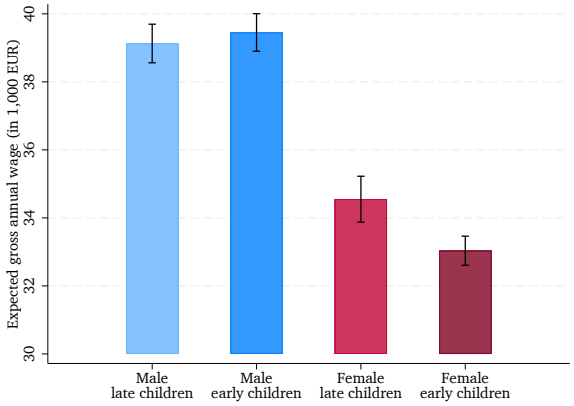
(a) Effect on time at home with children



(b) Effect on hours worked



(c) Effect on expected wages



Note: This figure presents bar graphs of (a) time spent at home with children (career break) and of (b) hours worked per week at the age of 40 and (c) expected wages of younger and older parents conditional on expecting at least one child for both female (red) and male (blue, dark lines) students in our sample including 95% confidence intervals. Lighter colors indicate that females or males expect their first child after the age of 30, darker colors before the age of 30.

4.2 Negotiation patterns

Wage negotiation strategies as well as initial wage claims and reservation wages may explain why a strong link exists between expected and actual wages (see section 3.4). For example, male-female differences in expected and actual wages may emerge if males are bolder in their initial wage claims or if females are more easily negotiated down towards their reservation wages.[18]

Table 4: Summary statistics on negotiation patterns

	Negotiation patterns			
	Males	Females	Diff.	N
A. Expressed in levels/Euro				
Initial wage claim	41,789	33,714	8,075	15,348
Expected wage	39,076	33,434	5,642	15,348
Reservation wage	34,355	28,002	6,352	15,348
B. Expressed in ranks				
Initial wage claim	58	40	18	15,348
Expected wage	50	37	14	15,346
Reservation wage	42	28	14	15,348
Negotiation style	16	13	3	15,348

Note: Panel A reports mean initial wage claims, expected and reservation wages in Euro for both males and females. Panel B expresses these in ranks measured on the male expected wage distribution. See section 2.4 for a description of how to calculate these ranks.

Table 4 presents initial wage claims, expected wages, and reservation wages of males and females first in Euros (panel A) and then in terms of ranks in the expected wage distribution of males (panel B). Expected wages on average lie between the initial wage claim and the reservation wage, indicating that most individuals expect to start a wage negotiation by claiming salaries above what they expect to receive. Similarly, they expect to settle on expected wages that lie above their respective reservation wages.[19] Moreover, as shown in Figure 8a, this is true for both males and females and along the entire expected wage distribution.[20]

[18]University graduates are usually asked to state their initial wage claim when applying for a position, such that there is little room for women to shy away from initiating a negotiation (Babcock and Laschever, 2009; Small et al., 2007).

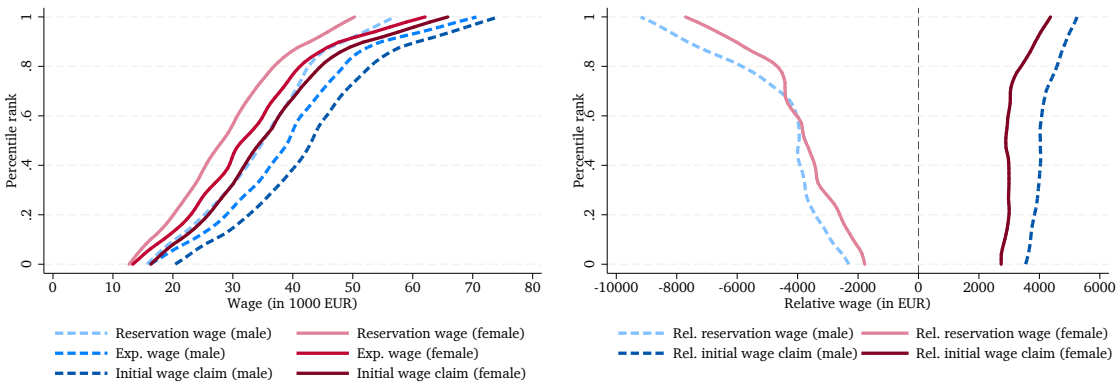
[19]For recent evidence on the importance of male-female differences in reservation wages for the gender gap, see Caliendo, Lee, and Mahlstedt (2017).

[20]The close association between initial wage claims, reservation wages and expected wages is further confirmed by the results displayed in Table A2. It indicates that the difference between expected wages and initial wage claims remains constant along the expected wage distribution (coefficient close to 1). Nonetheless, the difference between reservation and expected wages increases along the distribution (coefficient < 1). This implies that at the top individuals expect a negotiation result that exceeds their reservation wage relatively more (this can also be seen graphically in Figure 8b).

Males consistently expect to enter wage negotiations with a higher wage claim and reservation wage than females. The difference is substantial and the distribution of male reservation wages matches the distribution of female initial wage claims (compare Figure 8a). When expressing wage claims and reservation wages relative to an individual's expected wage, we also uncover that men tend to be bolder in their wage claims. As Figure 8b illustrates, males intend to claim a larger initial wage for every expected wage and they also expect to settle on a wage that exceeds their reservation wage more than females.

Figure 8: Initial wage claims, expected and reservation wages

(a) Initial wage claims, exp. and res. wages (b) Relative reservation wages and wage claims



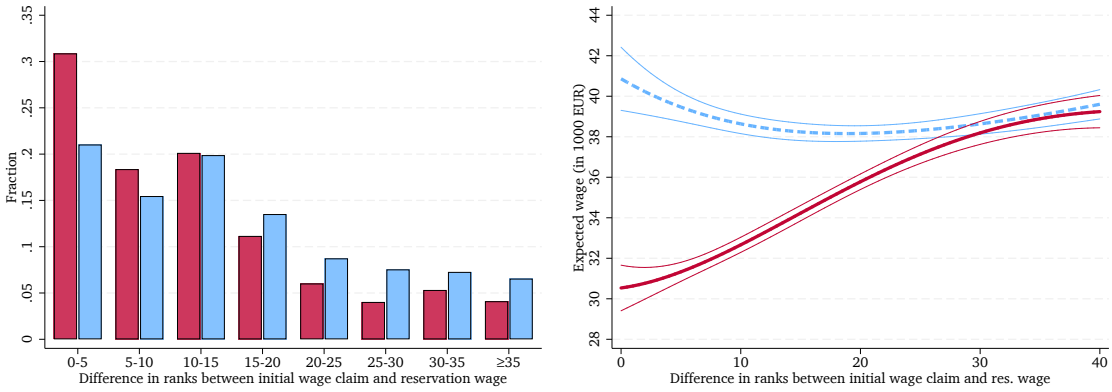
Note: Figure 8a presents reservation wages (w_R, light), expected wages (w_{exp}, medium) and initial wage claims (w_I, dark) ordered according to their percentile rank in the expected wage distribution of female (red, solid) and male (blue, dashed) students in our sample. Figure 8b presents the same distributions net of expected wages. All wages are winsorized at the 1% and 99% level.

