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Boll, Christina; Leppin, Julian Sebastian

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Equal matches are only half the story: Why German female graduates earn 27 % less than males

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Christina Boll, Julian Sebastian Leppin

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Corresponding author:
Dr. Christina Boll
Hamburg Institute of International Economics (HWWI)
Heimhuder Str. 71 | 20148 Hamburg | Germany
Phone: +49 (0)40 34 05 76 - 668 | Fax: +49 (0)40 34 05 76 - 776
boll@hwwi.org

HWWI Research Paper
Hamburg Institute of International Economics (HWWI)
Heimhuder Str. 71 | 20148 Hamburg | Germany
Phone: +49 (0)40 34 05 76 - 0 | Fax: +49 (0)40 34 05 76 - 776
info@hwwi.org | www.hwwi.org
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Equal matches are only half the story. Why German female graduates earn 27 % less than males

Abstract

Germany's occupational and sectoral change towards a knowledge-based economy calls for high returns on education. Nevertheless, female graduates are paid much less than their male counterparts. We find an overall unadjusted gender pay gap among German graduates of 27 %. This corresponds to an approximate wage gap of 32.5 % thereof 20,3 % account for different endowments and 12,2 % for different remunerations of characteristics. Suboptimal job matches of females tied in family and partner contexts are supposed to account for at least part of the gendered wage drift. But overeducation does not matter in this regard. Instead, females earn 4 % less because they work on jobs with fewer years of required education. Furthermore, solely males are granted breadwinner wage premiums and only men successfully avoid wage cuts when reducing working hours. We conclude that the price effect of the gap reflects employers' attributions of gender stereotypes, gendered work attitudes as well as noticeable unobserved heterogeneity within and between sexes.

JEL-Classification: J31; C33; J710

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Corresponding author:
Christina Boll
Hamburg Institute of International Economics (HWWI)
Heimhuder Str. 71
20148 Hamburg, Germany
Email: boll@hwwi.org

[1]Concomitantly, on behalf and for attention of BMFSFJ, a comprehensive report has been carried out in German language.

1 | Introduction

After 2020 the replacement need of German academics will increase markedly due to the retirement of baby-boom generations (Helmrich et al. 2012). The situation is aggravated by newly generated needs by means of the ongoing economic and occupational change. Admittedly, higher educational aspirations together with a higher employment inclination of women and elderly actually help to balance demand and supply on the graduates' labour market. But with younger cohorts being too small to capture the overall need conditional on demographic and structural development the skill gap is foreseeable (Bundesagentur für Arbeit 2012). To avoid future skilled labour shortages it will become more and more important to have an eye to the full exploitation of resources in terms of a productive use of acquired qualifications in proper job matches. Apparently, overeducation is adverse to this aim. Overeducation occurs if a person attained a higher level of education than is required to perform his or her actual job. That is, overeducation refers to overschooling as a vertical inadequance.[2]

Various *theoretical frameworks* deal with the phenomenon of overeducation and its earnings consequences (for an overview see Büchel 2001). Search theories (Stigler 1961, Mortensen 1987) postulate that overeducation may temporarily arise due to labour market frictions in the context of incomplete information. Search costs hinder proper matches only in the short term, but as long as the mismatch subsists it goes along with diminished returns on education. Career mobility theory (Sicherman and Galor 1990) as well considers overeducation to be of limited duration, even though differently motivated: According to career mobility theory, overeducation in the early career stage and associated earnings losses are individually rational from a life course perspective since the mismatch spell entails outstanding upward income mobility later in the career (see e. g. Dekker et al. 2002 for confirming results in internal labour markets). However, other findings do not support this theory: Overeducation is found to be highly path dependent (Andersson Joona et al. 2012, Nielsen 2011, Korpi and Tåhlin 2009, Büchel and Pollmann-Schult 2002), and, contrary to the theory, overeducated persons tend to have lower promotion prospects (Büchel and Mertens 2000). Furthermore, overeducation may arise in the context of labour market distortions. Job competition theory (Thurow 1975) predicts that an excess supply of graduates on the labour market causes persisting overeducation of graduates whereas lower educated persons become unemployed. The privileging of graduates has its origins in lower training costs for employers. Following this theory, excess education yields zero returns since wages are determined by the demand side exclusively. The same conclusion is drawn from assignment theory (Tinbergen 1956, Sattinger 1975; 1993): Assuming job requirements being more heterogeneous than educational degrees and production technologies not being capable to adapt to supplied qualifications, wages are determined solely by job requirements, irrespective of market balance.

[2] By contrast, overskilling may be interpreted as horizontal inadequacy in terms of a partial non-use of attained occupational skills in the actual job (Quintini 2011).

By contrast, human capital theory (Ben Porath 1967), commonly specified in a Mincerian wage equation (Mincer 1974), postulates that wages are exclusively determined by supplied human capital. The latter comprises schooling investment as well as job-specific skills gained by training-on-the-job. The focus on attained education grounds on Say's theorem that each unit of supplied human capital generates its own market demand and is therefore equally remunerated. Human capital theory as well as signaling theory (Spence 1973) rely on the assumption that attained education reflects productivity since productivity is the output or the pre-condition of human capital investments, respectively. Both theories predict equal returns on each unit of human capital, irrespective of demand side requirements. As income estimators hardly manage to fully control for unobserved heterogeneity, human capital theory may not be rejected easily.

Few theories account for linked lives in the context of labour market performance. One exception is the theory of differential overeducation (Frank 1978). According to this theory, job mismatch is regarded as an outcome of union decisions of couples. Partners may prioritise the male partner's job match quality due to different income capacity of partners and/or traditional gender roles. In this case, female partners behave like "tied movers" and "tied stayers" on the labour market (Mincer 1978). Frank postulates that this behavior is the more likely if partners are married. Büchel and Battu (2002) find partial support for the theory with German Socio-Economic Panel data (GSOEP), concluding that higher commuting distances may reduce female partners' risk of being overeducated.

Approaches how to measure overeducation are almost as manifold as those explaining it. Self-assessed educational (mis-)match by surveyed persons is a very common measurement method not only in the German but also in the international empirical literature (e. g. Rukwid 2012, McGuinness and Bennett 2007, Vahey 2000, Büchel 1996, Sicherman 1991, Duncan and Hoffman 1981). Like most micro data sets, the GSOEP raw data contain information on the self-assessed educational level that is necessary to perform the actual job. The subjective method is appealing due to its simple application and because, from a theoretical point of view, a survey person's knowledge is closest to his or her individual job requirements. However, it is its core property of being subjective that prevents the method from being appropriate to deal with wage effects of overeducation.[3] Empirical evidence suggests that self-assessed overeducation is subject to other job features like occupational status and particularly income (Dolton and Vignoles 2000). Survey persons may be inclined to exaggerate educational requirements of their job for various reasons (Borghans and de Grip 2000). Furthermore, self-assessed overeducation exhibits a severe gender bias (Leuven and Oosterbeek 2011, Boll and Leppin forthcoming).

[3] Empirical analyses of United States' microdata show that estimation results of the ORU model are qualitatively independent from the chosen measurement method. In detail, results do not change substantially if one switches from a Realized Matches approach to a measurement method that relies upon subjective self-assessment of overeducation (Chiswick and Miller 2009). Moreover, Nielsen (2011) shows that deploying the mean instead of the mode of average education does not cause a substantial change of results.

The first best method to deal with overeducation would be an objective evaluation of occupation-specific required education by professional job analysts. However, those approaches as well rely to some extent on arbitrary definitions and moreover, they fail to adapt to the dynamics of occupational and educational change (Eckaus 1964). Realised matches frameworks (Verdugo and Verdugo 1989 relying on the mean value, Kiker et al. 1997 relying on the mode) represent a pragmatic solution in this context. They refrain from externally defined standards and instead of this, let market players decide. According to this method, overeducation arises if one's attained education exceeds the education standard prevailing in one's occupational benchmark group. However, realised matches approaches have their limitations as well. Results vary with the operationalisation of the standard, and overall trends like a general upward move of educational standards may cause a distorted overeducation measurement within persons over time.

