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The gender lifetime earnings gap: Exploring gendered pay from the life course perspective

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The gender lifetime earnings gap – exploring gendered pay from the life course perspective

Christina Boll, Malte Jahn, Andreas Lagemann

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Content

List of Figures

List of Tables

Abstract

Research on the gender earnings divide so far mostly focuses on the gender gap in hourly wages which, due to its snapshot nature, is inappropriate to capture the biographical dimension of gendered pay. With the 'gender lifetime earnings gap' (GLEG), we introduce a new measure that meets this requirement. Based on a group of 93,511 German individuals born 1950-64 from the 'Sample of Integrated Labour Market Biographies' (SIAB 7510), we find that at the end of the employment career, women accumulated 49.8 % less earnings than men. Thus, the GLEG is more than twice as high as the current German gender pay gap. The GLEG is the largest (smallest) at the bottom (top) of the earnings distribution. It most prominently widens during the period of family formation (age 25-35). Relatedly, gender differences in endowments, mainly in terms of experience and hours, answer for three quarters of the GLEG. For younger cohorts, family breaks tend to lose importance whereas the role of work hours remains unchanged. Furthermore, the GLEG notably differs between occupational segments.

Key Words: lifetime earnings, Blinder & Oaxaca decomposition, occupational segments, cohort analysis, gender, life course, wage distribution, wage gap

JEL Codes: D31; J31; J16

1 Introduction

During the past decades, increasing education and labour force participation rates of women have boosted female earnings and have led to a convergence of genders' employment patterns and earnings (O'Neill & Polachek 1993, Blau & Kahn forthcoming). Similarly, the composition of the gap is subject to changes over time. Gender differences in characteristics related to human capital have been continuously decreasing (Goldin 2014, Blau & Kahn forthcoming) whereas the occupational and sectoral segregation of genders (Blau & Kahn forthcoming) as well as working time remains important. As Goldin (2014) points out, firms could penalize employees for deviating from the full-time-full-year (FTFY) standard employment pattern, to pass on firms' costs of time-flexibility to their employees. Since women bear the lion's share of household tasks, they are in generally more in need for flexible work hours. Gender differences in employment experience, occupational position and hours answer for 5.6, 3.4 and 3.8 percentage points of the German gender pay gap, respectively (Boll & Leppin 2015), pointing at the biographical dimension of gendered pay (Boll 2015). However, due to its snapshot nature, the gender pay gap is inappropriate to monitor the evolution of the gender earnings gap over the life course. Age-specific cross-sections based on the Structure of Earnings Survey (SES) show for Germany, that whereas women and men achieve similar average wages until age 30, the gap widens thereafter during the period of family formation and does not close until retirement, despite a modest recovery of female wages in the post-children period (Federal Statistical Office, 2013). However, the cross-sectional perspective does not allow us to disentangle age effects from cohort effects. To gain more insight into the biographical dimension of gendered earnings, it is necessary to focus on the earnings stream of single cohorts over the life course and their aggregate, lifetime earnings.

Lifetime earnings are an important object of economic analysis since they are closely related to individuals' lifetime resources and welfare. However, few studies so far focus on lifetime earnings in explaining gendered pay inequality. In some of them (e.g. Jacobsen et al. 2015; Joshi & Davies 2002), a synthetic specification is used. For example, Jacobsen et al. (2015) show with data from the US Census Annual Demographic Files for 1964-2013 a notable gender convergence in employment patterns and earnings, with a slower downturn of the gender earnings gap in the 80s. The findings based on lifetime earnings are broadly similar to the trends in wage gaps in that period (Blau & Kahn 2006). Bönke et al. (2015) use a lifetime earnings approach to explore intragenerational inequality in lifetime earnings. Based on German social security records, their analyses show that West German male cohorts born in the early 1960s are likely to experience

about 85 % more lifetime earnings inequality than their father generations did. However, this analysis mainly focuses on men's earnings.

To our knowledge, our study is the first one to present lifetime earnings for women and men based on individual employment histories that cover 30 years at minimum and, on that basis, to calculate and decompose a gender gap in aggregate lifetime earnings. With the 'gender lifetime earnings gap' (GLEG), we introduce a new measure of gender earnings inequality that focuses on the life course perspective. With respect to the magnitude of the gap, we distinguish between the overall mean and 5% quantiles over the earnings distribution. Moreover, we calculate the mean gap for 21 occupational segments. Regarding the magnitude and composition of the mean gap, we further differentiate between cohort groups to capture the changing importance of the main drivers of the gap across generations. For our analyses, we use the information from 93,511 German individuals of the Sample of Integrated Labour Market Biographies ("Stichprobe der Integrierten Arbeitsmarktbiografien, SIAB 7510") for the years 1975-2010, focusing on the cohort group 1950-64.

We find that at the end of the employment path, the GLEG of people born between 1950 and 1964 is more than twice as high as the current German gender pay gap (21%), assigning women 49.8 % less aggregate earnings than men. Numbers are remarkably similar to cohort-specific gender pension gaps (Grabka et al. 2017). The GLEG is the largest at the bottom of the earnings distribution and the smallest at the top. From a biographical perspective, the gap most prominently widens during the period of family formation from age 25 to age 35. Relatedly, three quarters of the gap can be explained with different endowments of women and men, mainly with respect to experience and hours. Whereas endowments work to the advantage of women at the beginning of the career, the picture reverses during family formation. On the contrary, the unexplained gap is to women's disadvantage throughout the career. In the cohort comparison, our results point to a slightly decreasing importance of family breaks for the gender earnings divide in younger generations whereas the role of work hours remains unchanged. Moreover, the GLEG notably differs between occupational segments.

The outline of the paper is as follows. Section 2 presents the methodology, Section 3 the data, variables and descriptive statistics. Section 4 discusses the results, and Section 5 completes with a discussion of possible implications and open questions.

2 Methodology

The calculation of the gender lifetime earnings gap (GLEG) is closely related to the conventional gender pay gap analysis as applied by the German Federal Statistical Office. Both concepts are based on cross-sectional data, that is, disregarding the

unobserved heterogeneity of individuals. Wage analyses rely on gross earnings which are deemed to reflect human capital returns. According to the GLEG concept, lifetime earnings are defined as the sum of deflated daily earnings without interest over at least 30 years of the individual's employment biography, referring to the time of the last observation.[1] Consequently, the GLEG is defined as the percentage share of the gender lifetime earnings differential on male earnings. Unless specified otherwise, the GLEG relates to the mean unadjusted gender earnings gap, analogous to the mean unadjusted gender wage gap.

The econometric design of this study follows the conventional steps in analyzing the gender pay gap: In a first step, we carry out OLS lifetime earnings regression based on the described cross-sectional data set. In a second step, we decompose the identified unadjusted pay gap in its single components. The Mincerian wage equation is specified as follows:

$$\ln LE = \beta_0 + \sum_j \beta_j x_j, \tag{1}$$

with LE being the cumulated earnings of an individual, β_j being parameters and x_j being explanatory variables.

For the calculation of the GLEG, we refer to the methodology used by the German Federal Statistical Office (Federal Statistical Office 2006, p. 5) for the calculation of the gender pay gap. That is, the gender lifetime earnings gap is calculated as the deflated aggregate earnings differential between women and men, related to those of men:

$$\mathrm{GLEG}_{\mathrm{unadjusted}} = \frac{\overline{\mathrm{LE}}_{\mathrm{M}} - \overline{\mathrm{LE}}_{\mathrm{F}}}{\overline{\mathrm{LE}}_{\mathrm{M}}} \cdot 100, \tag{2}$$

where $\overline{\mathrm{LE}}_{\mathrm{M}}$ depicts the average lifetime earnings of men and $\overline{\mathrm{LE}}_{\mathrm{F}}$ those of women.

We also calculate the median gap, in addition to the mean. Furthermore, we run quantile regressions to calculate the mean gender gap at different quantiles of the earnings distribution. Supplementing the aggregate gap at the end of the career, we also calculate the mean GLEG at different ages to track its development over different stages of life. The age-specific gap relates to the percentage difference in aggregate earnings between genders at the respective age.

Equivalent to the adjusted gender pay gap, the adjusted GLEG refers to the remaining gap in lifetime earnings between women and men when individuals with similar

[1] The 30-years-time frame is set due to data restrictions and serves as an approximation of lifetime earnings. See more details on average employment duration in the sample description below. Furthermore, the 30-years-span serves as a lower bound which individual careers are allowed to extend (but not to fall short of). The calculation takes account of this heterogeneity by controlling for years in employment and years of non-employment separately.

observable characteristics are compared. By contrast, the part of the gap that has to be attributed to different endowments in earnings-relevant characteristics is referred to as the explained lifetime earnings gap or simply the endowment effect. Explained and unexplained part sum up to the measured overall (unadjusted) gap.

Please also note that this statistically "explained" part of the gap may contain discriminatory practices as far as opportunities to work in jobs with these wage-relevant attributes differ between genders. Moreover, the adjusted earnings gap must not be equated with discrimination (Boll & Leppin 2015, Federal Statistical Office 2006, p. 10). The adjusted wage gap consists of the wage regression constants and the evaluation effects. The latter measure the part of the gap that may be attributed to different remunerations of women and men for the same characteristic. The constant as a 'blind spot' comprises of the earnings differential that can neither be explained by gender differences in endowments nor by remunerations for these endowments. Although a linkage to discrimination is most intuitive here, one has to bear in mind that the unadjusted gap might be due to (gender differences in) pay-relevant unobserved variables.

To decompose the unadjusted gap in its explained and unexplained part, we refer to the seminal work of Oaxaca (1973) and Blinder (1973). The decomposition equation notifies as follows (cf. Federal Statistical Office 2006):

$$\overline{\ln \mathrm{LE}_M} - \overline{\ln \mathrm{LE}_F} = (\beta_0^M - \beta_0^F) + \sum_j \bar{x}_j^F \left(\beta_j^M - \beta_j^F\right) + \sum_j \beta_j^M (\bar{x}_j^M - \bar{x}_j^F), \quad (3)$$

where $\overline{\ln \mathrm{LE}_M}$ and $\overline{\ln \mathrm{LE}_F}$ depict average log lifetime earnings of men and women, respectively. The first two terms on the right hand side of the equation refer to gender differences in remunerations. The first term captures the pure gender effect as the difference between the constant terms arising from the male and female wage regression. The second term depicts the sum of weighted gender differences in evaluations, for all further characteristics beyond gender, whereby women's endowments serve as weighting factors. The last term on the right hand side refers to the aggregate endowment effect. It contains the gender differences in observable characteristics evaluated with men's rewards.[2] It depicts the hypothetical wage gain of women if they had men's characteristics.

[2] This notion describes a post-discriminatory market as Blau & Kahn (forthcoming: 6) point out. Building on the assumption that females' characteristics are remunerated like males', this adjustment of the overall gap relegates the remaining gender gap to gendered rewards.

3 Data

3.1 Sample

From a theoretical point of view, a lower training engagement of women compared to men seems plausible

Basis of our analyses is the Sample of Integrated Labour Market Biographies ("Stichprobe der Integrierten Arbeitsmarktbiografien (SIAB) 1975-2010") version v1.[3] The SIAB is a 2 percent random sample drawn from the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB), comprising employment careers of 1,639,325 individuals from 1975 to 2010. The information comes from various sources, the Employee History ('Beschäftigten-Historik – BeH') being the most relevant for our purposes. The information refers exclusively to employees who are subject to statutory welfare contributions. Because employers are required by law to report the exact beginning and the end of any employment relationship that is subject to social security contributions, and due to the fact that misreporting of earnings is punishable by law, the SIAB is a very reliable source of employment information in Germany (Nedelkoska et al. 2013).

The sample contains individuals of the cohorts 1950 to 1964 that are observed in the context of employment, the receipt of payments or employment search. Due to the observation period of the data spanning from 1975 to 2010, no one can be observed for longer than 35 years. Hence, a longer observation period comes at the cost of lower numbers of observation and vice versa. We restrict the sample to individuals with a career of 30 years at minimum. As the AVID ('Altersvorsorge in Deutschland') study shows that cohorts 1942-1961 exhibit an average employment duration of 30.2 years for women and 39.8 years for men (BMFSFJ 2011), our standard perfectly meets women's careers while it is below the one of men. We exclude people participating in apprenticeships or training as well as those persons who were employed before the starting point of our data, 1st of January 1975, to ensure that we observe careers from their very beginning. For labour market entry, we pose a minimum age of 15 and the following maximum ages (depending on a person's attained education), age 30 (people with tertiary education), age 24 (people with completed vocational training and high school graduation – Abitur), age 21 (people without Abitur and completed vocational

[3] In more detail, we used the de facto anonymized version of the data. Only information with less than 20 observations (individuals and/or plants) will not be reported (Hochfellner et al. 2012). The data was accessed via a guest stay at the research data center of the Federal Employment Office at the Institute of Employment Research (FDZ) and controlled remote data processing afterwards. For a detailed data documentation, cf. vom Berge et al. (2013).

training and for those with Abitur but without vocational training), and age 18 (persons lacking both of the latter named qualifications).

After implementing the mentioned restrictions, we end up with a sample comprising 93,511 individuals. Individuals born around 1960 dominate the sample. Women (49%) and men (51 %) are almost evenly distributed. The share of individuals with foreign nationality is fairly low (3.1 % of men and 1.8 % of women have a non-German nationality) in the aggregate sample and a little higher among males. Due to the requirement of a 30-years-observation period, individuals who grew up in the Eastern part of Germany were excluded. Thus, our sample comprises for its major part of West Germans.[4]

3.2 Variables

Regarding the covariates used in the wage regressions and wage decomposition analyses we employ the standard individual and work place related variables that are used in gender pay gap analyses (cf. Boll & Leppin 2015, Federal Statistical Office 2006). Part of them are used in their original format (cf. vom Berge et al. 2013 for more details) while others were generated for the study's purposes. As the dependent variable focuses on the life course, we specify all time-variant covariates by their duration in years. To this end, we use the employment status information given on a daily basis in the spell-formatted raw data and transform days into years.

