The Unequal Impact of Firms on the Relative Pay of Women Across Countries

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Abstract

We use matched employer-employee datasets from the US and Europe to document the contribution of firm-specific pay premiums to the gender hourly wage gap. Our findings are as follows: (1) The impact of firm-specific wage premiums on the gender wage gap —the firm effects gap— varies considerably across the 11 countries we study. It accounts for two-thirds of the gender wage gap in the US and about one-third in Europe. (2) A decomposition of the firm effects gap into *sorting* (women working in lower-paying firms) and *pay-setting* (women earning less in similar firms) reveals stark differences across countries. The pay-setting effect explains less than 10 percent of the gender wage gaps in most countries. In countries with a lower degree of wage-setting centralization (Hungary and US) the importance of the pay-setting effect is much larger.

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1. Introduction

In an influential paper, Card et al. (2016) (CCK) developed a method for analyzing gender wage premiums using the Abowd et al. (1999) (AKM) model. The AKM model decomposes the variation in wages into a portable worker-specific component that is valued equally by all employers, and an employer-specific component that measures the monetary advantage or disadvantage of working for that employer. By estimating firm-specific wage premiums separately for men and women, CCK addressed the extent to which gender differences in wages can be explained by (1) women's ability to bargain for wages similar to men's and (2) women's sorting to employers that pay relatively low wages. They find that about 25% of the gender wage gap in Portugal is accounted for by differences in the firm effects gap.

The CCK approach has been important in understanding the role of the employer in generating the gender wage gap. Rather than assuming that labor markets are competitive and that gender wage gaps stem from employer distaste for hiring women (Becker 1957), differences in productivity (Mulligan and Rubinstein 2008), or unobserved differences in preferences for flexibility or long work hours (Goldin 2015), the CCK approach recognizes that labor markets are noncompetitive and that the lack of competition impacts the gender wage gap.

The CCK approach has been used to quantify the role of firm-wage premiums in explaining the gender wage gap mainly in Europe (discussed in more detail in the next section). Across these studies, the degree to which the firm-wage premiums explain the gender wage gap varies from 9 to 40%. However, comparing the estimates in this literature is challenging not only because studies may differ in observation periods, sample cuts, whether earnings are adjusted for hours worked, and the sets of control variables, but also because of differences in country-specific wage-setting institutions.

In this paper, we use administrative data from eleven developed economies to quan-

tify the importance of firm-specific wage premiums for understanding the gender wage gap. The countries included in the study are the United States (represented by Washington state), Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, Norway, Portugal, and Sweden. The main observation period is 2010–2019. For each country, we construct an employer-employee matched dataset following a uniform design. The uniform construction of the analysis samples allows us greater latitude in making cross-country comparisons of the role of employers in the gender wage gap. The most important requirement is that all the datasets include information on earnings and hours worked, which allow us to construct hourly wage rates. The availability of hours worked is crucial to account for the fact that women earn less but also work fewer hours than men.

To quantify the importance of firm-specific wage premiums in explaining the gender wage gap, we estimate the AKM model separately for men and women and then decompose the gender wage gap following CCK. We find that the contribution of firm-specific wage premiums to the gender wage gap varies considerably across countries — accounting for two-thirds of the gender wage gap in the US but less than one-third in Europe. Moreover, the relative importance of the sorting component versus the pay-setting component varies across countries. In particular, the pay-setting component is large in the US and Hungary — countries with relatively low degrees of wage-setting centralization. Sorting explains less than 10% of the gender wage gap in the Netherlands, Denmark, and Hungary, about 20% in the rest of Europe, and more than 30% in the United States. We show that the choice of the normalization of the firm effects, which affects only the pay-setting component, has implications for the importance of the relative importance of the pay-setting effect.[1] For this reason, following Card et al. (2016), we use two normalization approaches to construct ranges of this estimate to infer the ranking of countries. Despite these cross-country differences, we also document similarities. For

[1]This is especially true in Scandinavian countries.

example, pay-setting is more important for higher-wage workers and higher-premium firms in all countries.

We rationalize the pay-setting effect on the gender wage gap through a rent-sharing model where women extract less rent than men in the same firm (Card et al. 2016). We show that firms with higher productivity pay higher wage premiums, with an elasticity around 0.1 for men but lower for women, suggesting differential rent sharing.[2] However, the confidence intervals suggest that differential rent sharing across countries does not significantly drive cross-country differences in the within-firm wage gap, with the exception of Hungary. Using more granular country-industry variation, the analysis confirms that productivity differences amplify rent sharing differences and the within-firm gender wage gap. However, this more granular variation confirms that it is the overall availability of rents, rather than differential rent sharing, that primarily determines cross-country differences in the within-firm gender wage gap.

The remainder of the paper is structured as follows: Section 2 describes the datasets, sample selection criteria, and presents descriptive statistics.[3] Section 3 describes the two-way fixed effects wage regression (AKM) and the decomposition (CCK). Section 4 presents the main results on the AKM-CCK models for all countries. Section 5 discusses the relationship between productivity and wage premiums and the last section concludes.

2. Harmonized research design

Table 1 summarizes recent studies using North American and European data and applying CCK to quantify the extent to which gender difference in firm-wage premiums

[2]These estimates are available for the seven countries with access to firm-level financial data, allowing us to measure productivity. Countries with firm financial data are: Denmark, France, Hungary, Italy, Norway, Portugal and Sweden.

[3]We relegate a more detailed description of each country's data and institutional features to the appendix.

explain the gender gap in wages or earnings. The table indicates that the firm-wage premiums are important in all countries. However, this conclusion is potentially misleading because the research designs of these studies differ. Indeed, these papers differ in observation periods, sample cuts, whether earnings are adjusted by work time, and the sets of control variables. These discrepancies tend to produce different estimates of the impact of firms on the gender wage gap. The lack of comparable estimates makes it difficult to understand the sources of the gender wage gap across countries.

To address these limitations, we create a harmonized cross-country employer-employee dataset by integrating high-quality administrative data from the United States, Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, Norway, Portugal, and Sweden. This set of countries meets the central requirement of this study, which is the availability of work hours and, — at a minimum — information on the worker's gender and age.[4] The data period is at least ten years and covers 2010–2019.

2.1. Sample selection

To make the datasets consistent, we retain "prime-age workers," defined as aged 20 to 60 years. We keep workers employed in the private sector; however we conduct additional analysis in countries where we observe public sector employees.[5]

We annualize the data regardless of the original data collection frequency. To do so, we define a worker's primary employer as the employer from whom the worker had the highest annual earnings. We drop observations with earnings less than 80% of the minimum wage or 10% of median earnings, and jobs in the bottom and top 0.1% of the hourly wage rate distribution within country and year. We omit student workers,

[4]For example, the Canadian and the Austrian data do not contain work hours; and work hours are unavailable in most US linked employer-employee panels.

[5]Private sector jobs are all jobs that do not have as industry code "Public administration and defence, compulsory social securit" and the ownership of the company is not the government. Semi-public companies like train or oil companies are classified as private sector companies. Non-profit firms like associations and foundations are counted as private sector entities.

apprentices, and "marginal jobs" for those countries where we can observe them.

Table 2 summarizes each country's dataset and its main characteristics: the period covered, job and employer coverage, and the availability of information on workers and employers. The firm is defined as an employer (as opposed to an establishment).[6] Except for the United States for which we have data for 2001–2014, all the other countries' data span much of the the 2010–2019 decade. The choice of time period is guided by wanting to focus on the most recent complete decade recent and improvements in some country's datasets.[7]

In Appendix A B.1 to B.11 we provide more details for each country including the relevant institutional background, the data sources at the firm and worker level, and the particulars regarding definitions of the variables.

We define wages as the hourly wage rate, constructed by dividing labor earnings before taxes from the primary employer in a year by annual hours worked for the primary employer. The definition of hours is paid work hours, or contractual hours if paid work hours are not available (as is the case in Hungary). Labor earnings in administrative data include overtime, bonuses, and severance payments when available. We deflate wages using the OECD CPI for each country with the base year set at 2015.

Because the CCK decomposition is only meaningful for employers who employer both men and women, we drop single-gender firms that constitute between 95 to 100 percent of the raw analysis sample. Appendix Sections B.1 to B.11 present tables summarizing the three following sub-samples: the initial analysis sample subject to the above selection criteria, a sample of dual-connected workers and firms (that is, a sample of firms that employer both men and women and are connected through worker mobility), and the dual-connected set for which we have information on value-added or sales data. For the remainder of the paper, for each country, we refer to the dual-connected set as

[6] Germany is the only exception.

[7] For example, in Denmark data on hourly wage are available from 2008.

the main analysis sample.

In addition to the main analysis samples, we present additional estimates based on two alternative samples. First, we add employees in the public sector to our main analysis sample (unavailable in the US, Italy, Portugal, and Hungary). We estimate the same models and decompositions using this sample with the goal to determine if the results pertaining to sorting and bargaining are affected by the choice of dropping the public sector jobs. Second, we select firms with at least ten movers over the observation period with the goal of testing whether limited mobility leads to imprecisely estimated firm effect effects (Bonhomme et al. 2023). Results with public sector employees are presented in Section 4.4. Limited mobility has a minimal impact on our results.

2.2. Descriptive statistics

Table 3 provides descriptive statistics of the main analysis samples, for each country, and by gender. The first row shows the log of hourly wage rates. In every country, we observe that women's wages are lower than men's. Workers are on average between 38 to 41 years old, and in some countries, women are slightly younger than men. Women are more likely to work part-time (defined as less than 30 hours per week) than men.

The separation rate is defined as the ratio of workers who transition from one main employer in year t to a different employer in the following year or to non-employment divided by the number of employees in year t. Between 22 and 36% of employees are separating each year and women are more likely to separate. The data from Sweden oversample larger firms. In all of the datasets, the average number of movers per firm is more than 20, which is an informative statistic for inferring if the estimated firm-wage premiums are precisely estimated.[8] We also report the share of baseline observations with productivity measures, which are unavailable for Germany, Finland and the United

[8]Note that because the data from Sweden contain on average larger firms, on average there are also more movers per firm.

States.

3. Estimation of firm-wage premiums and decomposition of the gender wage gap

We begin by describing the gender-specific AKM two-way fixed effects model and then discuss the CCK decomposition.

3.1. The AKM two-way fixed effects model

We start by estimating the following two-way fixed effects model separately for men and women in each country:

$$\ln w_{(i(J),t)} = \alpha_i + \psi^{G(i)}_{J(i,t)} + X'_{it}\beta^{G(i)} + r_{J(i,j)t} \tag{1}$$

where $\ln w_{it}$ denotes the log hourly wage rate of worker i in firm $j \in \{1, ..., J\}$ in year t. α_i denotes a worker fixed wage effect that captures unobserved, time-invariant, and portable component of worker productivity. The worker fixed effect is equally valued by any employer. $\psi^{G(i)}_{J(i,t)}$ denotes a firm fixed wage effect that reflects any monetary advantages (or disadvantages) derived from being employed by employer j. X'_{it} is a vector of observables that includes a third-order polynomial in age, and year effects; this is the specification used by Bonhomme et al. (2023) in their cross-country study. To separately identify age, time, and worker fixed effects, we follow CCK in restrict the age-pay profile to be flat at 40. $r_{J(i,j)t}$ denotes the regression error term, which may contain a worker-firm match component.

Firm wage effects can be interpreted as reflecting inter-firm wage premiums that arise due to differences in firm wage policies rather than differences in workforce composition (Card et al. 2018). However, because we allow firm wage effects to differ

for men and women by estimating equation (1) separately by G, we can interpret $\hat{\psi}_{J(i,t)}^{G(i)}$ as systematic differences in a firm's wage policy toward men and women.

Equation (1) differs from the model used in Card et al. (2016) in that CCK's vector X allows a full interaction of year dummies with four education dummies and includes quadratic and cubic terms in age interacted with those education dummies. The reason equation (1) does not include these interaction terms is that education information is not available for France and Hungary; see Table 2.[9]

Econometric assumptions. To identify firm fixed effects, we follow the literature (Card et al. (2013)) in making the following assumptions. First, equation 1 assumes that worker and firm fixed effects are log additive, i.e., there are no complementarities between firm type and worker types. Consequently, the wage premium will be the same for all workers in the firm regardless of their characteristics. Second, the model assumes exogenous mobility, i.e., the residual $r_{J(i,j)t}$ is uncorrelated with the probability of moving. Third, the model is static, ruling out the presence of lagged terms in determining firm-wage premiums.[10] The firm effects in equation (1) are estimated using a set of firms and workers connected through worker mobility. Because for each country we estimate equation (1) for each gender, we focus on the dual-connected set sample, i.e., the part of the connected set that contains both female and male workers.

Measurement errors in firm effects. Firm effects in equation (1) are identified through year-to-year worker mobility. Kline et al. (2020) and Bonhomme et al. (2023) show

[9] Estimating the model with education dummy interactions for countries other than France, Italy, and Hungary yields similar results to the main specification.

[10] Bonhomme, Lamadon and Manresa (2019) find that the log additive specification is approximately accurate. Card, Heining and Kline (2013) use event-study figures to test whether wage changes following worker transitions from low to high-wage firms and transitions from high to low-wage firms are approximately symmetric. They conclude that symmetry implies that moving on the basis of a match effect is unlikely. Di Addario, Kline, Saggio and Sølvsten (2023) estimate an extension of the AKM model to include current employer and previous employer fixed effects find that "current" employer fixed effects explain much more of the variance of wages than "previous" employer fixed effects. Accordingly, they conclude that the static AKM is a good approximation of the wage-setting process.

that limited mobility will lead to an upward bias in the estimated variance of firm effects. However, in panels longer than six years (or for average number of movers per firm greater than ten) this is typically a minor issue (Lachowska et al. 2022). For most countries we have access to a ten-year panel with an average number of movers per firm exceeding 20, which lessens concerns about limited mobility bias. Moreover, our main evidence is built on levels rather than second-order moments, and the average firm fixed effect is unbiased under the usual assumptions of AKM models (Bonhomme et al. 2023). However, to show that our findings are not sensitive to measurement errors in the estimate of firm effects, we estimate our sample to firms with at least ten movers by gender over the observation period. We find very similar results.

3.2. The Firm Effects Gap and its Decomposition

After estimating equation (1) by gender, we measure the firm effects gap. We define it as the proportion of the gender wage gap explained by gender-differences in firm-wage premiums

$$\frac{E[\psi_j^M] - E[\psi_j^F]}{E[w^M] - E[w^F]} \tag{2}$$

The numerator in the equation above — the difference in gender firm-wage premiums — can be decomposed into a sorting component and a bargaining component by using a Blinder-Oaxaca decomposition of firm wage effects:

$$E[\psi_j^M] - E[\psi_j^F] = \underbrace{E[\psi_j^M - \psi_j^F|M]}_{\text{Pay-setting}} + \underbrace{E[\psi_j^F|M] - E[\psi_j^F|F]}_{\text{Sorting}} \tag{3}$$

The first component on the right-hand side is interpreted as the pay-setting effect: the degree to which women obtain a smaller share of the wage premium than men. The second component on the right-hand side reflects sorting: the degree to which women

sort to employers paying lower wage premiums to all their workers. The pay-setting component may contain differences in bargaining ("women don't ask"), see for example Babcock and Laschever (2009). It also contains monopsony power of firms (Robinson (1933), Manning (2003)).

Equation(3) estimates the sorting and pay-setting component over the distribution of jobs held by men. Although common in this literature, the choice of using men's jobs is arbitrary and equation (3) can also be estimated over the distribution of jobs held by women.[11]

Normalization of firm effects. Firm effects are estimated in reference to an omitted firm or group of firms. In order to make comparisons across fixed effects estimated using males and females requires normalization. The typical approach is to identify "low-surplus" firms and set their (gender-specific) firm fixed effects to zero with the assumption that those firms pay on average zero wage premiums for both genders (Card et al. 2016, 2018).

One approach is to normalize firm effects relative to the average firm effects in the hotel and restaurant sector, which has been shown to be the industry with the least surplus to share on average (Card et al. 2016). Another common approach uses value-added data and the observation that the relationship between firm value added per worker and firm wage effects then to follow a hockey-stick pattern: firm effects tend to be similar for low value-added firms and then increase linearly with value-added per worker Card et al. (2016). Because value added is only available for 7 out of 11 countries, we focus on a variant of the first approach. Instead of imposing a sector for all countries, we choose the sector i) with the lowest firm effects both male and female, ii) which employs at least 1 percent of the population. For the countries in which firm-level

[11]The decomposition using women's jobs is given by $E[\psi^M] - E[\psi^F] = E[\psi^M - \psi^F|F] + E[\psi^M|M] - E[\psi^M|F]$. We report the results using this alternative reference in Section 4.2.

productivity is observed, we also follow the first approach to provide an additional estimate with a different procedure.[12]

4. The Impact Of Firms On The Gender Wage Gap Across Countries

We begin this section by quantifying the importance of employers on wages by estimating AKM models and decomposing the variation in wages. We proceed by showing results of the firm effects gap and its decomposition by country and then by selected worker and firm characteristics.

4.1. AKM variance decompositions by country

To quantify the effect of firms on wages, we conduct the following decomposition of equation (1):[13]

$$\text{var}(\ln w_{it}) = \text{var}(\alpha_i) + \text{var}(\psi_{J(i,t)}) + 2\text{cov}(\psi_{J(i,t)}, \alpha_i) + \text{var}(r_{J(i,j)t}). \tag{4}$$

Firms' influence on the variance of wages is measured primarily through $\text{var}(\psi_J)$.

Figure 1 shows variance decompositions obtained by estimating equation (1) for log wages separately by gender for each country. The firm component explaining the variation on wages is the highest in Germany (22–27%), Hungary (20–23%), Italy (15-21%), US (16–17%), Norway (13–15%), and Portugal (13–15%). The firm component is the lowest in Sweden, where it accounts for between 3-4%.

In Appendix Figure A.1, we report the variance decomposition using the main analysis sample (left side of each graph) and using the main sample restricted to firm with at least ten movers (right side). For each country, comparing the main sample decompo-

[12]The relationship between firm value added per worker and firm wage premiums is presented in Figure 7.