Few studies control for measurement error by analysing different operationalisations of overschooling in the same data and model setting (e. g. Bauer 2002, Mendes de Oliveira et al. 2000; see Groot and Maassen van den Brink 2000 for an overview). Moreover, results are dependent on the deployed model specification (Leuven and Oosterbeek 2011, Korpi and Tåhlin 2009, Bauer 2002). Last but not least, results differ due to heterogeneous meta variables like labour market structural imbalances, trade-union density or the structure of academic funding. Davia et al. (2010) conclude from a multinational analysis that an excess supply of graduates raises the risk of being overeducated whereas higher education fees lower it.

Political inferences from overeducation have to be deduced with caution. Zero returns of superfluous years of education indicate that part of the output of the educational system is without productive use on the labour market. Persistent overeducation poses the question which barriers hinder markets to balance demand and supply of qualifications and prevent people from fully exploiting their income capacity. In this context, the question arises if education mirrors productivity.[4] Empirical evidence suggests that overeducation in the labour market is at least partly driven by unobserved heterogeneity. In this case, overeducation reflects hidden disabilities as time-invariant personal traits, and different returns to education do not reflect career strategies or imperfect labour markets but a lack of human capital. Hidden disabilities suggest a failure of the educational system: For obtaining the desired certificate, resources like financial or social capital apparently compensate a lack of incorporated mental fitness. People get what they deserve: They are accurately matched on the job market and income reflects individual abilities, but schooling does not. Returns from overeducation are underestimated in this case. The same applies to persons who willingly refrain from maximising their individual income due to hidden preferences (see Frank 1978 mentioned above): Also in this case, returns from excess education are downward biased. The empirical evidence of the prevalence of unobserved heterogeneity in the context of overeducation is manifold (e. g. Andersson Joona et al. 2012, Leuven and Oosterbeek 2011, Blázquez Cuesta

[4] As a result, Jensen et al. (2006) consider overeducation solely with regard to income issues.

and Budría 2011, McGuinness and Bennett 2007, Bauer 2002, Allen and Van der Velden 2001).

Staking out the scope for political action therefore requires a thorough analysis: Exogenous causal factors of overeducation have to be isolated from self-selection effects. Likewise, the estimation of income effects has to take unobserved heterogeneity into account. Not until external impediments which (a) hinder proper job matches, (b) cause noticeable income losses and (c) are subject to political interference are identified, the issue of overeducation is of interest for social and labour market policy.

Actual figures that shape the *magnitude of overeducation* in Germany, particularly among graduates, are hardly available. Accounting for necessity (a) from above, we estimated the incidence and driving factors of overeducation among German graduates (Boll and Leppin forthcoming). Following necessity (c), we deployed a random effects dynamic probit model that accounts for unobserved heterogeneity as well as for state dependence and initial conditions. The results indicate that, according to a realised matches framework, overeducation is neither gender-specific nor is there a marked East/West difference in magnitude. Actually, one third of female and male graduates (33.0 % and 33.9 %, respectively) attained a higher than the prevailing educational level in the respective occupational group.

The *aim* of this paper is twofold. Firstly, accounting for necessity (b) from above, we aim at quantifying the income consequences of inadequate education among German graduates, thereby relying on the estimated incidence of overeducation following the realised matches approach and, once again, accounting for omitted variable bias. Secondly, we intend to clarify to what extent overeducation accounts for the gender pay gap among graduates in our model and data setting and which other factors play a crucial role in this context. We firstly find that overeducation induces severe wage losses compared to properly matched graduates. The losses are even more pronounced for women. However, overeducation does not contribute to the observed gender wage gap among graduates that amounts to approximately 33 %. Instead, women's lower amount of required years of education accounts for 4 % of the gap. Affecting the gap more seriously, female graduates experience a lower wage return on household characteristics which stimulate a breadwinner role assignment by employers. Moreover, females apparently are less successful in avoiding wage cuts when reducing working hours. We conclude that the price effect of the gap reflects employers' attributions of gender stereotypes, gendered work attitudes as well as noticeable unobserved heterogeneity within and between sexes.

The *outline* of the paper is the following: In section 2, the underlying models for income estimation and decomposition are presented. Section 3 depicts the employed data and variables. Section 4 discusses the empirical results and section 5 concludes.

2 | Model

In order to test if demand side or supply side or both determine the market returns on education, we split attained education into its three components overeducation, required education and undereducation, according to job-specific requirements (Hartog 2000). We therefore follow the ORU[5] approach established by Duncan and Hoffman (1981). We deploy the ORU model by using the standard random effects approach.[6] In order to modify the restrictive assumption that unobserved heterogeneity is random and particularly uncorrelated with other covariates (that is, $cov(x_{it}, \alpha_i) = 0$) we incorporate intrapersonal means of time-variant variables which are allowed to interact with the individual fixed effect. Thus, we estimate the income effect of time-variant characteristics net of unobserved fixed effects, though keeping the time invariant information (Mundlak 1978).

In detail, the log-wage y_{it} is estimated by

$$y_{it} = x'_{it}\beta + \gamma_1 UE_{it} + \gamma_2 RE_{it} + \gamma_3 OE_{it} + \bar{x}'_i a + \alpha_i + u_{it}$$

where x_{it} denote the exogenous variables except schooling and $\bar{x}'_i$ their mean over time. OE_{it} depicts the years of surplus education, RE_{it} years of required education and OE_{it} years of deficit education.[7] α_i indicates the individual intercept and u_{it} the error term. We conduct the regressions for women and men separately to allow for gender-specified income effects.

In order to analyse the impact of overeducation on the gender pay gap among graduates we deploy the standard decomposition method of Oaxaca (1973) and Blinder (1973).[8] According to this approach, the observable differential in log-wages between men and women may be decomposed into an endowment effect and a price (evaluation) effect:

$$\overline{\ln(w_F)} - \overline{\ln(w_M)} = (\bar{X}_F - \bar{X}_M)\beta_M + (\beta_F - \beta_M)\bar{X}_F$$

The term on the left hand side of the equation denotes the difference in expected values of the female and male gross hourly wage rate, which equals the mean differential. The first term on the right hand side depicts the endowment effect since it indicates the hypothetical wage gain of women if they exhibited men's features. The second term on the right hand side captures the price effect of the wage gap – it displays the hypothetical wage gain of women if their own features were remunerated like men's. The endowment and the price effect sum up to the observed averaged gender wage gap.

[5] Overeducation/Required education/Undereducation

[6] A fixed effects approach would have been the first best option to deal with hidden wage-relevant features.

[7] Matching quality may vary over time due to job changes for which 12 % of females' observations account for.

[8] The decomposition is based on the wage regressions on pooled waves 2008 and 2009.

3 | Data and operationalisation

We employ an unbalanced panel of the GSOEP for the years 1984 to 2010. The sample comprises 22498 observations from 11557 female and 10941 male graduates.[9] 9485 females are employed, of whom 2921 are overeducated and 6564 are not. With regard to males, 3748 of 10482 employed persons are overeducated and 6734 are not. 15315 observations arise from parents, whereas 7183 originate from childless graduates. Only persons aged 20 to 55 are considered, and persons in education, retirement, civil or military service as well as self-employed persons are excluded. The sample is restricted to women and men with academic exams. Information from persons with lower educational levels is solely used to generate the required educational matching variables. Nevertheless, following international standard classification of educational degrees (ISCED), graduates are a heterogeneous group, since the six academic degrees differ in years of education.

Table 1 denotes the gendered distribution of academic degrees. As the statistics show, female graduates attain a lower average amount of years of education than males. Females' share on persons with an East German professional or technical college degree is far higher than males' whereas males have a higher share on university degrees.