Lifetime earnings are based on gross daily earnings including fringe benefits. This information is provided in the BeH file of our data. The daily wage is calculated by the data provider from the fixed-period wages reported by the employer and the duration of the (unsplit) original notification period in calendar days. The daily wage is shown in euros. Earnings exceeding the upper earnings limit for statutory pension insurance are only reported up to this limit. To correct the right censored earnings at this threshold, we use the imputation method introduced by Gartner (2005).[5] In more detail, we predict (uncensored) earnings beyond the upper ceiling by using parameter results for age, occupation, sector and other characteristics from a Tobit earnings estimation based on a sample of individuals whose earnings are located below but close to the ceiling. We specify the earnings equation as a Tobit model based on the assumption that earnings follow a logarithmic normal distribution. We aggregate daily earnings on a monthly and finally yearly basis. Annual earnings are further aggregated to age-specific total earnings (for the analysis of age-specific gender earnings gaps) and to lifetime earnings (for the analysis of the GLEG), respectively. As noted earlier, lifetime earnings refer to the

[4] By moving to the new 'Bundeslaender' later in life, some people became part of the sample.

[5] We thereby account for different earnings ceilings between years and within years between German regions.

accumulated earnings of an individual at the time of his or her last observation in the data.

As individual characteristics we use gender, year of birth, nationality, education, occupation, and employment status. Year of birth ranges from 1950 to 1967, with 1959 as a reference. Due to rather low numbers of individuals with foreign nationality in our sample, we generate a binary, time-constant variable that simply differentiates between individuals with German nationality throughout their (observed) career and other individuals (individuals with at least one observation of a non-German nationality). Regarding workplace related information, we differentiate between 9 area types according to settlement structure, referring to Federal Institute for Research on Building, Urban Affairs and Spatial Development for the year 2009 (BBSR 2011).[6]

We further control for sector affiliation, firm size, and occupation. Sector affiliation depicts the employment experience in a specific sector in years, referring to the German Classification of Economic Activities 1993 (completed by extrapolations and imputations, cf. vom Berge et al. 2013). To reach a sufficient number of observations, we use sectoral information on the two-digit level, meaning that we come up with 31 sectors ('Unterabschnitte'), with "wholesale and retail trade, maintenance and repair of motor vehicles" as reference. The variable firm size distinguishes between very small enterprises (up to 9 employees), small enterprises (10 to 49 employees), medium size enterprises (50 to 249 employees) and larger enterprises as a reference.

The occupational information available in the data refers to the occupation performed on the current job which may differ from the original occupation. Occupations are classified according to the 'Klassifizierung der Berufe 1988' ('KldB 88'), consisting of 330 categories. To increase the sample size by occupations, we follow Matthes et al. (2008) who aggregated 3-digit-occupational groups based on the KldB 88 to 21 occupational segments ('Berufssegmente'; see Stops 2011, Annex Table 5, for the detailed assignment of groups to segments). The segments contain vocationally similar occupations whereby similarity is empirically validated by occupational performance and recruitment alternatives drawn from the 'Zentrale Berufedatei' of the Federal Employment Agency (Matthes et al. 2008). As we expect that similar occupations generate similar earnings, the employed notification of segments is very valuable for our occupation-specific earnings analyses from the life course perspective.

Concerning formal education, we resort to the most robust information as given in the BeH file. We distinguish between five levels, (1) no completed vocational training,

[6] Specifically, there are three types of areas (agglomeration, urbanized and rural areas). Within agglomeration areas, central cities (>100.000 inhabitants) are distinguished from highly agglomerated counties (population density>300 inhabitants/km2), agglomerated counties (population density>150 inhabitants/km2) and rural counties (population density<150 inhabitants/km2). Within urbanized areas, central cities and agglomerated counties of the same type as in agglomeration areas apply. In rural areas, rural counties with a population density >100 inhabitants/km2 are distinguished from those with a population density <100 inhabitants/km2.

vocational training (2) without high school degree (as reference) or (3) with high school degree, a degree from (4) university of applied sciences, or (5) a university. To address remaining missing and inconsistent information, we use the recoding and imputation scheme by Fitzenberger et al. (2006). Since employer changes often relate to a change in earnings (e.g. for displaced workers, see Nedelkoska et al. 2013), we control for the number of establishment changes in the individual biography. This information was drawn from changes in the establishment identification number.

Years of employment are crucial for our analysis. Therefore, we employ a fine-grained analysis of the individual employment biography. Regarding years of employment, we differentiate between (years of) part-time and full-time work and use the latter as a reference in our analyses. A person works part-time when his or her individual contractual work hours are below the usual weekly work hours in the firm (cf. vom Berge et al. 2013, p. 43). Note that usual work hours vary between firms. In more detail, we distinguish between small-scale part-time (1-17 weekly work hours) and large-scale part-time (18 hours or more but less than the firm-specific full-time work).[7] Observations of part-time retirement that are drawn from the occupational position variable are classified as low- or large-scale part-time work, depending on weekly hours.

Non-employment refers to either registered unemployment, (observed) out-of the labour force (OLF) spells, or unobserved employment breaks. As the data relates to employers' documentation for social security purposes, OLF spells refer to time spells where the employment contract is maintained but the employee receives zero wages (e.g. sick leave paid by statutory health insurances).

'Blind spells' are periods in the individual career that lack any individual status information. They are far more frequent and of a longer average duration than OLF spells. Only 3 % (5 %) of women (men) show no 'blind spell' in their career. Roughly one quarter of females' and males' 'blind spells' cover a full year. When the break is not preceded and succeeded by an employment spell, that is, the beginning and end of the break are not observed in the data, the person is excluded from the sample. 'Blind spells' may have multiple reasons, e. g. family-related breaks, spells of self-employment or breaks related to further education and training. In general, we assume that during that time, there is no employment relationship in place that is fully subject to social insurance (cf. Ejrnæs/Kunze 2006). We argue that human capital depreciates during any labour market absence, disregarding its specific motivation, as shown by rich empirical evidence based on German data that confirms notable earnings losses due to

[7] For the differentiation between small/large part-time and full-time, we use the occupational position variable („Stellung im Beruf") that is available in the data. The 18 hours-boundary was introduced in 1988. From 1975 to 1978, the threshold for small-scale part-time was 20 hours and from 1979 to 1987 it was 15 hours. It cannot be ruled out that the recoding procedures has biased gendered part-time "endowments" and relatedly, gendered earnings. As weekly work hours are not observable, the extent of such a potential bias may not be assessed.

employment breaks (Beblo & Wolf 2002, Kunze & Ejrnæs 2004, Gangl & Ziefle 2009, Boll 2011). Since women work part-time and interrupt their careers more often than men, a pattern that notably contributes to the German gender pay gap (Boll et al. 2015; Boll & Leppin 2015), focusing solely on OLF spells when measuring employment breaks would most likely underestimate the true dimension of female (and male) labour market withdrawal and the related earnings gaps.

Until 1st April 1999, employers in principle only reported the earnings which were subject to social security contributions. Earnings below the marginal part-time income threshold were not reported (cf. vom Berge et al. 2013, p. 41). For this reason, we do not exploit information on marginal employment in this study. For the sake of consistency, marginal employment information from 1st April 1999 onwards is recoded as 'blind spell' information, as it was the case for the period before.[8]

The gendered pattern of vertical segregation is a relevant factor in explaining gendered earnings (Bettio & Verashchagina 2009). According to own analyses based on German microdata, occupational position accounts for 3.4 percentage points of the German gender wage gap (Boll & Leppin 2015). Unfortunately in the SIAB, information on an individual's hierarchical position is only available for full-time workers as part-time work is categorized as one of the occupational positions. This makes it impossible to trace vertical segregation and their earnings consequences for part-time workers.

3.3 Descriptive Statistics

Descriptive sample statistics which are fully reported in **Table A1** in the Annex show that men earn over their career on average 899.028 euros, whereas women's lifetime earnings amount to 459.904 euros. With 23.7 years on average, men exhibit more years of employment than women do (18.6 years). Whereas women have been working 4.6 (0.9) years in large (low) scale part-time jobs at the end of their career, men lack significant observations in reduced work hours. Whereas observed OLF spans are unsurprisingly short for both genders covering a few months only, with 10.5 years women's non-observed breaks ('blind spells') are more than twice as high as men's (4.8 years). By contrast, men spend more time in registered unemployment than women (2.3 vs. 1.8 years). Men are also more qualified on average, materializing in both a higher share of employees with tertiary education (8.9 % vs. 5.3 %) and a lower share of the low-skilled (4.0 % vs. 6.7 %) among men than among women.

Regarding occupations, we observe the traditional gender segregation (for the top ten female professions in our sample, see Annex **Figure A1**). Women make up for 48.5% of

[8] Deleting spells of marginal employment would have caused a large drop in the observation numbers, disproportionately affecting women.

all employees in our sample. Relying on the main occupation concept that assigns every individual the occupation he or she performed for the longest time in his or her career, women's share is highest in medical occupations[9] with 90,1 %, followed by social and care occupations[10] (82.3 %) and among white collar workers (72.5 %). Females hold the lowest share in wood occupations, constructing and among metal producers (8.5-9.9 %). In general, women are underrepresented in production occupations (e.g. wood occupations, constructing, security occupations, among metal producers and electricians) and overrepresented in person-related service occupations. Textile and leather professions mark two exceptions. The gendered segregation of occupations is by no means restricted to the cohorts under observation in our study but a persistent phenomenon. To date, women account for at least 70 % of employees in social, health, education, cleaning and nursing professions (Hausmann & Kleinert 2014). A similar pattern is observed for other European countries (Bettio & Verashchagina 2009) and the US (Hegewisch et al. 2010). The gendered occupational choice is particularly relevant for earnings from the life course perspective. Occupational change is deemed to be the less likely the more specific acquired qualifications are. For example, industrial occupations are known to be more qualification-specific than administrative and service occupations (Seibert 2007). Thus, depending on occupational mobility, we suggest that the occupational choice shapes the earnings pathway over the life course to a more or less extent.

Occupations are differently distributed across sectors (Warnken 1986). Relating to technological progress, some occupations that require highly specified skills are clustered in a few sectors only whereas others cover a broad range of sectors (Buchmann & Sacchi 1995). Furthermore, the flexibilization of working schemes has resulted in a higher occupational diversity at the workplace (Spöttl & Blings 2011: 19). In our sample, the majority of workers in an occupational segment is distributed across 2-3 main sectors. For example, employees in merchandise occupations concentrate in the trade sector and in the banking and insurance sector. Only a few occupations, amongst them teaching professions, are concentrated in one single sector with more than 50 % of employees. Furthermore, occupational rewards vary across sectors and within sectors by gender. Descriptive statistics show that particularly among white collar workers but also in merchandise occupations, the within-occupation gender pay gap differs markedly between sectors. On the other hand, for female teachers, a public administration sector affiliation relates to lower earnings than an education sector

[9] E.g. nurses, helpers in nursing, midwives, masseurs, healers, physiotherapists, laboratory assistants, and receptionists.

[10] E.g. social workers, social education workers, preschool teachers, directors of preschools, home directors, pastoral workers, care takers, helpers for cure of souls and cult.

affiliation. In our analyses of the GLEG, we therefore control for both occupational segments and sectors.

4 Results

4.1 Lifetime earnings regressions

As the coefficients of the OLS lifetime earnings regressions provide the basis for the calculation of the adjusted GLEG in the next chapter, we briefly sketch the most interesting findings. **Table A2** in the Annex reports the full results. For women, one year of employment (full-time or part-time) experience yields an earnings premium of 8.0 %. When this year relates to low (large)-scale part-time experience, the premium decreases by 3.6 (2.3) percentage points. For men, the overall experience premium is 6.6 % which diminishes by 5.3 (1.8) percentage points in the case of low (large)-scale part-time experience. That is, men achieve higher earnings penalties for part-time (compared to full-time) experience. In this context, it is important to note that the occupational position as the vertical dimension of occupational segregation is not directly measurable with the data at hand. As leadership positions are most frequently assumed in full-time jobs (Holst et al. 2015)[11], we suggest that the higher part-time penalties (that is, higher full-time premiums) of men relate to their higher positioning in the firm's hierarchy. A previous year of non-employment is associated with an earings penalty amounting to 2.8 % (2.1 %) for men (women). In case of registered unemployment, there is an extra penalty for both genders, being higher for men (2.8 %) than for women (1.2 %). As aforementioned, out-of-labour force (OLF) spells last a few months only and the job contract is maintained during that time whereas unobserved breaks are many times longer. This explains the lacking earnings penalty for OLF spells for both genders. A higher formal education is more highly rewarded for men than for women, compared to the benchmark education (completed vocational training). Moreover, a non-German nationality is negatively related to women's earnings but not to men's. Further, men and women differ in occupational and sector returns.

[11] In 2013, only 20 % of women and 2 % of men in leadership positions in the private sector report actual work hours below 35 hours per week.