[13]For simplicitly, we omit the covariances between fixed effects and the vector $X^{'}$.

sition to the at-least-ten-mover sample shows great similarity. As expected following Bonhomme et al. (2023), the reduction in the importance of firm effects is the highest in datasets with a random sample of workers (e..g, Italy, Hungary), or a panel of workers with less than six years of data (Germany is the only country with this feature in our data). However, as argued earlier, the high degree of worker mobility in the large majority of our data sets implies that firms effect in the main sample are estimated with a relatively low degree of error.

4.2. CCK decompositions by country

Figure 2 reports the estimates from equation 3. The overall gender wage varies between countries. It is the highest in Norway and the US (about 20 log points) and the smallest in Sweden (0.085 log points).

To visualize the link between firm wage premiums and the gender wage gap, we report the fraction of the gender wage gap that can be explained by wage premiums (the red bar) and its two components (the green and orange bars). We find that firms' contribution to the gap is unequal across countries. Following equation 2, this can be shown by computing the fraction of the gender wage gap explained by the firm pay gap component. In USA, the fraction of the gender wage gap explained by firm-wage premiums is 67%. This contrasts sharply with France, where the firm premium gap contributes to 18% of the gender wage gap. We find that for other countries, namely Denmark, Portugal, and Sweden, the values fall in between.

The importance of pay-setting vs. sorting varies across countries. In US, Hungary, and Denmark, most of the overall contribution of firm wage premiums is due to pay-setting. In contrast, in Portugal, France, and Italy most of contribution of wage premiums is due to sorting.

4.3. Decompositions by worker and firm characteristics

Figure 5 reports the CCK decompositions by wage and wage premium quintiles. In both cases, we pool country estimates and express them relative to the first quintile so that differences in normalization across countries are balanced out.

Sorting and pay-setting by workers' wages. Figure 5, panel B, decomposes the sorting and pay-setting components by quintiles of the hourly wage distribution.The component of the gender wage gap that can be attributed to pay-setting is larger for high-wage workers in all the countries. In general, the increase in the gender gap in wage premiums along the distribution of worker wages is stronger in countries where bargaining plays a greater role in the gender wage gap, on average. The sorting component does not show a clear pattern along the distribution of worker wages. These results are unaffected by using the women distribution as the reference for the decomposition of the gap in wage premiums within and between firms.

Sorting and pay-setting by firm wage premiums. Figure 5, panel C, decomposes the sorting and pay-setting components by quintiles of the estimated firm wage premiums. The pay-setting component increases with firm-wage premiums in all of the countries. The increasing gender gap in wage premiums may reflect the greater importance of individual wage bargaining in high-wage firms. This is consistent with previous work by Lachowska et al. (2022) who find that wage bargaining rather than wage posting (wage offers are given without bargaining) is more prevalent among high-wage workers than low-wage workers. At the same, wage-setting institutions in the form of statutory minimum wages and collectively agreed wage floors tend to be more binding for low-wage workers.

Most of the realization of the aggregate sorting occurs between quintiles. However,

if we look within quintiles, sorting at the bottom is more important for all countries.

4.4. Public sector jobs and gender wage gap

So far, the analysis has focused on private sector jobs. This is because we do not observe public sector jobs in the US, Portugal and Hungary. Nevertheless, it is widely documented that women are more likely than men to work in the public sector, a pattern that is confirmed in all out national datasets. Accordingly, it is reasonable to analyze how the CCK decomposition of the gender wage gap is affected by adding public sector jobs to the main analysis sample.

Figure 6 contrasts the main CCK decomposition with the results when public sector jobs are included. Indeed, the role of the firm effects gap becomes higher, driven by an increased sorting component. In summary, the inclusion of public sector jobs shows that women are more likely to sort into lower paid jobs than men, because these jobs are more common in the public sector. This suggests that most estimates of sorting in the literature that focus on private sector jobs underestimate the true sorting in the overall labor market.

4.5. Robustness

Alternative decomposition. Figure A.5 reports the alternative CCK decomposition. Recall that in the main decomposition, the pay-setting effect is calculated by comparing the firm effects for men and women across the distribution of jobs held by men. The sorting effect is calculated by comparing the average firm effects for women across the jobs held by men versus women. In the alternative decomposition, the pay-setting effect is calculated using the distribution of jobs held by women, and the sorting effect is calculated by comparing the average value of the male wage premiums across jobs held by men versus women. In all countries, the pay-setting effect is typically lower (e.g in

the US).

Sample cuts and econometric specifications. Figure A.6 reports the sorting and pay-setting effects for the sample of workers who work in firms with at least ten movers by gender over the period. Recall that in most countries, the data covers a panel of ten years covering the full population of employees in the private sector (see Table 2). Still, in some countries, such as Italy or Hungary, our data only cover a 50 percent random sample of workers. A lack of mobility could lead to higher sampling errors in firm effects estimates. We find that this is not the case: the sorting and pay-setting effects are almost identical.

Another concern is arguably the limited set of observable characteristics (the main specification only includes year effects and third-order polynomials in age).[14] Figure A.7 reports the sorting and pay-setting effects when we estimate the gender-specific AKM model with and without four educational attainment (less than high-school, high-school or vocational training, some college, and master or above) groups interacted with age. Both sorting and pay-setting effects are almost identical.

Upper bound of the pay-setting effect (TO BE IMPROVED). Following Gerard, Lagos, Severnini and Card (2021), we extend our normalization by estimating an upper bound on the component of the gender wage gap that can be attributed to differences in wage setting. Our baseline can be thought of as a lower bound. Recall that we first normalize the gender-specific firm effects to an average of low-wage sectors (cleaning, restaurants, postal services). Thus, we assume that the gender wage gap in these industries is due to differences in worker productivity as measured by worker fixed effects. We then estimate an upper bound by assuming that the gender wage gap is entirely due to

[14] Actual labor market experience is not available in the data sets we use (either because the data does not allow us to reconstruct a worker's employment history or the data sets report only point-in-time employment measures (e.g., who was on the payroll in October). Moreover, employment gaps are typically not exogenous. Card et al. (2018) provide a detailed discussion on this point.

differences in gender-specific firm wage effects (i.e., we assume that men and women in restaurants are equally productive). The results using this extended normalization vary somewhat but are not too large across countries.

5. Firm Wage Premiums and Firm Productivity

The results presented so far show that a source of the gender wage gap occurs within the employer, with women receiving lower firm wage premiums than men. In this section, we rationalize these findings through the lens of a rent-sharing model in which women earn less rent than men within the same firm.

In a competitive labor market, differences in firm productivity lead to differences in employment but not in wages. In markets with frictions, however, differences in firm productivity can affect both employment and wages. If high-productivity employers demand more workers than low-productivity employers, and there are search frictions that prevent the marginal productivity of labor from equalizing across firms, then wages for similar workers will tend to be higher in more productive firms. If women's labor supply is less responsive (elastic) to firms' wage premiums, the gender gap in wage premiums is predicted to be larger in more productive firms.

5.1. Firm-level estimates

To test the first prediction, we estimate the elasticity of firm-wage premiums with respect to productivity. In practice, this is done by regressing men's firm-level wage premiums on log value added per worker (log sales per worker in Portugal). The resulting elasticity is the degree of pass-through of firm-level productivity to wage premiums, which allows us to test whether higher-productivity employers are also higher-paying employers.

Next, we examine whether the productivity pass-through is higher for men's premiums than for women's premiums. Note that in order to examine this, we need to

compare men's and women's premiums within a consistent distribution of jobs. Here we normalize them to the distribution of men's jobs, consistent with our baseline estimates.

Figure 9 presents the results and Table A.2 reports the regression estimates. The results indicate that firm productivity pass-through to wage premiums for men is close to 0.1 on average across countries (columns 1 and 2). In other words, one percent higher labor productivity is associated with 0.1 percent higher wage premiums. However, the average masks enormous heterogeneity. This is in line with the central estimates in the literature (Card et al. 2018). Productivity pass-through is highest in Hungary, where it is 0.16, and lowest in Sweden where it is 0.02, which aligns with Hungary having the highest firm variance component in wages, and Sweden having the lowest. The results are similar when controlling for industry fixed effects, which suggests that the link between productivity and wages is mainly driven by differences between firms within industries.[15]

Next, we show that the pass-through of the pay-setting for men is higher than for women (Table A.2,columns 3 and 4). The results indicate that in almost all countries, there are systematic differences in pass-through between men and women. The estimates range from about 0.004 (in France) to 0.02 (in Hungary). If pass-through for men is about 0.1 it is about 0.09 for women. Differential pass-though is again higher for Hungary and lower for Sweden. However, the confidence intervals suggest that, with the exception of Hungary, differences in differential rent sharing across countries do not drive cross-country differences in the within-firm wage premium component. This implies that the overall level of rents to share is likely to be a determinant of the overall pay-setting effect that we document in the previous section.[16]

[15]The estimate for Portugal is 0.077, which is similar to the CCK's estimate equal to 0.072.

[16]Plausibly, more competitive product and labor markets limit the scope for wage premium differentials by limiting rents.

5.2. Country-industry level estimates

To exploit the richness of our data, we construct a country-2-d-industry dataset and use this more granular variation to test that, in the presence of aggregate and differential pass-through, productivity differences across markets amplify differences in rent sharing. We estimate a simple regression model:

$$E[\psi_j^M|M]_{i,c} - E[\psi_j^F|M]_{i,c} = \beta\pi_{i,c} + \delta_i + \delta_c + \varepsilon_{i,c} \tag{5}$$

where the left-hand side is the average pay-setting component in industry i in country c and $\pi_{i,c}$ is the average log value added per worker (log sales per worker in Portugal). The specification includes one-digit industry and country fixed effects[17] to account as much as possible for differences in the dependent variable that are unrelated to productivity differences. Consistent with the rent-sharing model presented in Card et al. (2016), the idea is to use this more detailed variation to identify cross-market differences that are directly related to excess rents and to see how they affect the within-firm component of the gender wage premium gap. The results of this simple model are presented in Table 4. We find a positive and significant relationship between this measure of excess rents and the within-firm gender wage premium gap. Interestingly, the model in (5) with a country-specific β does not improve the fit at all. This is consistent with the firm-level cross-country evidence that differences in the within-firm component of the gender wage premium gap across countries are mostly driven by differences in the availability of excess rents rather than by differences in differential rent sharing.

[17] note that this means that the country-specific normalization is balanced out

6. Conclusion

This paper contributes to our understanding of the gender wage gap by quantifying the importance of firm-wage premiums across countries by using a uniform approach to sample selection and estimation. To do so, we use matched employer-employee administrative data from the United States and ten European countries.

We find that firm wage premiums and their decomposition into pay-setting and a sorting channel affect the gender wage gap in all countries. However, their impact varies significantly. The pay-setting component increases across the wage and wage premium distributions. Our analysis highlights the importance of including the public sector in gender pay gap analyses. When we analyze all jobs in the economy — not only private-sector jobs — we find that the wage premium gap is even more relevant. We examine the productivity pass-through to wage premiums and find systematic differences across countries and between men and women.

This paper contributes significantly to the literature by providing novel stylized facts on the role of firms in shaping gender wage inequality. Our findings underscore the interplay of labor market structures, firm-specific factors, and institutional settings in shaping the gender wage gap.

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7. Tables

TABLE 1. Review of Research Designs and Estimates in the "Gender Wage Gap and Firms" Literature

Paper	Country	Wage measure	Year	GWG	Sorting (GWG %)	Bargaining (GWG %)	Firm gap (GWG %)
Li et al. (2023)	Canada	Annual	2001–15	.268	.029 (10.8)	.032 (11.9)	.061 (22.8)
Sorkin (2017)	USA	Annual	2000–08	.335	0.093 (27.7)	NA	NA
Card et al. (2016)	Portugal	Hourly	2002–09	.234	.047 (19.9)	.003 (1.2)	.049 (21.2)
Casarico and Lattanzio (2024)	Italy	Weekly	1995–15	.204	.042 (20.5)	.027 (13.3)	.069 (33.8)
Palladino et al. (2021)	France	Hourly	2002–07	.183	.019 (10.8)	-.002 (-1.4)	.017 (9.4)
Bruns (2019)	W. Germany	Daily	2001–08	.247	.063 (25.4)	.001 (0.3)	.064 (25.9)
Gallen et al. (2019)	Denmark	Hourly	2000–09	.208	.033 (15.8)	NA	NA
Masso et al. (2022)	Estonia	Monthly	2006–17	.271	.077 (28.5)	.031 (11.6)	.109 (40.1)

Notes: Selection of recent papers quantifying the role of firm-specific wage premiums on the gender wage gap in North America and Europe. *Wage measure* denotes the measurement of the outcome variable. Annual (respectively, hourly) indicates that wage is defined as annual earnings (hourly wage). *Year* denotes the period studied. Other differences in research designs include the units of analysis (firm or establishment), the controls used, and the normalization of the firm effects. *GWG* denotes the unconditional gender wage gap measured in logs. *Sorting* denotes the CCK sorting component (using female coefficients). *Bargaining* denotes the CCK bargaining component (using male jobs' distribution). *Firm gap* denotes the sum of both components. See Li et al. (2023), Table 6. See Card et al. (2016), Table 3. See Bruns (2019), Table 3. See Palladino et al. (2021), Table 2. Sorkin (2017) (Table 1) and Gallen et al. (2019) (Table 3) do not provide an estimate of the firms gap. See Casarico and Lattanzio (2024), Table 4. See Masso et al. (2022), Table 5.

TABLE 2. Characteristics of Data Sources by Country

	USA	Denmark	Finland	France	Germany	Italy	Hungary	Netherlands	Norway	Portugal	Sweden
Time span and population considered											
Year coverage	2001-14	2010-19	2010-19	2010-19	2010-2014	2010-19	2010-17	2010-19	2010-19	2010-19	2010-18
Reference month	NO	NO	YES	NO	NO	NO	YES	NO	NO	YES	YES
% private sector jobs	>95	100	50	100	100	50	50	100	100	100	50
Public sector jobs	NO	YES	NO	YES	YES	NO	YES	YES	YES	NO	YES
Information on employees											
Hourly wage	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Earnings information	P	P	P	P	P	P	P	P	P	C	P
Hours information	P	P	P	P	C	C	C	P	P	C	P
Education	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES	YES
Information on employers											
Firm or plant identifier	Firm	Firm	Firm	Firm	Plant	Firm	Firm	Firm	Firm	Firm	Firm
Labor productivity	NO	YES	NO	YES	YES	YES	YES	NO	YES	YES	YES

Notes: The table summarizes the main characteristics of the datasets. *Year coverage*: time range of our analysis. *Reference month*: the data contains information only for a reference month for the entire year. *% private sector jobs*: the data contains the full population or a sample of X% private sector jobs. *Public sector jobs*: the data contains most public sector jobs (e.g., employees paid by the state, public hospitals, and local governments). *Hourly wage*: the data contains hourly wage. Hourly wages are measured by dividing annualized total earnings by annualized total hours worked at the main employer (if the data is not only for a reference month). *Earnings information*: earnings measure to define hourly wage contains irregular payments such as overtime pay, bonus or not (labeled "Contractual"). *Hour information*: hours measure to define hourly wage contains hours that are paid and not only contractual. *Education*: the data contains a variable recording educational attainment in four categories. *Firm or plant identifier*: an employer is defined in the data at the firm (i.e., a legal unit in European countries) or the workplace level. *Industry (2-digit level)*: the data contains a 2-digit NACE code for Europe and a 2-digit NAICS code for the US. *Labor productivity*: the data contains a measure of labor productivity (defined as sales or value-added per worker) at the firm level. See the Appendix for explanations for each country.

TABLE 3. Summary Statistics

		Log Hourly Wage	Age	Part-time (%)	Separation (%)	Firm Size	Movers per Firm	Obs with VA (%)	Person/Yr Obs	N of workers	N of firms
DEU	Male	3.01 (0.58)	41.11	8.17	20.09	40	25	NA	51.57	13705.69	609.77
	Female	2.76 (0.51)	41.23	34.04	21.69	40	18	NA	38.82	10893.24	609.77
DNK	Male	3.41 (0.37)	41.63	31.06	29.31	94	70	80.63	3.67	928.25	19.73
	Female	3.27 (0.32)	41.33	42.74	28.96	96	42	65.20	2.49	655.56	19.73
FIN	Male	3.02 (0.36)	41.10	5.16	22.65	118	91	NA	3.30	678.73	12.78
	Female	2.85 (0.33)	41.00	15.60	26.90	115	72	NA	2.58	595.03	12.78
FRA	Male	2.85 (0.46)	39.02	16.28	39.15	37	35	87.95	91.45	20866.38	769.77
	Female	2.72 (0.40)	38.58	35.73	40.58	37	29	74.36	73.52	18104.74	769.77
HUN	Male	6.76 (0.62)	38.97	6.85	29.30	36	24	84.80	4.01	851.13	86.75
	Female	6.63 (0.55)	39.66	13.55	29.92	37	18	81.63	3.22	726.76	86.75
ITA	Male	6.32 (0.46)	40.98	11.79	22.58	22	34	86.47	30.19	4752.47	471.99
	Female	6.14 (0.40)	39.98	41.97	25.16	23	24	82.79	19.65	3196.24	471.99
NLD	Male	2.99 (0.54)	39.62	19.36	25.41	60	68	NA	29.74	4674.48	264.78
	Female	2.85 (0.44)	39.18	61.68	24.78	62	67	NA	28.77	4405.35	264.78
NOR	Male	3.19 (0.51)	39.72	10.23	22.39	32	54	90.09	8.03	1329.43	81.40
	Female	2.95 (0.52)	39.17	27.24	25.20	35	34	77.10	5.59	1033.19	81.40
PRT	Male	1.80 (0.55)	39.20	2.49	23.85	29	33	97.02	9.97	1907.33	127.88
	Female	1.63 (0.49)	38.78	6.64	24.42	30	29	94.50	9.03	1718.98	127.88
SWE	Male	5.33 (0.34)	41.72	5.29	23.21	227	156	86.22	4.78	1087.50	8.31
	Female	5.24 (0.31)	41.62	21.80	28.71	229	91	79.43	2.87	741.02	8.31
USA	Male	3.18 (0.62)	38.56	27.68	36.40	60	55	NA	6.67	881.29	102.68
	Female	2.97 (0.58)	38.80	34.99	35.24	63	40	NA	4.83	636.49	102.68

Notes: The table presents summary statistics of the dual-connected set samples across countries. Only private sector jobs. Part-time is defined as at less than 30 hours per week. Separation is the percentage of workers separating from their firms from one year to the subsequent one. Mean firm size is the number of employees by firms, not weighted by number of workers. Number of person-year is in millions. Number of workers and number of firms are in thousands.