Table 1: Degrees of higher education, by gender

Degree	Females (%)	Males (%)
Professional/technical college (East Germany)	19.47	5.88
University/university of applied sciences (East Germany)	6.91	7.16
University/university of applied sciences abroad	0.87	0.89
University of applied sciences (West Germany)	24.18	27.84
University/technical university (West Germany)	48.56	58.18
Doctoral and postdoctoral qualification	0.02	0.05

Sources: SOEP 1984-2010, calculations HWWI.

Graduates furthermore differ in fields of subject. However, we may not differentiate between fields of study since this information is not annually surveyed, and for the sake of consistency, too many observations would have to be eliminated. In order to generate the educational matching variable, we instead refer to the occupational information stored in the ISCO-variables.[10] In more detail, we follow the *realised matches approach* described above. We exploit the information of education in years and refer to the *mean value* of education in the benchmark group to secure a procedure that is sensitive even to small deviations between demanded and supplied education. The occupational affiliation of a person is validated by occupational status information and furthermore complemented by time period dummies to

[9] The definition of graduates refers to persons with higher education (ISCED categories 5a+6).

[10] Anyway, empirical evidence suggests a decreasing impact of field of study on income over the career: Multivariate analyses from Dolton and Vignoles (2000) show for the United Kingdom, that – apart from arts fields – fields of study have lost their income effect six years after exam.

control for occupational change over time.[11] Accordingly, superfluous education is defined as a positive deviation, deficit education as a negative deviation and required education as the perfect congruence with the standard. Persons with superfluous education for the actually performed job are regarded as overeducated, those with deficit education as undereducated and those with the required amount of education as correctly matched.

The endogenous variable being the object of income estimations is the (log of) gross hourly wage rate including fringe benefits. SOEP based analyses for Germany show that fringe benefits like Christmas or vacation allowances are more often granted to men even after controlling for the hourly wage rate (Frick et al. 2007). We prorate fringe benefits according to the previous year's ratio of overall fringe and regular income payments.[12] The statistics of the endogenous variable indicates that female graduates earned less than their male counterparts throughout observed years 1984 to 2010, with the sole exceptions 1984 and 1990. For 2010 being the last period observed, the hourly wage rate amounts to 20,62 Euro for female and to 28,35 Euro for male graduates.[13]

Apart from education, we control for a large set of employment biography, work place and household related variables, supplemented by further characteristics capturing parents' home and migration background. Detailed summary statistics of the deployed variables are to be found in table 2 in the appendix.

4 | Results

The **results of the ORU income estimations** are documented in detail in tables 3 and 4 in the appendix. The results confirm previous findings that superfluous education is partly remunerated by the labour market. One year of required education yields a return of 6.8 % for male and of 8.1 % for female graduates. A superfluous year of education is rewarded by 4.2 % for males and 4.7 % for females. A deficit year of education is penalised with a wage loss of 4.5 % for males and 7.2 % for females. That is, overeducated graduates earn more than their properly matched colleagues in the occupational benchmark group but less than their

[11] In detail, we exploit 10 main occupational groups provided by 1-digit international standard classification of occupations (ISCO) and 11 occupational statuses stored in the SOEP data set. The yielded job/status combinations (job cells) are kept if they contain at least 10 observations. The computation of the average education in a distinct job cell is repeated in six years-time intervals to account for an educational upgrading of occupations. The information is stored in four time period dummys 1984-1989, 1990-1996, 1997-2003, 2004-2010 per job cell. Since attained education is time-constant in our sample, a time-varying educational adequacy within person may solely be due to job changes associated with an altered educational benchmark.

[12] In case of a job change we exploit the information of most recent months in the new job. As the computation of fringe benefits is based on the information of the previous year, wave 2010 has been lost for persons with job change in 2010.

[13] Moreover (not displayed), East German women's wages are lower than West German women's throughout years, and the same applies to men, respectively. In 2010, East German male graduates almost reached the wage level of West German female graduates (21.35 vs. 21.99 Euro).

properly matched graduates. However, if a woman holds a degree from a technical college whereas the standard in her occupational group is defined by a technical university exam this woman is even paid less than her colleagues. The figures indicate that being properly matched pays off even more for female graduates than for their male counterparts.

The findings are contrary to the hypotheses of job competition as well as assignment theory which imply zero returns of overeducation. Obviously, the labour market is at least partly capable to absorb excess qualification and to use it in an income generating way. Furthermore, different returns on investment depending on job requirements are neither in line with human capital theory, if they persist over time. This particularly holds for women and contradicts findings from Vahey (2000) who found equal returns of overeducation for male and female graduates. However, although the estimation approach deals with unobserved heterogeneity in many ways, it may not be excluded that different returns to education partly reflect a self-selection into overeducation, driven by disabilities, health status or unaccounted preferences. Since employed women are a more selective group than employed men, this suggestion particularly applies to female graduates. According to Bauer (2002) women's differences in wage returns to education disappear when deploying a fixed effects estimator. For this reason, we suggest that human capital theory may not be clearly rejected by the findings of this study. However, there is no imperative that gender-specific returns on overeducation solely point to unobserved personal traits. Instead, they might furthermore originate in differences in assigned productivity from the employers' side. In this case, as Korpi and Tåhlin (2009) show, different returns to (over-)education keep their significance even in a fixed effects approach. Furthermore, based on the assumption that a higher income reflects higher abilities and is therefore rather seldom subject to unobserved heterogeneity, McGuinness and Bennett (2007) tested the human capital hypothesis by conducting a quantile-specific analysis of wage returns on education. The findings indicate that the lower female returns on overeducation do not vanish in the upper sections of the income distribution. As a result, the findings suggest that not only supply side but also demand side factors drive the observed gender differences in the remuneration of education.

Apart from education, some *other characteristics* feature *significant wage effects* with regard to within-person effects. Some of them display the same effects for men and women, others induce gender-specific effects. Since differences in endowments as well as a different remuneration of characteristics account for the gender pay gap, some of the results of the earnings estimation shall be discussed in the following paragraphs.

A higher employment experience or residing in the southern part of Germany induces higher wage for both men and women. The first of these effects strengthens career mobility theory.[14] Likewise, part-time employment (compared to full-time), an employment in the manufacturing sector, higher partner's earnings as well as parenthood induce positive wage effects. By contrast, working in a small enterprise with less than 200 employees, the experience of regis-

[14] However, the hypothesised higher wage mobility of formerly overeducated employees in their further career is not the subject of this study.

tered unemployment, a job change or living in the Eastern part of Germany lowers wages. Additionally, spells out of the labour market for family or other reasons which are not associated with an unemployment registration lead to significant wage cuts only for women. Furthermore, being employed in the public sector benefits females' but reduces males' wages. This finding confirms results from Holst (2010). It mirrors the lower risk of overeducation in the public sector that has been retrieved from own estimations of overeducation incidence. Obviously – and presumably due to a higher focus on attained formal qualification in personnel hiring – the public sector protects women against educationally inadequate jobs. However, this does not hold for males for whom the private sector seems to provide better job matches associated with higher incomes.

Some job features hardly vary over time; this particularly holds for sector affiliation. Here, the within estimator is of limited importance, since most variation accrues to interpersonal differences. For example, employees in the banking and insurances sector earn significantly more than other employees. As above mentioned, the main function of the mean values is to absorb (part of) the unobserved heterogeneity. The mean values allow an interpretation of the characteristics' parameters as a pure within-estimator. With regard to employment status, switching from full-time to *part-time employment* is associated with an hourly wage gain of 21.3 % for females and of 17.2 % for males.[15] Theories that deal with the wage effects of part-time are manifold. They comprise an enhanced attractiveness of a flexible handling of production factors, changed work preferences of scarce skilled labour as a supply side factor as well as differing assumptions with regard to productivity (see Wolf 2010 for a detailed discussion). Furthermore, since 2000 the German Part-Time Work and Fixed-Term Employment Contracts Law ("Teilzeit- und Befristungsgesetz") entitles employees to work part-time and prohibits any wage discrimination in the context of employment transfer from full-time to part-time. Some apparently contradicting results in the empirical literature (Wolf 2010, Busch and Holst 2008) may be referred to differences in model specification. For example, since the estimator deployed by Wolf (2010) does not control for unobserved heterogeneity, the parameter of part-time captures not only within-person- but also selection effects. Moreover, results depend on the deployed operationalisation, particularly the distinction between regular part-time and precarious employment.