When expressing initial wage claims, expected wages and reservation wages in terms of ranks on the expected wage distribution of males, we observe that the previous finding persists: gender differences in initial wage claims are larger than differences in expected and reservation wages. The difference in ranks between initial wage claims and reservation wages is thus higher for males (16 ranks) than for females (13 ranks) (see panel B of Table 4). Figure 9a presents the distribution of negotiation patterns. About one third of female students in our sample leave very little scope for negotiations, as there are only five ranks or fewer between their initial wage claims and their respective reservation wages. By contrast, males tend to enter negotiations with much bolder wage claims, with the majority planning to claim a wage that lies fifteen ranks or more above their reservation wage.

These differences in negotiation styles prompt the question whether bolder negotiation styles pay off. While our data do not permit establishing causality, they

Figure 9: Negotiation styles by gender

(a) Distribution of negotiation patterns (b) Association of nego. styles and exp. wages



Note: Figure 9a presents the negotiation styles NS_i defined by the difference in ranks measured on the male (log) expected wage distribution between the initial wage claims and reservation wages for both female (red, left bars) and male (blue, right bars) students in our sample. Figure 9b presents the association between these negotiation styles NS_i and expected starting wages, $w_{i,st}$, from regressions of the type $w_{i,st} = \beta_0 + \beta_1 NS_i + \beta_2 NS_i^2 + \beta_3 NS_i^3 + \beta_4 NS_i^4 + \epsilon_i$ estimated separately for male and female students including 95% confidence intervals. All wages are winsorized at the 1% and 99% level.

allow us to investigate the relationship between negotiation styles and expected wages. Figure 9b uncovers a striking pattern: while males expected wages are nearly unaffected by their negotiation patterns, negotiations have large perceived returns for female students. A larger scope for negotiations with a higher initial wage claim increases the wage females expect to earn after graduation. Increasing boldness in negotiation styles by one standard deviation (approx. 12 ranks) for a female at the mean is associated with an 3,453 EUR increase in her expected wage, while a corresponding increase for males only amounts to an increase of 171 EUR.

The results in this section provide a novel view on negotiation styles as a driver of gender differences in labor market outcomes. While previous research suggests that females are less likely to initiate negotiations (Bowles, Babcock, and Lai, 2007; Babcock and Laschever, 2009; Leibbrandt and List, 2015), we provide field evidence suggesting that females ask for less in wage negotiations, thereby complementing evidence from laboratory experiments (Rigdon, 2012). In addition, we show that negotiating pays off for female students, who expect large returns for higher initial wage claims. This finding might be consistent with the notion that women "know when to ask" (Exley, Niederle, and Vesterlund, forthcoming). By contrast, there is no such effect for males.

4.3 Decomposing the gender gap in wage expectations

Previous sections have documented the extent to which males and females differ in their prospective child-rearing and negotiation patterns. In this section, we use Oaxaca-Blinder decompositions to approximate the extent to which these and other factors contribute to the gender gap in wage expectations. Thus, for example, sorting into specific academic majors has been shown to hold particular importance for expected and actual wage gaps (Francesconi and Parey, 2018; Zafar, 2013), as is sorting into different occupations and industries (Goldin, 2014; Wiswall and Zafar, 2018b). Nonetheless, sorting into occupations and industries might not only reflect preferences, but might also be driven by individual perceptions about discrimination or class ceilings (Blau and Kahn, 2017), ability, perceived relative ability, personality or economic preferences (Cortes and Pan, 2018; Fouarge, Kriechel, and Dohmen, 2014), all of which may also have a direct effect on expected wages. We thus subsume all potential drivers of the gender wage gap by forming three groups: (A) sorting into majors, occupations, industries as well as perceived/actual ability and personality, (B) labor supply and family planning, and (C) negotiation styles.

To obtain relative shares of these factors, we compute the share of the gap that is attributable to sorting (comprised of sorting into majors, occupations, and industries as well as perceived relative ability, personality and economic preferences), family planning, and negotiation styles based on a twofold Oaxaca-Blinder decomposition using regression coefficients from a pooled regression model.[21] The results of this model suggest that each of the above factors matter for expected wages and that the estimated relationship mimics results of models with actual wages as dependent variable (see Tables A3 and A4). Thus, for example, majors in medical sciences, law, economics/business, and STEM each yield a large and significant premium over a major in humanities. Similarly, conscientiousness and extraversion yield a wage premium, while agreeableness is associated with lower wages (for a comparison using actual wages, see Heineck and Anger, 2010). Finally, working hours are positively associated with expected wages as is boldness in wage negotiations.

Table 5 and Figure 10a present the results from an Oaxaca-Blinder decomposition of the gender gap in wage expectations for both starting wages as well as expected wages earned over the life cycle (see Figure 10b). Consistent with previous research (Arcidiacono, Hotz, and Kang, 2012; Wiswall and Zafar, 2015; Zafar, 2013), we find

[21]We use pooled coefficients to obtain an estimate about the importance of differences in characteristics rather than their (perceived) prices. Differences in coefficients enter the unexplained difference, usually attributed to discrimination. Note that this yields a lower bound of the estimated effect of wage negotiations, given our estimates displayed in Figure 9b. There are no differences in the pricing of child-related labor force interruptions.

that a sizable share of the gender gap in wage expectations relates to differential sorting into majors, occupations, and industries, with occupations as the finest category being most important. By contrast, our vast battery of perceived/actual ability, personality and economic preference measures explains only 3% of the male-female difference in expected starting wages.[22] However, this share rises to 10% once we decompose expected lifetime wages. We interpret this as suggestive evidence of anticipated employer learning (see, e.g., Altonji and Pierret, 2001), i.e., the idea that employers are unable to fully price a graduate's non-cognitive characteristics at the beginning of the career, but only with increasing experience. The notion that majors explain a smaller share of the gap in lifetime wages relatively to starting wages is also consistent with this idea.

Compared to sorting, labor supply and family planning together make up for a somewhat smaller share of around 12%, where most of the variance is explained by anticipated working hours rather than child-related career breaks. In fact, we observe hardly any expected child penalty after we control for occupations and industries, indicating that women may opt for somewhat more family-friendly occupations (with flatter wage trajectories as described in section 3.3), but then do not experience a relative decline in expected wages due to family planning and child-related career breaks (see Kuziemko et al., 2018, for related evidence). Finally, negotiation styles explain 14% of the gender gap and this is true on average even within occupation categories and after controlling for measures of perceived and actual ability. Moreover, the importance of negotiation styles remains similar at 9% over the life cycle, indicating that negotiation strategies set individuals on different initial wage trajectories with important ramification throughout their entire career.