4.2 Magnitude of the unadjusted gender lifetime earnings gap

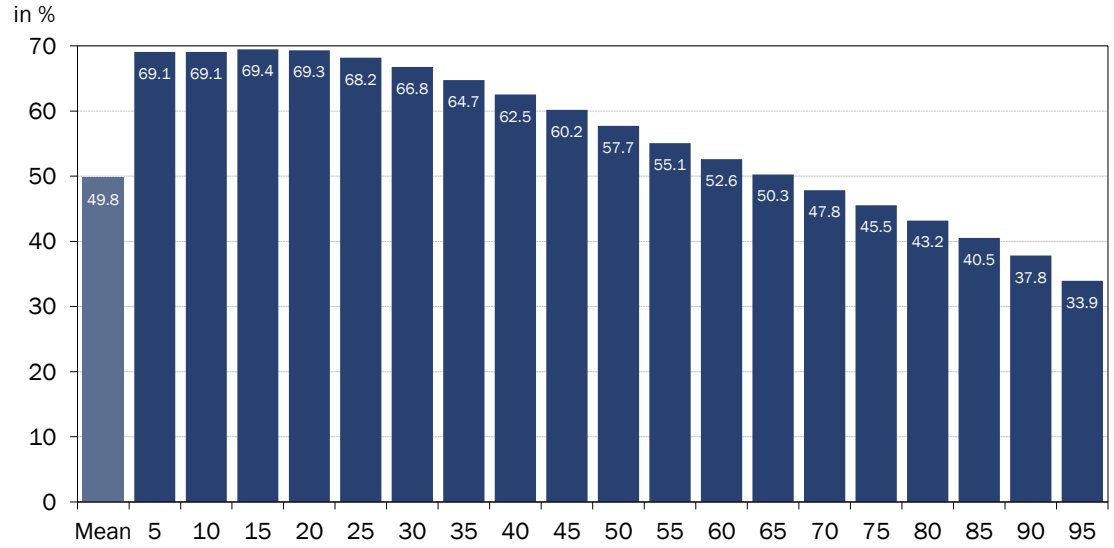
In this chapter, we present results on the calculated and decomposed mean gender lifetime earnings gap (GLEG).

First, **Figure 1** shows the distribution of the mean gap by earnings quantiles. The gap is calculated at the upper bound of the respective quantile. The bar "mean" marks the aggregate gap over the whole career. Note that, as indicated in Section 3, the end of the career is marked by the last available observation of the individual. Women earn on average 49.8 percent less income during their employment career than men do. Apparently, women do not manage to close that part from the gap resulting from family-related breaks and reduced work hours at older ages. This points to generally flatter earnings profiles of women compared to men which confirms previous findings by Aretz (2013, p. 26) based on the SIAB 1975-2008 for West Germany. He reports an overall lower earnings mobility of women throughout the observation period although a slight convergence process between genders can be ascertained.

However, the gender gap in lifetime earnings notably differs across the earnings distribution. As **Figure 1** shows, the gap decreases between the 20th and the 95th quantile.

Figure 1:

Unadjusted gender lifetime earnings gap, by 5% quantiles



Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

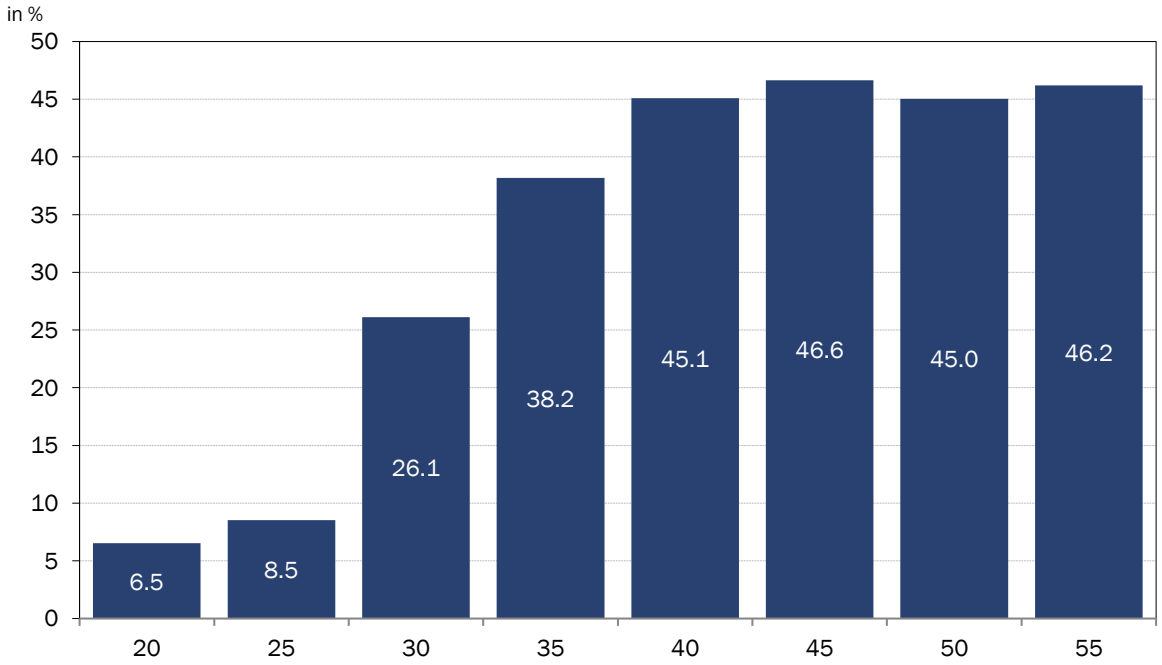
The median gap amounts to 57.7 %, exceeding the mean by roughly 8 percentage points. Contrary to results of quantile regressions for the gender pay gap which often come up with higher gaps at the upper end of the earnings distribution than in the

middle (Boll & Leppin 2015; OECD 2012 for Europe), our results do not confirm such a glass ceiling effect for the GLEG. For the underlying sample of people born between 1950 and 1964, it seems plausible that women and men at the top of the earnings distribution are more similar to each other in terms of occupational choice, employment path and lifetime earnings mobility when contrasted with their counterparts in lower earnings quantiles.

Figure 2 depicts the evolution of the mean gender earnings gap over the life course. Specifically, the gender difference in accumulated earnings upon the respective age is calculated, based on the age-specific cross-sections in the data. As indicated, the gap increases until age 45 and then somewhat stagnates. The earnings differential particularly widens between age 25 and 35, that is, in the period of family formation.[12]

Figure 2:

Mean unadjusted gender earnings gap, by age



Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Numbers resemble remarkably the composition of the gender pension gap by age. For West Germans of the cohort group 1946-55 (1956-65), the gender gap with respect to statutory pensions starts with 22 % (20 %) at age 25 and increases to roughly 50 % (45 %)

[12] Reported values for age 20 to 55 differ from the lifetime earnings gap of 49.8 % since the latter refers to accumulated earnings at the time of the last observation. Note that the age distribution reflects cross-sections of our sample at the corresponding age (referring to different cohorts each) and must not be confused with a life course analysis of a given cohort. Therefore, older (younger) generations are relatively more frequent in older (younger) age groups.

at age 55 (Grabka et al. 2017). Due to the strong connection between old-age pension entitlements and the individual employment career in the German statutory pension system, the similarity of results is not that astonishing at second sight, despite substantial differences in methodology and data. However, our GLEG approach goes one step further than the gender pension gap framework as we do not only measure the gender divide in outcomes at the end, but also trace its evolution over the life course.

Note that while the median gap (see **Figure A 2** in the Annex) is larger than the mean from age 30 to age 55, it is smaller than the mean gap at the ages 20-25. As promotions become more likely with increasing age, the above noted lower earnings difference among higher income groups might contribute to the lower mean gap compared to the median gap for people aged 30 and older.

Results so far focused on aggregated earnings gaps across occupations. A more detailed analysis of occupation-specific gender earnings gaps reveals notable differences both in the overall level and in the evolution of the gap over the life course. To this end, individuals were assigned a main occupation and sector, referring to the occupation/sector that the individual belonged to for the longest time in his or her career.

Table 1 depicts age-specific gender gaps in accumulated earnings by 21 occupational segments.[13] Note that in some segments, women earn more than men at the beginning of their career. This applies to white collar workers, social and care occupations, and medical occupations. At age 30, female physicians and women in social and care occupations have accumulated higher earnings than men. However, at age 35 the picture reverses, with men exhibiting higher accumulated earnings than women in all 21 occupational segments. At the age of 55, gender earnings gaps amount to 49-50% or more in the segments textile and leather production, merchandise occupations, miner/chemical occupations, storage/transport occupations, hotel/restaurant occupations, natural scientists, security occupations, and white collar workers. A comparatively low gap (26-36 %) is observed for the segments social and care occupations, medical occupations, among physicians, in teaching occupations, among artists and athletes, and in constructing. According to our findings, women's share on employees does not indicate a higher (or lower) gender earnings gap in the respective occupational segment. Referring to the gap at age 55, social and care occupations as well as medical occupations, which are characterized by high female shares on employees exhibit comparatively low earnings gaps (36 % and 31 %, respectively) whereas women in female-dominated hotel/restaurant occupations and merchandise occupations suffer fairly high gender earnings gaps (55 % and 61 %, respectively). On the other hand, security occupations and constructing, which are rather seldom performed by women, are characterized by a rather high (50 %) and low (26 %) gap, respectively.

[13] The respective table for the medium gap can be provided by the authors upon request.

Table 1:

Mean unadjusted gender earnings gap, by age and main occupation (in %)

Age	20	25	30	35	40	45	50	55
Total	6.5	8.5	26.1	38.2	45.1	46.6	45.0	46.2
„Green“ occupations	16.2	19.3	35.5	45.9	51.2	52.8	52.5	n/a
Miner/chemical occupations	11.3	25.6	37.4	44.7	47.6	48.6	44.3	48.7
Glass/ceramic/paper production	-18.4	16.9	36.5	45.4	49.3	51.0	52.8	n/a
Textile/leather production	-34.0	22.3	47.0	60.3	66.7	69.6	69.6	73.5
Metal producer	-9.1	20.8	37.3	46.9	51.6	53.7	51.8	n/a
Electricians	-91.5	-10.5	21.8	38.7	46.3	49.1	48.6	41.5
Wood occupations	-10.8	27.7	42.8	49.6	52.3	53.1	49.7	n/a
Constructing	37.3	11.9	19.3	27.3	31.0	30.8	31.0	26.0
Hotel/restaurant occupations	5.6	33.7	49.7	56.4	58.3	57.8	53.2	54.9
Storage/transport occupations	2.3	27.2	43.4	49.4	50.3	49.4	48.4	49.4
Merchandise occupations	-52.6	3.4	35.1	51.1	57.6	60.0	59.2	60.5
White collar worker	-76.9	-34.0	7.8	31.8	41.4	45.1	46.8	49.1
Security occupations	-1.1	26.2	43.4	53.2	56.6	56.6	52.7	49.6
Social/care occupations	-25.5	-58.0	-11.7	18.6	29.3	32.3	31.8	35.9
Medical occupations	-15.7	-35.6	3.8	26.2	36.0	39.1	38.8	31.3
Physicians	-44.7	-63.0	-2.3	19.7	31.6	34.0	32.4	33.3
Teaching professions	7.4	-9.1	0.8	22.7	30.3	31.1	29.5	33.6
Artists/Athletes	20.2	21.5	27.4	34.0	37.8	38.9	41.2	33.1
Natural scientists	4.0	-14.1	9.5	35.6	47.6	51.3	52.2	54.7
Humanists	-148.2	-38.8	4.1	27.4	35.3	37.2	36.0	43.5
Unskilled worker	22.0	40.8	53.6	59.3	60.8	61.0	51.8	n/a

n/a=not available. Due to low observation numbers for natural scientists, humanists and female workers in wood occupations, these occupational segments have to be interpreted with caution. Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

The discussed earnings gaps so far refer to the unadjusted gaps. Even in the case of occupation-specific earnings gaps, it is likely that women and men differ in further pay relevant characteristics beyond occupation, e.g. formal qualification, work experience, or work hours. In what follows, we address the role of gender differences in endowments and remunerations for the overall mean gender earnings gap. To this end, we step back to the aggregate level, averaging across occupations.

4.3 Decomposing the unadjusted gap into an explained and an unexplained part

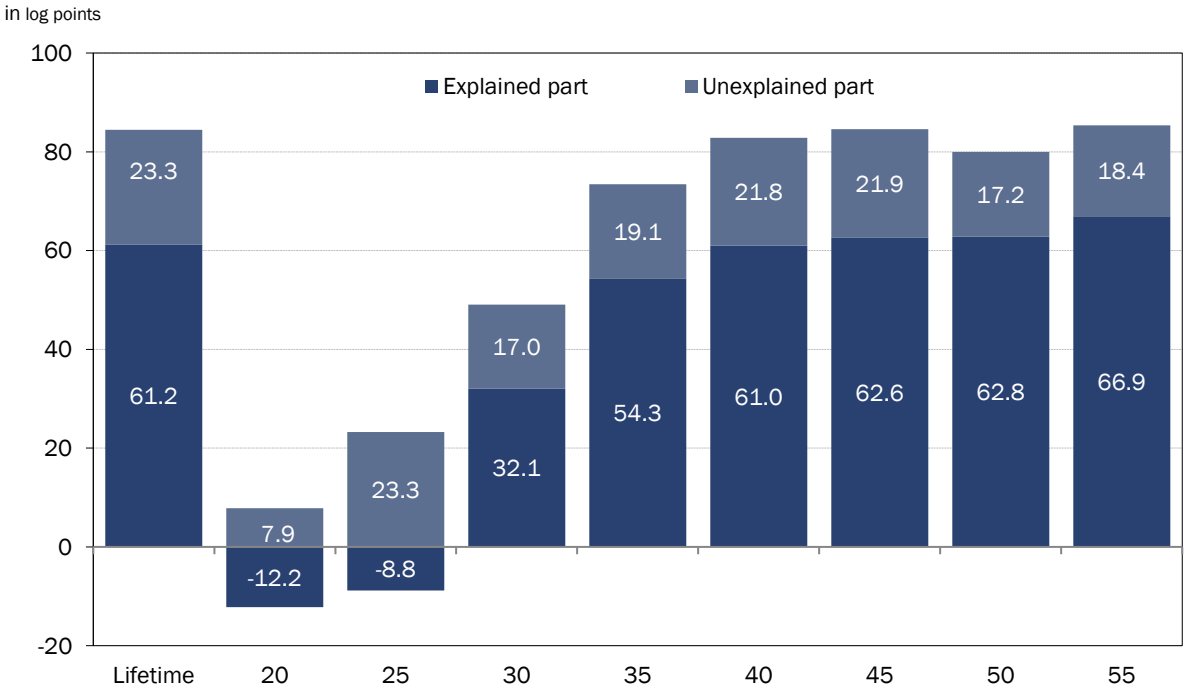
We first focus on the overall mean gap of 49.8 %. The approximation of relative differences (percentages) by log differences (as used in the decomposition) becomes

inaccurate for larger relative differences. For example, the mean gap of 49.8% is equivalent to 84.5 log points. We will use the concept of log points in the following. The so-called explained gap denotes the part of the overall gap that is due to different endowments of women and men in terms of individual and workplace related characteristics. The unexplained part of the gap (the so-called adjusted gap) comprises of (a) the remuneration effects, referring to different rewards for women and men for the same characteristic, and (b) a residuum (in technical terms, the 'constant') that remains completely unexplained (for more methodological details see Section 3). The log point-based analysis provides valuable insights regarding the relative importance of the explained and the unexplained part of the gap and the role of single factors driving the results. **Table A 3** in the Annex reports detailed decomposition results.