Some further results point to severe *selection effects*, particularly with regard to women. Although the mean values are not interpreted easily, it has to be assumed that they capture part of the unobserved heterogeneity between persons. In an interpersonal comparison, part-time employed male and female graduates earn less per hour than full-time employed. The hourly wage rate for part-time employed versus full-time employed (not sex-differentiated) in our sample comes close to the figures based on the Structure of Earnings Survey of the Ger-

[15] The advantageous effect is even more pronounced in Western Germany, compared to the Eastern part („Neue Bundesländer"). Nevertheless, the gender effect should not be overrated since only 4.6 % and 4.7% of male graduates work part-time in Western and Eastern Germany, respectively.

man Federal Statistical Office.[16] Moreover, mothers earn less than childless female graduates, whereas fathers do not suffer any fatherhood penalty in a cross-sectional view. It has to be suggested that female graduates are to a higher extent than their male counterparts subject to selection processes which themselves are driven by unobserved personal traits.

Female and male graduates further differ in the *remuneration of de facto working hours*. A reduction of de facto weekly working hours is associated with a reduction of the hourly wage rate for women and an increase for men. That is, women who reduce their working time are confronted with an even higher loss of the monthly salary, inducing the hourly wage rate to decrease. By contrast, men doing so manage to keep the salary constant or without noticeable cuts. At least two reasons may account for this finding. Firstly, a higher level of de facto weekly working hours (irrespective of agreed working hours in the employment contract) might facilitate a salary-neutral reduction of working hours in terms of reduced overtime hours. It has to be noted that the accruing wage effect of de facto working time is retrieved from the earnings regressions, given all other characteristics including employment status. But indeed, overtime hours are higher for men than for women in our sample, even among the full-time employed. Secondly, the more sensitive respondence of females' monthly salary to a modification in working hours might reflect gendered working attitudes with regard to a fair wage, resulting in a more modest demeanor in wage negociations.[17]

Last but not least, the *household context is differently remunerated* for men than for women. The within estimators indicate that males' wages benefit from the existence of a pre-school child, a higher household size and partners' cohabitation (instead of being single or living apart). Between persons, married men earn more than unmarried men and fathers earn more than childless men. None of these within or between effects applies to women. By contrast, a pre-school child lowers females' income within persons. As mentioned above in the context of selection effects, mothers furthermore earn less than childless women in an interpersonal comparison. It has to be concluded that gendered cross-section effects presumably not only reflect selection processes on the side of employees but also different attributions on the side of employers. In more detail, household characteristics that stimulate the breadwinner role seem to induce a wage premium solely for men, whereas women do not benefit. The fact that solely men are granted those breadwinner premiums reflects traditional gender stereotypes assigned to male and female graduates.

[16] In 2010, the median value of the gross hourly wage rate amounted in the deployed SOEP sample to 19.50 Euro for part-time and to 21.94 Euro for full-time employed persons. Since these figures base on de facto weekly working hours, the somewhat higher figures of the German Federal Statistical Office of 21.38 Euro and 23.97 Euro, respectively (Statistisches Bundesamt 2012a) are assumed to origin in a deviant specification of working hours.

[17] The more sensitive salary respondence with regard to women holds for both directions; analogously, an increase in females' de facto working hours leads to an even more pronounced salary increase, resulting in an increased hourly wage rate. Nevertheless, as wage decomposition later on will show, it is the wage effect of reduced hours that contributes to the observed gender wage gap.

The calculated **mean gender wage gap** in our sample of graduates amounts to approximately 32.5 %. Due to the nonlinearity of logarithms, the gross hourly wage differential has to be denoted by approximation. The overall wage differential that amounts to 0.325 log-points may be interpreted as an approximately wage gap of 32.5 %.[18]

For assessing the **effect of overeducation** on the gap we decomposed the mean following the approach from Oaxaca (1973) and Blinder (1973) as described above in the model chapter. For this purpose we use earnings regressions based on the pooled information from waves 2008 and 2009. The results indicate that 20.3 % of the gap refers to different endowments and 12.2 % to a different remuneration of characteristics by the labour market. That is, female graduates earn 20.3 % less than males because they feature different characteristics and 12.2 % less because their characteristics pay off differently. The latter effect has not to be considered as discrimination for two reasons. Firstly, it might be harder for women to access highly remunerated job attributes; the discrimination signaled by the price effect would be then be biased downward. Secondly, the price effect also encompasses unobserved heterogeneity. This arises from the fact that we may not incorporate mean values in the regressions which provide the basis for the decomposition. Hence, the discrimination displayed by the price effect may be upward biased due to selection effects.

With regard to the years of education, only required years of education display a significant effect on the gap. The effect refers to different endowments, not to a different remuneration of those. In detail, female graduates earn 4.2 % less than their male counterparts because they work more often in jobs with fewer required years of education. This must not be interpreted as overeducation, since the effect of overeducation is separately controlled for. Instead, as table 1 above showed, women exhibit a higher share of graduates with a professional or technical college degree, whereas males dominate university degrees with a higher amount of required years of education. Therefore, the endowment effect of required education reflects a gendered educational distribution among graduates. Indeed, overeducation does not make any significant contribution to the wage gap. As mentioned above, former own analyses showed that with regard to the educational standard in the relevant occupational benchmark group, female graduates are almost as often overeducated as male graduates. Notwithstanding the result from income regression that this circumstance is more severely penalised for women than for men, overeducation apparently does not matter for explaining the wage gap between sexes. The lack of significant overeducation effects in this regard is congruent with the empirical evidence (Li and Miller 2012, Leuze and Strauß 2009, Vahey 2000).

[18] That is, female graduates earned 27.3 % less than male graduates. This value is congruent with calculations of the German Federal Statistical Office that actually numbers the gap with 27.1 % (Statistisches Bundesamt 2012b).

Apart from a lower amount of required years of education, several further differences in endowments or remunerations account for the gap. Among others, females graduates earn less than their male counterparts because … (accounting for …% of the gap)

- they have less employment experience (1.6 %),
- they feature more unemployment experience (2.8 %),
- time out of the labour market is penalized more severely (3.2 %),
- they work more often in the public sector (2.1 %),
- they work more often as civil servants (0.5 %),
- they work more often in small enterprises (1.8 %),
- they are less often married (1.8 %),
- being married does not pay off (11.3 %),
- they more often live in the Eastern part of Germany (3.0 %), and
- they are less successful in avoiding wage cuts when reducing working hours (33.0 %).

These effects do not sum up to the mentioned overall wage gap since the list is not complete. The full endowment and price effects are documented in table 5 in the appendix. It has to be recognised that some factors work more advantageous for women, thereby reducing the gap. This applies to the evaluation of part-time work, of public sector employment and of several sector affiliations.

5 | Conclusion

In accordance with Leuven and Oosterbeek (2011) we conclude that in the awareness of omitted variable bias and measurement error, a thorough analysis of the returns to overeducation is required. Accounting for unobserved heterogeneity and relying on a realised matches approach, we find that overeducation induces positive but lower wage returns than proper matches. The wage penalty of inadequate matches is even more pronounced for female graduates than for their male counterparts. The findings are contrary to assignment and job competition theory. Human capital theory may not be fully rejected since the deployed random effects estimator does not fully account for unobserved fixed effects, and the Mundlak correction provides only a partial compensation.