We conduct several additional analyses and robustness checks. First, we notice that the above Oaxaca-Blinder decomposition explains a substantial portion, but not all of the difference in male-female expected starting (lifetime) wages. Given the breadth of available measures on individual characteristics in our data, unmeasured differences in personal characteristics are unlikely to account for the remaining difference. Instead, differences in regional contexts may prove important (see, e.g., Malmendier and Nagel, 2011, 2015; Kuchler and Zafar, forthcoming), since individuals stem from very different regional labor markets with very different actual gender wage gaps (see Figure A2). Nonetheless, our findings displayed in Tables A5 and Figure A3 indicate that regional differences in gender wage gaps are largely unrelated to actual expected wages. Second, along the same lines, we investigate the importance of having expe-

[22]Overconfidence, measured by perceived and actual ability, thus proves much less important in our data than suggested by some of the previous evidence on elite students (see, e.g., Reuben, Wiswall, and Zafar, 2017).

Table 5: Oaxaca-Blinder decomposition of the gender gap in wage expectations

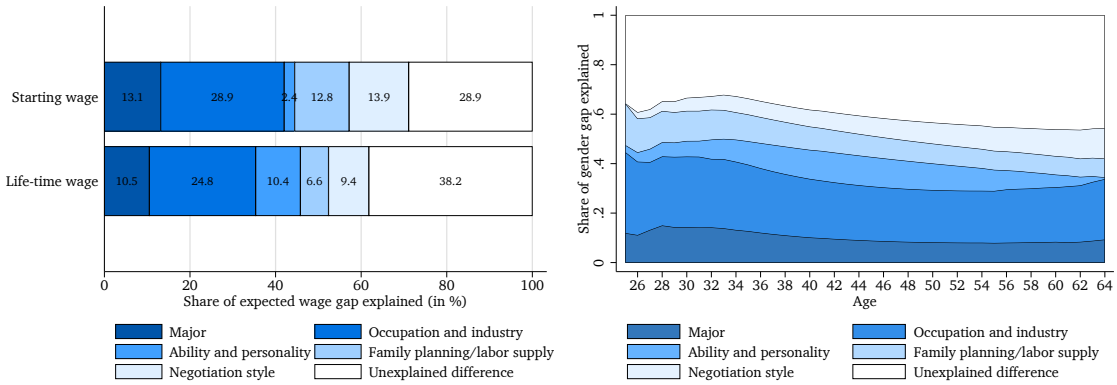
	log(Expected starting wage)				log(Expected lifetime wage)			
	(1) with occ. sorting		(2) without occ. sorting		(3) with occ. sorting		(4) without occ. sorting	
Unadjusted difference	0.181	100.000	0.181	100.000	0.230	100.000	0.230	100.000
	(0.010)		(0.010)		(0.011)		(0.011)	
Explained difference	0.129	71.104	0.101	55.752	0.142	61.812	0.119	51.740
	(0.009)		(0.008)		(0.009)		(0.008)	
Composition effects attributable to								
A. Sorting								
Major	0.024	13.143	0.044	24.535	0.024	10.504	0.046	19.944
	(0.005)		(0.004)		(0.004)		(0.004)	
Occupation	0.029	16.165			0.041	17.653		
	(0.006)				(0.006)			
Industry	0.023	12.708			0.017	7.195		
	(0.004)				(0.004)			
Perc./actual ability & personality	0.004	2.432	0.005	2.899	0.024	10.443	0.027	11.786
	(0.005)		(0.005)		(0.005)		(0.005)	
B. Labor supply/family planning								
Hours worked	0.018	9.783	0.018	9.714	0.017	7.299	0.019	8.234
	(0.003)		(0.003)		(0.002)		(0.003)	
Children	0.005	2.969	0.007	4.065	-0.002	-0.723	0.003	1.388
	(0.005)		(0.005)		(0.004)		(0.004)	
C. Negotiation styles								
Boldness	0.025	13.904	0.026	14.539	0.022	9.440	0.024	10.388
	(0.002)		(0.002)		(0.002)		(0.002)	
Observations	10788		10788		9146		9146	

Note: This table decomposes the differences in log expected starting or lifetime wages into components attributable to (A) sorting into majors, occupations, and industries as well as perceived ability, personality and economic preferences (perceived ability on the job and in university, IQ, Big Five personality traits, altruism, impatience, positive and negative reciprocity, risk aversion and trust), (B) labor supply and family planning (expected hours per week, expected number of children, months at home with children, indicator for early parenthood), and (C) negotiation styles (as defined in section 2.4) using Oaxaca-Blinder decompositions. For each decomposition, we also present the share of the difference that is attributable to the respective component and present results with and without controls for sorting into occupation and industries. Robust standard errors in parentheses. Log gross annual wages are winsorized at the 1% and 99% level.

rienced different degrees of female wage discrimination in previous student jobs. Here, again we find that the wage earned in previous student jobs does not explain the wage differences as shown in Table A6. Third, we replicate Table 5 for students who do not aim to enter the public sector as for them negotiation styles might be more important than for prospective civil servants. As Table A7 documents, we do not find substantial differences when focusing on this subsample. Finally, in Appendix Table A8 and A9, we also present unconditional quantile decompositions corresponding to the decompositions in Table 5 at different points along the distribution. The results of these decompositions are similar to the Oaxaca-Blinder decompositions at the mean, with one exception: the importance of negotiation styles decreases along the distribution, while personality traits become more important in explaining the gap.

Figure 10: Decomposition of expected wages

(a) Decomposition of starting and lifetime wages (b) Decomposition over the life-cycle



Note: Figure 10a illustrates the decomposition of expected starting and lifetime wages presented in Table 5. Figure 10b presents this decomposition for all ages over the life cycle. Categories are aggregated such that labor supply/children corresponds to the sum of hours worked and children, negotiation style/personality corresponds to negotiation style, perceived ability/discrimination as well as personality.

5 Conclusion

This study provides first large-scale evidence on the gender gap in wage expectations. Already prior to labor market entry, women expect much lower wages than men and this gender gap in expected wages is significant and large across all subgroups. Moreover, it prevails along the entire distribution, and increases over the prospective life cycle. In terms of relative magnitudes, females would need to work on average around four hours more per week in the same occupation and industry, or major for instance in medical sciences rather than humanities to catch up with the starting wages of their male peers. Similarly, in expectation, it would take them about nine years more of accumulated work experience to make up for the gender penalty.

The overall pattern of results confirms previous findings on the importance of sorting into certain majors, industries or occupations, and a female preference for jobs with flatter wage schedules (Blau and Ferber, 1991; Brunello, Lucifora, and Winter-Ebmer, 2004; Zafar, 2013; Blau and Kahn, 2017). Yet, except for a wage penalty of having children early, women seem to underestimate the extent and importance of child-related career breaks. We also document a striking relationship between expected wages, initial wage claims and reservation wages, and use this information to construct a measure of negotiation styles, which reveals that women plan to enter wage negotiations with more modest wage claims relative to their reservation wage. A decomposition of starting and lifetime wages into components related to sor-

ting, perceived/actual ability as well as personality, child-rearing responsibilities and negotiation styles unveils that after sorting is accounted for, working hours matter but child-related career breaks are largely unimportant. What does matter, however, is boldness in initial wage negotiations, with important consequences for expected starting and lifetime wages.