TABLE 4. Pay-setting and Productivity

	Pay-Setting	Pay-Setting
$\beta\{\bar{\pi}\}$	0.0167***	0.0124***
	(0.0029)	(0.0033)
Country FE	✓	✓
1-d Industry FE		✓
Within R^2	0.1615	0.0603
N	470	470

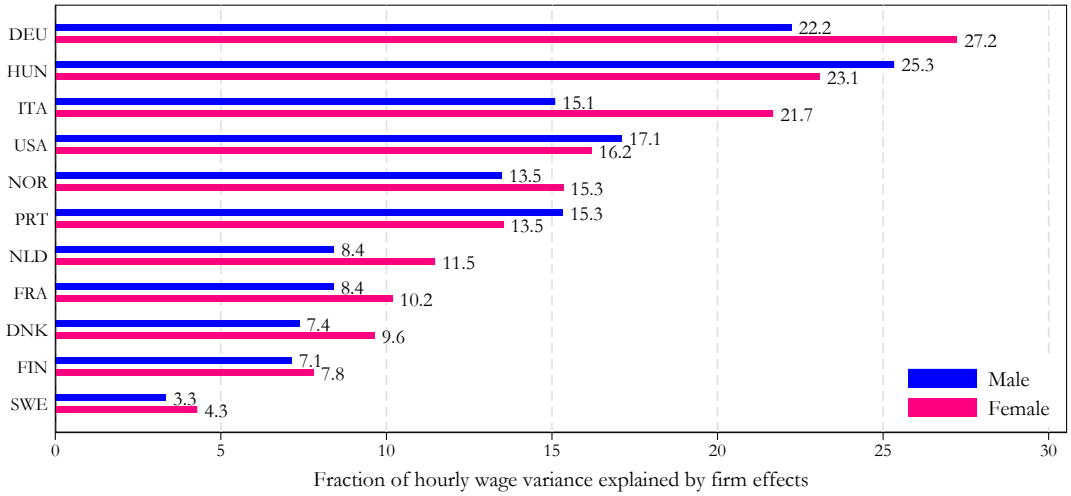
Notes: Results coming from Model 5, where we regress the average pay-setting component on the the average log value added per worker (log sales per worker in Portugal) in a country-2-d-industry setting, controlling for country and one-digit industry fixed effects. Standard errors obtained using a bootstrap procedure with 1000 replications

*, ** and *** denote statistical significance at the 10%, 5% and 1% levels

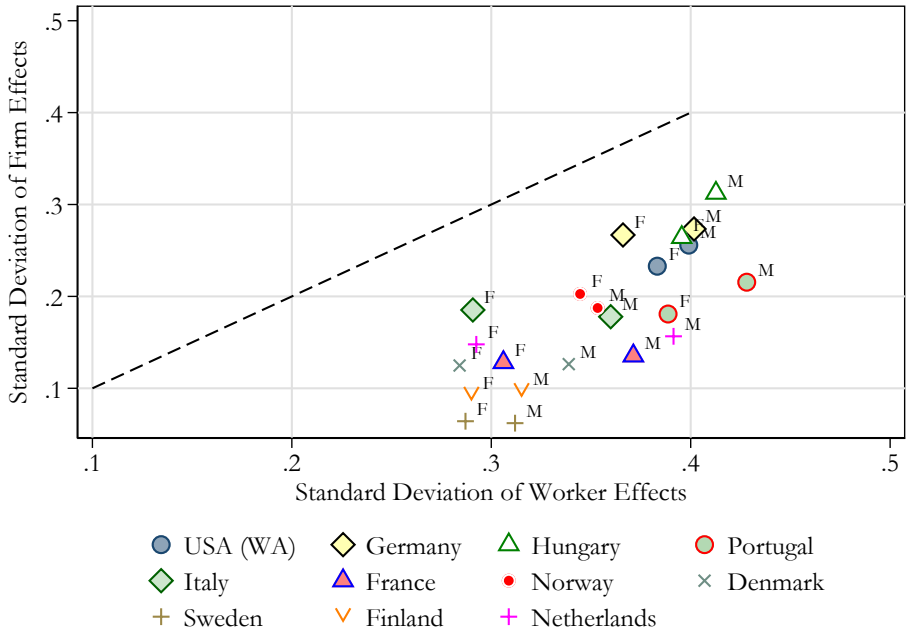
8. Figures

FIGURE 1. Wage Inequality and Firm-Specific Pay Premiums Across Countries

Panel (a) Firm effects variance shares



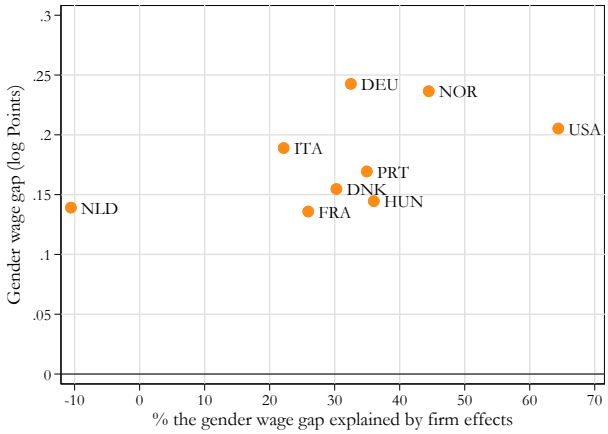
Panel (b) Standard deviations of firm and worker effects



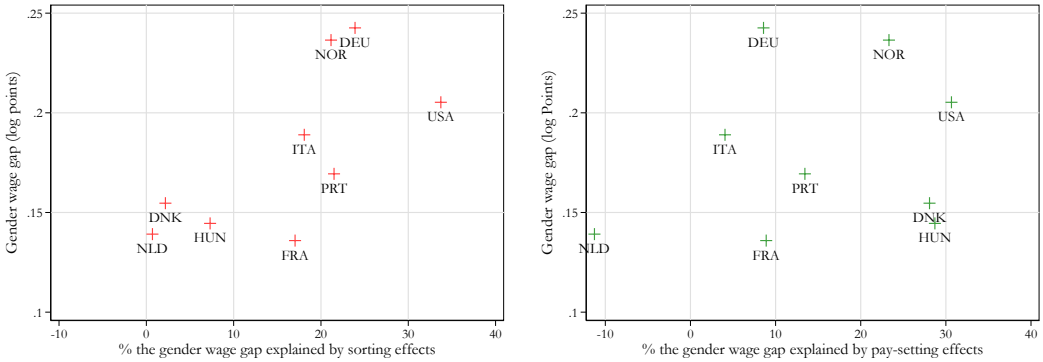
Notes: Panel (a) reports the variance of hourly wages explained by firm-specific wage premiums in the baseline sample. Figure A.1 reports the person and covariance effects of the variance decomposition. Panel (b) reports

FIGURE 2. The Firm Effects Gap Across Countries

A. The Firm Effects Gap

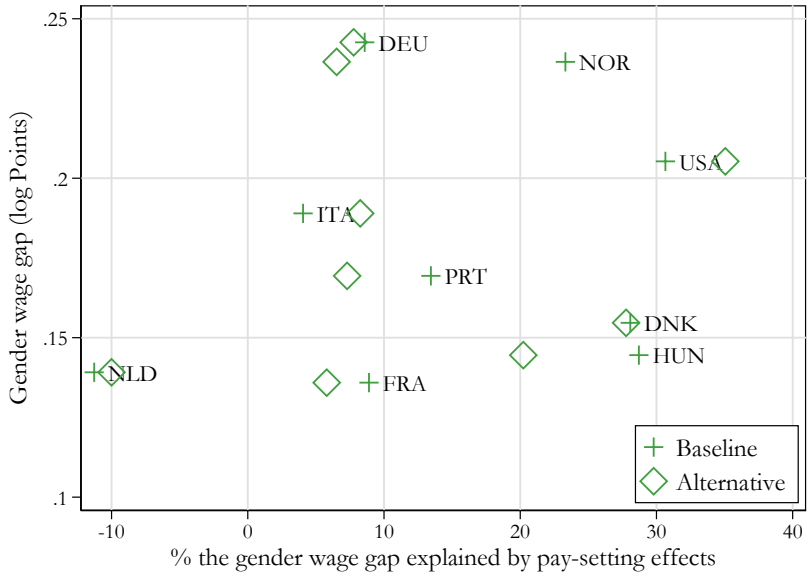


B. Firm Effects Gap: Sorting Effect and Pay-setting Effect



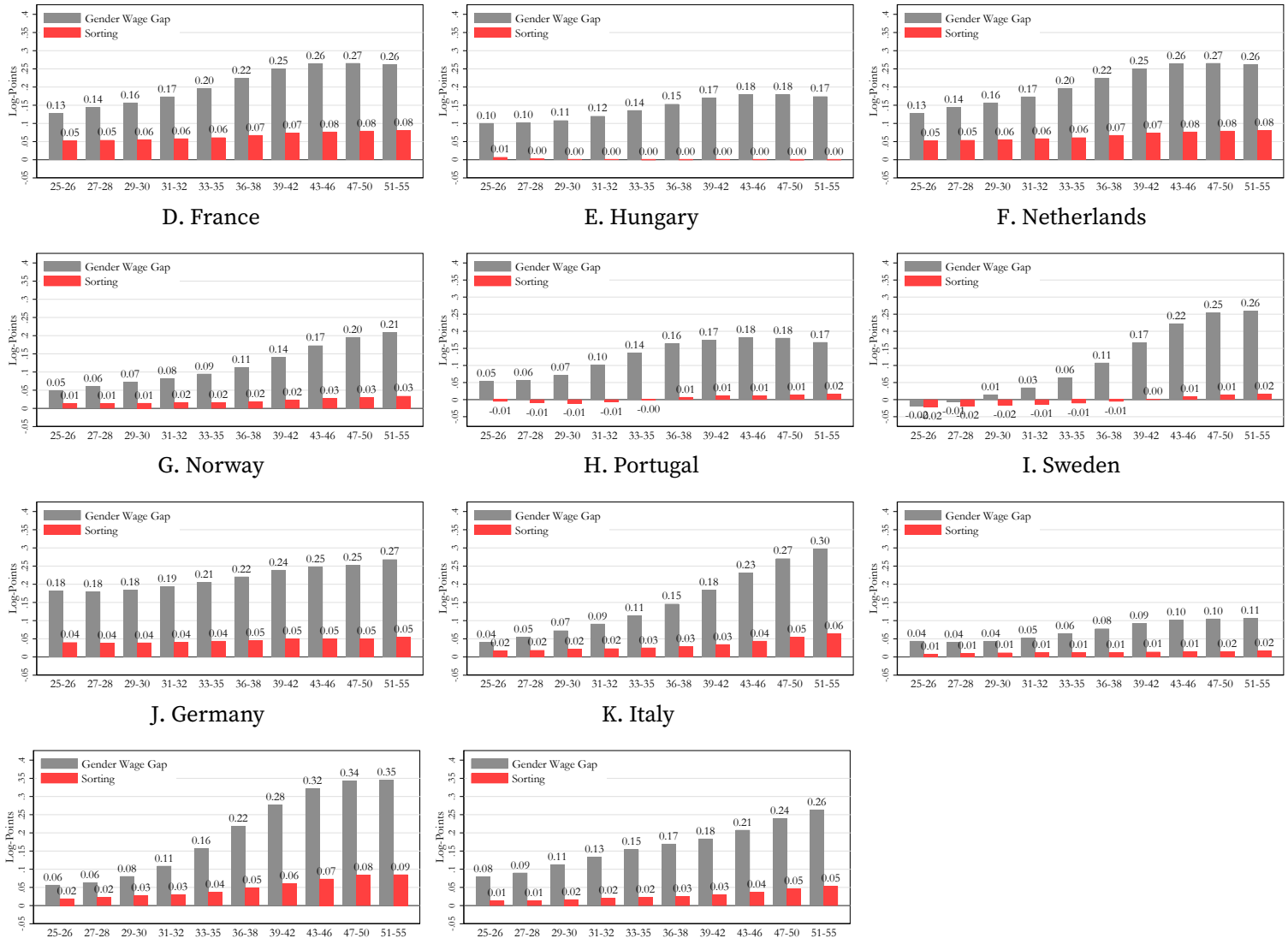
Notes: The y-axis reports the unconditional gender hourly wage gap in the baseline sample (private sector jobs for the set of dual-connected firms). Panel A. x-axis reports the firm effects gap. Panel B decomposes the firm effects gap, i.e., the sorting and the pay-setting effect. We sort countries in Panel B by the size of the firm effects gap. We normalize the pay-setting effect using the lowest paying sector industry for each country.

FIGURE 3. The Firm Effects Gap Across Countries: Normalization of Pay-setting Effects



Notes: We normalize the pay-setting different industry grouping.

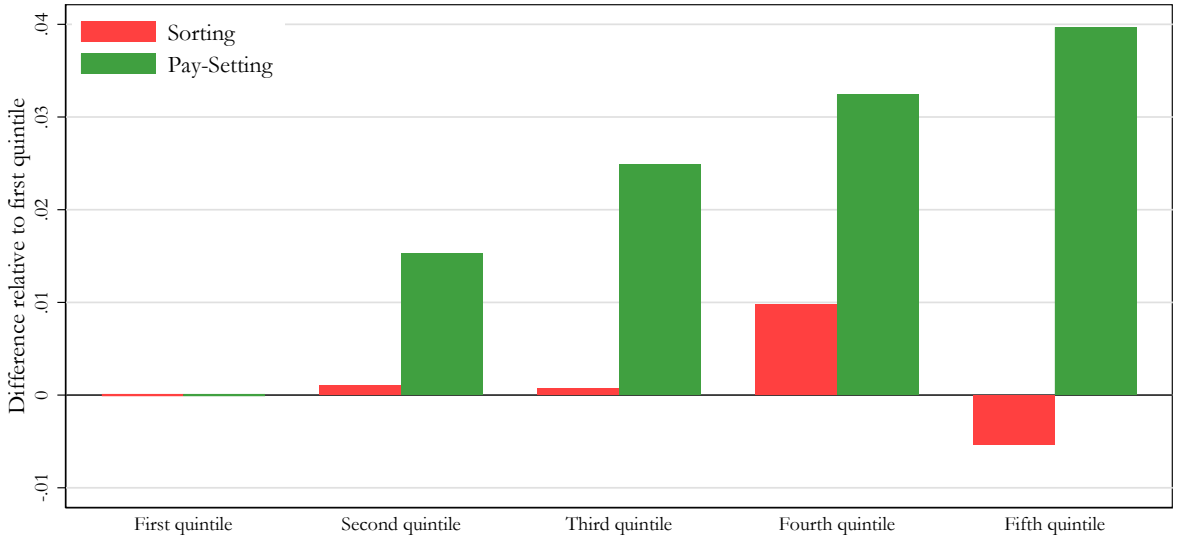
FIGURE 4. Evolution of the Gender Wage Gap and the Sorting Component Over the Life Cycle



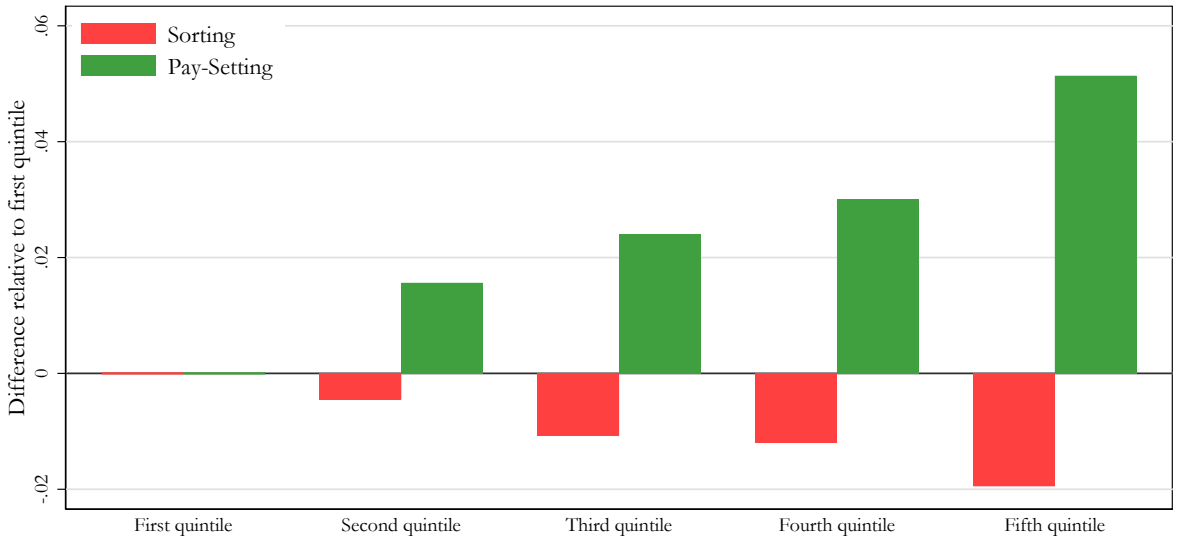
Notes: This figure shows the unconditional wage gap and the sorting component.