Following an interpretation of Korpi and Tåhlin (2009), overeducated persons seem to be a heterogeneous group. (1) Some persons experience temporary overeducation associated with an early stage in the occupational career or with job market frictions. (2) For others income differentials might originate in unobserved impediments, health status or preferences. (3) They might reflect assigned gender stereotypes, and (4) a last group of persons might be

trapped in overeducation due to institutional barriers, although being equally productive and equally treated. Only the last two causes may be remedied by adequate policies. .

Notwithstanding the wage effects of overeducation, overeducation does not matter for explaining the gender wage gap among graduates. This result does not come as a surprise considering the almost equal occurrence of overeducation among German male and female graduates from an objective (realised matches) point of view. Moreover, the result is in line with previous empirical findings. Apparently, other factors affect the gap more seriously. Equal matches are only one part of the story.

The findings indicate that a noticeable part of the wage gap may be attributed to gender stereotypes assigned by employers and presumably incorporated in women's labour market decisions. Academically qualified women who accept the role of being an additional earner and who claim lower earnings for their work receive a lower remuneration from the labour market. Only male graduates are granted breadwinner wage premiums, and women suffer wage reductions when reducing working hours. Apart from those price effects, also some differences in endowments are evident for the gap, similarly subject to gendered attitudes: The prevalence of women in the public sector as well as the lower amount of labour market experience reflects women's preferences for parental childcare in early years and for jobs being reconcilable with family chores (Boll 2011). Hence, social policies as well as human resources management tools on the firm level, which boost equal responsibilities and chances of men and women on the labour market and within families enhance the quality of job matches.

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ANNEX – Table 2:

Descriptive statistics

*=Dummy	Female graduates				Male graduates			
	Overeducated		Not overeducated		Overeducated		Not overeducated	
	Mean value	Std. dev.	Mean value	Std. dev.	Mean value	Std. dev.	Mean value	Std. dev.
Endogenous variable								
Log gross hourly wage rate	2.7016	0.545	2.8737	0.4909	3.0744	0.5908	3.173	0.4761
Exogenous variables								
Education								
Attained education (years)	16.8812	1.6009	15.9016	2.2092	17.4048	1.3072	16.5434	1.785
Required education (years)	12.9226	1.5217	15.5431	2.0446	13.844	1.5881	16.0582	1.3314
Superfluous education (years)	3.9586	1.4208	0.6703	0.6685	3.5607	1.2476	0.8115	0.8169
Deficit education (years)	0	0	0.3118	0.8277	0	0	0.3263	0.7534
Employment biography								
Full-time employment* (self-assessment of survey person) (*Reference*)	0.6765	0.4679	0.6552	0.4753	0.9434	0.231	0.9399	0.2378
Part-time employment* (self-assessment of survey person)	0.2824	0.4503	0.3312	0.4707	0.0499	0.2178	0.0564	0.2308
Precarious/irregular employment* (self-assessment of survey person)	0.0411	0.1985	0.0136	0.1157	0.0067	0.0814	0.0037	0.0608
Age (years)	40.3899	8.3068	41.4794	7.9311	41.9373	7.7592	42.5829	7.8326
Employment experience (full-time + part-time, years)	13.8652	8.2315	16.0861	8.3748	15.6005	8.118	16.4415	8.2408
OLF experience (years out of the labour force for family or other reasons)	2.0295	4.2487	1.7302	3.6557	0.1735	1.4128	0.1902	1.3234
Unemployment experience (registered UE, years)	0.4661	1.1376	0.2693	0.8236	0.2505	0.7762	0.1512	0.4938
Job change*	0.1743	0.3794	0.0957	0.2942	0.1195	0.3245	0.0967	0.2955
Re-entry after break*	0.0402	0.1965	0.0279	0.1648	0.0009	0.0298	0.0014	0.0369
Job features								
Primary sector, energy, mining*	0.0209	0.143	0.0143	0.1188	0.0224	0.148	0.0288	0.1673
Manufacturing* (*Reference*)	0.1181	0.3228	0.0506	0.2192	0.1945	0.3959	0.1534	0.3604
Construction*	0.0555	0.2289	0.0283	0.1659	0.119	0.3238	0.1607	0.3673
Trade*	0.1072	0.3094	0.0363	0.1869	0.0648	0.2463	0.0296	0.1694
Transport*	0.0411	0.1985	0.0235	0.1514	0.0502	0.2183	0.0248	0.1555
Banking and insurances*	0.0688	0.2532	0.018	0.1329	0.095	0.2932	0.0294	0.1689
Other services* (business services, public administration, social insurance carriers)	0.5885	0.4922	0.8291	0.3765	0.4541	0.498	0.5734	0.4946
Civil servant*(*Reference: otherwise dependently employed*)	0.0941	0.2921	0.2329	0.4227	0.1427	0.3499	0.1991	0.3994

*=Dummy	Female graduates				Male graduates			
	Overeducated		Not overeducated		Overeducated		Not overeducated	
	Mean value	Std. dev.	Mean value	Std. dev.	Mean value	Std. dev.	Mean value	Std. dev.
Public sector* (*Reference: Private sector*)	0.3526	0.4779	0.6429	0.4792	0.2444	0.4298	0.375	0.4841
Big enterprise* (2000 or more employees) (*Reference*)	0.229	0.4203	0.2485	0.4322	0.3493	0.4768	0.3119	0.4633
Medium-size enterprise* (200-199 employees)	0.2352	0.4242	0.1885	0.3911	0.2665	0.4422	0.2282	0.4197
Small enterprise* (less than 200 employees)	0.5207	0.4997	0.5424	0.4982	0.3647	0.4814	0.4385	0.4962
Partner- and household context								
Single* (without partner or not living together with a partner)	0.2537	0.4352	0.227	0.4189	0.2068	0.405	0.161	0.3675
Married* (living together with husband/wife)	0.811	0.3916	0.8573	0.3498	0.8759	0.3298	0.8782	0.327
Cohabiting * (living together but not married)	0.189	0.3916	0.1427	0.3498	0.1241	0.3298	0.1218	0.327
Partner's gross wage income (per month, Euro)	3947.18	3007.94	3814.16	3551.25	1866.86	1981.81	1770.13	2155.74
Partner is highly educated* (ISCED 6)	0.5931	0.4914	0.5845	0.4928	0.5536	0.4972	0.492	0.5
Partner is medium educated* (ISCED 3-5)	0.3638	0.4812	0.393	0.4885	0.4238	0.4942	0.4736	0.4993
Partner is lowly educated* (ISCED <3)	0.0431	0.2032	0.0225	0.1482	0.0225	0.1484	0.0343	0.1821
Nonwage income of the household (interest, rent, dividend, redistributive income, Euro)	222.29	683.49	217.55	794.24	261.92	1178.71	290.62	1273.87
Parenthood* (referring to births; reference= childlessness)	0.6553	0.4754	0.7198	0.4491	0.5993	0.4901	0.6534	0.4759
Child aged 7 or older* (Reference)	0.8736	0.3324	0.8874	0.3161	0.7569	0.429	0.7791	0.4149
Child aged 6 or younger*	0.2079	0.4059	0.1989	0.3992	0.3914	0.4882	0.3659	0.4817
Single parent* (single status with at least one child)	0.1594	0.3661	0.1323	0.3388	0.0454	0.2083	0.0418	0.2002
Household size (persons)	2.8388	1.1799	2.9447	1.2194	3.0192	1.3341	3.183	1.3536
Daily leisure time budget (24 minus 8 minus one fifth of de facto weekly working hours)	7.6162	2.5424	7.7625	2.2513	5.9731	1.7193	6.1305	1.6541
Residence in North Germany* (Hamburg, Schleswig-Holstein, Bremen, Niedersachsen)	0.1082	0.3107	0.0862	0.2807	0.1211	0.3263	0.1301	0.3364
Residence in East Germany* (Sachsen, Sachsen-Anhalt, Thüringen, Brandenburg, Mecklenburg-Vorpommern, Berlin)	0.4365	0.496	0.473	0.4993	0.306	0.4609	0.2377	0.4257

