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Gender pay gap varies greatly by occupation

By Katharina Wrohlich and Aline Zucco

The German labor market is characterized by marked occupational segregation between women and men. The median earnings in female dominated occupations are lower than those in male dominated professions. This is one of the reasons for the gender pay gap. However, there are also large differences in earnings between men and women within occupations. These profession-specific gender pay gaps are smaller in professions with a high proportion of employees in the public sector. This finding indicates that more transparency with respect to earnings could reduce the gender pay gap in the private economy.

The discrepancy in pay between men and women has become a hotly debated topic in the political arena. The German Federal Statistical Office (Statistisches Bundesamt) documented the extent of the “unadjusted” pay gap, which has hovered around 21 to 23 percent in the years 2006 to 2016.1 The gender pay gap widens considerably over the course of professional careers, and for income over a lifetime the gender lifetime earnings gap is just under 50 percent.2 After people retire, the difference in pay continues in the form of the gender pension gap, which measures the gender-specific difference in pension levels. Current calculations document that the gender pension gap is a major problem—particularly in Germany. In 2014, it was 42 percent in western Germany and 23 percent in eastern Germany.3

The “adjusted” pay gap is often a topic of discussion.4 This term describes the unexplained portion of the gender pay gap and accounts for differences in characteristics in the earning estimate such as: professional experience, education, sector, profession, company size, number of hours worked, tasks, hierarchy level, and type of employment contract. According to the German Federal Statistical Office, the adjusted pay gap equals six percent.5

3 Markus M. Grabka et al., “Der Gender Pension Gap verstärkt die Einkommensungleichheit von Männern und Frauen im Rentenalter,” DIW Wochenbericht no. 5 (2016): 87-96 (available online). See also the article by Anna Hammenschmid, Peter Haan and Carla Rowold in this issue.
4 For a discussion of the terms “adjusted pay gap” and “unadjusted pay gap,” see the term “gender pay gap” in the DIW Glossary (available online).
The characteristics of number of hours worked, profession, and vertical segregation explain the pay gap to a large extent. This fact is often used to argue that the pay gap between men and women stems from different sets of decisions and is therefore possibly driven by different preferences. However, choice of profession and number of hours worked are not only expressions of preference. They are also the consequences of societal and institutional norms and restrictions.

The German labor market is heavily segregated by gender. As a study of the Institute for Employment Research (IAB) of the Federal Employment Agency documented, in 2010 a total of 60 percent of women worked in female dominated, 29 percent in mixed gender, and 11 percent in male dominated occupations. “Female dominated occupations” refer to those in which the proportion of women is over 70 percent, and “male dominated occupations” refer to those with a proportion of women of less than 30 percent. All other occupations are defined as mixed gender professions.

In total, 69 percent of men work in male dominated occupations, 20 percent in mixed gender occupations, and 11 percent in female dominated occupations. The IAB study also showed that there was virtually no change in the distribution of women and men among female dominated, male dominated and gender mixed professions between 1976 and 2010 in western Germany. Further studies document a similar relationship nationwide between 1993 and 2010.

A current evaluation of the sample of the 2014 IAB data, Sample of Integrated Labour Market Biographies (SIAB) (Box), showed that not even half (13) of the 30 most frequently cited professions are mixed gender professions (Figure 1). With a proportion of women of more than 80 percent, stenographers, kindergarten teachers, and doctor’s office assistants are among the typical women’s professions. Lathe operator, electrical installer, and truck repairman are all professions with an average proportion...
of women of less than three percent, making them men’s professions. Nursing care assistants, shop assistants, and office workers are all typical mixed gender professions.

**Gross wages in male dominated occupations are significantly higher than in female dominated occupations**

Based on the SIAB data, we were able to calculate the median wages paid within individual professions. The median wage is the wage in the 50th percentile of the wage distribution: it is the value with the same number of people with a higher and a lower wage. There is a difference between median wage and average wage, the latter being more robust against outliers. Since wages at the upper end of the distribution have to be estimated, the median wage is preferable to the average wage. In order to compare the difference in earnings among and within occupations, we use the median wage in our analyses.

In general, professions with a higher proportion of women have lower median wages than professions with a lower proportion of women (Figure 2). The five professions with the highest median wages are all men’s professions: entrepreneur, company manager, engineer, IT specialists, and banking and insurance specialists. Ranking the 30 most common professions according to median earnings, the best-paid women’s profession is number 14 (nurse, midwife), followed by stenographer.