FIGURE 5. The Firm Effects Gap: Decomposition by Worker and Firm Characteristics

A. By worker's wages

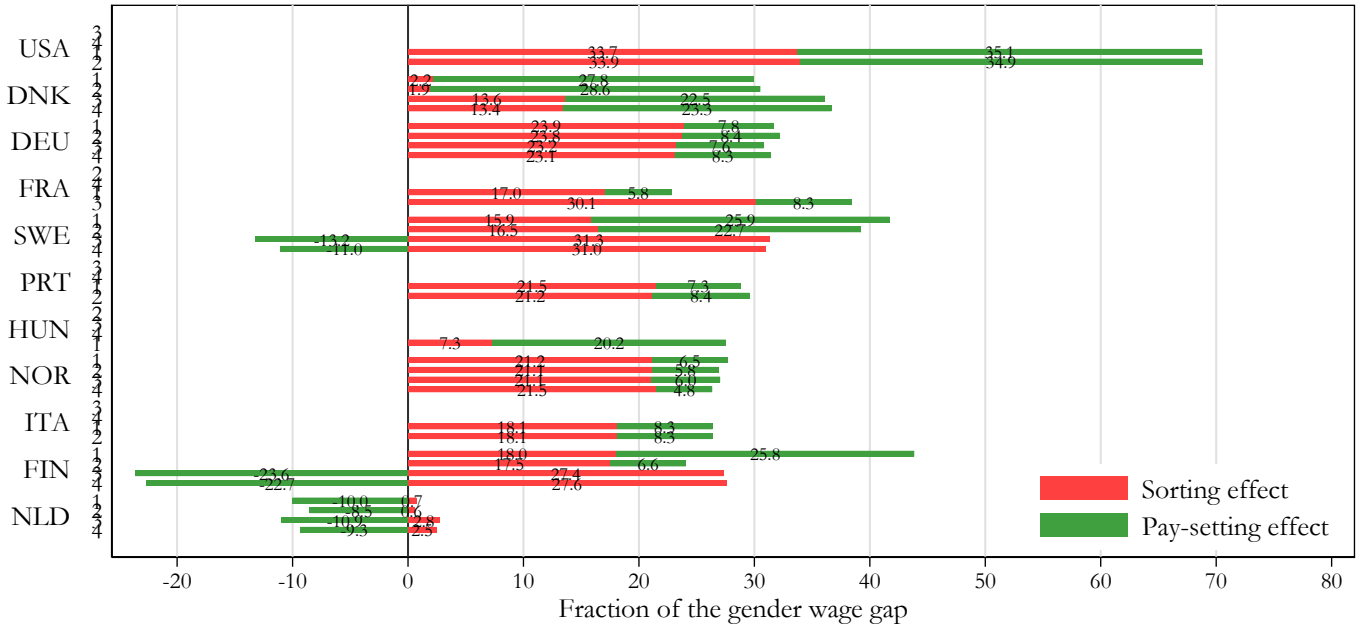


B. By firm-wage premiums



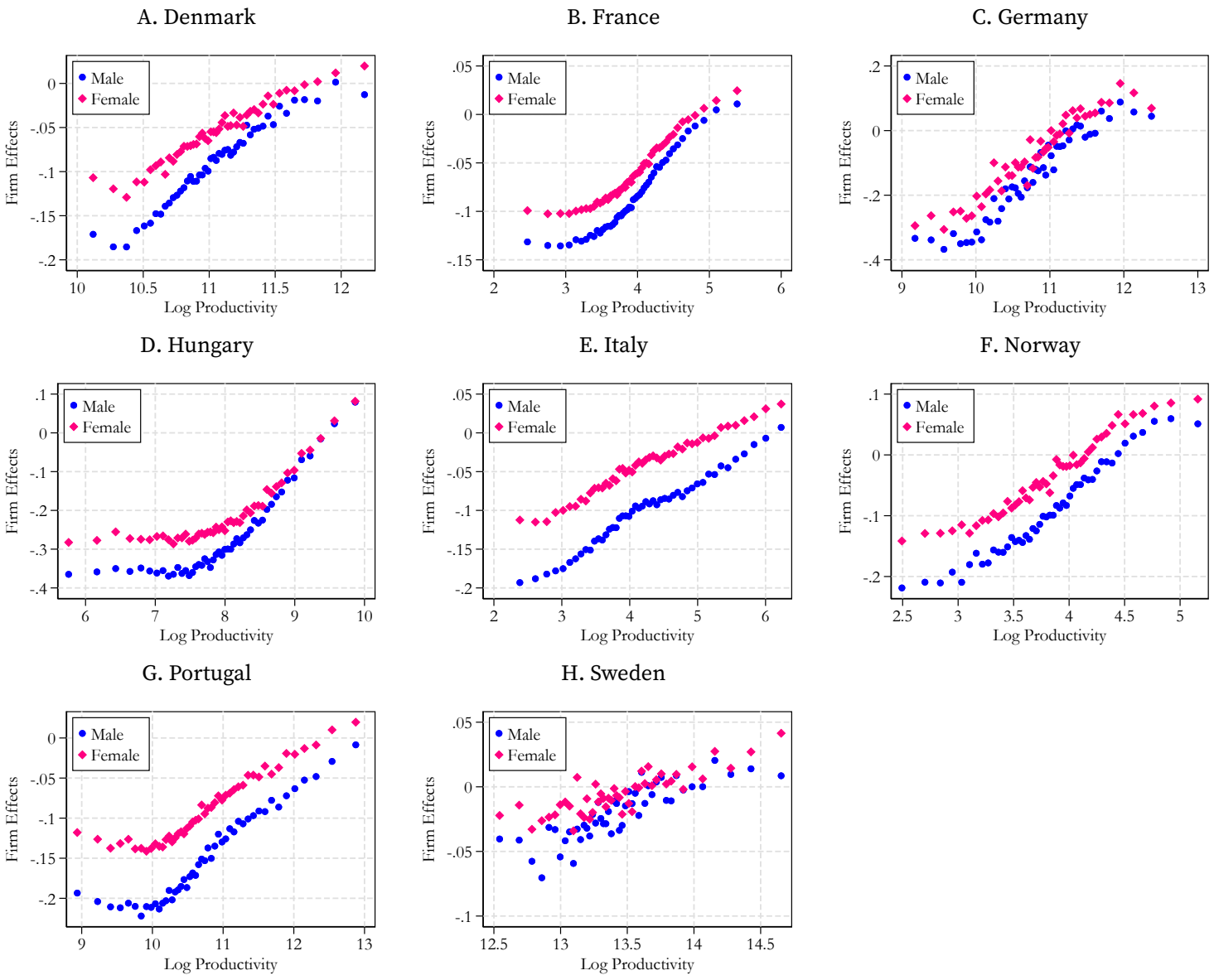
Notes: Panel A, B report hourly wage quintiles and firm effects quintiles. See Section 3.2 for explanation.

FIGURE 6. The Firm Effects Gap: Public sector Jobs



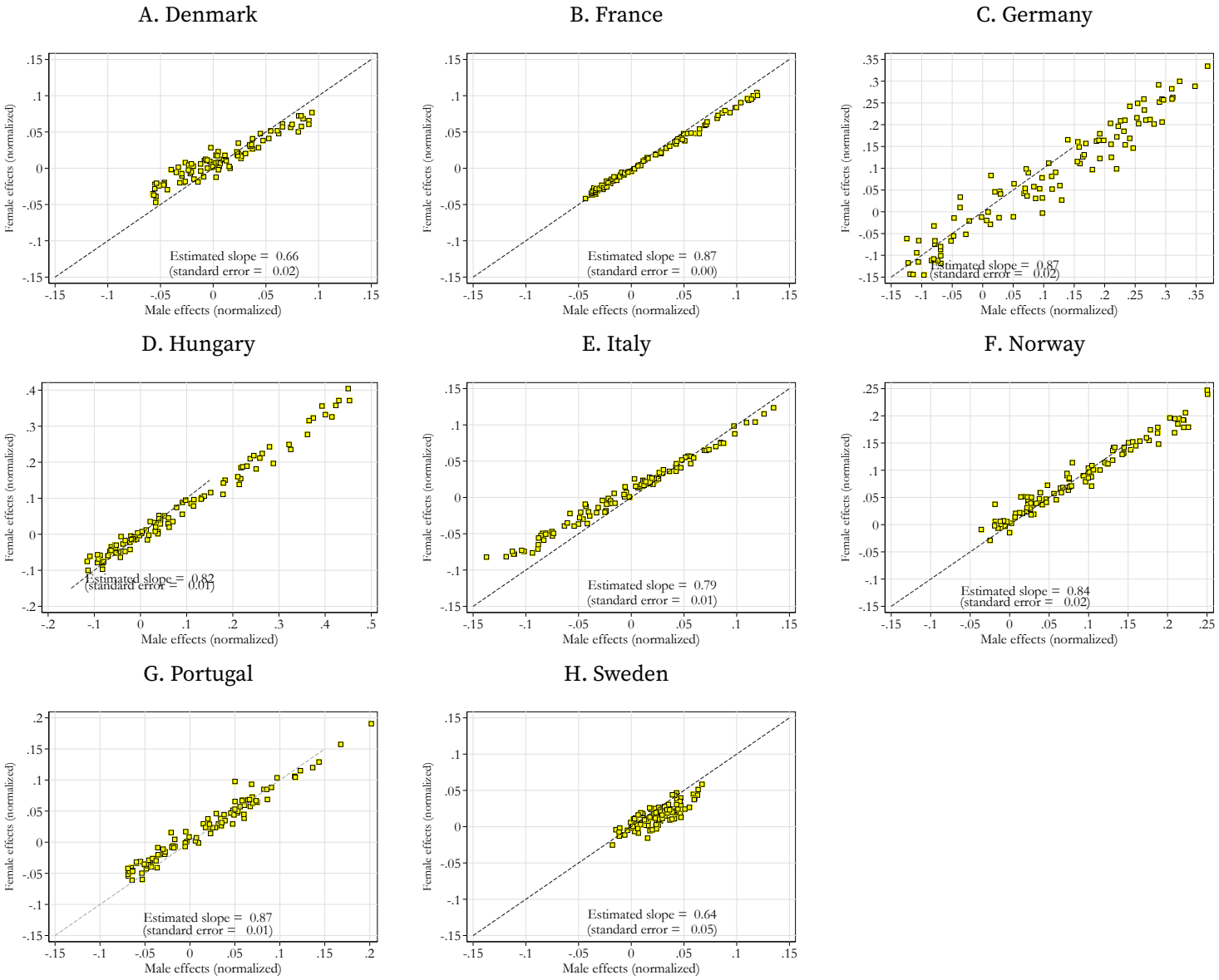
Notes: The figure reports the CCK decomposition, in the baseline sample (Private) and in the sample including public sector jobs.

FIGURE 7. Firm Fixed Effects and Productivity Across Countries



Notes: The points shown represent mean estimated firm-specific wage premiums from the AKM models for men and women, averaged across firms with value-added data available in 100 percentile bins of mean log value-added per worker.

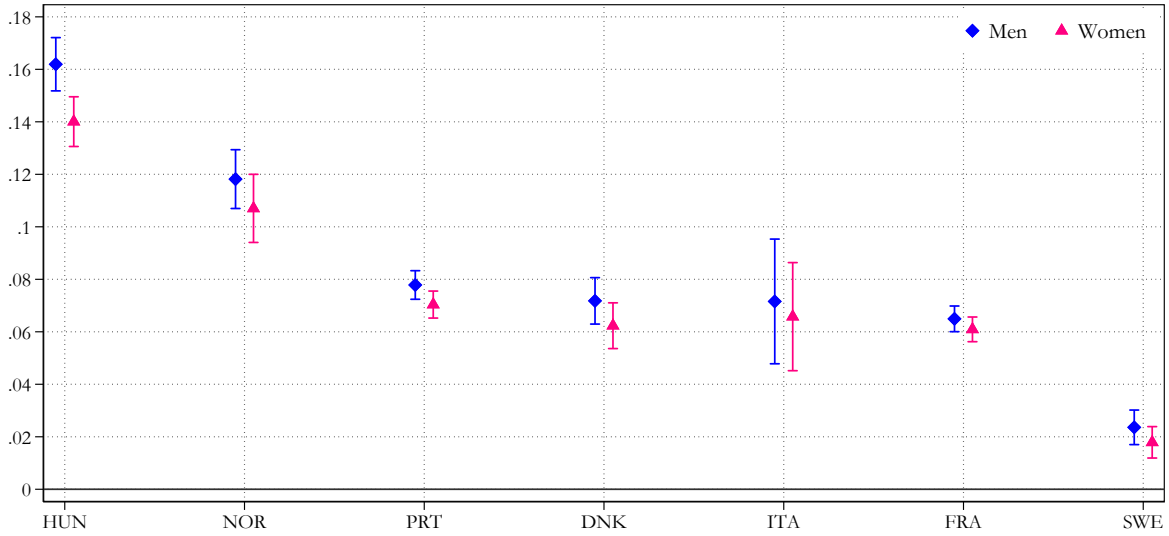
FIGURE 8. Firm Fixed Effects For Males and Females



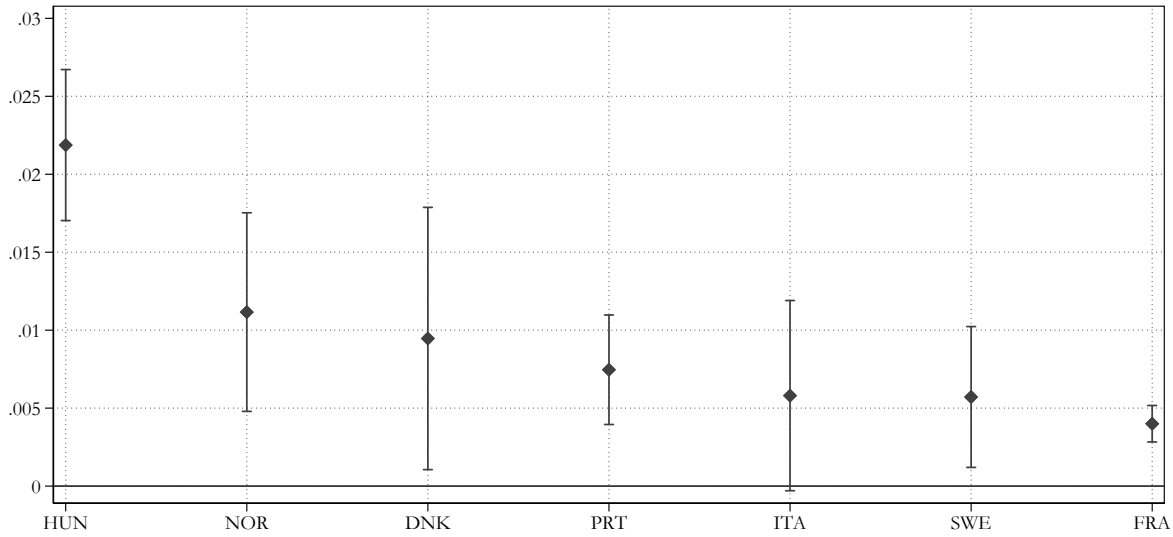
Notes: The figure shows bin scatter plot of estimated firm effects for female workers against estimated firm effects for male workers. Firm-level data are grouped into 100 percentile bins based on mean log value added per worker at the firm (log sales per worker for Portugal). Estimated slope is estimated across percentile bins by OLS. Sample of firms with at least 10 movers by gender. The dotted black line is the 45 degree line.

FIGURE 9. Firm Wage Premiums And Firm Productivity

A. Productivity pass-through to wage premiums



B. Differential productivity pass-through for men and women



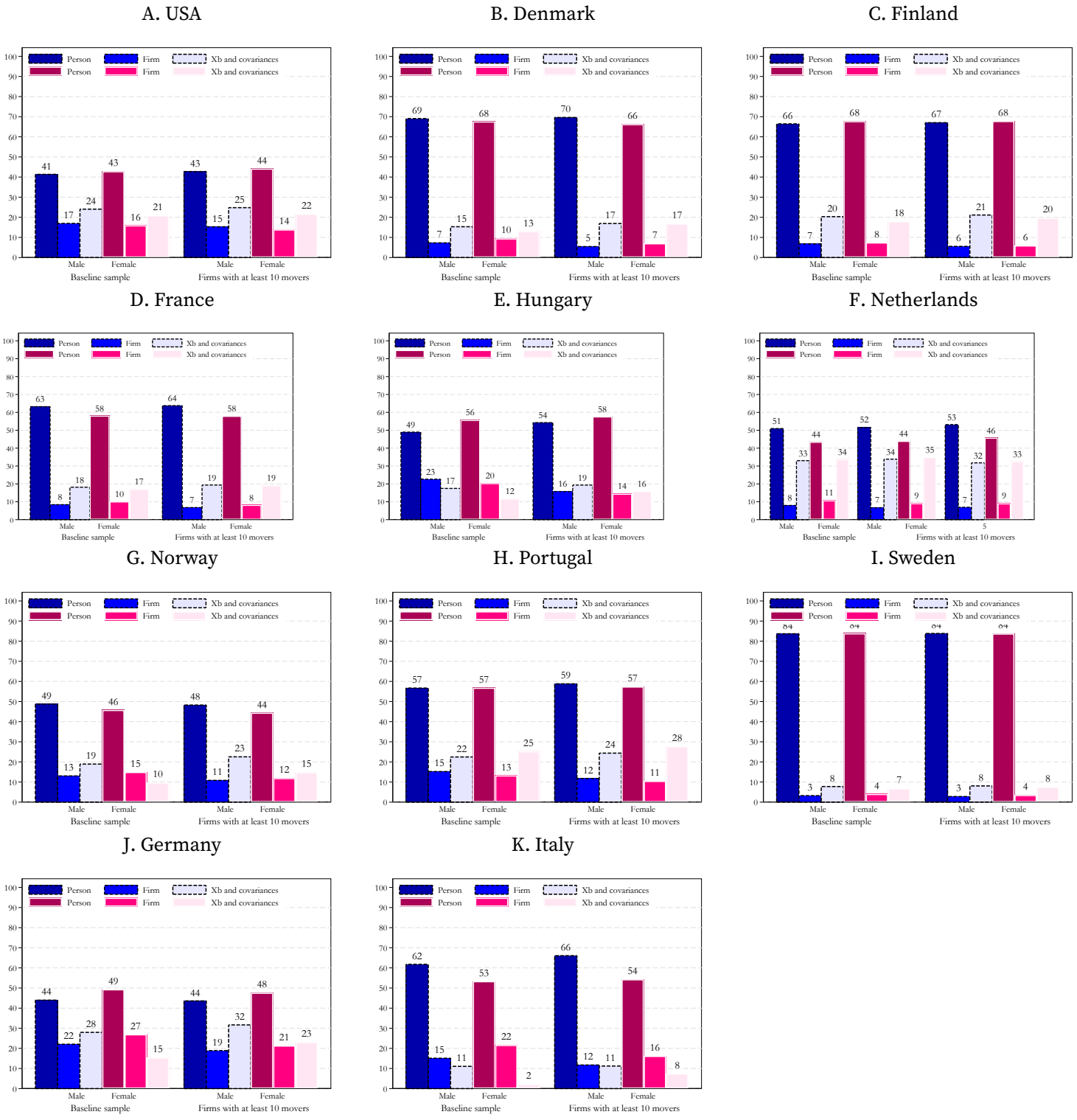
Notes: This figure reports OLS firm-level estimates of the elasticity gender-specific wage premiums on labor productivity. Panel A reports the estimates of the regression of labor productivity on wage premiums for men and women controlling for 2-digits industry fixed effects. Panel B shows the estimates of the same regression on the firm-level difference in wage premiums for men and women. Regressions are weighted by the number of male workers.