The above findings have implications for our understanding of wage-setting processes, expectation formation, and economic modeling. In particular, the documented systematic and accurate gender differences in wage expectations and their strong relation with wage claims and reservation wages suggest that expected wages drive actual wage differences and persistent gender wage gaps. At the same time, the expectation formation process for wages is non-adaptive, given that relative wage expectations are not affected by contextual labor market variables. Instead, expected wages seem a prospective, preference-related component in wage setting, which might thus be more easily malleable than, e.g., expectations about aggregate economic relationships that are indeed shaped by experiences (Fuster, Laibson, and Mendel, 2010; Malmendier and Nagel, 2011, 2015; Kuchler and Zafar, forthcoming). Given their accuracy and forward-looking nature, relative expected wage disparities likely matter for financial decision-making, household bargaining, as well as education and labor market choices. In this respect, our results also inform the economic modeling of such decisions and associated learning processes (see, e.g., Breen and Garcia-Penalosa, 2002; Xia, 2016; Reuben, Wiswall, and Zafar, 2017; Wiswall and Zafar, 2018b).

The findings presented in this paper also provide an explanation for several empirical patterns. First, our results suggest that women are aware of the career cost of having children early, which may explain the observational tendency to delay child birth among highly-educated women (Bratti, 2015). However, aside from considerations of timing, women underestimate the child-related dampening in their wage trajectories, with potential implications for household bargaining and the distribution of child-rearing tasks. Thus, women may stay home at a higher rate not only because they expect lower labor market returns than their spouses, but also because they underestimate the wage loss associated with raising children (Kuziemko et al., 2018). Second, it seems as if reluctant negotiation behavior leads to lower reference points and lower subsequent wage expectations. While we cannot make strong causal statements given the nature of our data, our evidence strongly supports the idea that initial negotiation styles matter for starting wages and differences in starting wages lead to different wage trajectories. Hence, these findings may explain why wage gaps are larger among university students entering labor markets in which unionized wage

setting is rare and where employer-employee negotiations hold particular importance in the wage-setting process (Blau and Kahn, 2017).

Our results also deliver insights regarding the effective implementation of policies aimed at leveling the playing field between genders. First, our findings suggest that negotiation trainings – rather than encouraging more negotiations per se (Exley, Niederle, and Vesterlund, forthcoming) – might be an effective measure to improve female labor market outcomes and reduce the gender wage gap (Ashraf et al., 2018). In fact, such measures seem to be more effective than policies that encourage women to enter male-dominated fields, for which the gender gap in expectations tends to be somewhat higher. They may also be more effective than exposure to low actual gender gaps (e.g. by enforcing equal pay in student jobs), which we find to be unrelated to differences in wage expectations. Second, the above evidence suggests that information treatments on child-related wage penalties might help women to gain a more realistic view of the career costs of raising a family and they might also lead women to bargain for a more equal distribution of child-rearing responsibilities within households. In future research, it would thus be informative to ascertain how our measure of negotiation styles elicited before labor market entry translates into realized wages, and whether randomly-assigned information treatments about negotiation styles or child-related labor market penalties can reduce actual wage gaps to the same extent as suggested in this paper.

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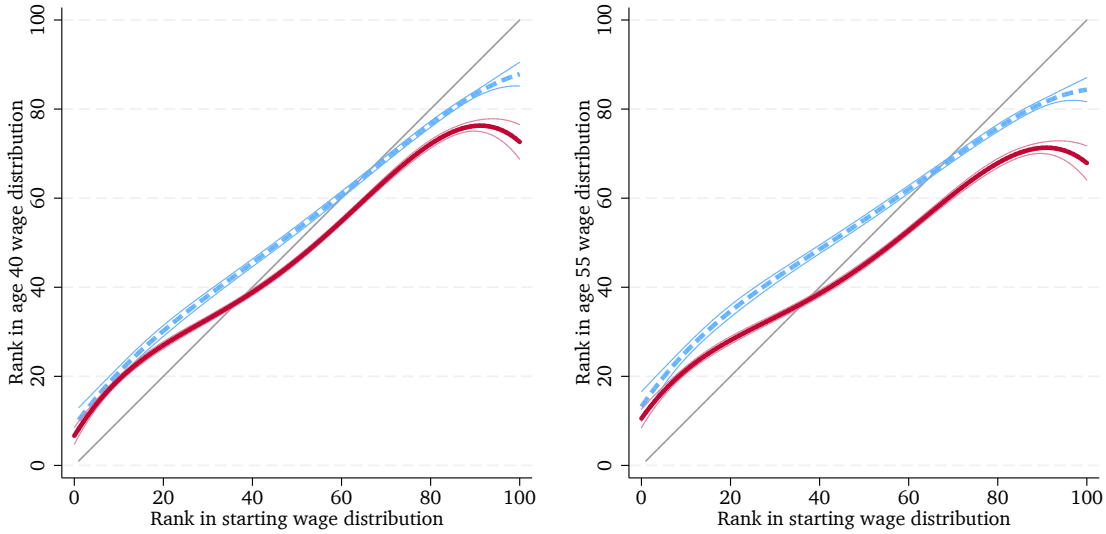
A Appendix

A.1 Additional Figures and Tables

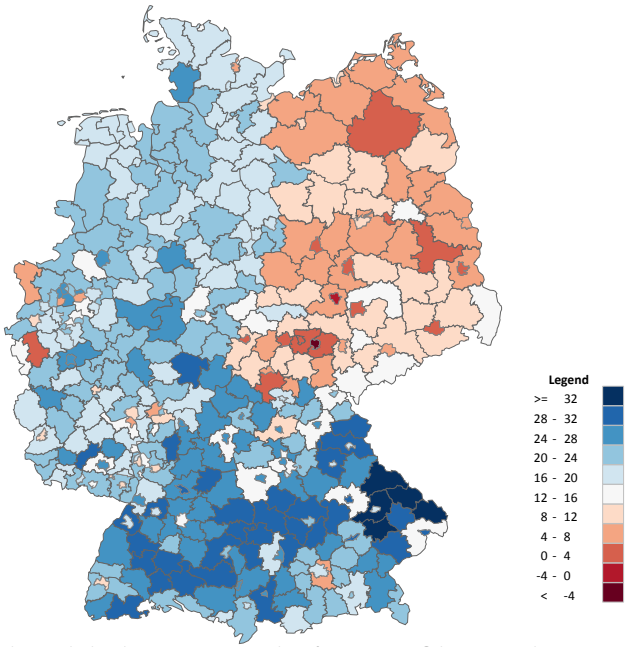
Figure A1: Marginal effects of increases in ranks of starting wages on later earnings

(a) Age 40 (b) Age 55



Note: This figure presents the associations between the an individual's rank in the starting wage distribution (R_{st}) and the rank in the distribution of ranks later in life (R_a, $a = 40, 55$) including 95% confidence intervals. Marginal effects are from regressions of the type $R_{a,i} = \beta_0 + \beta_1 R_{st,i} + \beta_2 R^2_{st,i} + \beta_3 R^3_{st,i} + \beta_4 R^4_{st,i} + \epsilon_i$ ($a = 40, 55$) estimated separately for female (red, solid) and male (blue, dashed) students.