As **Figure 3** shows, almost three quarters (61.2 log points) of the overall gap may be explained with different endowments of women and men in earnings-relevant characteristics whereas roughly one quarter refers to the unexplained part (adjusted earnings gap, 23.3 log points).

Figure 3:

Decomposition of the mean unadjusted gender earnings gap, by age



Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Note that the adjusted gap is positive throughout the age distribution, that is, women accumulate fewer earnings than men do, even if one compares men and women with similar observed characteristics. By contrast, endowments are to the advantage of women at age 20 and 25. However, as the unexplained part of the gap outweighs the

explained one, women accumulate fewer earnings than men do even at age 20 and 25. Moreover, the endowment advantage reverses at age 30, where 32.1 out of 49.1 log points relate to less favorable characteristics of women compared to men. From now on, women accumulate fewer earnings than men do, due to both less advantageous endowments and a residuum that fails to be explained with the characteristics at hand. Note that the explained part of the gap significantly increases from age 25 to age 35, presumably related to diverging employment patterns of women and men in the course of family formation, as mentioned earlier. Note also that observation numbers for people aged 50 to 55 are far lower than for younger people in our sample. For example, there are 91,958 (39,432) observations from people aged 30 (50).

4.4 Decomposing the explained and the unexplained gap in its single factors

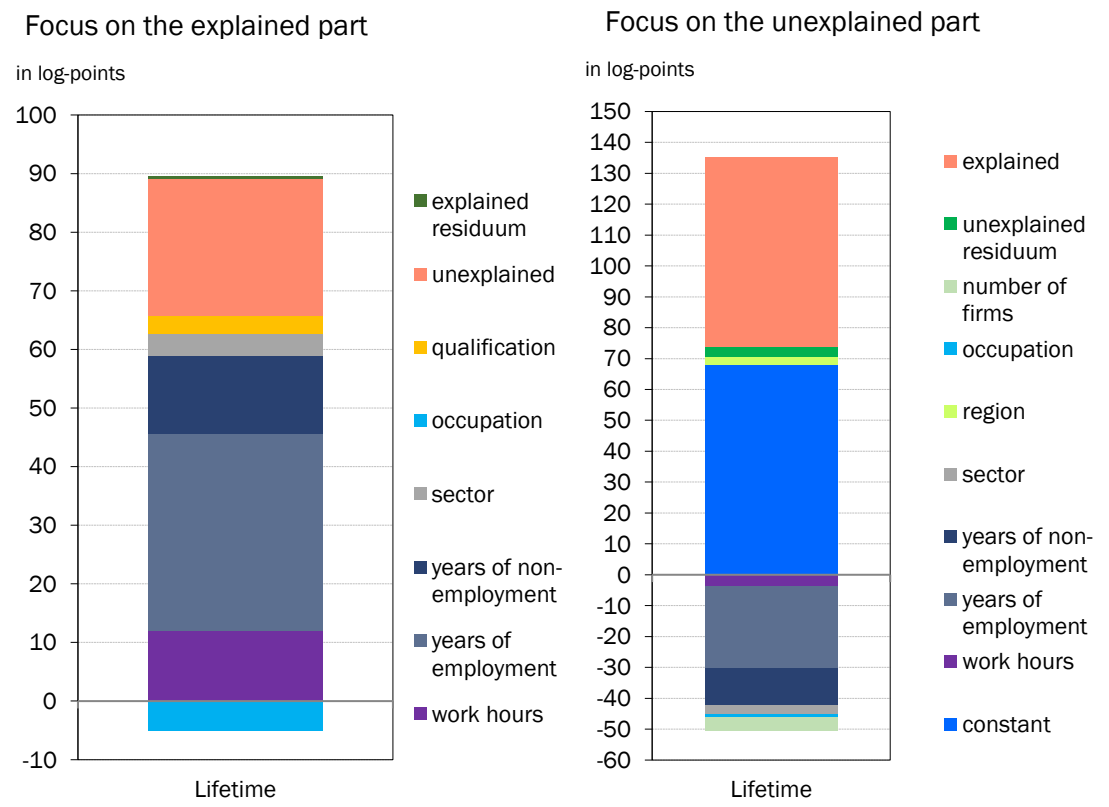
In what follows, we go one step further and analyze the role of single factors within the explained and unexplained part of the reported earnings gaps. We thereby partly aggregate single characteristics to groups, e.g. the 21 occupational segments to the group "occupation" and the 31 sector affiliations to the group "sector". Furthermore, unemployment spells, blind spells and OLF spells form the group "non-employment" whereas the group "work hours" comprises of low-scale and large-scale part-time (with full-time as a reference). The bar on the **left hand side of Figure 4** depicts the decomposition of the unadjusted gap with a focus on the distribution of the explained part, with the orange area marking the unexplained part. The bar on the **right hand side** of Figure 4 depicts the decomposition of the unadjusted gap, this time focusing on the distribution of the unexplained part, with the orange area marking the explained gap. The group contributions sum up to the 61.2 log points of the explained gap and the 23.3 log points of the unexplained gap, respectively, as noted above in Figure 3. Some minor factors are pooled to residuum-groups (cf. **Table A 3** in the Annex for the full decomposition results). In what follows, we discuss some interesting findings.

As the bar on the left hand side illustrates, the explained part of the gap is dominated by the different labour market participation of women and men. With 46.9 out of 61.2 log points, men's longer employment duration and shorter non-employment spells answer for three quarters of the overall gap.[14]

[14] Note that, although, as aforementioned, years of non-employment comprise of (registered) unemployment spells, spells out-of-the-labour force and ‚blind spells' without an observed work contract, the latter clearly dominate the group effect of non-employment spells.

Figure 4:

Decomposition of the mean gender lifetime earnings gap (84.5 log points) – with a focus on the explained part (61.2 log points) and the unexplained part (23.3 log points)



Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Sources: Sample of Integrated Labour Market Biographies - SIAB 7510 v1; HWWI.

Additionally, different work hours of women and men contribute with 12.0 log points to the overall earnings gap. That is, the fact that women have shorter employment spans, interrupt their careers more often and work shorter hours than men almost fully accounts for the explained part of the gap (58.9 out of 61.2 log points) and for roughly two thirds of the overall gap (58.9 out of 84.5 log points). Controlling for sector and qualification, which potentially correlate with occupation, the occupational distribution is associated with an earnings advantage of women. Women work more frequently in pay-attractive occupations than men, accounting for 5.0 log points of the overall earnings gap. In more detail, the comparatively lower number of women among metal producers, in constructing and in storage/transport occupations (that are moderately paid from the perspective of men, compared to the benchmark segment of merchandise occupations) constitutes an earnings advantage for women that mitigates the gender earnings gap.

On the other hand, women's higher presence in hotel/restaurant occupations, merchandise occupations, and social and care occupations with a similarly unfavorable earnings (from the perspective of men) magnifies the GLEG. Note that endowment differences between genders are weighted with men's rewards (cf. Section 3). The remaining factors are of minor relevance for the gap.

The sector distribution of women and men contributes with 3.6 log points to the GLEG. Analogous to occupations, the picture looks different at a second glance. For example, the comparatively higher number of women in the sectors "financial intermediation" and "other community, social and personal service activities" mitigate the gap since paid salaries are more attractive here (from men's perspective) than those paid in the benchmark sector ("wholesale and retail trade: repair of motor vehicles, motorcycles and personal and household goods"). Some other sectors, e.g. "public administration and defense; compulsory social security", do not yield significant results. For most of the remaining sectors, the gendered distribution is to the advantage of men, increasing the gender earnings gap since men are more prevalent than women are in these pay-attractive sectors. This particularly applies to "manufacture of machinery and equipment" and „manufacture of transport equipment". Furthermore, men in our sample exhibit a higher average education than women do, which contributes with 3.3 log points to the earnings gap.

The bar on the **right hand side of Figure 4** illustrates the relative importance of single factors to the *adjusted* gap. Here, the constant is the clearly dominant component with 68.1 log points. The diagram shows that most evaluation effects are to the advantage of women, acting as a counterbalance. All else being equal, women accumulate more earnings due to higher remunerations for these characteristics than men do. Note that the evaluation effects and the constant sum up to the adjusted earnings gap of 23.3 log points as indicated in **Figure** 3 above.

Regarding evaluation effects in more detail, women's lower earnings penalties for working part-time (compared to full-time) decreases the gap by 3.9 log points. Women's lower penalties for years of non-employment work in the same direction (-11.9 log points). Furthermore, women receive higher earnings premiums for years of employment (-26.4 log points). This could relate to women's, on average, shorter employment spans in combination with diminishing marginal returns to employment. In general, women also receive higher earnings premiums than men for the same occupations (-1.1 log points). Looking at occupations in more detail reveals notable differences between segments.[15] Finally, compared to men, women receive higher sector

[15] Note that the returns to occupations reflect relative remunerations compared to the benchmark segment of merchandise occupations. Therefore, gender differences in remunerations rely on different occupational rankings within genders with respect to pay attractiveness.

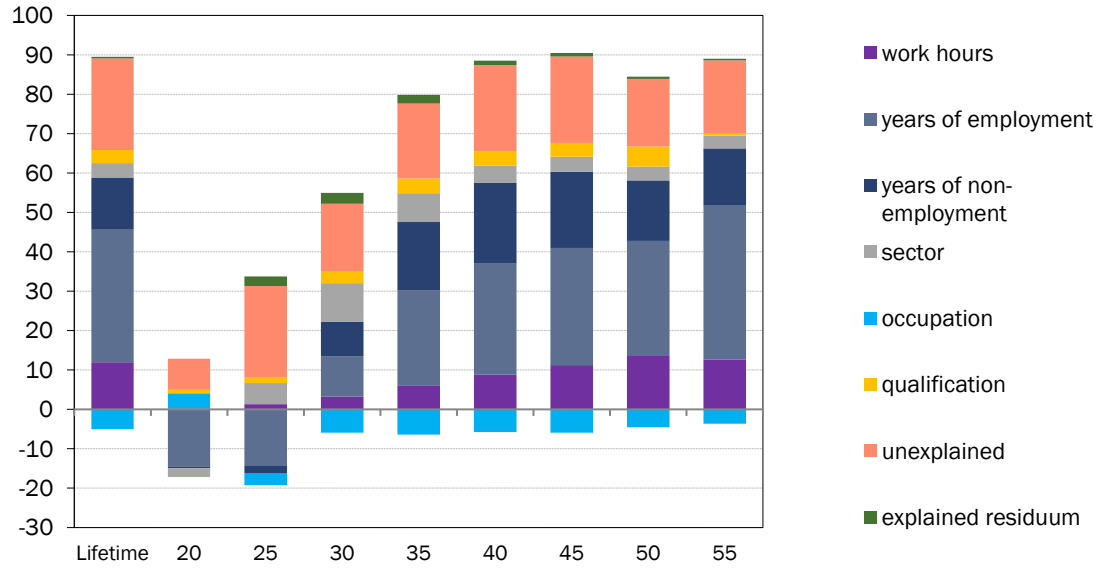
premiums (-2.9 log points) and higher earnings premiums for the number of employers that they have been working with during their career than men (-4.3 log points).

Next, we present results on the earnings gap decomposition by age (see **Figure 5**). These analyses show how the importance of single factors evolves over the life course. **Table A 4** in the Annex reports the full results.

Figure 5:

Decomposition of the explained part of the of the gender earnings gap, by age

in log points



Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Presumably due to men's military service spells in early years of the career, women exhibit a lower number of years of non-employment at age 25 which reduces the gender gap in accumulated earnings at age 25. The trend reverses at age 30 where years of non-employment account for 8.7 log points of the gender earnings gap, with an increasing importance of this factor until age 40 with 20.5 log points after which it starts to decrease again. Similarly, years of employment mitigate the earnings gap in the first stage of the career but, after reaching age 30, contribute to the gap, e.g. at age 55 with 39.1 log points. Throughout the life course, years of employment are the most important driver of the gender earnings gap. The impact of weekly work hours also exhibits a clear age pattern. Being of minor importance at employment entry, the higher frequency of part-time jobs among women contribute to the earnings gap at age 30 with 3.3 log points, further increasing over the life course and peaking at age 50 with 13.8 log points. This finding demonstrates that part-time careers of (West) German women are highly path-dependent. In Germany, 58.3 % of working women with a youngest child at teen age (12+) holds a part-time job, whereas the EU-28 average is 32.1 % (Eurostat 2015). The

sectoral distribution of women and men adds to the pay gap at any age, the same applies to the qualification structure. The occupational composition of genders decreases the earnings gap at every age.