### Box

**Sample of Integrated Labour Market Biographies (SIAB)**

The SIAB sample is an administrative data set provided by the Institute for Employment Research (IAB) of the Federal Employment Agency. It is a two-percent sample drawn from the Integrated Employment Biographies population, which contains the complete employment history of more than 1.75 million individuals.

The size of the SIAB sample gives it a key advantage in comparison to other data sets: for 2014 alone, the data set contained more than 764,000 observations. As a result of the administrative data collection process, the data set has no missing values, and its information on gross pay is accurate to the day. However, the SIAB does not record working hours, which means that part-time employees must be excluded from the comparison of daily pay in order to avoid distorting the results. And due to the administrative data collection process, the data set does not contain any information outside employer reports (no family status, number of children, or partner’s pay, for example).

**Definition: Profession**

We based our definition of “profession” on the 3-digit level of *Klassifikation der Berufe 1988* (KldB 88), a scheme for classifying professions in which they are allocated to groups based on the knowledge, skills, and experience required. For example, the system differentiates between human and veterinary medicine but not between surgeons and pediatricians. In effect, the classification makes it possible to differentiate between professions requiring different skill levels. This is important when comparing the pay in heterogeneous professions.

On the other hand, the classification cannot be used to examine how genders are divided into subgroups of professions. This means, for example, that within the profession of human medicine, we could not observe whether men and women segregate themselves into different areas of specialization. That means the gender pay gap within a profession can be traced to two factors, but differentiation is not possible. Men and women may work in subgroups of a profession that are paid differently; then again this could involve discrimination.
The other women’s professions are numbers 18 (kindergarten teacher), 19 (social worker), and 27 (doctor’s office assistant).

In summary, we can state than in the upper part of the pay distribution, male dominated professions predominate while female dominated professions are found in the lower half of the distribution. The professions with the lowest wages (waitress, waiter, steward, room and domestic cleaners, and cooks) are mixed gender professions.

Many studies have examined the causes of the systematically lower pay observed in women’s professions in comparison to men’s. The devaluation hypothesis rests on the assumption that society attributes different competencies to women and men. According to this hypothesis, women are ascribed to have strengths in housework and family duties, while men are ascribed to be more productive in gainful employment. For this reason, women and the professions in which most of them work have a lower status and are thus poorly paid.14 Further, inequality of pay between men’s and women’s professions can arise as a result of differences in human resources requirements. For example, the theory of compensating differentials claims that lower wages compensate for better possibilities to reconcile work and family duties in female dominated professions.15 The theory also suggests that fewer specific human resources are required in female dominated occupations professions than in those that are male dominated. This specialization leads to higher pay in the latter occupations.16


Gender pay gap also evident within professions

The previous analyses showed that in general, the pay in typical male dominated occupations is higher than that in female dominated occupations: part of the gender pay gap is due to the gender differences in occupational “choice”. However, we also find that gender pay gaps exist within occupations (Figure 3).17

Indeed, nine professions show a pay gap that is greater than the average unadjusted pay gap of 22 percent. These nine professions include male and female dominated as well as gender mixed occupations. For example, at 43 percent, the profession with the highest proportion of women (doctor’s office assistant) has the highest gender pay gap among the 30 most common professions. But even some male dominated professions show a very wide gender pay gap, for example, lathe operators and metal processors (28 percent each). The same applies to mixed professions. The pay structures of some also exhibit above-average gender pay gaps: salesperson (29 percent), banking specialists (25 percent), and bookkeepers (24 percent). The gender pay gap in the best-paid profession (entrepreneur, company manager) is 23 percent, which is also slightly above the average. This confirms the findings of current studies showing that overall the gender pay gap is significantly larger in the upper part of the income distribution than in the middle and lower parts.18 Further, earlier studies have found that the unexplained portion of the gender pay gap is increasing in the upper income range, which can be interpreted as a greater level of discrimination (glass ceiling).19

Some professions have a very low gender pay gap or none at all. This is the case in the male dominated occupation truck repairman, and in the female dominated occupation kindergarten teacher. In the mixed gender profession waitress, waiter, steward, the female dominated occupation nurse or midwife, and the male dominated occupations machine fitter and IT specialist, the gender pay gap is below ten percent.

19 For example Francine D. Blau and Lawrence M. Kahn, “The Gender Wage Gap.”

The Gender Pay Gap varies strongly between occupations.
Gender pay gap level unrelated to proportion of women in professions

Overall, we found that median pay has a negative correlation with the proportion of women in a profession but the gender pay gap does not. We ran a simple linear regression to relate the gender pay gap within a profession to factors such as the proportion of women in the profession, the proportion of employees in various sectors, and qualification levels, which confirmed the finding (Table). It reveals that neither the proportion of women among the employees in a profession, nor the proportion of part-time employees, nor median pay had a statistically significant relationship to the gender pay gap within a profession.  