*=Dummy	Female graduates				Male graduates			
	Overeducated		Not overeducated		Overeducated		Not overeducated	
	Mean value	Std. dev.	Mean value	Std. dev.	Mean value	Std. dev.	Mean value	Std. dev.
Residence in West Germany* (Nordrhein-Westfalen, Rheinland-Pfalz, Saarland)	0.2273	0.4192	0.1968	0.3976	0.238	0.4259	0.2617	0.4396
Residence in South Germany* (Bayern, Baden-Württemberg, Hessen)	0.228	0.4196	0.2439	0.4295	0.3348	0.472	0.3705	0.483
Parents' home characteristics								
Mother is highly educated* (ISCED 6)	0.1482	0.3554	0.1414	0.3484	0.1283	0.3345	0.1099	0.3128
Father is highly educated* (ISCED 6)	0.3112	0.4631	0.3112	0.463	0.3359	0.4724	0.2914	0.4544
Mother is employed* (at age 15 of survey person)	0.2746	0.4464	0.2186	0.4133	0.2423	0.4285	0.2318	0.422
Father is employed* (at age 15 of survey person)	0.9291	0.2566	0.9167	0.2764	0.9176	0.2751	0.9087	0.2881
Nationality/migration background								
Foreign nationality*	0.0305	0.1719	0.0158	0.1249	0.0358	0.1857	0.0186	0.135
No migration background*	0.9127	0.2823	0.943	0.2318	0.9178	0.2747	0.933	0.25
Indirect migration background* (at least one parent born abroad)	0.0195	0.1383	0.0203	0.1409	0.0277	0.1643	0.0269	0.1617
Direct migration background* (survey person born abroad)	0.0678	0.2514	0.0367	0.1881	0.0544	0.2269	0.0401	0.1962

ANNEX – Table 3:

Earnings estimation results, male graduates

Number of observations	= 10482
Number of persons	= 1605
R-sq: within	= 0,1527
Between	= 0,4192
Overall	= 0,3487
Observations per Person: min	= 1
avg	= 6,5
max	= 25
Wald chi2(60)	= 2730,23
Prob > chi2	= 0,0000

Log(hourly wage rate)	Coefficient	Std. Err.	z	P>z	[95% Conf. Interval]	
Employment biography						
Part-time employment	0.1715	0.0168	10.20	0.000	0.1385	0.2044
Employment experience	0.0221	0.0009	25.68	0.000	0.0204	0.0238
OLF experience	-0.0520	0.0714	-0.73	0.466	-0.1919	0.0879
Unemployment experience	-0.0932	0.0171	-5.44	0.000	-0.1268	-0.0596
Job change	-0.0320	0.0094	-3.42	0.001	-0.0504	-0.0137
Re-entry after break	-0.1904	0.1013	-1.88	0.060	-0.3888	0.0081
Required education	0.0683	0.0067	10.21	0.000	0.0552	0.0814
Superfluous education	0.0424	0.0069	6.13	0.000	0.0289	0.0560
Deficit education	-0.0454	0.0096	-4.71	0.000	-0.0642	-0.0265
Mean Part-time employment	-0.1556	0.0633	-2.46	0.014	-0.2796	-0.0317
Mean Employment experience	-0.0140	0.0018	-7.63	0.000	-0.0176	-0.0104
Mean OLF experience	0.0503	0.0718	0.70	0.484	-0.0904	0.1909
Mean Unemployment experience	0.0202	0.0224	0.90	0.367	-0.0238	0.0642
Mean Job change	-0.4328	0.0576	-7.51	0.000	-0.5457	-0.3199
Job features						
Primary sector. energy. mining	-0.0187	0.0398	-0.47	0.638	-0.0968	0.0593
Construction	0.0042	0.0168	0.25	0.802	-0.0287	0.0371
Trade	-0.0564	0.0267	-2.11	0.035	-0.1087	-0.0040
Transport	-0.0976	0.0333	-2.93	0.003	-0.1629	-0.0323
Banking and insurances	-0.0792	0.0360	-2.20	0.028	-0.1497	-0.0087
Other services	-0.0439	0.0172	-2.54	0.011	-0.0777	-0.0101
Civil servant	-0.0241	0.0231	-1.05	0.295	-0.0694	0.0211
Public sector	-0.0517	0.0156	-3.31	0.001	-0.0824	-0.0211
Medium-size enterprise	-0.0130	0.0111	-1.17	0.242	-0.0347	0.0088
Small enterprise	-0.0262	0.0116	-2.27	0.023	-0.0488	-0.0036
Mean Primary sector. energy. mining	-0.0448	0.0806	-0.56	0.578	-0.2027	0.1132
Mean Construction	-0.0019	0.0439	-0.04	0.965	-0.0880	0.0841
Mean Trade	-0.1169	0.0654	-1.79	0.074	-0.2451	0.0112
Mean Transport	0.0825	0.0736	1.12	0.262	-0.0617	0.2267
Mean Banking and insurances	0.3003	0.0622	4.83	0.000	0.1785	0.4222

Log(hourly wage rate)	Coefficient	Std. Err.	z	P>z	[95% Conf. Interval]	
Mean Other services	0.0532	0.0392	1.36	0.174	-0.0235	0.1300
Mean Public sector	-0.0771	0.0343	-2.25	0.025	-0.1444	-0.0099
Mean Medium-size enterprise	0.0195	0.0337	0.58	0.562	-0.0465	0.0855
Mean Small enterprise	-0.1141	0.0287	-3.98	0.000	-0.1703	-0.0579
Partner- and household context						
Married	-0.0443	0.0373	-1.19	0.236	-0.1175	0.0289
Cohabiting	-0.0957	0.0376	-2.55	0.011	-0.1693	-0.0221
Partner's gross wage income	0.0000	0.0000	4.29	0.000	0.0000	0.0000
Partner is highly educated	0.0529	0.0358	1.48	0.140	-0.0173	0.1230
Partner is medium educated	0.0339	0.0335	1.01	0.311	-0.0317	0.0995
Nonwage income of the household	0.0000	0.0000	6.05	0.000	0.0000	0.0000
Parenthood	0.0636	0.0225	2.83	0.005	0.0196	0.1077
Child aged 6 or younger	0.0267	0.0123	2.18	0.030	0.0027	0.0507
Household size	0.0182	0.0050	3.61	0.000	0.0083	0.0281
Daily leisure time budget	0.0089	0.0024	3.66	0.000	0.0041	0.0136
Residence in East Germany	-0.1826	0.0268	-6.81	0.000	-0.2352	-0.1301
Residence in West Germany	0.0648	0.0257	2.52	0.012	0.0144	0.1151
Residence in South Germany	0.0917	0.0249	3.68	0.000	0.0428	0.1405
Mean Married	0.1495	0.0434	3.44	0.001	0.0644	0.2347
Mean Cohabiting	0.1047	0.0492	2.13	0.033	0.0082	0.2011
Mean Partner's gross wage income	0.0000	0.0000	-2.59	0.010	0.0000	0.0000
Mean Nonwage income of the household	0.0000	0.0000	1.25	0.211	0.0000	0.0000
Mean Parenthood	0.0305	0.0387	0.79	0.431	-0.0453	0.1063
Mean Child aged 6 or younger	-0.0350	0.0395	-0.88	0.376	-0.1125	0.0425
Mean Household size	-0.0110	0.0121	-0.91	0.362	-0.0348	0.0127
Mean Daily leisure time budget	-0.0241	0.0080	-3.01	0.003	-0.0398	-0.0084
Parents' home characteristics						
Mother is highly educated	-0.0760	0.0326	-2.33	0.020	-0.1400	-0.0120
Father is highly educated	0.0232	0.0233	1.00	0.318	-0.0224	0.0688
Mother employed	0.0336	0.0216	1.56	0.120	-0.0087	0.0759
Father employed	0.0168	0.0350	0.48	0.631	-0.0517	0.0854
Nationality/migration background						
Indirect migration background	-0.0425	0.0567	-0.75	0.454	-0.1536	0.0686
Direct migration background	-0.0248	0.0453	-0.55	0.585	-0.1136	0.0641

Sources: SOEP 1984-2010, calculations HWWI.