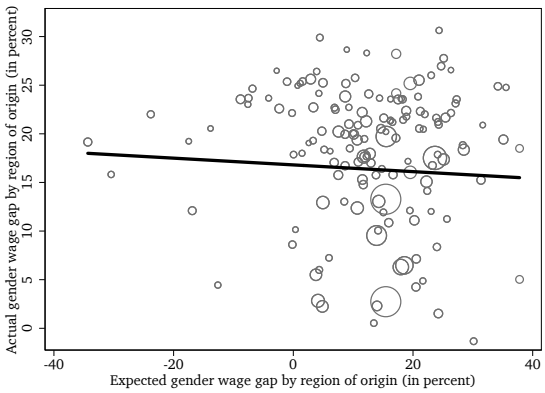
Figure A2: Regional differences in gender wage gaps



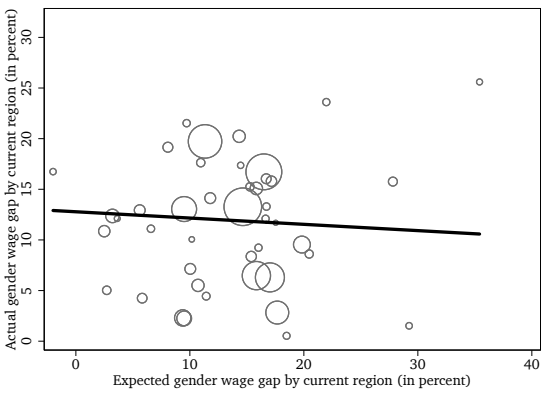
Note: This figure displays percentage differences in actual wages for the year 2012 across regions (Kreise) in Germany using data from the German statistical office.

Figure A3: Regional differences in gender wage gaps

(a) Region of origin



(b) Current region



Note: These figures display the relationship between the expected and actual gender gap by region (Kreise) in Germany using either the region of origin (Figure A3a; slope of -0.035, standard error: 0.037) or the current region (Figure A3b; slope of -0.062, standard error: 0.152).

Table A1: Level and rank gaps by major

	Quantiles				
	10th	25th	50th	75th	90th
A. Level gap					
Baseline	-0.236	-0.221	-0.238	-0.138	-0.108
	(0.012)	(0.003)	(0.009)	(0.005)	(0.011)
Control for majors	-0.178	-0.148	-0.129	-0.137	-0.121
	(0.012)	(0.010)	(0.006)	(0.009)	(0.012)
Separately by major					
Med./Health Sciences	-0.135	-0.149	-0.071	-0.183	-0.179
	(0.058)	(0.036)	(0.031)	(0.025)	(0.028)
STEM	-0.219	-0.232	-0.134	-0.145	-0.114
	(0.019)	(0.022)	(0.008)	(0.013)	(0.015)
Law	-0.116	-0.131	-0.187	-0.220	-0.140
	(0.085)	(0.049)	(0.036)	(0.057)	(0.081)
Econ./Business	-0.128	-0.115	-0.109	-0.108	-0.092
	(0.028)	(0.017)	(0.007)	(0.012)	(0.020)
Hum./Soc. Sciences	-0.165	-0.124	-0.131	-0.078	-0.106
	(0.032)	(0.019)	(0.017)	(0.020)	(0.036)
B. Rank gap					
Baseline	-5.2	-12.6	-20.6	-19.1	-8.5
	(0.3)	(0.5)	(0.7)	(0.8)	(0.8)
Control for majors	-4.0	-8.1	-12.4	-13.7	-7.0
	(0.4)	(0.6)	(0.7)	(0.9)	(1.0)
Separately by major					
Med./Health Sciences	-3.0	-5.9	-9.5	-20.2	-10.1
	(1.2)	(1.8)	(3.1)	(3.3)	(2.5)
STEM	-7.9	-15.2	-17.7	-14.3	-6.3
	(1.0)	(1.2)	(1.3)	(1.2)	(1.0)
Law	-2.7	-12.4	-21.0	-14.0	-1.7
	(2.4)	(3.9)	(4.8)	(3.6)	(1.1)
Econ./Business	-7.3	-10.7	-12.7	-11.7	-7.5
	(1.1)	(1.2)	(1.2)	(1.4)	(1.3)
Hum./Soc. Sciences	-1.3	-2.6	-7.1	-11.0	-10.6
	(0.3)	(0.5)	(1.0)	(1.9)	(3.7)

Note: Each cell of this table reports the female coefficient, which characterizes the gender differences for different quantiles and sample specification. Panel A uses log expected wages as an outcome and thus reports level gaps, while panel B uses percentile ranks of expected wages measured in the expected wage distribution of males and therefore reports rank gaps as outlined in section 2.4. Log gross annual wages are winsorized at the 1% and 99% level.

Table A2: Comparison of initial wage claims, reservation and expected wages

	log(Initial claim)		log(Reserv. wages)	
	(1)	(2)	(3)	(4)
A. Complete sample				
Log average expected wage (starting)	0.954***	0.903***	1.061***	1.012***
	(0.016)	(0.018)	(0.021)	(0.023)
Gender, major, occupation, industry, labor supply	No	Yes	No	Yes
R^2 (adj.)	.44	.44	.41	.42
Observations	15346	15346	15346	15346
p-value: Coefficient=1	0.00	0.00	0.00	0.60
	log(Initial claim)		**log(Reserv. wages)**	
	(1)	(2)	(3)	(4)
	Females	Males	Females	Males
B. Subsamples by gender				
Log average expected wage (starting)	0.884***	0.931***	1.006***	1.014***
	(0.025)	(0.023)	(0.032)	(0.032)
Gender, major, occupation, industry, labor supply	Yes	Yes	Yes	Yes
R^2 (adj.)	.4	.49	.39	.45
Observations	8720	6626	8720	6626
p-value: Coefficient=1	0.00	0.00	0.85	0.65

Note: This table presents the relation of expected starting wages to initial wage claims and reservation wages. In panel (a), we present results for the whole sample, while we replicate columns (2) and (4) of panel (a) for each gender separately. Robust standard errors in parentheses. Log gross annual wages are winsorized at the 1% and 99% level. *, **, and *** denote significance at the 10, 5, and 1 percent level.