Appendix

A. Additional Figures and Tables

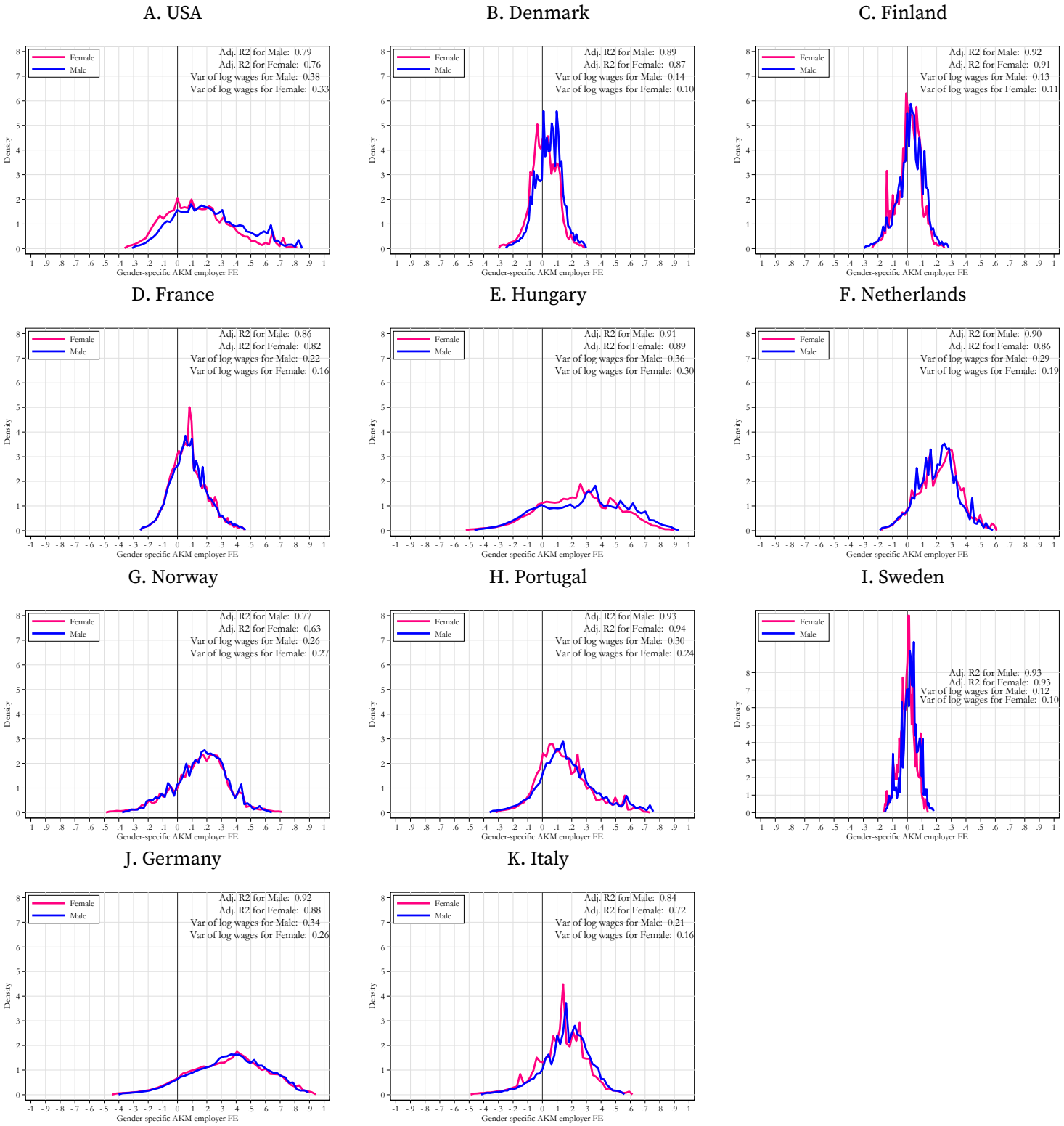
A.1. Figures

FIGURE A.1. Inequality Decomposition of Two-way Fixed Effects Models Across Countries



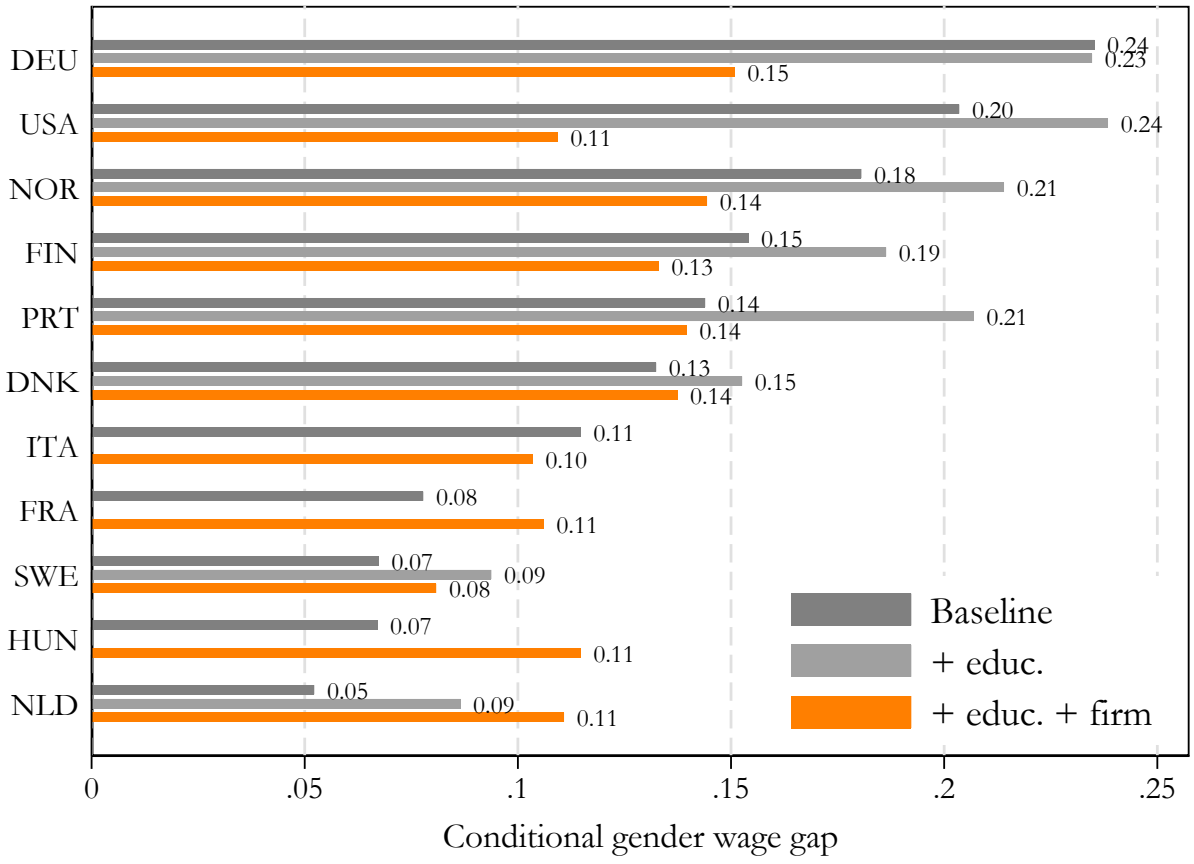
Notes: This figure shows the share of variance of log hourly wages due to person effects ("Person"), firm effects ("Firm"), the variance of observable worker characteristics and covariances ("Xb and covariances"). See Section 3.2 for model specification. Each figure reports four different models: male and female in the baseline sample, and male and female for the sample of firms with at least ten movers for each gender.

FIGURE A.2. Gender-Specific Firm Effects Across Countries



Notes: The figure shows estimates of gender-specific firm effects. See model description in section 3. Each figure additionally reports the adjusted R-squared of the model and the variance of log wages.

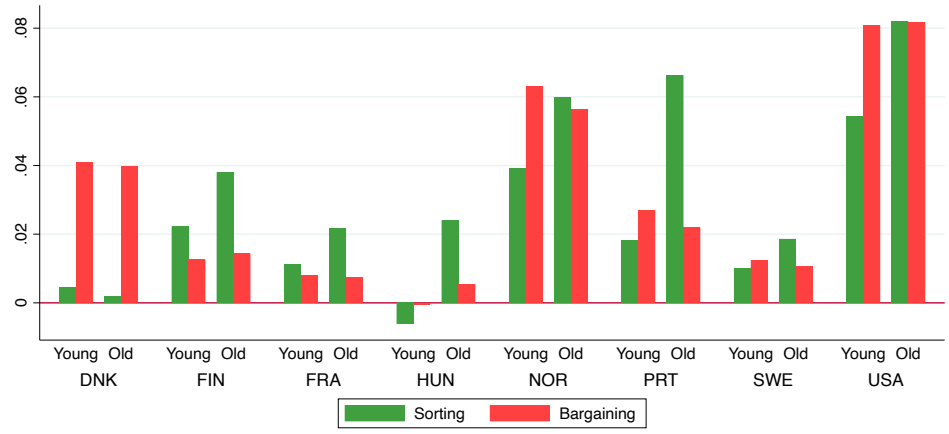
FIGURE A.3. Conditional Gender Wage Gap



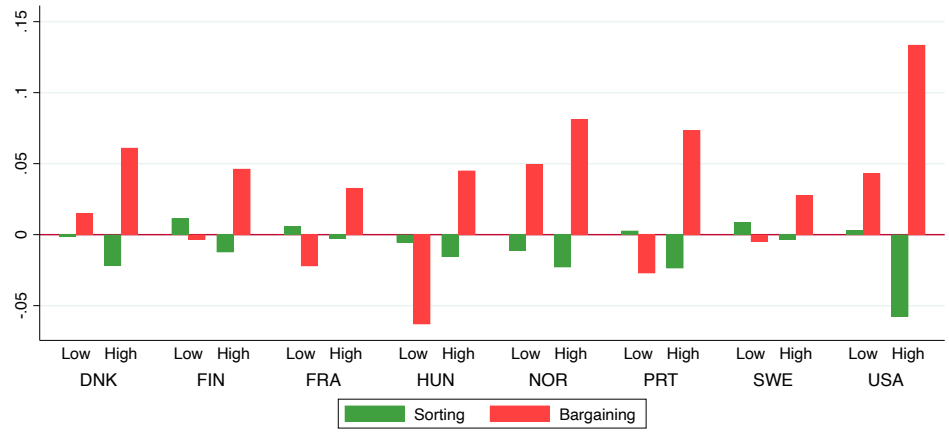
Notes: The figure reports the OLS estimated coefficients of a male dummy. The outcome variable is the log hourly wage. The model controls for year effects, third-order polynomials in age and full-time status, ("Baseline"); with 4 educational categories ("+ educ."); and with firm fixed effects ("+ educ. + firm").

FIGURE A.4. Decompositions by Worker and Firm Characteristics

A. Over the Life-Cycle

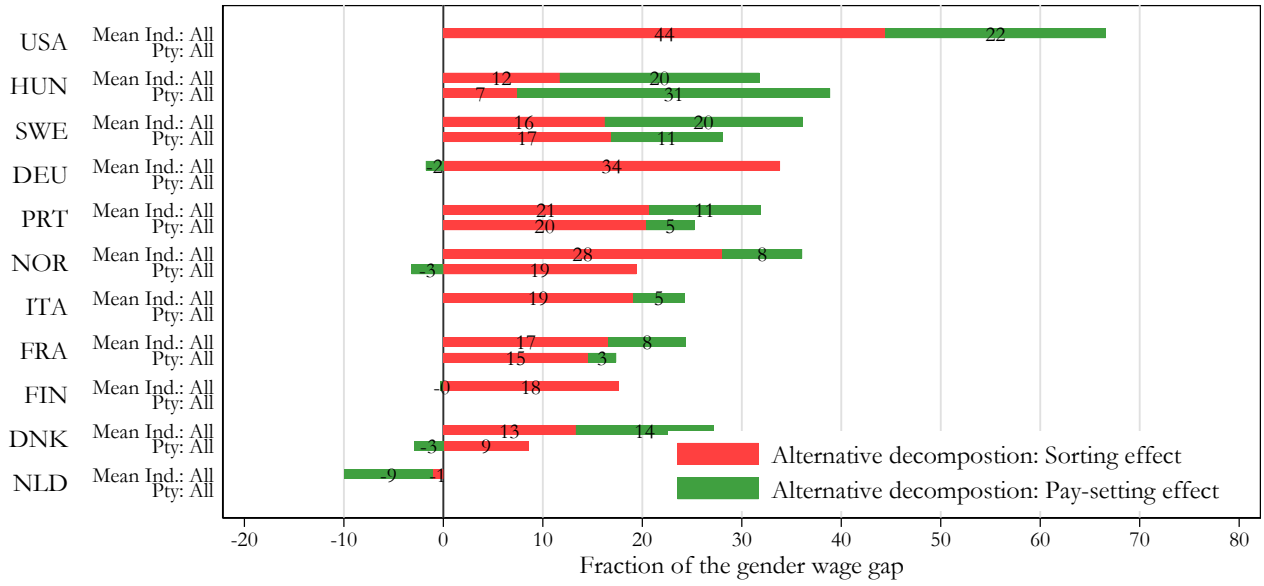


B. Over the Distribution of Firm Effects



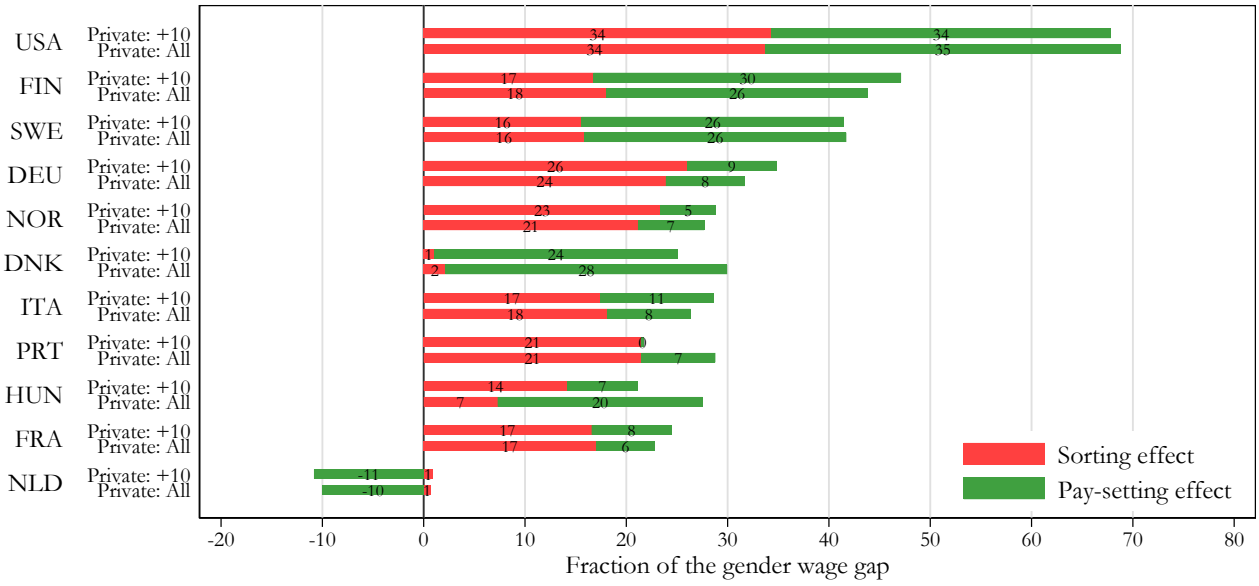
Notes: Panel A reports the mean across countries of the Oaxaca-Blinder for young and old workers. "Young" workers as workers below 30, and "Old" workers as workers above 50. Panel B reports the mean across countries of the Oaxaca-Blinder by quintile of the firm effects distribution. See Section 3.2 for model specification.

FIGURE A.5. The Firm Effects Gap: Robustness to Decomposition



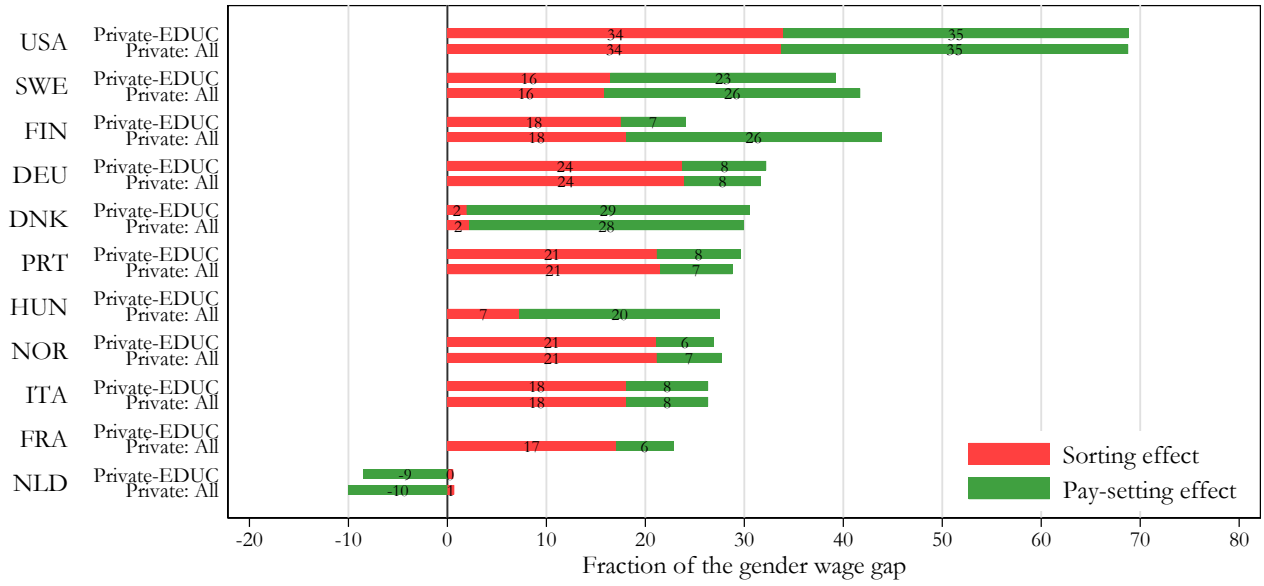
Notes: The figure reports the alternative CCK decomposition. Recall that in the main decomposition, the pay-setting effect is calculated by comparing the firm effects for men and women across the distribution of jobs held by men. The sorting effect is calculated by comparing the average firm effects for women across the jobs held by men versus women. In the alternative decomposition, the pay-setting effect is calculated using the distribution of jobs held by women, and the sorting effect is calculated by comparing the average value of the male wage premiums across jobs held by men versus women.