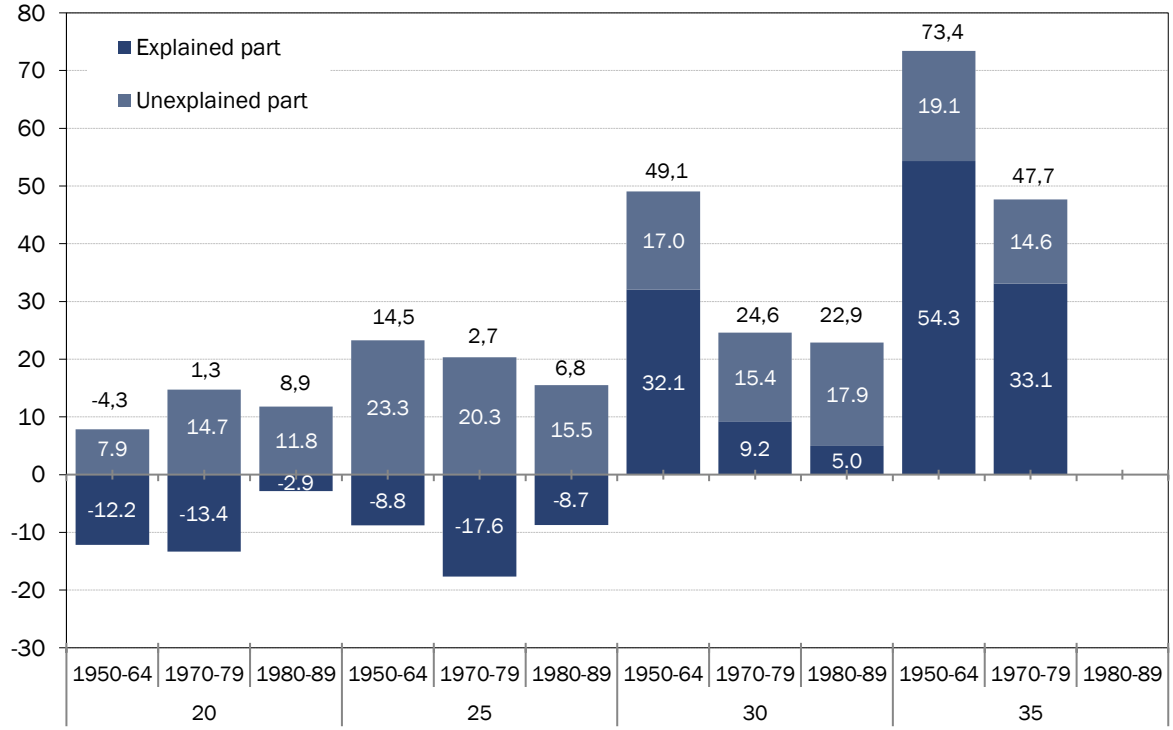
4.5 Comparing the Gender Earnings Gap across cohorts

Up to now, our results referred to the cohorts 1950-64. As employment and qualifications patterns of younger generations differ from older ones, particularly with respect to females, we extend our analyses to cohorts 1970-1979 and 1980-89. However, since the data covers the period 1975-2010 only, cohorts 1980-89 (1970-79) are observable until age 30 (40) the longest. Therefore, in what follows we focus on age 25, 30 and 35 when analyzing the drivers of the gender earnings gap by age. As **Figure 6** illustrates, the gap composition by age in younger cohorts resembles that of older ones, with an increasing unadjusted earnings gap with age.

Figure 6:

Decomposition of the mean unadjusted gender earnings gap in an explained and an unexplained part, by cohorts and age

in log-points



Persons of cohorts 1980-89 are not observed at age 35. Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

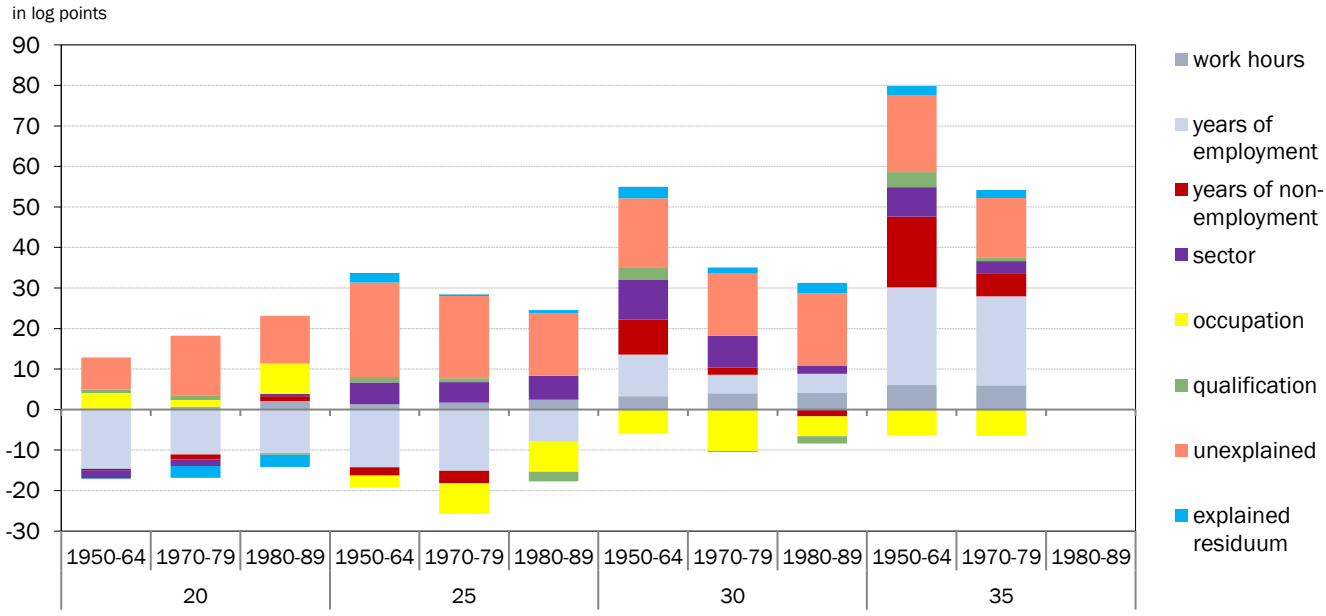
Note that also in younger cohorts, endowments work to the advantage of women at the very beginning of their career, turning to disadvantages around age 30, whereas the

unexplained residuum (adjusted earnings gap) is to women's disadvantage at any age. In this respect, the results for younger cohorts fully replicate those of cohort 1950-64. However, the age pattern shows up on an overall lower level of the gap. For example, cohorts 1970-79 exhibit an earnings gap of 47.7 log points at age 35, compared to a gap of 73.4 log points in the cohort 1950-64 at the same age. As the diagram further shows, the smaller overall gap is driven by a smaller explained part of the gap, that is, gender differences in earnings-relevant endowments are smaller in younger generations. This meets our expectations.

Further interesting insights can be derived from decomposing the explained part of the gap into its single factors (see **Figure** 7 and **Table A 5** in the Annex). Although years of employment lose their advantageous effect from the women's perspective at age 30 in all three cohort groups, years of employment and years of non-employment play an overall less important role in younger cohorts.

Figure 7:

Decomposition of the mean gender earnings gap in its single factors with a focus on the explained gap, by cohorts and age



Persons of cohorts 1980-89 are not observed at age 35. Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

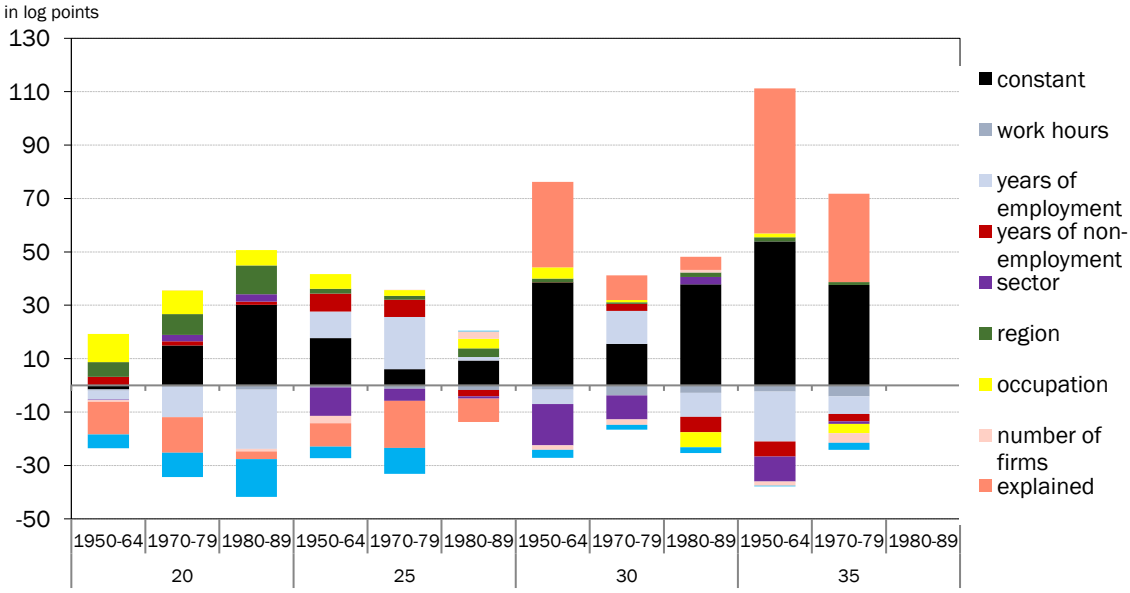
By contrast, women's higher part-time frequency (factor "work hours") are to the detriment of women at any age, with an increasing importance with age. Contrary to the effect of employment breaks, part-time does not lose importance in younger cohorts. This points to a modified employment pattern of younger women in the course of childbirth, characterized by fewer and shorter employment breaks. The mitigating effect of the occupational segregation by gender holds for all cohort groups. The changing role of formal qualifications is interesting. Whereas women of the cohort group 1950-64

exhibit a lower average qualification than men, educational differences in cohorts 1970-79 are less pronounced and turn to women's advantage in the cohort group 1980-89, mitigating the gender earnings gap. The effect of sector distribution among genders seems to lose importance in younger cohorts. This finding might be related to the diminished role of industry-level collective agreements for the wage setting process in Germany. From 1996 to 2010, the coverage rate of West German employees by sector-related collective agreements decreased from 70 % to 56 % (IAB 2016).

Finally, we investigate the composition of the adjusted earnings gap by age and cohort (**Figure 8**). **Table A 6** in the Annex reports the full results. The prominent role of the constant, encompassing the truly unexplained part of the earnings gap stands out. From age 25 to 35, the constant increases with age in the cohort groups 1950-64 and 1970-79 (this age is not observable for cohorts 1980-89). Throughout cohorts, years of employment tend to be evaluated more advantageously and years of non-employment less disadvantageously for women than for men at the time of family formation when women's endowments in this respect worsen compared to men's.

Figure 8:

Decomposition of the mean gender earnings gap in its single factors with a focus on the unexplained gap, by cohorts and age



Persons of cohorts 1980-89 are not observed at age 35. Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

This might point to a higher extent of societally accepted (family-related) employment breaks for women as compared to men. Whereas sector premiums were to the advantage of women at any age in the cohort group 1950-64, the effect seems to reverse for younger generations. This might relate to the increasing wage heterogeneity across and within sectors that answers for a significant part of increasing overall wage inequality since the mid-1990s (Antonczyk et al. 2011). Based on the Structure of earnings survey 2010, sector

premiums are more favorable for men than for women, contributing to the pay gap in most European countries as does the sectoral segregation of genders (Boll et al. 2016). Against this finding at the current edge of the SIAB 7510, the women-benefitting sector premiums as they are observed for cohorts 1950-64 seem to be somewhat outdated. Instead, whereas sectoral endowments seem to be of less disadvantage to women in younger cohorts, sector premiums are of less advantage.

Lower part-time penalties for women compared to men apply to any age and cohort, but the gender difference in part-time penalties is particularly pronounced in the family formation period and, at any age, in younger cohorts. The latter finding is surprising in the context of a higher number of female leaders in younger generations, compared to older ones. One would expect that this trend leads females' part-time penalties to approach those of men's.

5 Conclusion

Taking the challenges of the gender pay gap to monitor the gender earnings divide over the life course as a starting point, this study introduced a new indicator for gender earnings inequality. The gender lifetime earnings gap (GLEG) measures the difference in men's and women's accumulated earnings over at least 30 years of their career, with male earnings as a benchmark. To this end, we make use of information from 93,511 German individuals of the SIAB 1975-2010, focusing on cohorts born 1950-64, but additionally exploring cohorts 1970-79 (1980-89) until the age of 30 (35).