ANNEX – Table 4:

Earnings estimation results, female graduates

Number of observations	= 9485
Number of persons	= 1571
R-sq: within	= 0,1288
Between	= 0,4244
Overall	= 0,3905
Observations per Person.: min	= 1
avg	= 6,0
max	= 24
Wald chi2(62)	= 2349,24
Prob > chi2	= 0,0000

Log(hourly wage rate)	Koeffizient	Std. Err.	z	P>z	[95% Conf.	Interval]
Employment biography						
Part-time employment	0.2130	0.0118	18.07	0.000	0.1899	0.2361
Precarious/irregular employment	0.5178	0.0302	17.14	0.000	0.4586	0.5770
Employment experience	0.0163	0.0010	16.49	0.000	0.0144	0.0182
OLF experience	-0.0297	0.0088	-3.37	0.001	-0.0469	-0.0124
Unemployment experience	-0.0744	0.0116	-6.41	0.000	-0.0972	-0.0516
Job change	-0.0261	0.0104	-2.50	0.012	-0.0466	-0.0057
Re-entry after break	0.0142	0.0225	0.63	0.528	-0.0299	0.0582
Required education	0.0807	0.0057	14.20	0.000	0.0695	0.0918
Superfluous education	0.0474	0.0059	8.08	0.000	0.0359	0.0589
Deficit education	-0.0715	0.0093	-7.73	0.000	-0.0897	-0.0534
Mean Part-time employment	0.0065	0.0390	0.17	0.867	-0.0698	0.0829
Mean Precarious/irregular employment	-0.5283	0.0885	-5.97	0.000	-0.7019	-0.3548
Mean Employment experience	-0.0058	0.0018	-3.15	0.002	-0.0094	-0.0022
Mean OLF experience	0.0224	0.0092	2.45	0.014	0.0045	0.0404
Mean Unemployment experience	0.0125	0.0150	0.83	0.404	-0.0169	0.0419
Mittelwert Jobwechsel	-0.1979	0.0455	-4.35	0.000	-0.2871	-0.1087
Job features						
Primary sector. energy. mining	-0.1902	0.0507	-3.75	0.000	-0.2895	-0.0909
Construction	0.0162	0.0339	0.48	0.632	-0.0503	0.0827
Trade	-0.0799	0.0310	-2.58	0.010	-0.1407	-0.0192
Transport	-0.0433	0.0433	-1.00	0.318	-0.1281	0.0416
Banking and insurances	-0.0969	0.0531	-1.82	0.068	-0.2009	0.0072
Other services	-0.0421	0.0254	-1.66	0.096	-0.0918	0.0076
Civil servant	-0.0102	0.0217	-0.47	0.638	-0.0528	0.0323
Public sector	0.0284	0.0143	1.98	0.047	0.0003	0.0565
Medium-size enterprise	0.0034	0.0142	0.24	0.808	-0.0243	0.0312
Small enterprise	-0.0492	0.0127	-3.88	0.000	-0.0741	-0.0243
Mean Primary sector. energy. mining	0.1564	0.1001	1.56	0.118	-0.0397	0.3526
Mean Construction	0.1392	0.0728	1.91	0.056	-0.0035	0.2818
Mean Trade	-0.1192	0.0649	-1.84	0.066	-0.2465	0.0080

Log(hourly wage rate)	Koeffizient	Std. Err.	z	P>z	[95% Conf. Interval]	
Mean Transport	0.1417	0.0870	1.63	0.103	-0.0288	0.3122
Mean Banking and insurances	0.3045	0.0835	3.65	0.000	0.1408	0.4682
Mean Other services	0.0674	0.0501	1.35	0.178	-0.0307	0.1655
Mean Public sector	0.0325	0.0298	1.09	0.275	-0.0259	0.0909
Mean Medium-size enterprise	0.0241	0.0371	0.65	0.515	-0.0485	0.0968
Mean Small enterprise	-0.0247	0.0292	-0.85	0.397	-0.0820	0.0325
Partner- and household context						
Married	-0.0123	0.0387	-0.32	0.750	-0.0881	0.0635
Cohabiting	-0.0291	0.0387	-0.75	0.452	-0.1050	0.0468
Partner's gross wage income	0.0000	0.0000	3.09	0.002	0.0000	0.0000
Partner is highly educated	0.0200	0.0372	0.54	0.591	-0.0530	0.0930
Partner is medium educated	0.0138	0.0346	0.40	0.691	-0.0540	0.0816
Nonwage income of the household	0.0000	0.0000	-0.45	0.649	0.0000	0.0000
Parenthood	0.1195	0.0292	4.09	0.000	0.0622	0.1768
Child aged 6 or younger	-0.0372	0.0151	-2.47	0.013	-0.0667	-0.0077
Household size	0.0079	0.0066	1.20	0.229	-0.0050	0.0208
Daily leisure time budget	-0.0098	0.0025	-3.91	0.000	-0.0147	-0.0049
Residence in East Germany	-0.1934	0.0308	-6.29	0.000	-0.2537	-0.1331
Residence in West Germany	0.0291	0.0297	0.98	0.327	-0.0291	0.0873
Residence in South Germany	0.0657	0.0295	2.23	0.026	0.0079	0.1235
Mean Married	-0.0468	0.0374	-1.25	0.211	-0.1202	0.0265
Mean Cohabiting	-0.0260	0.0431	-0.60	0.546	-0.1104	0.0585
Mean Partner's gross wage income	0.0000	0.0000	-0.37	0.714	0.0000	0.0000
Mean Nonwage income of the household	0.0001	0.0000	3.33	0.001	0.0000	0.0001
Mean Parenthood	-0.0841	0.0447	-1.88	0.060	-0.1718	0.0036
Mean Child aged 6 or younger	0.1116	0.0426	2.62	0.009	0.0281	0.1951
Mean Household size	0.0019	0.0136	0.14	0.891	-0.0248	0.0285
Mean Daily leisure time budget	-0.0350	0.0080	-4.36	0.000	-0.0507	-0.0192
Parents' home characteristics						
Mother is highly educated	-0.0137	0.0282	-0.49	0.627	-0.0690	0.0416
Father is highly educated	0.0290	0.0217	1.34	0.182	-0.0136	0.0717
Mother employed	0.0125	0.0208	0.60	0.549	-0.0283	0.0532
Father employed	0.0547	0.0352	1.56	0.120	-0.0142	0.1237
Nationality/migration background						
Indirect migration background	-0.0090	0.0571	-0.16	0.875	-0.1210	0.1030
Direct migration background	-0.0356	0.0400	-0.89	0.374	-0.1140	0.0428
constant	1.6480	0.1264	13.04	0.000	1.4003	1.8957

Sources: SOEP 1984-2010, calculations HWWI.