We were unable to confirm a statistically significant relationship between this variable and the formal education of employees within a profession, the proportion of employees in a profession in various industries, or the average size of the company. Only the average age of the employees in a profession was correlated with the gender pay gap: The higher the average age of the employees, the wider the gender pay gap within a profession. This matches the empirical finding that in general the gender pay gap increases with age.

We were not able to include some of the factors of influence that seem to cause differences in the gender pay gap in individual professions due to a lack of information. For example, previous analyses of the German Federal Statistical Office have shown that in occupations in which the proportion of employees in the public sector is very high, the gender pay gap is much lower than in professions that are primarily practiced in the private sector. This could explain the large difference in gender pay gaps between doctor’s office assistants (43 percent) and kindergarten teachers (0 percent). The proportion of kindergarten teachers who are civil servants was around 63 percent in 2014, while only nine percent of doctor’s office assistants were civil servants.

The gender leadership gap is the difference in the proportion of women among total employees and the proportion of women in high management positions in a specific profession. The relationship can also be used to establish the existence of a gender pay gap within a profession. The present analysis based on the SIAB data was able to show that the profession of banking specialist has an above-average gender pay gap of 24 percent, for example (Figure 3). Earlier analyses conducted by DIW Berlin documented the existence of a particularly wide gender leadership gap in the financial sector. This can be an explanation of why the pay gap between men and women among banking specialists is higher than average.

Table

Linear regression of occupational characteristics on the Gender Pay Gap within occupations

<table>
<thead>
<tr>
<th></th>
<th>regression coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily wage (Median)</td>
<td>-0.00</td>
</tr>
<tr>
<td>Average age</td>
<td>0.018*</td>
</tr>
<tr>
<td>Average firm size</td>
<td>0.000</td>
</tr>
<tr>
<td>Education (Reference: Share with vocational training and without A-Level)</td>
<td>0.027</td>
</tr>
<tr>
<td>Share without vocational training and without A-Level</td>
<td>0.418</td>
</tr>
<tr>
<td>Share with A-Level</td>
<td>0.029</td>
</tr>
<tr>
<td>Share with higher education</td>
<td>0.179</td>
</tr>
<tr>
<td>Industry (Reference: Share of manufacturing)</td>
<td>0.192</td>
</tr>
<tr>
<td>Share of agriculture/mining</td>
<td>0.125</td>
</tr>
<tr>
<td>Share of construction</td>
<td>0.038</td>
</tr>
<tr>
<td>Share of trade/traffic/storage/hotel and restaurants/communication</td>
<td>0.117</td>
</tr>
<tr>
<td>Share of economical service</td>
<td>0.066</td>
</tr>
<tr>
<td>Share of administration/education/social services/entertainment</td>
<td>0.018</td>
</tr>
<tr>
<td>Share of personalized service</td>
<td>0.026</td>
</tr>
<tr>
<td>Share without assignment to an industry</td>
<td>0.018</td>
</tr>
<tr>
<td>Share of parttime employed</td>
<td>0.094</td>
</tr>
<tr>
<td>Share of women</td>
<td>-0.064</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.436</td>
</tr>
<tr>
<td>Number of occupations</td>
<td>90</td>
</tr>
<tr>
<td>R²</td>
<td>0.181</td>
</tr>
</tbody>
</table>

Note: The calculations are solely based on full-time employed persons. Levels of significance: ** p<0.01  * p<0.05  *p<0.1. The assignment to the respective occupations is based on the KldB 88. The Gender Pay Gap corresponds to the difference between the median wages of men and women in relation to the median wage of men. Reading aid: A positive coefficient indicates an increase of the Gender Pay Gap within occupations if the respective characteristic rises. Thus, this occupational property has a positive effect on the Gender Pay Gap if it is statically significant.

Source: Authors' own calculations based on the Occupational Panel (OccPan) 2010.

Only the average age within an occupation correlates with the Gender Pay Gap within an occupation. The higher the average age within an occupation, the higher is the Gender Pay Gap.