For cohorts 1950-64, men accumulate twice as much earnings as women over their career. The GLEG is remarkably similar to the gender pension gap by age. However, compared to the latter, our GLEG approach goes one step further as we do not only measure the gender divide in outcomes at the end but also its evolution over the life course. The gender earnings gap is wider at the bottom than at the top of the earnings distribution, and from the life course perspective, earnings spread up most dynamically during the period of family formation (age 25-35). Moreover, the GLEG notably differs between occupational segments, with women's share on employees failing as a robust indicator for the magnitude of the gap. Three quarters of the gap may be explained by observable characteristics, amongst them years in (non-) employment and work hours being the most prominent factors. The unexplained part of the gap is driven by the constant, but different remunerations of genders for the same characteristics also play a role. It may not be ruled out that the constant contains statistically unobserved pay-relevant factors like further endowments, gendered preferences and (dis-)abilities, which might interact with gendered returns to observed characteristics. Therefore, the

unexplained lifetime earnings differential must not be equated with gender discrimination in lifetime earnings.

Analyses for younger cohort groups show that the importance of gender differences in human capital related endowments is diminishing whereas the unexplained gap hardly decreases, confirming the finding of Blau & Kahn (forthcoming) for the US gender pay gap over time. Our result regarding human capital related factors hold for qualification, a factor that used to contribute to the gap in older cohorts and which turned to females' advantage in the youngest cohort group (1980-89). Furthermore, maybe due to a higher labour market attachment of younger women, the importance of employment interruptions decreases a little in younger cohorts. However, females' higher frequency in part-time work continues to mark a significant portion of the explained gap, at least during the period of family formation.

Moreover, men receive higher earnings penalties for part-time employment than women which mitigates the gap. Whereas part-time earnings penalties as such are in line with human capital theory, gendered penalties are not. We argue that compensation differentials as suggested by Goldin (2014) might be a more suitable explanation here. If costs of time-inflexibility do relate to both technology and culture, firms might pay genders different premiums for sticking to the traditional full-time-full-year (FTFY) employment pattern, depending on firm-specific gender roles, time and leadership culture.

With the data at hand, it is only possible to track younger cohorts until age 30 or 35. Based on longer observation periods, future analyses will show whether younger cohorts manage to close the gender gap in lifetime earnings. Specifically, it remains open whether women's continued part-time employment at older ages continues to magnify the gap. Preferences of men (women) for a down (up-) scaling of current work schedules give rise to the expectation of more gender-egalitarian work patterns in the near future. For example, in 2015, 12.1 % of German female part-timers aged 15-64 wished to work more hours (Eurostat 2017), whereas from 1991 to 2013, actual weekly work hours of fathers of children below the age of 16 in the household were well above the individually desired work hours (Holst & Wieber 2014). Women and men born 1980-96 report a strong preference for dual part-time earner-arrangements on the household level (BMFSFJ 2015)[16]. Furthermore, our observation that part-time penalties seem to relate to the life course stage points towards the societal acceptance of work patterns, leading us to the assumption that part-and full-time returns will also adjust to changing gender roles and work cultures. In this context, a valuable research question will be to explore

[16] Basis: Online Survey on behalf of the Federal Ministry of Family Affairs, Senior Citizens, Women and Youth (BMFSFJ) in September/October 2014 among 4,166 women and men born from 1980 to 1996 („Generation Y"-Check).

how the increasing female leadership positioning (Kohaut & Möller 2016) fits into these patterns.

Another avenue for future research is the interplay between the overall dynamics in earnings inequality with the future gender earnings divide. Whereas according to our findings, the gendered sectoral segregation loses some of its driving effect for the gap, gendered sector premiums that used to benefit women in older cohorts seem to be less favorable for women in younger cohorts. Apparently, much of the sorting into occupations and occupational positions takes place within rather than between industries. The decreasing coverage of firms by collective agreements that relates to a strengthened role of intra-firm bargaining processes feeds into this pattern. As working time cultures differ between sectors (Goldin 2014), it seems likely that sector premiums also mirror sector-specific personnel management rationales. Another open question left to future research is whether the currently highly debated revaluation of social professions in Germany will materialize in a narrowing gender earnings gap in the future.

Finally, controlling for unobserved heterogeneity by exploiting the panel structure of the data seems a valuable addition to the study at hand. In future work with earnings simulation techniques that build on panel estimates, we therefore aim to quantify lifetime earnings depending on biographical and occupational decisions, and gender.

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Annex

Table A 1: Summary Statistics

	Men		Women	
	Mean	SD	Mean	SD
Employment biography				
Years in employment	23.681	(7.722)	18.593	(8.859)
Years in full-time employment	23.213	(8.062)	13.059	(9.006)
Years in low-scale part-time employment	0.086	(0.634)	0.922	(2.662)
Years in large-scale part-time employment	0.352	(1.625)	4.568	(6.187)
Years out-of-the-labour force (OLF)	0.061	(0.199)	0.254	(0.395)
Years of unemployment	2.259	(3.887)	1.831	(2.756)
Blind spells	4.774	(5.722)	10.512	(8.187)
Occupation				
„Green“ occupations	0.419	(2.705)	0.142	(1.373)
Miner/chemical occupations	1.187	(4.637)	0.331	(2.315)
Glass, ceramic, paper production	0.479	(2.991)	0.233	(1.848)
Glass, ceramic, paper production	0.510	(2.745)	0.489	(2.444)
Metal producer	4.859	(8.897)	0.375	(2.300)
Electricians	2.371	(6.558)	0.491	(2.641)
Wood occupations	0.537	(3.137)	0.037	(0.667)
Constructing	2.227	(6.180)	0.221	(1.974)
Hotel/restaurant occupations	0.986	(3.989)	1.665	(4.497)
Storage/ transport occupations	2.741	(6.351)	0.446	(2.198)
White collar worker	1.884	(5.867)	3.497	(6.944)
Merchandise occupations	2.468	(6.483)	5.702	(9.200)
Security occupations	0.975	(3.640)	0.151	(1.300)
Social/care occupations	0.320	(2.508)	1.438	(5.145)
Medical occupations	0.292	(2.434)	2.523	(6.748)
Physicians	0.095	(1.462)	0.059	(1.010)
Teaching professions	0.138	(1.467)	0.177	(1.737)
Artists/Athlets	0.148	(1.650)	0.086	(1.164)
Natural scientists	0.179	(1.813)	0.062	(1.050)
Humanists	0.081	(1.252)	0.085	(1.202)

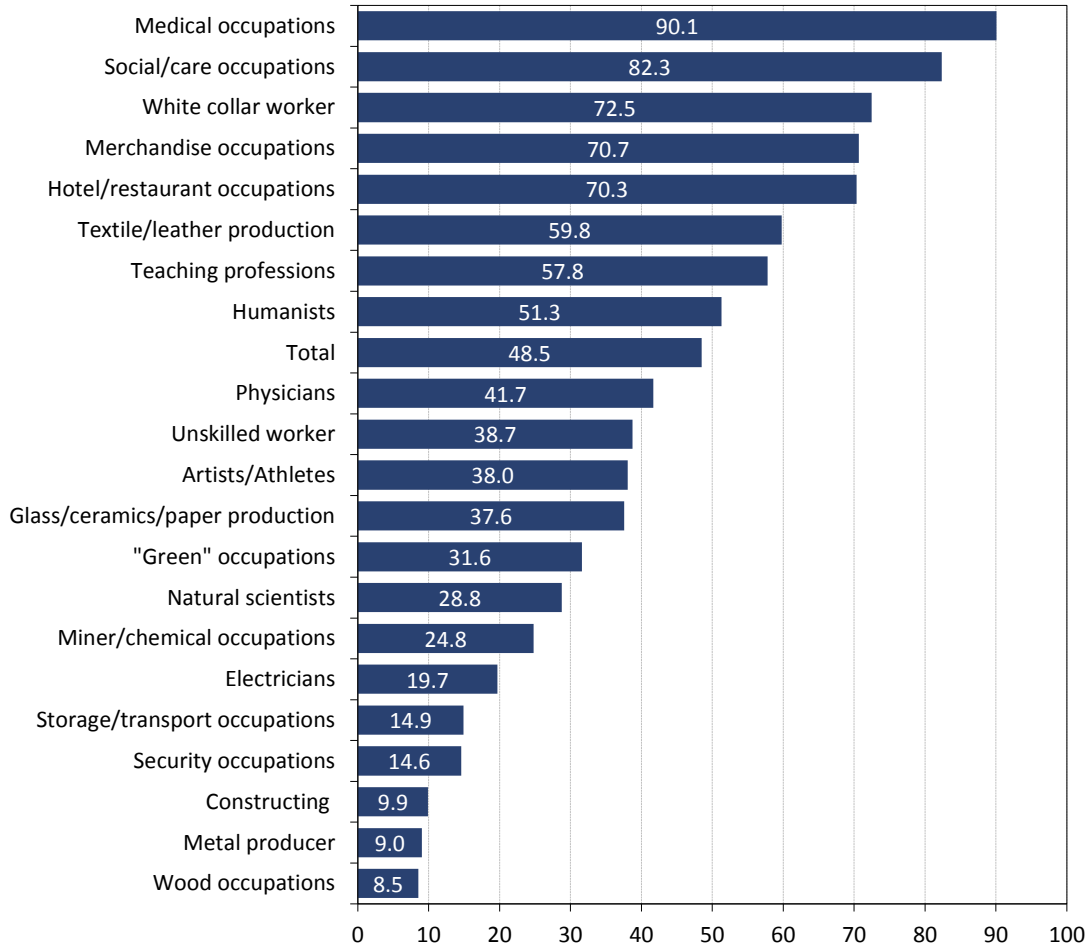
	Men		Women	
	Mean	SD	Mean	SD
Unskilled worker	0.333	(1.892)	0.122	(1.040)
Not specified	0.000		0.000	
Sector				
Agriculture, hunting and forestry	0.235	(1.921)	0.091	(1.027)
Fishing	0.002	(0.146)	0.001	(0.120)
Mining and quarrying of energy producing materials	0.330	(2.756)	0.014	(0.513)
Mining and quarrying, except of energy producing materials	0.092	(1.311)	0.015	(0.475)
Manufacture of food products, beverages and tobacco	0.648	(3.339)	0.534	(2.528)
Manufacture of textiles	0.179	(1.761)	0.399	(2.196)
Manufacture of leather and leather products	0.033	(0.730)	0.060	(0.867)
Manufacture of wood and wood products	0.229	(1.914)	0.050	(0.807)
Manufacture of pulp, paper and paper products; publishing and printing	0.537	(3.254)	0.345	(2.277)
Manufacture of coke, refined petroleum products and nuclear fuel	0.049	(1.028)	0.010	(0.452)
Manufacture of chemicals, chemical products and man-made fibres	0.659	(3.650)	0.264	(2.122)
Manufacture of rubber and plastic products	0.483	(2.868)	0.181	(1.569)
Manufacture of other non-metallic mineral products	0.320	(2.378)	0.115	(1.351)
Manufacture of basic metals and fabricated metal products	1.573	(5.345)	0.347	(2.252)
Manufacture of machinery and equipment n.e.c.	1.607	(5.526)	0.348	(2.329)
Manufacture of electrical and optical equipment	1.356	(5.030)	0.732	(3.290)
Manufacture of transport equipment	1.485	(5.725)	0.230	(2.107)
Manufacturing n.e.c.	0.327	(2.384)	0.148	(1.490)
Electricity, gas and water supply	0.364	(2.860)	0.083	(1.265)
Construction	2.249	(6.208)	0.312	(1.997)

	Men		Women	
	Mean	SD	Mean	SD
Wholesale and retail trade: repair of motor vehicles, motorcycles and personal and household goods	2.847	(6.775)	3.237	(6.532)
Hotels and restaurants	0.256	(1.934)	0.450	(2.229)
Transport, storage and communications	1.245	(4.564)	0.494	(2.694)
Financial intermediation	0.773	(4.331)	0.985	(4.520)
Real estate, renting and business activities	1.325	(4.221)	1.383	(4.280)
Public administration and defence; compulsory social security	1.001	(4.476)	1.417	(5.133)
Education	0.235	(1.973)	0.777	(3.608)
Health and social work	0.756	(3.871)	3.479	(7.672)
Other community, social and personal service activities	0.510	(3.033)	0.709	(3.207)
Activities of private households as employers and undifferentiated production	0.006	(0.201)	0.093	(0.812)
Extraterritorial organisations and bodies	0.042	(0.876)	0.026	(0.705)
Not specified	0.038	(0.219)	0.038	(0.186)
Type of Region				
Central city in urban areas	7.044	(10.190)	5.521	(8.946)
Highly agglomerated county in agglomeration areas	4.631	(8.665)	3.254	(6.983)
Agglomerated county in agglomeration areas	1.475	(5.199)	1.156	(4.371)
Rural county in agglomeration areas	0.277	(2.223)	0.251	(2.020)
Central city in urbanized areas	1.752	(5.728)	1.420	(4.910)
Agglomerated county in urbanized areas	4.384	(8.928)	3.498	(7.479)
Rural county in urbanized areas	1.803	(5.984)	1.473	(5.065)
Rural county with higher density in rural areas	1.669	(5.926)	1.443	(5.201)
Rural county with lower density in rural areas	0.567	(3.464)	0.496	(3.006)
Not specified	0.115	(0.240)	0.107	(0.232)
Qualification				
No completed vocational training	0.040	(0.197)	0.067	(0.250)
Vocational training	0.724	(0.447)	0.741	(0.438)
High school degree (‚Abitur')& vocational training	0.078	(0.268)	0.098	(0.297)