ANNEX – Table 5:

Decomposition of the mean Gender Pay Gap among German graduates

(reference group: male graduates)

Blinder-Oaxaca decomposition	Number of obs	=	2377
	Model	=	linear
Group 1 (female graduates): hq = 0	N of obs 1	=	1160
Group 2 (male graduates): hq = 1	N of obs 2	=	1217

log_wage_h	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Overall						
Log hourly wage rate of female graduates	2.8395	0.0151	188.51	0.000	2.8099	2.8690
Log hourly wage rate of male graduates	3.1644	0.0155	204.80	0.000	3.1342	3.1947
Difference in Log- hourly wage rates	-0.3250	0.0216	-15.06	0.000	-0.3673	-0.2827
- thereof endowment effect	-0.2053	0.0300	-6.85	0.000	-0.2641	-0.1466
- thereof evaluation effect (price effect) (including the constant term)	-0.1197	0.0301	-3.98	0.000	-0.1786	-0.0607
Composition of the endowment effect						
Employment biography						
Part-time employment	0.0114	0.0166	0.69	0.493	-0.0212	0.0439
Employment experience	-0.0157	0.0069	-2.27	0.023	-0.0294	-0.0021
OLF experience	0.0202	0.0099	2.05	0.041	0.0009	0.0395
Unemployment experience	-0.0281	0.0082	-3.42	0.001	-0.0442	-0.0120
Job change	-0.0013	0.0015	-0.87	0.382	-0.0041	0.0016
Re-entry after break						
Required education	-0.0418	0.0094	-4.43	0.000	-0.0604	-0.0233
Superfluous education	0.0018	0.0023	0.80	0.421	-0.0026	0.0063
Deficit education	0.0008	0.0009	0.91	0.360	-0.0009	0.0026
Job features						
Primary sector. energy. mining	0.0021	0.0014	1.53	0.125	-0.0006	0.0048
Construction	0.0009	0.0041	0.21	0.832	-0.0072	0.0089
Trade	-0.0023	0.0018	-1.31	0.190	-0.0058	0.0012
Transport	0.0008	0.0010	0.87	0.382	-0.0010	0.0027
Banking and insurances	-0.0013	0.0016	-0.82	0.414	-0.0044	0.0018
Other services	-0.0212	0.0089	-2.39	0.017	-0.0385	-0.0038
Civil servant	-0.0051	0.0024	-2.14	0.033	-0.0098	-0.0004
Public sector	-0.0207	0.0070	-2.94	0.003	-0.0345	-0.0069
Medium-size enterprise	0.0013	0.0013	1.03	0.302	-0.0012	0.0039
Small enterprise	-0.0182	0.0047	-3.86	0.000	-0.0274	-0.0089
Partner- and household context						
Married	-0.0178	0.0077	-2.30	0.022	-0.0329	-0.0026
Cohabiting	0.0013	0.0018	0.73	0.466	-0.0023	0.0050

log_wage_h	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Partner's gross wage income	-0.0187	0.0129	-1.45	0.147	-0.0440	0.0066
Partner is highly educated	-0.0003	0.0009	-0.31	0.756	-0.0021	0.0015
Partner is medium educated	0.0039	0.0056	0.70	0.482	-0.0070	0.0148
Nonwage income of the household	-0.0038	0.0043	-0.88	0.376	-0.0123	0.0046
Parenthood	0.0001	0.0005	0.12	0.908	-0.0009	0.0010
Child aged 6 or younger	-0.0060	0.0033	-1.83	0.068	-0.0124	0.0004
Household size	-0.0017	0.0037	-0.45	0.655	-0.0089	0.0056
Daily leisure time budget	-0.0035	0.0136	-0.26	0.797	-0.0301	0.0231
Residence in East Germany	-0.0304	0.0071	-4.28	0.000	-0.0443	-0.0165
Residence in West Germany	-0.0005	0.0009	-0.59	0.556	-0.0022	0.0012
Residence in South Germany	-0.0093	0.0043	-2.17	0.030	-0.0178	-0.0009
Parents' home characteristics						
Mother is highly educated	-0.0007	0.0009	-0.73	0.468	-0.0024	0.0011
Father is highly educated	-0.0003	0.0007	-0.44	0.663	-0.0017	0.0011
Mother employed	0.0001	0.0004	0.36	0.716	-0.0006	0.0009
Father employed	-0.0005	0.0008	-0.71	0.480	-0.0020	0.0009
Nationality/migration background						
Indirect migration background	0.0002	0.0006	0.35	0.725	-0.0010	0.0014
Direct migration background	-0.0012	0.0012	-0.95	0.341	-0.0036	0.0013
Composition of the evaluation effect (price effect)						
Employment biography						
Part-time employment	0.0389	0.0226	1.72	0.085	-0.0054	0.0832
Employment experience	-0.0729	0.0478	-1.53	0.127	-0.1665	0.0208
OLF experience	-0.0322	0.0140	-2.30	0.021	-0.0596	-0.0048
Unemployment experience	0.0190	0.0138	1.38	0.168	-0.0080	0.0461
Job change	0.0033	0.0082	0.40	0.687	-0.0128	0.0194
Required education	-0.0793	0.2014	-0.39	0.694	-0.4741	0.3155
Superfluous education	-0.0062	0.0273	-0.23	0.821	-0.0597	0.0474
Deficit education	-0.0074	0.0045	-1.63	0.103	-0.0163	0.0015
Job features						
Primary sector. energy. mining	0.0036	0.0022	1.62	0.105	-0.0008	0.0080
Construction	0.0080	0.0036	2.22	0.027	0.0009	0.0151
Trade	0.0031	0.0050	0.62	0.536	-0.0067	0.0130
Transport	0.0052	0.0031	1.68	0.094	-0.0009	0.0112
Banking and insurances	0.0061	0.0033	1.82	0.069	-0.0005	0.0126
Other services	0.0429	0.0514	0.83	0.404	-0.0579	0.1437
Civil servant	0.0003	0.0092	0.03	0.976	-0.0178	0.0184
Public sector	0.0710	0.0239	2.97	0.003	0.0242	0.1178
Medium-size enterprise	0.0033	0.0095	0.35	0.728	-0.0153	0.0219
Small enterprise	0.0178	0.0238	0.75	0.454	-0.0288	0.0643
Partner- and household context						

log_wage_h	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Married	-0.1130	0.0600	-1.88	0.060	-0.2306	0.0046
Cohabiting	-0.0120	0.0154	-0.78	0.436	-0.0422	0.0182
Partner's gross wage income	0.0361	0.0298	1.21	0.227	-0.0224	0.0945
Partner is highly educated	0.0262	0.0415	0.63	0.528	-0.0552	0.1077
Partner is highly educated	0.0000	0.0232	0.00	1.000	-0.0455	0.0455
Nonwage income of the household	-0.0283	0.0104	-2.73	0.006	-0.0486	-0.0080
Parenthood	0.0153	0.0391	0.39	0.696	-0.0613	0.0919
Child aged 6 or younger	-0.0013	0.0086	-0.15	0.880	-0.0182	0.0156
Household size	0.0474	0.0555	0.85	0.393	-0.0613	0.1561
Daily leisure time budget	-0.3299	0.0839	-3.93	0.000	-0.4943	-0.1655
Residence in East Germany	0.0287	0.0224	1.28	0.199	-0.0151	0.0726
Residence in West Germany	0.0072	0.0135	0.54	0.592	-0.0192	0.0336
Residence in South Germany	0.0041	0.0154	0.27	0.789	-0.0261	0.0344
Parents' home characteristics						
Mother is highly educated	-0.0086	0.0090	-0.97	0.334	-0.0262	0.0089
Father is highly educated	0.0143	0.0133	1.07	0.283	-0.0118	0.0405
Mother employed	-0.0229	0.0135	-1.70	0.089	-0.0493	0.0035
Father employed	-0.0369	0.0544	-0.68	0.497	-0.1435	0.0697
Nationality/migration background						
Indirect migration background	0.0044	0.0032	1.39	0.166	-0.0018	0.0106
Direct migration background	-0.0029	0.0051	-0.57	0.569	-0.0130	0.0072
constant	0.2279	0.2612	0.87	0.383	-0.2841	0.7398

Sources: SOEP 1984-2010, calculations HWWI.

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Hamburg Institute of International Economics (HWWI)

Heimhuder Str. 71 | 20148 Hamburg | Germany
Phone: +49 (0)40 34 05 76 - 0 | Fax: +49 (0)40 34 05 76 - 776
info@hwwi.org | www.hwwi.org