FIGURE A.6. The Firm Effects Gap: Limited Mobility Bias



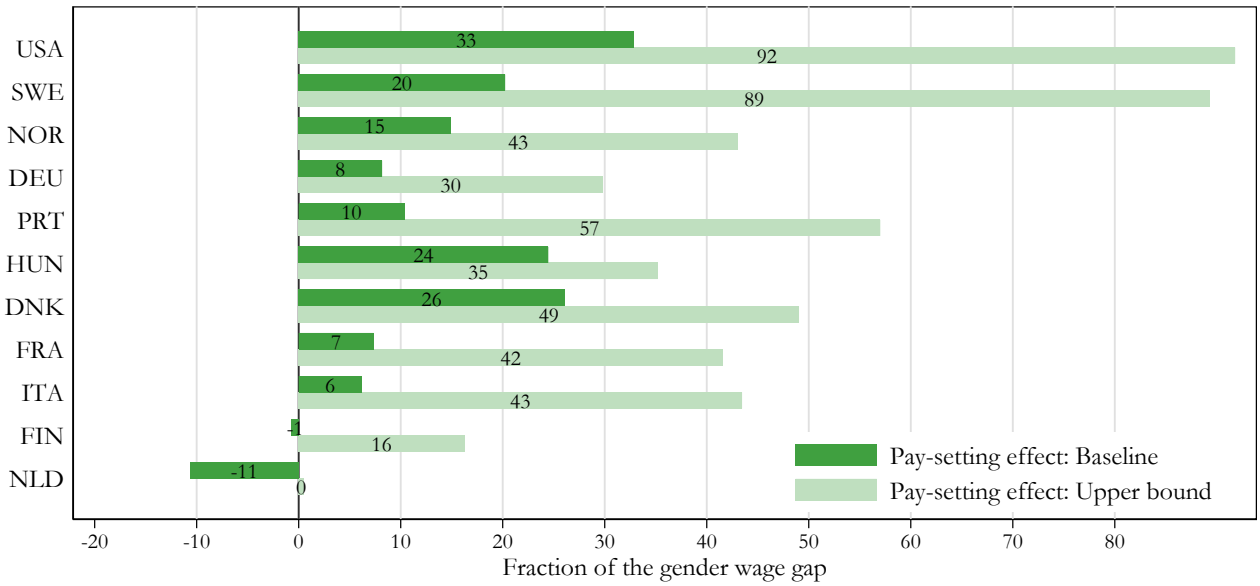
Notes: The figure reports the CCK decomposition, in the baseline sample (Private: All) and in the sample including only firms with at least 10 movers over the period by gender (Private: +10).

FIGURE A.7. The Firm Effects Gap: Observables in the AKM Model



Notes: The figure reports the CCK decomposition, in the baseline sample (Private: All) with and without four educational dummies to estimate the AKM model (Private-EDUC).

FIGURE A.8. The Firm Effects Gap: Upper Bound of the Pay-setting Effect



Notes: The figure reports the baseline pay-setting effect and its upper bound. The baseline specification sets to 0 rents in low-AKM firm effect industries. The upper bound of the pay-setting effect is calculated by adding to the baseline pay-setting effect the OLS estimated of a male dummy. The OLS model controls for the following fixed effects: region (NUTS classification at the third level for European countries), year, 3-digit occupation categories interacted with four age categories fixed effects, and full-time dummies interacted with four age categories.

A.2. Tables

TABLE A.1. Overview of Wage-setting Institution In Our Sample

Country	Union density	Coverage	Excess coverage	Bargaining vertical	Bargaining horizontal
Some wage floors at the sectoral level:					
Sweden	62	90	28	3	4
Finland	66	89	23	4	4
Denmark	67	80	15	3	4
Norway	52	73	21	3	4
Netherlands	17	78	61	3	4
Germany	17	56	39	3	4
Portugal	15	74	59	3	2
France	8	98	90	3	2
Wages set locally the firm level:					
Hungary	10	23	13	1	1
United States	11	12	1	1	1

Note: Reorganized data from Boeri and Ours (2021).

TABLE A.2. Log-Labor Productivity and Pay Premiums - Firm-Level Regressions

		$\Psi^M \vert g = M$	$\Psi^M \vert g = M$	$\Psi^M - \Psi^F \vert g = M$	$\Psi^M - \Psi^F \vert g = M$
DNK	β	0.0712***	0.0718***	0.0028	0.0095**
		(0.0055)	(0.0045)	(0.0057)	(0.0043)
	R^2	0.1044	0.2300	0.0000	0.0407
	N. of firms	15,617	15,616	15,617	15,616
FRA	β	0.0754***	0.0649***	0.0069***	0.0040***
		(0.0034)	(0.0025)	(0.0006)	(0.0006)
	R^2	0.1490	0.3193	0.0018	0.0134
	N. of firms	645,569	645,569	645,569	645,569
HUN	β	0.1840***	0.1619***	0.0262***	0.0219***
		(0.0044)	(0.0052)	(0.0022)	(0.0025)
	R^2	0.3478	0.4340	0.0140	0.0347
	N. of firms	65,497	65,495	65,497	65,495
ITA	β	0.0851***	0.0716***	0.0085***	0.0058*
		(0.0111)	(0.0121)	(0.0035)	(0.0031)
	R^2	0.1826	0.3038	0.0020	0.0175
	N. of firms	67,952	67,951	67,952	67,951
NOR	β	0.1547***	0.1182***	0.0127***	0.0112***
		(0.0074)	(0.0057)	(0.0031)	(0.0032)
	R^2	0.2512	0.3717	0.0012	0.0105
	N. of firms	70,640	70,640	70,640	70,640
PRT	β	0.0766***	0.0778***	0.0078***	0.0075***
		(0.0050)	(0.0028)	(0.0020)	(0.0018)
	R^2	0.1513	0.3709	0.0023	0.0220
	N. of firms	125,489	125,489	125,489	125,489
SWE	β	0.0361***	0.0236***	0.0074***	0.0057***
		(0.0047)	(0.0034)	(0.0019)	(0.0023)
	R^2	0.1157	0.2857	0.0068	0.0770
	N. of firms	6,619	6,617	6,619	6,617
	Industries FE		✓		✓

Notes: This table reports OLS firm-level estimates of the effect of labor productivity on firm-specific wage premiums. Regression are weighted by the number of male workers. 2-digit NACE codes are used to estimate the industry fixed-effects. Robust standard error in parenthesis. Asterisks represent statistical significance at the 1, 5, and 10% level. * p<0.10, ** p<0.05, *** p<0.01. Sample includes male workers in dual connected set linked with value-added data to measure labor productivity at the firm-level.

B. Further Information on the Data

In this section, we describe for each country the main institutional background, the data sources at the firm and worker level, sample selection, and the particulars regarding definitions and construction of the variables. We also describe the sample selection of establishment/entreprises (firm) and workers.

B.1. United States: Washington state

B.1.1. Institutional setting

In the United States, wages are predominantly determined at the level of individual workers. When collective bargaining occurs, it typically transpires at the company level rather than on an industry-wide scale. The framework for collective bargaining is governed by the National Labor Relations Act (NLRA). As per data from the OECD, approximately ten percent of the American workforce were encompassed by collective bargaining agreements in 2020.[18] Government regulations that play a role in wage determination include minimum wage standards and regulations governing overtime pay.

Minimum wages. Minimum wage rates are set through federal, state, and local legislation. At the federal level, the Fair Labor Standards Act (FLSA) has maintained a minimum wage of $7.25 per hour since 2010.[19] However, states and localities may enact their own minimum wage laws, which can exceed the federal standard. For instance, during the period of analysis, Washington state's minimum wage consistently surpassed the federal minimum, making it the relevant wage floor. [20] Notably, Washington's minimum wage is adjusted annually based on changes in the Consumer Price Index. For instance, in 2001, the minimum wage stood at $6.72, whereas in 2014, it rose to $9.32.[21].

[18] https://www.oecd.org/employment/collective-bargaining-database-unitedstates.pdf

[19] Over the period covered by the available data, the federal minimum wage rate was changed three times: in 2008 to $5.85 (from $5.15), in 2009 to $6.55, and in 2010 to $7.25; see https://fred.stlouisfed.org/series/STTMINWGFG

[20] Furthermore, within Washington state, certain localities, such as the Seattle area, have implemented even higher minimum wage rates. Given limitations in data availability regarding the geographic location of workers and employers, we focus on the state-level minimum wage.

[21] See https://fred.stlouisfed.org/series/STTMINWGWA for this series

Overtime payments. FLSA also regulates the use of overtime payments. Specifically, "employees must receive overtime pay for hours worked over 40 in a workweek at a rate not less than time and one-half their regular rates of pay." (See the U.S. Department of Labor page https://www.dol.gov/agencies/whd/overtime).

Exemptions. Some workers are exempt from both the federal minimum wage and overtime pay regulations. These include employees in executive and professional roles and highly compensated employees (generally earning more than $100,00 per year).[22]

Parental leave policies. The federal Family and Medical Leave Act (FMLA) provides eligible workers up to 12 workweeks of unpaid leave a year. Since 2020, Washington state mandates paid family and medical leave; however, this policy was not in effect during the time period studied.

B.1.2. Literature

No exact analogue of the CCK regression has been estimated using U.S. data due to lack of information on work hours in U.S. Census Bureau's Longitudinal Employer Household Dynamics (LEHD) dataset. The LEHD includes information from records maintained by participating states' unemployment insurance (UI), which generally include data on earnings but not hours.[23]

The closest paper is by Sorkin (2017), who uses LEHD to estimate separate AKM models for men and women and estimate what share of the overall gender gap in earnings (not in hourly wages) is explained by men and women sorting to different employers. Sorkin finds that sorting explains about 26–28% of the 0.33 log-point gender earnings gap. Other related papers on the U.S. gender earnings gap that control for establishment characteristics include Goldin et al. (2017) and Barth et al. (2021).

B.1.3. Data sources

The data come from the wage and unemployment insurance (UI) claim records maintained by the Employment Security Department (ESD) of Washington state.[24] The pur-

[22]The complete list of exempt workers is listed at the U.S. Department of Labor page: https://www.dol.gov/agencies/whd/compliance-assistance/handy-reference-guide-flsa#8.

[23]In addition to Washington state, also Minnesota, Oregon, and Rhode Island collect data on work hours, but Washington is unique in using work hours to determine eligibility for unemployment insurance benefits. The data on work hours is not included in LEHD.

[24]This section relies heavily on Lachowska et al. (2022).

pose of collecting the data is to administer the state's UI system, which collects quarterly earnings records from all *UI-covered* employers in Washington and the UI claims records of all individuals who claimed UI in Washington.[25] The data cover over 95% of all private sector jobs in Washington state[26] The data used in this study cover the period 2001:1–2014:4.

The wage records include (a) a worker identifier, (b) a year-quarter identifier, (c) an employer identifier, (d) the NAICS industry code of the employer, (e) the worker's earnings from that employer in that quarter, and (d) the worker's paid work hours from that employer in that quarter.

Data source for information on workers. The information on workers comes from the wage records, which allow to track each worker's employment history in Washington state (earnings, work hours, and employer), and the claim records that include demographic information (date of birth, gender, level of education, and race/ethnicity) for workers who claimed UI.[27]

To assess the bias due to this potentially selected sample, we create weights from the 2013 Current Population Survey (CPS) Outgoing Rotation Group in order to make the Washington state data representative of the US workforce. First, using the CPS, we calculate sample proportion (p^{CPS}) for all possible interactions of age, gender, race/ethnicity, and educational attainment categories. In practice, these proportions are calculated by collapsing the data by values of these variables.[28] We then merge these proportions to the Washington state sample on age, gender, race/ethnicity, and educational attainment. In the Washington sample, we create the analogous proportions (p^{WA}). Finally, for each worker, we compute an adjustment factor ω by dividing the CPS proportion by the proportion in the Washington analysis sample, $\omega = \frac{p^{CPS}}{p^{WA}}$. ω is then used in the analysis as a frequency weight intended to adjust the Washington state sample to better reflect

[25] Government agencies and private non-profits are not required to report quarterly earnings. Also, self-employed workers do not file quarterly earnings reports, and underground earnings are not reported.

[26] This number is based on the employment coverage estimate from the LEHD, which is based on UI wage records from over 40 states, see https://lehd.ces.census.gov/data/veo_experimental.html#employment-coverage.

[27] That demographic variables are available only for the subset of workers who claimed UI may raise concerns about the representativeness of the Washington sample for the Washington labor market as a whole. Analyses in Lachowska, Mas, and Woodbury (2022) show that UI claimants tend have lower levels of educational attainment but somewhat higher earnings than Washington state workers overall, yet basic estimates from Mincer-style wage regressions suggest similar coefficients to those estimated using CPS from WA.

[28] When doing this, we use the associated CPS household weights.

the US workforce.

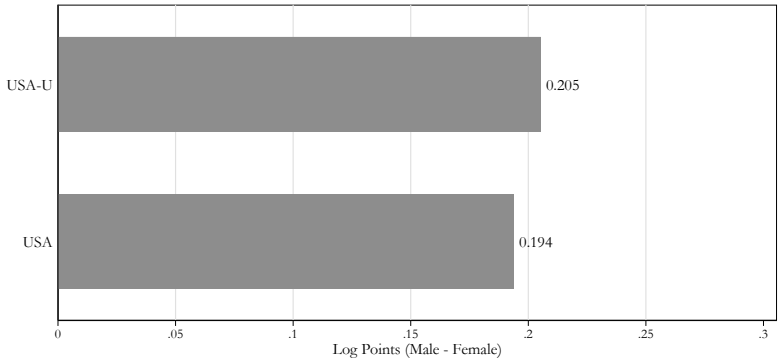
In practice, the gender wage gap, the contribution of the firm effects to the gap, and the CCK decomposition of unweighted data are very similar to their reweighed counterparts. For example, Figure A.9, Panel A, shows that the reweighted gender wage gap is slightly smaller (19.4%) compared to the unweighted gap (20.5%).

Figure A.9, Panels B and C, show that the sorting effect accounts for about 32.9% of the unweighted firm-wage gender gap (and pay-setting for 32.4%, making the total contribution of firm effect sum to 65.4%). When weighted, the sorting effect accounts for about 33.7% of the firm-wage gender gap (and pay-setting for 30.7%, making the total contribution of firm effect sum to 64.4%).

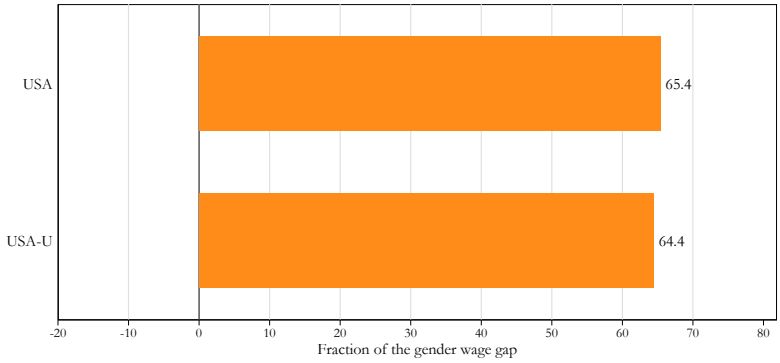
Data source for information firms. The information on employers comes from the wage records, which allow us to observe an employer's industry and to calculate employer characteristics such as employment or average employer hours or earnings. Typically, the employer is the set of establishments operating in Washington under a single owner, so for a company operating entirely in Washington (with a single or multiple addresses) the employer is a firm, and for a company with one address in Washington, the employer is also an establishment.

FIGURE A.9. Comparing Unweighted and Reweighted Results

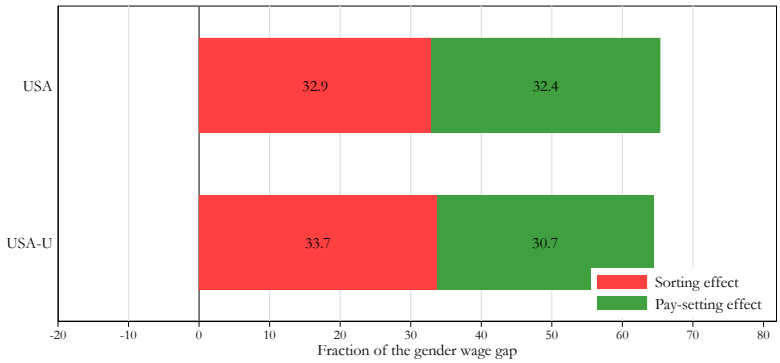
A. Gender Wage Gap



B. Firm-Wage Gender Gap



C. Sorting and Pay-Setting Effects



Notes: The figure compares the weighted and unweighted (denoted by "U") gender wage gap (panel A), firm effects gap (panel B), and CCK decomposition (panel C) in the Washington state baseline analysis sample. The reweighed result use weights calculated from the CPS. See Appendix B.1 for details.

Definition of earnings and hours worked. Worker's earnings from a given employer in given quarter include the compensation earned for work, back pay, bonuses, commissions, royalties, severance pay, sick-leave pay, and tips.[29]

Work hours are the worker's paid work hours from a given employer in given quarter. When reporting hours, employers are asked to report the "number of hours worked in the quarter," including regular hours, overtime hours, hours of vacation and paid leave. For salaried, commissioned, and piecework employees, employers are instructed to report actual hours unless those hours are not tracked, in which case they are instructed to report 40 hours per week.[30] The data do not allow us to distinguish whether a worker is salaried or paid hourly.