	Men		Women	
	Mean	SD	Mean	SD
University of Applied Sciences	0.068	(0.252)	0.038	(0.191)
University	0.089	(0.284)	0.053	(0.225)
Not specified	0.000		0.000	
Firm size				
Very small enterprise (1-9 employees)	0.092	(0.288)	0.197	(0.398)
Small enterprise (10-49 employees)	0.172	(0.377)	0.209	(0.407)
Medium size enterprise (50-249 employees)	0.212	(0.409)	0.195	(0.396)
Large enterprise (250 employees and more)	0.300	(0.458)	0.204	(0.403)
Not specified	0.225	(0.417)	0.195	(0.396)
Cohort				
1950	0.007	(0.086)	0.002	(0.044)
1951	0.008	(0.090)	0.003	(0.057)
1952	0.010	(0.099)	0.004	(0.062)
1953	0.009	(0.094)	0.005	(0.068)
1954	0.040	(0.196)	0.017	(0.128)
1955	0.035	(0.184)	0.025	(0.155)
1956	0.027	(0.161)	0.033	(0.178)
1957	0.035	(0.183)	0.044	(0.205)
1958	0.053	(0.225)	0.071	(0.257)
1959	0.090	(0.285)	0.110	(0.313)
1960	0.127	(0.333)	0.140	(0.347)
1961	0.130	(0.337)	0.138	(0.345)
1962	0.126	(0.332)	0.130	(0.336)
1963	0.121	(0.326)	0.121	(0.326)
1964	0.102	(0.303)	0.094	(0.292)
German nationality	0.060	(0.238)	0.037	(0.189)
Nationality not specified	0.000		0.000	
Number of employers	6.823	(5.514)	5.733	(3.890)
Observations No.	48234		45277	

Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Figure A 1: Share of women in occupational segments (main occupation)



Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Table A 2: Lifetime Earnings Regression Results (OLS)

	Men		Women	
	Coefficient	SE	Coefficient	SE
Employment biography (Reference: Years in full-time employment)				
Years in employment	0.066***	(0.001)	0.080***	(0.001)
Years in low-scale part-time employment	-0.053***	(0.002)	-0.036***	(0.001)
Years in large-scale part-time employment	-0.018***	(0.001)	-0.013***	(0.000)
Years out-of-the-labour-force (OLF)	0.082***	(0.008)	0.157***	(0.006)
Years of unemployment	-0.028***	(0.001)	-0.012***	(0.001)
Blind spells	-0.028***	(0.001)	-0.021***	(0.001)
Occupations (reference: merchandise occupations)				
„Green“ occupations	-0.006***	(0.001)	-0.003	(0.002)
Miner/chemical occupations	-0.004***	(0.000)	-0.001	(0.001)

	Men		Women	
	Coefficient	SE	Coefficient	SE
Glass/ceramic/paper production	-0.006***	(0.001)	-0.005***	(0.001)
Textile/leather production	0.000	(0.001)	-0.005***	(0.001)
Metal producer	-0.005***	(0.000)	-0.003***	(0.001)
Electricians	0.000	(0.000)	0.001	(0.001)
Wood occupations	-0.008***	(0.001)	-0.002	(0.003)
Constructing	-0.003***	(0.000)	0.004***	(0.001)
Hotel/restaurant occupations	-0.008***	(0.001)	-0.004***	(0.001)
Storage/transport occupations	-0.007***	(0.000)	-0.003***	(0.001)
White collar worker	0.000	(0.000)	-0.004***	(0.000)
Security occupations	0.001**	(0.000)	0.001	(0.002)
Social/care occupations	-0.002**	(0.001)	0.007***	(0.001)
Medical occupations	0.000	(0.001)	-0.001	(0.001)
Physicians	0.015***	(0.001)	0.029***	(0.002)
Teaching professions	0.004***	(0.001)	0.009***	(0.001)
Artists/Athletes	-0.001	(0.001)	0.004**	(0.002)
Natural scientists	0.004***	(0.001)	0.013***	(0.002)
Humanists	0.004***	(0.001)	0.009***	(0.002)
Unskilled worker	-0.009***	(0.001)	-0.002	(0.002)
Not specified	0.000***		0.000***	
Sector (Reference: Trade)				
Agriculture, hunting and forestry	-0.001	(0.001)	-0.005**	(0.002)
Fishing	0.041***	(0.010)	-0.019	(0.018)
Mining and quarrying of energy producing materials	0.004***	(0.001)	0.007*	(0.004)
Mining and quarrying, except of energy producing materials	0.004***	(0.001)	0.008*	(0.004)
Manufacture of food products, beverages and tobacco	0.002***	(0.001)	-0.002***	(0.001)
Manufacture of textiles	-0.002***	(0.001)	0.005***	(0.001)
Manufacture of leather and leather products	-0.009***	(0.002)	0.002	(0.003)
Manufacture of wood and wood products	0.003***	(0.001)	0.003	(0.003)
Manufacture of pulp, paper and paper products; publishing and printing	0.006***	(0.001)	0.007***	(0.001)
Manufacture of coke, refined petroleum products and nuclear fuel	0.009***	(0.002)	0.014***	(0.005)
Manufacture of chemicals, chemical products and man-made fibres	0.006***	(0.001)	0.012***	(0.001)
Manufacture of rubber and plastic products	0.002***	(0.001)	0.003**	(0.001)
Manufacture of other non-metallic mineral products	0.003***	(0.001)	0.005***	(0.002)
Manufacture of basic metals and fabricated metal products	0.003***	(0.000)	0.006***	(0.001)

	Men		Women	
	Coefficient	SE	Coefficient	SE
Manufacture of machinery and equipment n.e.c.	0.005***	(0.000)	0.009***	(0.001)
Manufacture of electrical and optical equipment	0.005***	(0.000)	0.008***	(0.001)
Manufacture of transport equipment	0.007***	(0.000)	0.013***	(0.001)
Manufacturing n.e.c.	0.003***	(0.001)	0.002	(0.001)
Electricity, gas, and water supply	0.007***	(0.001)	0.010***	(0.002)
Construction	0.002***	(0.000)	-0.002*	(0.001)
Hotels and restaurants	-0.003***	(0.001)	-0.006***	(0.001)
Transport, storage and communications	0.003***	(0.000)	0.008***	(0.001)
Financial intermediation	0.005***	(0.000)	0.012***	(0.001)
Real estate, renting and business activities	0.005***	(0.000)	0.004***	(0.001)
Public administration and defence; compulsory social security	0.000	(0.000)	0.003***	(0.001)
Education	0.001	(0.001)	0.003***	(0.001)
Health and social work	0.001	(0.001)	0.004***	(0.001)
Other community, social and personal service activities	0.003***	(0.001)	-0.001	(0.001)
Activities of private households as employers and undifferentiated production	-0.011	(0.008)	-0.014***	(0.003)
Extraterritorial organisation and bodies	-0.002	(0.002)	0.010***	(0.003)
Not specified	-0.013*	(0.008)	0.014	(0.013)
Type of Region (Reference: Central city in urban areas)				
Highly agglomerated county in agglomeration areas	0.000	(0.000)	-0.001***	(0.000)
Agglomerated county in agglomeration areas	-0.003***	(0.000)	-0.004***	(0.001)
Rural county in agglomeration areas	-0.002***	(0.001)	-0.004***	(0.001)
Central city in urbanized areas	-0.001**	(0.000)	-0.002***	(0.000)
Agglomerated county in urbanized areas	-0.002***	(0.000)	-0.003***	(0.000)
Rural county in urbanized areas	-0.003***	(0.000)	-0.005***	(0.000)

	Men		Women	
	Coefficient	SE	Coefficient	SE
Not specified	-0.011	(0.007)	-0.090***	(0.011)
Qualification (Reference: Vocational training)				
No completed vocational training	-0.246***	(0.008)	-0.290***	(0.009)
High school degree (‚Abitur') & vocational training	0.138***	(0.006)	0.132***	(0.007)
University of Applied Sciences	0.383***	(0.007)	0.231***	(0.012)
University	0.500***	(0.007)	0.381***	(0.011)
Not specified	0.000***		0.000***	
Firm size (Reference: Large enterprise)				
Very small enterprise (1-9 employees)	-0.078***	(0.006)	-0.092***	(0.007)
Small enterprise (10-49 employees)	-0.048***	(0.005)	-0.037***	(0.007)
Medium size enterprise (50-249 employees)	-0.023***	(0.005)	-0.011	(0.007)
Not specified	-0.075***	(0.005)	-0.142***	(0.008)
Cohort (Reference: 1960)				
1950	-0.210***	(0.019)	-0.163***	(0.050)
1951	-0.191***	(0.018)	-0.073*	(0.039)
1952	-0.174***	(0.017)	-0.053	(0.036)
1953	-0.177***	(0.017)	-0.103***	(0.032)
1954	-0.111***	(0.009)	-0.028	(0.018)
1955	-0.071***	(0.009)	-0.049***	(0.015)
1956	-0.054***	(0.010)	-0.034**	(0.013)
1957	-0.021**	(0.009)	-0.022*	(0.012)
1958	-0.022***	(0.008)	-0.013	(0.010)
1959	-0.023***	(0.006)	-0.012	(0.008)
1961	0.006	(0.005)	0.002	(0.007)
1962	0.017***	(0.005)	-0.001	(0.008)
1963	0.029***	(0.006)	-0.007	(0.008)
1964	0.038***	(0.006)	0.004	(0.009)
German Nationality	0.014**	(0.007)	0.043***	(0.011)
Nationality not specified	0.000***		0.000***	
Number of employers	0.007***	(0.000)	0.014***	(0.001)
Constant	12.130***	(0.019)	11.448***	(0.026)
F-Statistics	2498,030		2067,610	
Prob > F	0,000		0,000	
R^2	0,824		0,805	
Adjusted R^2	0,823		0,804	
Root MSE	0,334		0,450	

Standard error in parantheses, *p<0.1, **p<0.05, ***p<0.01.

Table A 2: Qaxaca-Blinder Decomposition of the gender lifetime earnings gap

	Coefficient	SE
Total		
Men	13.530***	(0.004)
Women	12.686***	(0.005)
Difference	0.845***	(0.006)
Explained	0.612***	(0.007)
Unexlained	0.233***	(0.006)
Explained part		
Employment biography		
Years in employment	0.337***	(0.005)
Years in low-scale part-time employment	0.044***	(0.002)
Years in large-scale part-time employment	0.076***	(0.004)
Years out-of-the-labour-force (OLF)	-0.016***	(0.002)
Years of unemployment	-0.012***	(0.001)
Blind spells	0.160***	(0.004)
Occupations (Reference: Merchandise occupations)		
„Green“ occupations	-0.002***	(0.000)
Miner/chemical occupations	-0.004***	(0.000)
Glass/ceramic/paper production	-0.002***	(0.000)
Textile/leather production	0.000	(0.000)
Metal producer	-0.022***	(0.001)
Electricians	-0.001	(0.001)
Wood occupations	-0.004***	(0.000)
Constructing	-0.005***	(0.001)
Hotel/restaurant occupations	0.005***	(0.000)
Storage/transport occupations	-0.017***	(0.001)
White collar workers	-0.001	(0.001)
Security occupations	0.001***	(0.000)
Social/care occupations	0.002**	(0.001)
Medical occupations	-0.001	(0.002)
Physicians	0.001***	(0.000)
Teaching professions	0.000**	(0.000)
Artists/Athletes	0.000	(0.000)
Natural scientists	0.000***	(0.000)
Humanists	0.000	(0.000)
Unskilled worker	-0.002***	(0.000)
Not specified	0.000***	
Sector (Reference: Trade)		
Agriculture, hunting and forestry	0.000	(0.000)
Fishing	0.000	(0.000)
Mining and quarrying of energy producing materials	0.001***	(0.000)

	Coefficient	SE
Mining and quarrying, except of energy producing materials	0.000***	(0.000)
Manufacture of food products, beverages and tobacco	0.000***	(0.000)
Manufacture of textiles	0.001***	(0.000)
Manufacture of leather and leather products	0.000***	(0.000)
Manufacture of wood and wood products	0.000***	(0.000)
Manufacture of pulp, paper and paper products; publishing and printing	0.001***	(0.000)
Manufacture of coke, refined petroleum products and nuclear fuel	0.000***	(0.000)
Manufacture of chemicals, chemical products and man-made fibre	0.002***	(0.000)
Manufacture of rubber and plastic products	0.001***	(0.000)
Manufacture of other non-metallic mineral products	0.001***	(0.000)
Manufacture of basic metals and fabricated metal products	0.004***	(0.000)
Manufacture of machinery and equipment n.e.c.	0.007***	(0.000)
Manufacture of electrical and optical equipment	0.003***	(0.000)
Manufacture of transport equipment	0.009***	(0.000)
Manufacturing n.e.c.	0.001***	(0.000)
Electricity, gas and water supply	0.002***	(0.000)
Construction	0.004***	(0.001)
Hotels and restaurants	0.001***	(0.000)
Transport, storage and communications	0.002***	(0.000)
Financial intermediation	-0.001***	(0.000)
Real estate, renting and business activities	0.000**	(0.000)
Public administration and defence; compulsory social security	0.000	(0.000)
Education	-0.001	(0.001)
Health and social work	-0.002	(0.002)
Other community, social and personal service activities	-0.001***	(0.000)
Activities of private households as employers and undifferentiated production	0.001	(0.001)