Table A3: Determinants of the gender gap in starting wage expectations

	log(expected starting wage)				
	(1)	(2)	(3)	(4)	(5)
Female	-0.184***	-0.105***	-0.087***	-0.063***	-0.052***
	(0.009)	(0.010)	(0.012)	(0.013)	(0.012)
A. Sorting					
Medical/health sciences		0.117***	0.150***	0.123***	0.107***
		(0.029)	(0.035)	(0.034)	(0.033)
STEM		0.126***	0.140***	0.137***	0.114***
		(0.020)	(0.021)	(0.020)	(0.020)
Law		0.189***	0.139**	0.084*	0.079
		(0.044)	(0.055)	(0.050)	(0.050)
Economics/business		0.174***	0.178***	0.156***	0.133***
		(0.017)	(0.019)	(0.019)	(0.018)
Civil servant		-0.040***	-0.031**	-0.018	-0.020
		(0.013)	(0.015)	(0.015)	(0.014)
Agreeableness			-0.009	-0.007	-0.006
			(0.007)	(0.006)	(0.006)
Conscientiousness			0.021***	0.018***	0.019***
			(0.007)	(0.007)	(0.007)
Emotional Stability			-0.001	0.000	-0.003
			(0.007)	(0.006)	(0.006)
Extraversion			0.028***	0.021***	0.020***
			(0.006)	(0.006)	(0.006)
Openness			0.003	-0.002	-0.005
			(0.006)	(0.005)	(0.005)
B. Labor supply/family planning					
Exp. working hours per week				0.016***	0.015***
				(0.002)	(0.002)
Exp. number of chidren				0.013**	0.011*
				(0.007)	(0.007)
Exp. months at home				-0.000	-0.000
				(0.000)	(0.000)
Exp. children before age 30				-0.006	-0.008
				(0.010)	(0.010)
C. Negotiation Style					
Boldness					0.007***
					(0.000)
Occupation and industry	No	Yes	Yes	Yes	Yes
Subjective ability/perc. discrimination	No	No	Yes	Yes	Yes
IQ and economic preferences	No	No	Yes	Yes	Yes
R^2 (adj.)	.025	.087	.11	.16	.18
Observations	15346	15346	10788	10788	10788

Note: This table presents regressions of log expected starting wages on varying sets of controls: variables that relate to (A) sorting based on majors (with humanities as the omitted baseline major category), occupations, industries and standardized measures of personality, (B) labor supply and family planning, and (C) negotiation styles. Column (5) corresponds to the specification underlying the decomposition in Table 5. Robust standard errors in parentheses. Log gross annual wages are winsorized at the 1% and 99% level. *, **, and *** denote significance at the 10, 5, and 1 percent level.

Table A4: Determinants of the gender gap in lifetime wage expectations

	log(expected lifetime wage)				
	(1)	(2)	(3)	(4)	(5)
Female	-0.239***	-0.153***	-0.113***	-0.097***	-0.088***
	(0.009)	(0.009)	(0.011)	(0.012)	(0.012)
A. Sorting					
Medical/health sciences		0.163***	0.203***	0.199***	0.182***
		(0.020)	(0.024)	(0.024)	(0.023)
STEM		0.137***	0.146***	0.147***	0.127***
		(0.017)	(0.018)	(0.018)	(0.017)
Law		0.221***	0.166***	0.133***	0.131***
		(0.045)	(0.055)	(0.051)	(0.051)
Economics/business		0.207***	0.198***	0.185***	0.165***
		(0.016)	(0.018)	(0.017)	(0.017)
Civil servant		-0.083***	-0.074***	-0.065***	-0.066***
		(0.012)	(0.014)	(0.014)	(0.014)
Agreeableness			-0.021***	-0.022***	-0.020***
			(0.006)	(0.006)	(0.006)
Conscientiousness			0.016***	0.015***	0.015***
			(0.006)	(0.006)	(0.006)
Emotional Stability			0.003	0.003	0.000
			(0.006)	(0.005)	(0.005)
Extraversion			0.034***	0.030***	0.029***
			(0.006)	(0.005)	(0.005)
Openness			0.022***	0.020***	0.017***
			(0.005)	(0.005)	(0.005)
B. Labor supply/family planning					
Exp. working hours per week				0.010***	0.010***
				(0.001)	(0.001)
Exp. number of chidren				0.021***	0.019***
				(0.006)	(0.006)
Exp. months at home				-0.000	-0.000
				(0.000)	(0.000)
Exp. children before age 30				0.038***	0.036***
				(0.010)	(0.010)
C. Negotiation Style					
Boldness					0.006***
					(0.000)
Occupation and industry	No	Yes	Yes	Yes	Yes
Subjective ability/perc. discrimination	No	No	Yes	Yes	Yes
IQ and economic preferences	No	No	Yes	Yes	Yes
R^2 (adj.)	.052	.19	.23	.26	.28
Observations	12734	12734	9146	9146	9146

Note: This table presents regressions of log expected starting wages on varying sets of controls: variables that relate to (A) sorting based on majors (with humanities as the omitted baseline major category), occupations, industries and standardized measures of personality, (B) labor supply and family planning, and (C) negotiation styles. Column (5) corresponds to the specification underlying the decomposition in Table 5. Robust standard errors in parentheses. Log gross annual wages are winsorized at the 1% and 99% level. *, **, and *** denote significance at the 10, 5, and 1 percent level.

Table A5: Association of actual gender gaps with expected gender gaps

	log(expected starting wage)					
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.190***	-0.152***	-0.154***	-0.147***	-0.177***	-0.073***
	(0.010)	(0.013)	(0.012)	(0.013)	(0.016)	(0.016)
Avg. wage in county of origin (in 1,000 EUR)		0.010***		0.004	0.002	0.000
		(0.002)		(0.003)	(0.003)	(0.003)
Avg. wage in current county (in 1,000 EUR)			0.012***	0.009***	0.002	0.003
			(0.002)	(0.003)	(0.004)	(0.003)
State fixed effects	No	No	No	No	Yes	Yes
Major, occupation, industry, labor supply	No	No	No	No	No	Yes
R^2 (adj.)	.027	.029	.029	.03	.033	.16
Observations	11759	11759	11759	11759	11759	11759

Note: This table presents regressions of log expected starting wages on a female indicator and measures of actual regional wage levels for a respondent's own gender. The sample is restricted to those with valid information on their county of origin (i.e. where students received their high school diploma) and current county (i.e., where they are currently living). Robust standard errors in parentheses. Log gross annual wages are winsorized at the 1% and 99% level.