The availability of quarterly earnings and quarterly hours allows to construct an hourly wage rate for each worker from each employer by dividing earnings by hours.

Data access. The data described in this section are restricted administrative UI wage and claims records provided by the Washington state ESD. Because of the confidential information contained, the data cannot be shared or otherwise re-disclosed. An online data-sharing request form is available at: https://fortress.wa.gov/esd/file/datasharing#client.

B.2. Denmark

B.2.1. Institutional setting

Basic wage levels, hours worked, vacation weeks, etc., are typically negotiated by trade unions and employer organizations at the sector level. For the private sector, final wage-setting is often determined in local negotiations at the firm level (see Dahl et al. (2013) for historical details on the development of wage negotiations in the Danish labor market). In the public sector, little adjustment takes place at the local level. Approximately 66 % of Danish workers are members of unions and wages set in collective bargaining cover 84 % of the Danish workforce (Kreiner and Svarer 2022).

Since the early 00's, the unemployment rate has on average been 4.4 % (Kreiner and Svarer 2022) and most employment spells are short (Andersen 2023). To receive unemployment insurance workers need to be members of a voluntary unemployment insurance fund. In the event of unemployment, insured workers receive 80 % of former

[29] https://esd.wa.gov/employer-taxes/zero-hour-reports.
[30] https://www.esd.wa.gov/employer-taxes/reporting-requirements.

earnings capped at DKK 20.359 (in 2024, EUR 2.730) for up to 2 years. This implies that low-income workers are well-insured and the replacement rate is decreasing with income above the cap. In 2010, the maximum duration of unemployment benefits was reduced from 4 to 2 years and the compensation rate was reduced from 90 to 80 %. Unemployed individuals who are uninsured or have been unemployed for longer than the maximum duration of benefits can receive means-tested social benefits.

Danish firms can easily adjust their workforce due to lax employment protection legislation. Low job security is accepted by unions and workers due to fairly generous employment insurance. The combination of a flexible labor market and high compensation rates is often referred to as the "flexicurity model". Moreover, active labor market policies include search assistance and retraining programs as well as monitoring of the recipients (see Kreiner and Svarer (2022) for details).

Minimum Wages. Denmark has never had a statutory minimum wage, but rather sector-specific wages set in collective bargaining. As of 2024, the basic wage set in collective bargaining for the hospitality industry was 144 DKK (EUR 19) and in farming the basic wage was set to 155 (EUR 21).

Family Policies. Denmark has a long tradition of family-friendly policies enabling the vast majority of mothers to participate in the labor market. These policies include heavily subsidized daycare for children, paid parental leave, and job protection while on leave. During the period of analysis, maternity leave is available for 14 weeks, parental leave - which in principle can be taken by either parent, but predominately used by mothers - is available for an additional 32 weeks, and fathers have the right to 2 weeks of paternity leave just following the birth of their child (Lassen 2021). Leave is compensated at levels corresponding to unemployment insurance, with most collective bargaining ensuring a top-up so earnings while on leave correspond to previous labor market income for 1-6 months. The childcare system for preschool children has universal coverage and is heavily subsidized. It covers child care services on weekdays between 7 am and 5 pm for children from the age of 6 months to the age of school start. Take-up is high and Danish children start daycare around the age of 10 months on average.

B.2.2. Literature

Gallen, Lesner and Vejlin (2019) is the closest paper. They study the gender wage gap using administrative data from 1980 to 2010. They find a GWG of 0.300 in 1980, and

around 0.201 in 2010. The fraction of the GWG that is unexplained stay constant over time (0.133 in 1980 and 0.127 in 2010). They quantify the role of the sorting effect using the same decomposition as Card et al. (2016). The sorting component explains just under 10% of the GWG for 1980 decade (estimated sorting effect: 0.026, and the GWG is 0.27). It explains about 15% in the 2000 decade (estimated sorting effect: 0.022, and the GWG is 0.208). The sorting effect is broadly similar to the estimated effect in Portugal, reported by Card et al. (2016).

Merlino, Parrotta and Pozzoli (2018) study job mobility within and between firms. They find that women are more likely than men to voluntarily move (proxy by job-to-job transitions) to other firms when they are high-wage females (proxied by residual wages). However, high-wage females are less likely than men to be promoted in the same firm.

B.2.3. Data sources

Data source for information on workers. We use several datasets to collect information on workers. The first dataset is called BEF. BEF contains information about the total population in Denmark. The status information for the individuals mainly refers to the beginning of the year (1 January). From this dataset, we retrieve information on worker age and gender.

The second data set is called UDDA. UDDA contains information on the highest achieved education and an indicator for whether the person is currently enrolled in education. We exclude students.

The third dataset is called IDAN (*IDA ansættelser*). From this dataset, we retrieve information on occupation, earnings, hours worked, and firm identifier. We use information from this dataset to define the dominant job. Occupation classification follows the ISCO classification. This data set also contains information on whether individuals are self-employed. Hours worked are defined as paid hours worked: Include contractual and overtime hours. Earnings is defined as the near-universe of taxable income.

Data source for information firms. We use the General Company Statistics called the FIRM dataset, which annually lists active companies in Denmark. FIRM is built from several Statistics Denmark registers. FIRM covers economic and employment information on all sectors and industries. Active companies are defined as companies with at least 0.5 full-time hours of work. The firm identifier is the CVR number, the legal firm identifier in Denmark. We use this dataset to retrieve information about the industry classification (NACE) and the regional classification (NUTS).

The register that is used in FIRM for the variable value-added is the Accounts statistic for Non-Agricultural Private Sector (Regnskabsstatistikken for private byerhverv), abbreviated APB therefrom.[31] APB only includes market activity and does not contain agriculture, fishing, ports, banks, insurance, public housing companies, or public administration. There is a data break in 2014 in the population of firms considered in APB. Since 2014, firms in utilities, regional and long-distance trains, and radio and TV stations have been included. Value added (*GF_VTV*) is defined using several items from the income statement (*Resultatopgørelse*). Those items are: sales and other operating income - cost of materials and equipment - costs of energy and subcontractors - rent paid - payments for temporary workers and operational leasing of goods, and ordinary write-offs and other external charges.

Data access. All datasets can be obtained by contacting the Research service (*Forskningsservice*) of Denmark Statistics. To our knowledge, datasets provided by DST do not contain a DOI number, complicating the replicability. The datasets that are used are recorded at a yearly frequency. Establishment identifiers are available, but our analysis focuses on the legal unit firm identifier (CVR number) and only changes due to firm restructuring. Individual identifiers are anonymized social security numbers (PNR number), and doesn't change over time. Contact Anne Sophie Lassen for questions.

B.3. Finland

B.3.1. Institutional setting

Collective bargaining agreements. In Finland, there is no statutory minimum wage. Instead, collective agreements at the industry or sector level specify the baseline terms and conditions to which employments contracts and relationships must comply. The conditions in each agreement include, among other things: basic salary, working hours, sickness allowance and other types of allowances, holiday compensation. Each agreement is reached between two parts: unions and employers' associations. In Finland there are two broad types of collective agreements: universally binding agreements and normally binding agreements. Under generally binding agreements, all companies operating in the given industry covered must comply with the regulations, including the employers that are not part of an employer's association. Collective agreements that

[31] This register is itself built from several sources: questionnaires, official annual accounts submitted in XBRL format to the Danish Business Authority (*Erhvervsstyrelsen*), the Danish tax authority (SKAT), Denmark's Statistics business register, and the Danish medicines agency (*Lægemiddelstyrelsen*).

are normally binding are only effective for the company or for the employer association that has signed it. It is possible for employers and employees to reach local agreements on certain terms and conditions of employment (e.g., performance pay). In general, collective agreements may impose restrictions on local agreements and have priority over local agreements. When considering both generally binding and normally binding agreements, about 90% of the Finnish workforce is covered by a collective agreement.

Parental leave policies. Finland is characterized by generous family policies. Fathers are entitled to paternity leave, mothers to maternal leave, and both are entitled to parental leave. Nowadays, maternal leave must start between 50 and 30 days before the scheduled due date and gives the right to maternity allowance. Fathers can take paternity leave for 54 days after childbirth. Parental leave can be taken after the child is born and parental allowance is paid for 320 days (equally shared among partners; some of the parental allowance can be transferred to the partner). It is also possibly to part-time work (and get partial parental allowance) for the same period. While in many ways the Finnish parental leave setting is comparable to those of other Nordic countries, one institutional feature sets it aside internationally. The Finnish home care allowance program (HCA) provides generous payments to mothers that prefer to stay home with their children from an age of 10 months (when children are entitled to a slot in public daycare) through 3 years old (Gruber, Kosonen and Huttunen 2023). Although the Finnish daycare system is public-funded and relatively high-quality by international comparison, the HCA has a long tradition (it was introduced in 1985, and take up is close to 80%).

B.3.2. Literature

The previously mentioned paper by Gruber et al. (2023) uses municipality-level supplements and finds that the Finnish HCA negatively affects maternal labor market outcomes. In perspective, the initial child penalty on earnings for Finland is of about 70%, whereas this number is 30% for Denmark. This child penalty lasts for years after the birth of the first child, and the supplement variation in HCA is large enough to explain the immediate child penalty gap between Finland and Denmark. We are not aware of published papers implementing the CCK decomposition in the Finnish context.

B.3.3. Data Sources

We use several administrative registers to build the information used in the analyses. FOLK registers allow to follow the population of Finnish workers over time and include the link to the main employer at the end of the year. These registers also include detailed demographic and socioeconomic characteristics (including yearly earnings and employment information, occupation, sector, and industry), and employer-level spells. Earnings at the primary employer are computed by using TAX databases (and scaled by months worked at the employer level). The information on hourly wages, including overtime and bonuses, and of hours worked is retrieved for the private sector from the Structure of earnings (SES) database. The SES covers 55-75% of the private sector in the period considered.

B.4. France

B.4.1. Institutional setting

France introduced an ambitious gender pay transparency law in 2019 that requires firms with more than 50 employees to report detailed statistics on the gender wage gap (Décret n°2019-15 du 8 janvier 2019).[32] France does not yet have a pay transparency law, but one of the left political party (La France insoumise) in June 2023 proposed a bill on pay transparency.

B.4.2. Literature

Palladino, Roulet and Stabile (2021) is the closest paper. In this paper, they investigate firms' contribution to the gender wage gap over time and the life cycle. They find larger estimates of firms' contribution compared to previous studies, driven by a higher bargaining component. Interestingly, despite a decline in the unconditional gender wage gap between 1995 and 2015, the gap in firm wage premiums and its decomposition remained constant. It increases with age, exclusively driven by the sorting component.

[32]The report must contain the pay gap between men and women, wage increase rate between men and women, promotion rate between men and women, the percentage of employees who received a wage increase the year they returned from maternity leave, etc.

B.4.3. Data sources

Our dataset is derived from the matched employer-employee registers in France known as DADS data. This comprehensive dataset provides valuable information on workers' employment, including their earnings, their hours of work, their firm and other administrative data for each of their jobs. The data is pseudonymous, with individuals being assigned unique codes that change annually, enabling cross-sectional analysis. However, it does not allow for long-term panel analysis for workers. Traditionally, panel analysis of workers in France has been conducted using the *DADS Panel*. This panel consists of a sample of individuals who are followed over time, with a sampling frequency of 1/24 before 2002 and 1/12 after.

To enhance our analysis, we utilize a recently constructed and nearly exhaustive workers' panel based on the original dataset described in detail by Babet, Godechot and Palladino (2022). The DADS files for each year provide job variables at the individual level for the current and the previous year. This overlap allows for matching between yearly files at the worker level based on common information such as establishment ID, gender, number of hours worked, job duration, dates of employment, municipality of work and residence, earnings, and age. Using these matching procedures, Babet, Godechot and Palladino (2022) achieved a high matching success rate of 98% for individuals between 2002 and 2019.

B.5. Italy

B.5.1. Institutional setting

Italy has taken significant steps to address the gender pay gap through legislative measures. The primary legislation addressing gender equality, including pay equity, is the Code of Equal Opportunities (*Codice delle Pari Opportunità*, Legislative Decree No. 198/2006), which extended and strengthened an older piece of legislation from the 1990s (Law 191/1991). This code has been amended several times to strengthen provisions related to gender equality in the workplace, and in 2021, Italy introduced new legislation (Legislative Decree No. 162/2021) requiring greater pay transparency and measures to ensure equal pay for men and women. Specifically, companies with more than 50 employees are required to report on gender pay gaps and publish this information. These reports should include details on salaries, bonuses, and other forms of compensation. Companies that comply with equal pay standards can obtain a certification, which not only serves as a public recognition, but can also result in tax incentives and

favorable public procurement conditions. Conversely, failure to comply with reporting requirements can result in administrative penalties and fines.

B.5.2. Literature

Casarico and Lattanzio (2024) is the closest paper to ours. They analyze the role of firm pay policy in shaping the gender wage gap in Italy between 1995 and 2015. Using matched employer-employee data on the universe of employees in the non-agricultural private sector, they document that gender differences in firm pay premiums explain around one-third of the average gender wage gap, with sorting playing a dominant role in determining these differences. The contribution of firms varies along the wage distribution and, in particular, the pay-setting channel is stronger in the top decile of wages. Moreover, the paper shows that firms have increasingly explained a larger share of the gender wage gap over time, with a smaller role for the sorting channel. Cohort effects are also important determinants of the wage and firm premium gap, with older cohorts showing larger gaps over their careers than younger cohorts of the same age. Finally, the paper relates firm-specific gender differences to heterogeneity in mobility across firms, showing that women are more likely to move to lower-paying firms and to those with higher intra-firm gender inequality, thereby exacerbating the gender pay gap over the life cycle.

B.5.3. Data sources

We use a representative sample of 50 percent of firms from 2005 to 2019 in the non-agricultural private sector, available through an agreement between the Italian Social Security Institute (INPS) and the Bank of Italy. The firm-level data are matched with information on all workers ever employed by these firms. This includes the entire workforce of the sampled firms, as well as the complete employment histories of individuals who passed through these firms.

The data include detailed information on work contracts (annual earnings, weeks worked, contract type, hours type, broad occupation, contractual hours, municipality of work, hiring and separation dates, and reasons for separation), worker demographics (gender, year of birth, province of residence), and firm characteristics (6-digit industry, opening and closing dates, and balance sheets for a sub-sample).

Earnings are measured as full net annual earnings, including all forms of cash compensation, grossed up for income taxes and social security contributions. To measure

work intensity, we use full-time equivalent (FTE) weeks worked, with FTE weeks for part-time workers adjusted by the ratio of monthly paid hours to contractual hours for full-time jobs. FTE weekly earnings are then calculated as the ratio of annual earnings to FTE weeks, providing an equivalent measure of hourly earnings in the absence of overtime.

B.6. Germany

B.6.1. Institutional setting

In Germany, wage formation is highly diverse. Firms can opt into collective bargaining agreements at the sectoral level, where wages are negotiated between employers' associations and trade unions. Alternatively, firms may choose to negotiate directly with a union at the firm level. At the start of the sample used in this paper's analysis, collective bargaining coverage in Germany was about five times higher than in the U.S. According to the OECD database, in 2010, collective agreement coverage was around 60% in Germany compared to only 13% in the U.S. Union density was about 19% in Germany and approximately 11% in the U.S. Labor unions play a crucial role in enforcing employment agreements. On the other hand, wages can also be negotiated individually between workers and firms without union involvement. Firms are always allowed to voluntarily pay wages higher than those fixed in collective agreements. Binding collective agreements have been declining for years in both East and West Germany. This process is clear and ongoing. Although many firms still use sectoral collective agreements as a reference for negotiating wages and working conditions, there is no legal obligation to do so, leading to a lack of security for employees. In June 2017, "The Act to Promote Transparency in Wage Structures among Women and Men" came into effect, prohibiting direct or indirect remuneration discrimination based on gender "with regard to all elements of remuneration and conditions of remuneration" (Section 3 (1)).

B.6.2. Literature

Bruns (2019) demonstrates that the sorting effect significantly outweighs the bargaining. This suggests that the primary source of firm wage premium differentials between genders is the underrepresentation of women in high-wage firms. Bruns (2019) shows that during the sample period 2001-2008, the bargaining effect—differences in gender-specific wage premia within firms—was negligible compared to the impact of gender segregation across firms with varying wage premia.

B.6.3. Data sources

Our empirical analysis utilizes data from the Institute for Employment Research (IAB) of the German Federal Employment Agency. The primary dataset is the Integrated Employment Biographies (IEB), which provides comprehensive records of employment and unemployment spells as documented by the German social security system. The IEB contains detailed information such as the start and end dates of employment spells, total earnings, occupation and industry codes, as well as individual worker characteristics like gender, age, and education. Additionally, for certain years, the data includes information on working hours sourced from the German Social Accident Insurance. Between 2010 and 2014, employers reported individual total hours worked via the social security notification system, which can be linked to the administrative IEB data.

Imputations. To compute hourly wages, we follow a two-step process. First, we calculate gross daily wages using total earnings and the total duration of each worker's employment spell, then deflate these wages using the CPI. We also follow standard procedures to impute censored wages above the social security contribution limit. Second, we divide earnings by hours worked, leveraging the significant advancement in data availability by linking our dataset with hourly wage data from 2010-2014 (see Dustmann et al. (2022). Annual earnings are right-censored at the contribution assessment ceiling ("Beitragsbemessungsgrenze"), which is determined by the statutory pension fund and may be adjusted annually. We define a wage observation as censored whenever the reported wage exceeds 99% of the censoring thresholds. Following Dustmann et al. (2009) and Card et al. (2013), we fit a series of tobit regressions to impute the right tail of the wage distribution.[33] Assuming the error term is normally distributed but with different variances for each education and age category, we impute censored wages for each year as the sum of the predicted wage and a random component, drawn from separate normal distributions with mean zero and variances specific to each education and age category.

[33]We estimate tobit regressions by year, sex, education, and age group, controlling for variables such as worker age, average log wage in other years, the fraction of censored wages in other years, the number of full-time employees at the current establishment and its square, an indicator for large firms, average years of schooling and the fraction of university graduates at the current establishment, the average log wage of coworkers, the fraction of coworkers with censored wages, an indicator for individuals observed in only one year, an indicator for employees in one-worker establishments, and an indicator for region.