Gender pay gap level unrelated to proportion of women in professions

Overall, we found that median pay has a negative correlation with the proportion of women in a profession but the gender pay gap does not. We ran a simple linear regression to relate the gender pay gap within a profession to factors such as the proportion of women in the profession, the proportion of employees in various sectors, and qualification levels, which confirmed the finding (Table). It reveals that neither the proportion of women among the employees in a profession, nor the proportion of part-time employees, nor median pay had a statistically significant relationship to the gender pay gap within a profession. We were unable to confirm a statistically significant relationship between this variable and the formal education of employees within a profession, the proportion of employees in a profession in various industries, or the average size of the company. Only the average age of the employees in a profession was correlated with the gender pay gap: The higher the average age of the employees, the wider the gender pay gap within a profession. This matches the empirical finding that in general the gender pay gap increases with age.

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21 Previous analyses of the Federal Statistical Office did not find a significant correlation between the gender pay gap and the share of women working in an industry (see Claudia Finke (2010): a.a.O.).
23 Claudia Finke (2010): a.a.O.
24 These numbers are based on a weighted evaluation of the Socio-Economic Panel (SOEP) v32, 2014.
25 See Elke Holst and Martin Friedrich, "Women’s likelihood of holding a senior management position is considerably lower than men’s—especially in the financial sector," DIW Wochenbericht no. 37 (2016): 827–838 (available online).
It has been shown previously for the US that occupations in which working hours can be flexibly designed have smaller gender pay gaps than less flexible professions in which compulsory presence plays a greater role.\textsuperscript{26} However, when flexibility is mapped as the proportion of part-time employees, this relationship cannot be conclusively established for Germany (Table).

**Conclusions**

In the highly gender segregated German labor market, employees in female dominated occupations receive lower median pay than those in male dominated occupations. Therefore, choice of occupation is an important factor in explaining the gender pay gap. Based on the SIAB data of the IAB, DIW Berlin’s analyses, however, also show that in some cases there are very wide gender gaps within professions. However, in our initial analyses, we were unable to find a correlation between the proportion of women in a profession and the gender pay gap. There are above-average gender pay gaps across the board: in male dominated, female dominated, and mixed professions.

The data also showed that in general, professions with a high proportion of employees in civil service have smaller gender pay gaps. This is probably due to the tariff-based contracts in civil service, which leave less leeway for negotiation than in the private sector. Numerous behavioral economics studies have shown that women make fewer demands during negotiations than men.\textsuperscript{27} Social norms regarding the gendered expectations of men and women were identified as the cause of the discrepancy.\textsuperscript{28}

Based on data for the US, it has been shown that the gender pay gap is particularly low in professions in which flexible working hours are possible. Using the proportion of part-time employees as a measure of flexibility, we were unable to find a correlation with the gender pay gap in Germany. However, it must be noted that the proportion of part-time employment in a profession is not necessarily an indication of employees’ time sovereignty or the extent to which management positions can be held without compulsory presence. For example, earlier studies in the US identified the financial sector as one with a very large gender pay gap and at the same time, a lower likelihood of women holding management positions. With regard to that sector, the same holds true for Germany.

Our findings indicate a need for more research into the causes of the different levels of the gender pay gap within individual professions in Germany. Although many studies have analyzed the causes of lower pay in female dominated in comparison to male dominated occupations, little research has been done to answer the question of why the gender pay gap is much higher in some professions than in others.

The results suggest that more transparency in wage negotiations would lead to lower differences in pay between men and women.\textsuperscript{29} The Remuneration Transparency Act (\textit{Entgelttransparenzgesetz, EntgTranspG}) can be viewed as a step in that direction.\textsuperscript{30} And a change in corporate culture—away from overtime and compulsory presence to more employee control over working hours and flexible career models—could lead to more equal opportunity for men and women in the labor market, closing the gender pay gap in the process.


\textsuperscript{27} For example, see Linda Babcock and Sara Laschever, \textit{Women Don’T Ask: The High Cost of Avoiding Negotiation—and Positive Strategies for Change}, (London: Bantam Press, 2003).

\textsuperscript{28} For an overview, see Mario Macis and Mirco Tonin, “Gender Differences in Earnings and Leadership: Recent Evidence on Causes and Consequences,” \textit{ifo DICE Report} 2/2017 (2017): 18–21.

\textsuperscript{29} Linda Babcock and Sara Laschever, \textit{Women Don’T Ask}.

\textsuperscript{30} The German Women Lawyers Association initiated a series of proposals for improving the Remuneration Transparency Act with the goal of actually implementing a legal right to equal pay for women and men for the same or similar work. See German Women Lawyers Association, “Stellungnahme des Deutschen Juristinnenbundes,” (Web page, German Women Lawyers Association, Berlin, March 6, 2017) (available online).

**Keywords:** Gender pay gap, occupational segregation