Table A6: Oaxaca-Blinder decomposition of the gender gap in wage expectations including past wages in student jobs

	log(Expected starting wage)				log(Expected lifetime wage)			
	(1) with occ. sorting		(2) without occ. sorting		(3) with occ. sorting		(4) without occ. sorting	
Unadjusted difference	0.181	100.000	0.181	100.000	0.230	100.000	0.230	100.000
	(0.010)		(0.010)		(0.011)		(0.011)	
Explained difference	0.129	71.295	0.102	56.106	0.142	61.832	0.119	51.784
	(0.009)		(0.008)		(0.009)		(0.008)	
Composition effects attributable to								
A. Sorting								
Major	0.024	13.507	0.045	24.921	0.024	10.535	0.046	19.989
	(0.005)		(0.004)		(0.004)		(0.004)	
Occupation	0.029	16.052			0.041	17.646		
	(0.006)				(0.006)			
Industry	0.023	12.673			0.017	7.192		
	(0.004)				(0.004)			
Perc./actual ability & personality	0.004	2.227	0.005	2.659	0.024	10.421	0.027	11.751
	(0.005)		(0.005)		(0.005)		(0.005)	
B. Labor supply/family planning								
Hours worked	0.018	9.764	0.018	9.709	0.017	7.302	0.019	8.239
	(0.003)		(0.003)		(0.002)		(0.003)	
Children	0.005	2.694	0.007	3.766	-0.002	-0.747	0.003	1.354
	(0.005)		(0.005)		(0.004)		(0.004)	
C. Negotiation styles								
Boldness	0.025	13.838	0.026	14.477	0.022	9.433	0.024	10.379
	(0.002)		(0.002)		(0.002)		(0.002)	
D. Student jobs								
Wage in student jobs	0.001	0.538	0.001	0.574	0.000	0.050	0.000	0.072
	(0.000)		(0.001)		(0.000)		(0.000)	
Observations	10788		10788		9146		9146	

Note: This table decomposes the differences in log expected starting or lifetime wages into components attributable to (A) sorting into majors, occupations, and industries as well as perceived ability, personality and economic preferences (perceived ability on the job and in university, IQ, Big Five personality traits, altruism, impatience, positive and negative reciprocity, risk aversion and trust), (B) labor supply and family planning (expected hours per week, expected number of children, months at home with children, indicator for early parenthood), (C) negotiation styles (as defined in section 2.4), and (D) past wages in student jobs using Oaxaca-Blinder decompositions. For each decomposition, we also present the share of the difference that is attributable to the respective component and present results with and without controls for sorting into occupation and industries. Robust standard errors in parentheses. Log gross annual wages are winsorized at the 1% and 99% level.

Table A7: Oaxaca-Blinder decomposition of the gender gap in wage expectations for students who want to enter the private sector

	log(Expected starting wage)				log(Expected lifetime wage)			
	(1) with occ. sorting		(2) without occ. sorting		(3) with occ. sorting		(4) without occ. sorting	
Unadjusted difference	0.186	100.000	0.186	100.000	0.252	100.000	0.252	100.000
	(0.012)		(0.012)		(0.012)		(0.012)	
Explained difference	0.143	77.001	0.114	61.436	0.158	62.583	0.130	51.349
	(0.011)		(0.010)		(0.010)		(0.010)	
Composition effects attributable to								
A. Sorting								
Major	0.026	14.139	0.051	27.425	0.022	8.816	0.048	19.212
	(0.006)		(0.004)		(0.005)		(0.004)	
Occupation	0.034	18.483			0.046	18.169		
	(0.007)				(0.007)			
Industry	0.023	12.096			0.020	7.966		
	(0.005)				(0.005)			
Perc./actual ability & personality	0.009	5.082	0.011	5.663	0.029	11.639	0.034	13.414
	(0.006)		(0.006)		(0.006)		(0.006)	
B. Labor supply/family planning								
Hours worked	0.019	10.271	0.019	10.042	0.016	6.508	0.018	7.312
	(0.004)		(0.004)		(0.003)		(0.003)	
Children	0.008	4.515	0.010	5.206	0.003	1.071	0.005	2.123
	(0.005)		(0.005)		(0.004)		(0.005)	
C. Negotiation styles								
Boldness	0.023	12.416	0.024	13.099	0.021	8.414	0.023	9.289
	(0.002)		(0.003)		(0.002)		(0.003)	
Observations	8340		8340		7079		7079	

Note: This table decomposes the differences in log expected starting or lifetime wages into components attributable to (A) sorting into majors, occupations, and industries as well as perceived ability, personality and economic preferences (perceived ability on the job and in university, IQ, Big Five personality traits, altruism, impatience, positive and negative reciprocity, risk aversion and trust), (B) labor supply and family planning (expected hours per week, expected number of children, months at home with children, indicator for early parenthood), and (C) negotiation styles (as defined in section 2.4) for individuals who want to enter the public sector (i.e., excluding those who aim for the public sector) using Oaxaca-Blinder decompositions. For each decomposition, we also present the share of the difference that is attributable to the respective component and present results with and without controls for sorting into occupation and industries. Robust standard errors in parentheses. Log gross annual wages are winsorized at the 1% and 99% level.

Table A8: Quantile decomposition

	Quantiles										OB	
	10th		25th		50th		75th		90th		Mean	
Unadjusted difference	0.225	100.000	0.208	100.000	0.225	100.000	0.122	100.000	0.086	100.000	0.181	100.000
	(0.016)		(0.010)		(0.008)		(0.009)		(0.014)		(0.010)	
Difference explained	0.183	81.465	0.124	59.396	0.119	52.743	0.085	69.452	0.058	67.731	0.129	71.104
	(0.013)		(0.008)		(0.007)		(0.007)		(0.011)		(0.009)	
Composition effects attributable to												
A. Sorting												
Major	0.023	10.302	0.021	10.208	0.026	11.564	0.017	13.810	0.011	12.933	0.024	13.143
	(0.007)		(0.005)		(0.005)		(0.005)		(0.006)		(0.005)	
Occupation	0.046	20.285	0.028	13.556	0.028	12.279	0.018	14.513	0.017	19.616	0.029	16.165
	(0.008)		(0.005)		(0.005)		(0.005)		(0.008)		(0.006)	
Industry	0.032	14.308	0.026	12.611	0.024	10.833	0.022	17.894	0.012	13.607	0.023	12.708
	(0.006)		(0.004)		(0.004)		(0.004)		(0.006)		(0.004)	
Perc./actual ability & personality	0.004	1.951	0.007	3.357	0.013	5.617	0.016	13.492	0.029	33.793	0.004	2.432
	(0.008)		(0.004)		(0.004)		(0.004)		(0.007)		(0.005)	
B. Labor supply/family planning												
Hours worked	0.014	6.307	0.008	3.824	0.006	2.639	0.005	4.291	0.007	8.044	0.018	9.783
	(0.003)		(0.002)		(0.001)		(0.001)		(0.002)		(0.003)	
Children	0.009	4.209	-0.001	-0.675	0.002	0.987	0.006	4.975	0.005	5.563	0.005	2.969
	(0.006)		(0.004)		(0.003)		(0.003)		(0.005)		(0.005)	
C. Negotiation styles												
Boldness	0.054	24.102	0.034	16.517	0.020	8.824	0.001	0.477	-0.022	-25.825	0.025	13.904
	(0.004)		(0.003)		(0.002)		(0.001)		(0.003)		(0.002)	

Note: Quantile decomposition (using unconditional quantile regressions based on Firpo, Fortin, and Lemieux, 2009) of the gender gap in expected starting wages using the same variables as in Table 5. The final column presents results from an Oaxaca-Blinder decomposition at the mean for reference. Log gross annual wages are winsorized at the 1% and 99% level.