	Coefficient	SE
Extraterritorial organisations and bodies	0.000	(0.000)
Not specified	0.000	(0.000)
Type of region (Reference: Core city (‚Kernstadt') in urban areas)		
Very densely populated district in urban areas	0.000	(0.000)
Densely populated district in urban areas	-0.001***	(0.000)
Rural district in urban areas	0.000	(0.000)
Small town in urbanized areas	0.000***	(0.000)
Densely populated district in urbanized areas	-0.002***	(0.000)
Rural district in urbanized areas	-0.001***	(0.000)
Very densely populated rural district in rural areas	-0.001***	(0.000)
Less densely populated rural district in rural areas	0.000***	(0.000)
Not specified	0.000	(0.000)
Qualification (Reference: Vocational training)		
No completed vocational training	0.007***	(0.000)
High school degree (‚Abitur') & vocational training	-0.003***	(0.000)
University of Applied Sciences	0.011***	(0.001)
University	0.018***	(0.001)
Not specified	0.000***	
Firm size (Reference: Large enterprise (250 employees and more)		
Very small enterprise (1-9 employees)	0.008***	(0.001)
Small enterprise (10-49 employees)	0.002***	(0.000)
Medium size enterprise (50-249 employees)	0.000***	(0.000)
Not specified	-0.002***	(0.000)
Cohort (Reference: 1960)		
1950	-0.001***	(0.000)
1951	-0.001***	(0.000)
1952	-0.001***	(0.000)
1953	-0.001***	(0.000)
1954	-0.003***	(0.000)
1955	-0.001***	(0.000)
1956	0.000***	(0.000)

	Coefficient	SE
1957	0.000**	(0.000)
1958	0.000***	(0.000)
1959	0.000***	(0.000)
1961	0.000	(0.000)
1962	0.000	(0.000)
1963	0.000	(0.000)
1964	0.000***	(0.000)
German Nationality	0.000**	(0.000)
Nationality not specified	0.000***	
Number of employers	0.007***	(0.000)
Unexplained part		
Employment biography		
Years in employment	-0.264***	(0.022)
Years in low-scale part-time employment	-0.015***	(0.002)
Years in large-scale part-time employment	-0.024***	(0.005)
Years out-of-the-labour-force (OLF)	-0.019***	(0.002)
Years of unemployment	-0.031***	(0.003)
Blind spells	-0.069***	(0.011)
Occupations (reference: Merchandise occupations)		
„Green“ occupations	0.000	(0.000)
Miner/chemical occupations	-0.001***	(0.000)
Glass/ceramic/paper production	0.000	(0.000)
Textile/leather production	0.002***	(0.001)
Metal producer	-0.001**	(0.000)
Electricians	-0.001	(0.000)
Wood occupations	0.000*	(0.000)
Constructing	-0.001***	(0.000)
Hotel/restaurant occupations	-0.007***	(0.001)
Storage/transport occupations	-0.002***	(0.001)
White collar workers	0.014***	(0.002)
Security occupations	0.000	(0.000)
Social/care occupations	-0.012***	(0.001)
Medical occupations	0.002	(0.003)
Physicians	-0.001***	(0.000)
Teaching professions	-0.001***	(0.000)
Artists/Athletes	0.000***	(0.000)
Natural scientists	-0.001***	(0.000)
Humanists	0.000*	(0.000)
Unskilled worker	-0.001***	(0.000)
Not specified	0.000***	

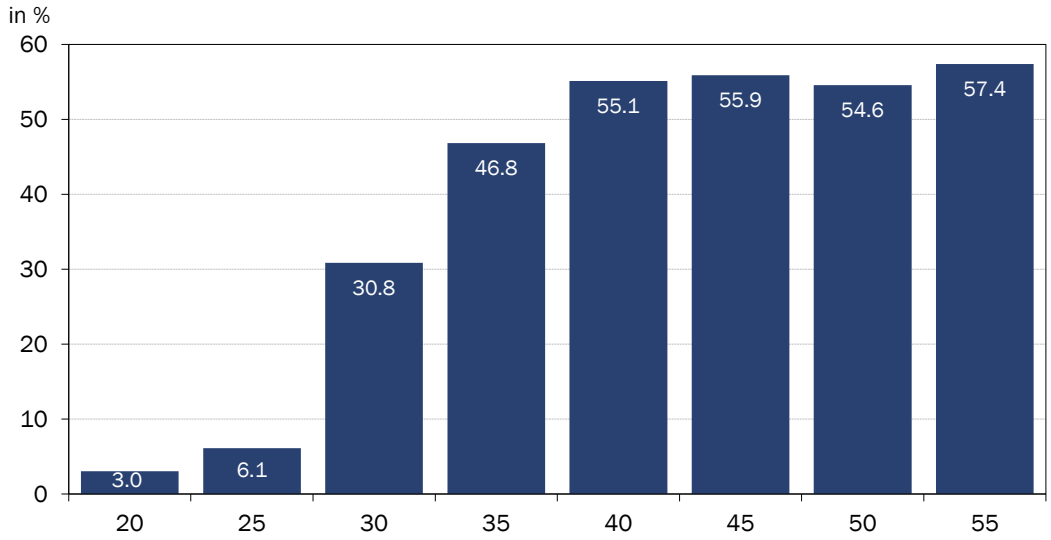
	Coefficient	SE
Sector (Reference: Trade)		
Agriculture, hunting and forestry	0.000	(0.000)
Fishing	0.000	(0.000)
Mining and quarrying of energy producing materials	0.000	(0.000)
Mining and quarrying, except of energy producing materials	0.000	(0.000)
Manufacture of food products, beverages and tobacco	0.002***	(0.001)
Manufacture of textiles	-0.003***	(0.001)
Manufacture of leather and leather products	-0.001***	(0.000)
Manufacture of wood and wood products	0.000	(0.000)
Manufacture of pulp, paper and paper products; publishing and printing	-0.001	(0.000)
Manufacture of coke, refined petroleum products and nuclear fuel	0.000	(0.000)
Manufacture of chemicals, chemical products and man-made fibre	-0.002***	(0.000)
Manufacture of rubber and plastic products	0.000	(0.000)
Manufacture of other non-metallic mineral products	0.000	(0.000)
Manufacture of basic metals and fabricated metal products	-0.001***	(0.000)
Manufacture of machinery and equipment n.e.c.	-0.001***	(0.000)
Manufacture of electrical and optical equipment	-0.002***	(0.001)
Manufacture of transport equipment	-0.001***	(0.000)
Manufacturing n.e.c.	0.000	(0.000)
Electricity, gas and water supply	0.000	(0.000)
Construction	0.001***	(0.000)
Hotels and restaurants	0.001*	(0.001)
Transport, storage and communications	-0.002***	(0.001)
Financial intermediation	-0.007***	(0.001)

	Coefficient	SE
Real estate, renting and business activities	0.002**	(0.001)
Public administration and defence; compulsory social security	-0.004***	(0.001)
Education	-0.001	(0.001)
Health and social work	-0.012***	(0.003)
Other community, social and personal service activities	0.003***	(0.001)
Activities of private households as employers and undifferentiated production	0.000	(0.001)
Extraterritorial organisations and bodies	0.000***	(0.000)
Not specified	-0.001*	(0.001)
Type of region (Reference: Central city in urban areas)		
Highly agglomerated county in agglomeration areas	0.003**	(0.001)
Agglomerated county in agglomeration areas	0.001*	(0.001)
Rural county in agglomeration areas	0.000*	(0.000)
Central city in urbanized areas	0.001*	(0.001)
Agglomerated county in urbanized areas	0.005***	(0.001)
Rural county in urbanized areas	0.003***	(0.001)
Rural county with higher density in rural areas	0.003***	(0.001)
Rural county with lower density in rural areas	0.001*	(0.000)
Not specified	0.009***	(0.001)
Qualification (Reference: Vocational training)		
No completed vocational training	0.003***	(0.001)
High school degree (‚Abitur') & vocational training	0.001	(0.001)
University of Applied Sciences	0.006***	(0.001)
University	0.006***	(0.001)
Not specified	0.000***	#WERT!
Firm size (Reference: Large enterprise (250 employees and more)		
Very small enterprise (1-9 employees)	0.003*	(0.002)
Small enterprise (10-49 employees)	-0.002	(0.002)
Medium size enterprise (50-249 employees)	-0.002	(0.002)
Not specified	0.013***	(0.002)

	Coefficient	SE
Cohort (Reference: 1960)		
1950	0.000	(0.000)
1951	0.000**	(0.000)
1952	0.000***	(0.000)
1953	0.000	(0.000)
1954	-0.001***	(0.000)
1955	-0.001	(0.000)
1956	-0.001	(0.001)
1957	0.000	(0.001)
1958	-0.001	(0.001)
1959	-0.001	(0.001)
1961	0.001	(0.001)
1962	0.002*	(0.001)
1963	0.004***	(0.001)
1964	0.003***	(0.001)
German Nationality	-0.001**	(0.000)
Nationality not specified	0.000***	
Number of employers	-0.043***	(0.004)
Constant	0.681***	(0.033)
Observations No.		
Total	93511	
Men	48234	
Women	45277	

Standard errors in parantheses, *p<0.1, **p<0.05, ***p<0.01.
Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Figure A 2: Median unadjusted gender earnings gap, by age



Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Table A 4: Decomposition of the explained part of the of the mean gender earnings gap, by age

		Contribution to the gap at age ...(in log points)							
Factor	Lifetime	20	25	30	35	40	45	50	55
Unexplained	23.27	7.86	23.27	16.99	19.07	21.83	21.92	17.18	18.43
Years of employment	33.66	-14.63	-14.22	10.23	24.11	28.20	29.75	29.03	39.10
Work hours	11.98	0.19	1.36	3.31	6.09	8.82	11.21	13.75	12.63
Years of non-employment	13.23	-0.32	-2.10	8.68	17.39	20.45	19.38	15.35	14.53
Occupation	-5.02	3.88	-2.95	-5.92	-6.43	-5.74	-5.92	-4.51	-3.66
Sector	3.67	-2.09	5.30	9.79	7.28	4.43	3.82	3.51	3.28
Firm size	0.73	0.88	1.84	3.39	2.96	1.84	1.31	1.13	1.23
Qualification	3.28	0.90	1.39	3.16	3.71	3.61	3.47	5.06	0.65
Explained residuum	0.42	-0.10	2.41	2.82	2.20	1.22	0.95	0.61	0.41

The explained residuum contains the following factors: Cohorts, German nationality, and number of employers. Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Table A 5: Decomposition of the mean gender earnings gap in its single factors with a focus on the explained gap, by cohorts and age

	Contribution to the gap at age …(in log points)											
	20			25			30			35		
Factor	1950-64	1970-79	1980-89	1950-64	1970-79	1980-89	1950-64	1970-79	1980-89	1950-64	1970-79	1980-89
Unexplained	7.86	14.70	11.79	23.27	20.31	15.50	16.99	15.37	17.91	19.07	14.58	
Years of employment	-14.63	-11.05	-10.77	-14.22	-15.15	-7.92	10.23	4.63	4.72	24.11	21.93	
Work hours	0.19	0.69	2.11	1.36	1.74	2.53	3.31	4.00	4.12	6.09	5.98	
Years of non-employment	-0.32	-1.25	1.18	-2.10	-3.02	0.00	8.68	1.67	-1.68	17.39	5.54	
Occupation	3.88	1.64	7.49	-2.95	-7.62	-7.45	-5.92	-10.18	-4.93	-6.43	-6.46	
Sector	-2.09	-1.59	0.55	5.30	5.00	5.79	9.79	7.92	2.03	7.28	3.21	
Qualification	0.90	1.19	-0.37	1.39	1.00	-2.38	3.16	-0.25	-1.82	3.71	0.94	
Explained residuum	-0.10	-2.98	-3.04	2.41	0.40	0.72	2.82	1.45	2.53	2.20	1.96	

Persons of cohorts 1980-89 are not observed at age 35. The explained residuum contains the following factors: Cohorts, German nationality, firm size, and number of employers.
Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

Table A 6: Decomposition of the mean gender earnings gap in its single factors with a focus on the unexplained gap, by cohorts and age

	Contribution to the gap at age …(in log points)											
	20			25			30			35		
Factor	1950-64	1970-79	1980-89	1950-64	1970-79	1980-89	1950-64	1970-79	1980-89	1950-64	1970-79	1980-89
Explained	-12.18	-13.36	-2.86	-8.81	-17.64	-8.71	32.06	9.24	4.96	54.35	33.09	
Years of employment	-3.33	-11.39	-22.18	9.87	19.59	1.27	-5.44	12.37	-9.06	-18.67	-6.63	
Work hours	-0.56	-0.49	-1.61	-0.78	-1.23	-1.71	-1.58	-3.78	-2.76	-2.29	-4.14	
Years of non-employment	3.15	1.53	1.13	6.71	6.45	-2.47	0.03	2.65	-5.68	-5.74	-2.73	
Occupation	10.54	8.80	5.78	5.55	2.12	3.56	4.20	0.82	-5.72	1.43	-3.52	
Sector	-0.24	2.38	2.75	-10.65	-4.61	-0.80	-15.46	-9.01	2.80	-9.34	-0.95	
Region	5.59	7.84	10.84	1.79	1.52	3.30	1.36	0.54	1.67	1.59	1.10	
Number of firms	-0.59	0.20	-0.94	-2.74	0.06	2.77	-1.71	-1.97	0.96	-1.47	-3.52	
Firm size	-2.53	-1.88	-7.17	-0.34	-0.22	2.48	-2.46	-1.98	-0.11	-2.47	-3.14	
Qualification	-0.54	-0.06	-0.58	-3.95	-5.93	-1.93	-0.96	-0.03	-1.00	0.61	1.41	
Cohort	-2.28	-7.69	-6.16	0.42	-2.51	-0.28	0.81	0.68	0.00	1.84	-0.39	
Nationality	0.08	0.48	-0.31	-0.39	-0.94	-0.04	-0.38	-0.46	-0.99	-0.28	-0.56	
Constant	-1.42	14.98	30.23	17.77	6.02	9.35	38.58	15.54	37.80	53.87	37.64	

Persons of cohorts 1980-89 are not observed at age 35. Sources: Sample of Integrated Labour Market Biographies – SIAB 7510 v1; HWWI.

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