Table A9: Quantile decomposition without sorting

	Quantiles										OB	
	10th		25th		50th		75th		90th		Mean	
Unadjusted difference	0.225	100.000	0.208	100.000	0.225	100.000	0.122	100.000	0.086	100.000	0.181	100.000
	(0.016)		(0.010)		(0.008)		(0.009)		(0.014)		(0.010)	
Difference explained	0.147	65.167	0.098	47.336	0.091	40.473	0.065	53.260	0.045	52.244	0.101	55.752
	(0.012)		(0.007)		(0.006)		(0.006)		(0.010)		(0.008)	
Composition effects attributable to												
A. Sorting												
Major	0.060	26.634	0.047	22.460	0.046	20.542	0.031	25.838	0.020	23.207	0.044	24.535
	(0.005)		(0.003)		(0.003)		(0.003)		(0.004)		(0.004)	
Perc./actual ability & personality	0.005	2.433	0.008	4.034	0.014	6.259	0.017	14.147	0.030	34.730	0.005	2.899
	(0.008)		(0.005)		(0.004)		(0.004)		(0.007)		(0.005)	
B. Labor supply/family planning												
Hours worked	0.014	6.238	0.008	3.817	0.006	2.688	0.006	4.748	0.008	9.024	0.018	9.714
	(0.003)		(0.002)		(0.001)		(0.001)		(0.002)		(0.003)	
Children	0.011	5.091	0.000	0.006	0.004	1.758	0.009	7.072	0.008	8.969	0.007	4.065
	(0.006)		(0.004)		(0.003)		(0.003)		(0.005)		(0.005)	
C. Negotiation styles												
Boldness	0.056	24.770	0.035	17.020	0.021	9.226	0.002	1.455	-0.020	-23.685	0.026	14.539
	(0.004)		(0.003)		(0.002)		(0.001)		(0.003)		(0.002)	

Note: Quantile decomposition (using unconditional quantile regressions based on Firpo, Fortin, and Lemieux, 2009) of the gender gap in expected starting wages using the same variables as in Table 5 without controls for sorting into occupations and industries. The last column presents results from an Oaxaca-Blinder decomposition at the mean for reference. Log gross annual wages are winsorized at the 1% and 99% level.

A.2 Expected wage gaps by major category and for selected occupations

The gender gap in wage expectations prevails within majors. To determine the respective gaps, we aggregate all majors into five categories (Medicine and health sciences, STEM, Law, Economics and business studies, humanities and social sciences) and present expected overall wages in Table A10. While there exists substantial heterogeneity in levels across majors female students expect to earn less than their male counterparts within each of the respective study fields. This holds both for starting wages and over the life cycle. However, the gender gap is slightly lower in fields that are traditionally chosen by females than in male-dominated subjects. Thus females on average expect to earn only 84% of the average male starting wage in legal studies, as compared to 93% in humanities. At the age of 55, the respective shares decrease to 72–80%.

Table A10: Descriptive statistics of gross annual expected wages by major

	Med./Health Sci.				**STEM**			
	Males	Females	Ratio	N	Males	Females	Ratio	N
Starting	38860	34282	0.88	1313	40620	35472	0.87	5234
Age 40	59589	49800	0.84	1313	58214	47314	0.81	5234
Age 55	70977	56474	0.80	1313	69692	52657	0.76	5234
	Law				**Econ./Business**			
	Males	Females	Ratio	N	Males	Females	Ratio	N
Starting	48511	40670	0.84	676	40352	36345	0.90	3427
Age 40	76524	60519	0.79	676	66612	52688	0.79	3427
Age 55	96180	69487	0.72	676	82717	60698	0.73	3427
	Human./Soc. Sci.				**All subjects**			
	Males	Females	Ratio	N	Males	Females	Ratio	N
Starting	31808	29480	0.93	4698	39076	33434	0.86	15348
Age 40	44822	38009	0.85	4698	58301	45765	0.78	15348
Age 55	53151	41489	0.78	4698	70518	51291	0.73	15348

Note: This table shows average expected starting wages as well as expected wages at the age of 40 and 55 for males and females for majors aggregated into five categories. All wages are winsorized at the 1% and 99% level.

Additionally, Table A11 presents the gender gap in wage expectations for different occupations. Goldin (2014) suggests that occupations for which earnings are a nonlinear/convex in working hours have larger gender gaps than those with fairly flat/linear relationships. Indeed, we observe the gender gap in wage expectations for occupations with nonlinear hours-earnings profiles (e.g. lawyers) to be larger than for, e.g.,

teachers, who tend to have very flat hours-earnings profiles.[23] Along these same lines the gap tends to be smallest for authors and journalists, who might even have decreasing hours/earnings profiles due to decreasing marginal productivity. Students thus correctly anticipate that flatter hours-earnings profiles are associated with lower earning gaps.

Table A11: Gender gap in wage expectations by occupations

	Gender gap by occupation				
	Journalists & authors	Teachers	Engineering professionals	Medical doctors	Lawyers
Gap in EUR	-1423	-1792	-3578	-6630	-9824
Gap in log-points	-0.071	-0.130	-0.123	-0.122	-0.225
Gap in ranks	-5.6	-9.7	-12.6	-13.0	-14.1
Observations	729	1141	1470	464	433

Note: This table presents the gender gap in wage expectations measured in Euro, log-points and ranks for different occupations. Each coefficient corresponds stems from a regression of expected wages, log expected wages or ranks in the male expected wage distribution on an indicator for females. All wages are winsorized at the 1% and 99% level.

[23]The table does not include results for pharmacists, as we cannot distinguish individuals planning to work in pharmacies from those planning to work in the pharmaceutical industry.

A.3 A regression-based comparison of expected and actual wages

We formally compare expected and actual wages by pooling them in a single regression on an indicator for being an actual graduate. Table A12 reveals that in terms of raw wages, graduates earn 11.2 percentage points lower wages when compared to the expected wages of students.[24] Nonetheless, once we control for gender, sorting patterns and hours worked the difference vanishes. In fact, this difference is entirely driven by differences in hours worked as some graduates start working part-time after finishing their studies and thus earn lower wages than graduates in full-time jobs. Similar to what has been found in the literature (e.g., Webbink and Hartog, 2004; Wiswall and Zafar, 2018a), the wage expectations of students elicited in our survey thus tracks the distribution of realized earnings very well once we account for hours worked. This suggests that the gender gap in expected wages likely translates into differences in realized wages.

Table A12: Comparison of expected and actual log wages

	log wages (pooled)	
	(1)	(2)
Actual graduate	-0.112	0.016
	(0.022)	(0.025)
Gender, major, occupation, industry, labor supply	No	Yes
R^2 (adj.)	.0022	.13
Observations	16501	16400

Note: Robust standard errors in parentheses. Sample pools over log gross annual wages of both current students using expected wages and actual graduates with realized wages. All wages are winsorized at the 1% and 99% level.

[24]Note that we do not observe a difference in mean actual and expected wages but in log wages, given that taking the logarithm gives more weight on the lower end of the wage distribution. As can be seen from Figure 5, this is where the differences between actual and expected wages are more pronounced.