B.6.4. Data access

The data outlined in our article are social insurance data of administrative origin, which are processed and kept by the Institute for Employment Research (IAB) according to German Social Code III. There are certain legal restrictions due to the protection of data privacy. The data contain sensitive information and therefore are subject to the confidentiality regulations of the German Social Code (Book I, Section 35, Paragraph 1). The data are held by the IAB, Regensburger Str. 104, D-90478 Nurnberg, iab@iab.de, phone: +49 911 1790. Our data, computer programs, and results will be archived by the IAB to meet the objective of good scientific practice. This approach also extends to all data that cannot be shared directly. Interested researchers can access the data through the Research Data Centre (FDZ) of the German Federal Employment Agency at the IAB. The FDZ of the German Federal Employment Agency (BA) at the IAB is intended mainly to facilitate access to BA and IAB micro data for noncommercial empirical research using standardized and transparent access rules. The FDZ mediates the relationship between data producers and external users. For this purpose, the FDZ provides separate workplaces for guest researchers at different locations. Access can be granted only after successful application and approval.

B.7. Hungary

B.7.1. Institutional setting

Hungarian employment protection institutions are flexible and closer to the Anglo-Saxon institutions than to those found in other continental countries. It is relatively easy to dismiss workers (Tonin et al. 2009) and wage bargaining takes place mostly at the individual level. The dominant for of collective wage bargaining is at the firm level. Union membership was 10.2% percent in 2014, one of the lowest in the OECD.[34] Unions participate in the country-level bargaining forum called National Interest Reconciliation Council, which makes only non-binding recommendations (Rigó 2012). Part time work contracts add up to only 5 percent of the workforce and most employment contracts usually assume full time employment and pre-specify 8-hour working days.

Family policies allow women stay home for 3 years in many cases after the birth of each child, even though a set of policies centered around tax incentives for women to go back to work. Policies also allow mothers to retire early, after 40 years, including the time spent with children.

[34] OECD Employment and Labor Market Statistics.

B.7.2. Data sources

Data sources for information on workers. The main datasource on workers is administrative data based on social security records, collected by the Social Security Administration. It covers a random 50% of the population and records earnings from different employers each month as well, as well as occupation, days worked and contracted hours. At the same time, the data does not include information on the education for most of the workers. This dataset is provided by the Databank of Centre for Economic and Regional Studies.

Data sources for information on firms. The main data source on firms comes from Corporate Tax Declarations, collected by the Hungarian Tax and Customs Authority (NAV). Firms conducting double bookeeping are obliged to submit these declarations each year, while other firms submit a simplified form. These data includes financial information, number of employees and the firm's industry code. This dataset is provided by the Databank of Centre for Economic and Regional Studies.

Definition of earnings and hours worked. We use the social security data to calculate gross earnings for the workers main job, by following the harmonized guidelines of this project. The number of hours worked is contracted hours.

Data access. These confidential datasets are managed by the Databank of Centre for Economic and Regional Studies.

B.8. Portugal

B.8.1. Institutional setting

In August 2018, Portugal passed pay transparency legislation (*Lei 60/2018 de 21 de Agosto*) mandating the development of two yearly assessments on the GWG. First, a general assessment on general and sectoral gender pay gaps. Secondly, a firm-level assessment of gender wage disparities by professional category and qualifications. Firms with identified gender-based differences have to justify those differences, or alternatively present and enact a plan to correct the disparities within a period of 12 months. Non-compliance is considered an administrative offense and firms risk sanctions. To the current date and to the best of our knowledge, there is no evidence on the impact of the pay transparency law in Portugal on the GWG.

B.8.2. Literature

The closest study is Card, Cardoso and Kline (2016). They study the impact of firm-specific wage premiums on the gender wage gap, using QdP data for 2002-2009. They use "fuzzy matching" as firm identifiers are not present in both the QP and the financial data. Overall, they have current-year employer financial data for about 66% of the person-year observations in their QP sample from 2006 to 2009.

The overall GWG in the dual-connected set of men and women is 0.234.[35] 21.2% (0.049) of the overall GWG is explained by firm-specific pay premiums. The sorting component explains 15% of the GWG (0.035). The bargaining channel explains 1.2% of the GWG (0.003). Sorting rise with age and are more important among less educated workers. Bargaining effect is larger for highly educated workers.

Another related paper is Cardoso, Guimarães and Portugal (2016a). Using QdP data for the period 1986-2008, they find that one-fifth of the gender gap can be explained by allocation to firms of different quality, while another one-fifth is due to allocation to jobs of different quality.

Cardoso, Guimarães, Portugal and Raposo (2016b) use QdP data for the period 1991-2013. They they find a significant decrease of the raw GWG from 32 to 20 percent. The improvement in the gender wage gap can be fully attributed to composition effects: the adjusted GWG remained roughly constant at around 25 percent over this period.

B.8.3. Data sources

The data source is the Quadros de Pessoal (referred to as QP) from 2010 to 2019. This dataset is gathered annually by the Portuguese Ministry of Employment. Each October, it is legally required that firms with at least one salaried employee provide workforce information. The dataset encompasses virtually the universe of firms and establishments, along with information on their respective workforce as of October each year. Consequently, it only contains information on jobs for employed individuals during October. The dataset excludes the public administration and independent contractors.

Data source for information on workers. The QdP data contains worker-level information reported by firms on each employee's gender, education, occupation, date of hire, earnings and hours worked.

[35] The GWG correspond to 0.18 log points in the analysis sample with value added data (see Table 1).

Data source for information firms. At the firm-level, the QdP data contains information on industry (NACE), regional location (NUTS), firm size (number of employees) and sales per worker. We use sales per worker to measure firm productivity. Our focus on the legal unit firm identifier, although establishment identifiers are available.

Definition of earnings and hours worked. Hours worked refer to monthly contractual hours and do not include overtime. Earnings are defined as regular monthly salary, which include the individual's monthly base salary plus regular salary supplements (e.g. tenure-related premiums).

B.9. Netherlands

B.9.1. Institutional setting

In the Netherlands, the proportion of women (and men) in employment is relatively high (about 74% for women and 82% for men in 2020). However, although about three out of four men work full time (in the Netherlands defined as working 35 or more hours), only one out of four women works full time.
For consistency with other countries, throughout the analyses on the Netherlands, full-time employment is defined as working 30 hours or more.

B.9.2. Literature

The closest study is Schneck (2021), who analyses wage inequality in the Netherlands in the period 2001–2016. Schneck applies the AKM model, only to a sample of employed men, and finds that between-firm wage variation explains almost entirely the overall wage dispersion. Decomposing the between-firm wage components, the paper finds that the increase in this component is explained for 45% by the average worker effects (i.e. worker segregation), 39% by the covariance of the worker and firm effects (i.e. worker sorting) and for 12% by the firm fixed effect. The paper does not study gender wage inequalities over time.

B.9.3. Data sources

The administrative data from Statistics Netherlands cover the entire population of Dutch individuals.

Data source for information on workers. Demographic, household and job characteristics are observed based on several datasets. *GBPERSOONTAB* contains an individual identifier ('rinpersoon') and individuals' demographic characteristics including gender, birth date and nationality, for the universe of individuals. *HOOGSTEOPLTAB* contains information on a person's highest level of educational attainment. As information on educational information is unobserved for those who graduated before 1995, five categories are used: missing information, and four categories based on ISCED: less than high school (ISCED 0 to 2), high-school/vocational (ISCED 3 and 4), short-run tertiary and bachelor (ISCED 5 and 6); and Master, Phds or similar (ISCED 7 and 8). *GBAADRESOBJECTBUS* contains an individual identifier ('rinpersoon') and the anonymized individuals' home address identifier ('rinobjectnummer') for the universe of housing spells including start and end dates. *VSLGWBTAB* contains the home address ('rinobjectnummer') and regional identifiers for the universe of house addresses. *SPOLISBUS* contains an anonymized individual identifier ('rinpersoon') and monthly information on gross wages ('basisloon'), hours worked ('basisuren'), type of contract, full-time/part-time status, and a firm identifier ('beid'), for the universe of employment spells including start and end dates (both dates are measured from January 2006 onwards, so job tenures are counted from this point onwards). Hourly wage is computed by dividing gross wages by working hours. The number of weekly days worked is not observed in the data. We use data from 2010 until 2019, and aggregate the monthly data from the dataset *SPOLISBUS* based on (predominantly) monthly income statements to an annual level. The main limitation of the information on workers is that occupational information is not available.

Data source for information firms. At the firm-level, we use the dataset *ABR*. This annual dataset contains an anonymized firm identifier ('beid') and information on economic sector and firm size for the universe of firms. Firms are defined as entities, and each entity has control with legal basis over its own activities, as defined by Statistics Netherlands consistent with the Eurostat recommendations manual on business registers. Note that large firms could consist of multiple entities, but this depends on the control with legal basis of activities across these entities. The main limitation of the information on firms is that productivity information is not available.

Definition of earnings and hours worked. Hours worked refer to monthly actual paid working hours and do include overtime. In addition, in the case of unpaid leave, working hours decrease, whereas in the case of paid leave and holidays, working hours and

monthly wages are unaffected. Hourly wage is defined as the ratio of monthly gross wages divided by monthly working hours. Earnings are defined as monthly earnings from employment, unaffected by paid leave but affected by unpaid leave.

Disclaimer. We are grateful to Statistics Netherlands (Centraal Bureau voor de Statistiek, CBS) for providing access to the administrative data. Results are based on calculations using non-public microdata from Statistics Netherlands. Under certain conditions, these microdata are accessible for statistical and scientific research. For further information: microdata@cbs.nl and https://www.cbs.nl/en-gb/our-services/customised-services-microdata/microdata-conducting-your-own-research.
For questions: j.meekes@law.leidenuniv.nl

B.10. Norway

We use data for the period 2010 to 2019 for which we can construct employer-employee matched data for the population of workers and firms with hours of work with the Norwegian register data.

B.10.1. Institutional setting

Unions, wage bargaining and Minimum wages. The Norwegian collective wage bargaining system is characterised by negotiations involving employer organizations, labor unions, and the government. The system is characterized by centralized "main agreements" which set the general framework. Typically, the industry setting the main agreement is the one most exposed to competition and trade. The other industries then negotiate next by decentralized negotiations at the individual company or industry level for specific wage and working condition adjustments. Less than 20 percent of employees are not covered by collective bargaining agreements (Visser, 2016). The Norwegian system is therefore a highly coordinated system of wage bargaining by international comparison. Norway has no minimum wage law in place. However, wage floors negotiated by the unions are high.

Family policies. The Norwegian labor market is characterised by overall high employment and high female employment rates. Female employment rates have substantially increased since the early 1970s when the share was 43 percent (SSB, the Labor force

survey). The share of employed women has been between 72 to 76 percent during the 2000s (see Nilsen, 2022).

Parental leave policies. Norway has generous job-protected and paid parental leave in place since 1993 when 47 weeks of paid leave were introduced. The wage replacement rate is 100 percent and leave can be extended by 10 weeks by going down to 80 percent. In 1993, it was introduced that 4 weeks of leave were earmarked for fathers. Despite that also before parents could share leave, fathers did not take any longer leave. The paternity quota has been extended several times, first in 2005 to 5 weeks. By today the father quota is 15 weeks.

Childcare. Norway has public highly subsidized childcare in place which was expanded to high coverage first through the child-care act in 1974 for the 3 to 6 years old. In 2002, the second childcare act led to the expansion of childcare for the 1 to 2 years old. Since 2008, 80 percent of a birth cohort from age 1, referred to as full coverage of demand for childcare, can have a childcare place in their municipality. School starts at age 6. Alongside publicly provided childcare Norway still has a cash-for-care policy for parents of children of age 1 who do not use public childcare. This scheme has been however little used since 2008.

Definition of Full-time work. Full-time work is in Norway 37.5 hours per week.

B.10.2. Literature

In international comparison Norway has been described as one of the most gender equal countries in the world (see World Economic Forum) and having a low gender pay gap in terms of full-time adjusted median earnings (5 percent according to the OECD statistics). In Norwegian register data studies, however, the average gender gap is monthly wages is 12.4 percent in 2021 (Grini and Fløtre, 2023, SSB report). Adjusted for age, age squared, education and full-time versus part-time work Penner, et al. (2023, Nature Human Behavior) report a gap of 20 percent in 2018.

Even though family policies are often credited for explaining high female employment in Norway and Scandinavia overall, studies have shown that expansion of childcare for the 3-6 year old in the 1970s had no impact on female employment (Havnes and Mogstad, 2011), expansionary parental leave policies had little if any no positive effect on female employment (Dahl et al. 2013) and careers (Corekcioglu, et al. 2023). Expansion

of childcare for the youngest had positive employment effects for women (Andersen and Havnes, 2019; Kunze and Liu, 2019).

Andresen, M. E., Havnes, T. (2019). Child care, parental labor supply and tax revenue. Labour Economics, 61, 101762. Dahl, G. B., Løken, K. V., Mogstad, M., Salvanes, K. V. (2016). What is the case for paid maternity leave?. Review of Economics and Statistics, 98(4), 655-670. Havnes, T., Mogstad, M. (2011). Money for nothing? Universal child care and maternal employment. Journal of Public Economics, 95(11-12), 1455-1465. Kunze, A. and X. Liu (2019): Universal Childcare for the Youngest and Maternal Employment, IZA Discussion Paper No. 12146/2019.

B.10.3. Data sources

Data sources for information on workers. We use the employment statistics for two periods: the employment statistics (called aa-lto register) for 1995 to 2014 as well as the new employment register already merged with more extensive information on employees and employers by month (called a-form register) for the period 2015 to 2022. Both registers cover the population of employee contracts and are event history data sets. We construct a yearly employer-employee matched panel data set for the population of employees where earnings are observed in November of every year.

From the employment registers, we extract yearly information on the main job during a calendar year and earnings paid for work and all related characteristics of the employer (establishment idendifier, enterprise identifier, industry, public sector) and the job characteristics incl. hours of work and occupation. Using the unique person identifier, we follow workers over time and merge to these data information on gender and year of birth from the population registers. We construct age as calender year minus the year of birth. We merge education categories from the education registers based on the constructed highest level of education an individual has achieved. For generating tenure within establishment we use the time series data since 2000. For the final estimation, we keep the period 2010 until 2019.

Data sources for information on firms. Using the unique organisation number, we merge enterprise-level information collected by the *Brønnøysund register center* through the cleaned and documented version by Berner et al. (2016). We calculate establishment and enterprise size as the number of employees per year.

Berner E, Mjøs A, Olving M (2016) Norwegian corporate accounts. Working Paper 11/16, Center for Applied Research at NHH, SNF, Bergen, Norway.

Definition of earnings and hours worked. We use the annual and monthly wage paid by the main employer. It includes the agreed monthly wage, irregular additional payments and bonus payments. Pay for overtime is not included. We measure hours as the total hours of work during a year in the main job. The hourly wage is then defined as the ratio of total earnings in year t divided by the total hours in year t. We also keep weekly hours that are agreed in the contract of an employee.

Data access. The data used for the empirical analysis in the paper are Norwegian register data that we have gained access to through Statistics Norway (SSB) that has anonymized person, establishment and enterprise identifiers consistently across registers and prepared the raw data.

B.11. Sweden

B.11.1. Institutional setting

Sweden does not have a minimum wage. The labor market operates under collective agreements established at the sectoral level, covering the majority of workers and stipulating terms of employment, including the wage-setting process. Collective bargaining coverage rate is quite high in Sweden, more than ninety percent of the workforce were covered in 2015.[36] Wage-setting process involves three stages: First, unions and employer organizations form central agreements setting the frame for wage formation. Then, bargaining at the local (establishment) level occurs, where the local union and firm representatives translate the central agreement to the establishment level. Finally, wages at the individual level are negotiated between the manager and the worker. In practice, wages are set in bilateral negotiations between the employer and the worker. This decentralized approach allows for considerable employer discretion in wage setting, although the scope varies across agreements.

Sweden is known for its high gender equality. The employment rates for women in Sweden are among the highest in the world, and there are relatively small employment differences between men and women, although part-time work is more prevalent among women. In 2018, the employment rates for women and men aged 20–64 were 75% and 78%, respectively (OECD (2024))

[36] https://www.oecd.org/employment/emp/collective-bargaining-Sweden.pdf

Parental leave policies. Parental benefit is paid out by the government (the Swedish Social Insurance Agency) for 480 days for one child. For 390 days, the compensation is 80% of employees' income. For the remaining 90 days, the compensation is set at SEK 180 per day. Each parent is entitled to half of the time.[37]

B.11.2. Literature

To the best of our knowledge, similar analyses (CCK) have not been performed previously in a Swedish setting, despite very active research on gender differences in Swedish data. Classic references on Swedish data include: Albrecht et al. (2003) Albrecht et al. (2018) Bronson and Thoursie (2019) Meyersson Milgrom et al. (2001)

B.11.3. Data sources

We use a comprehensive RAMS matched employer-employee database from Statistics Sweden (SCB), encompassing labor earnings of all workers linked to firms and employees from 2010 to 2018. We complement the employment information with socioeconomic characteristics from the LOUISE dataset. The data on wages and occupations come from a firm level survey Wage Structure Statistics (WSS, Lönestrukturstatistik) conducted by Statistics Sweden.

Data source for information on workers. Demographic data are collected from Statistics Sweden's LOUISE register, including the entire Swedish population aged 16 to 74. These data include demographic information such as the year of birth, gender, and the highest completed education level.

Data source for information firms. The information on employers comes from RAMS and WSS, all linked through anonymized firm and establishment identifiers. We can observe an employer's industry and calculate employer characteristics such as employment or average earnings. We can observe both the firm identifier and the physical workplace.

Definition of earnings and hours worked. The earnings-spells include the first and last month of employment, so we can calculate monthly gross labor earnings using RAMS. These data are collected from tax registers, and the reporting is mandatory. This data,

[37] See https://www.forsakringskassan.se/english/parents/when-the-child-is-born/parental-benefit for more information.

however, does not include hours worked. Instead, we use Wage structure statistics data (WSS, Lönestrukturstatistik), very large sample at the firm level.[38] WSS data are collected during a measurement week in September for private sector and in November for public sector, including workers who have worked at least one hour with pay. All public sector employees are included. However, the sampling of private sector firms is stratified by firm size with the sampling probabilities 3, 12, 41, 70, and 100 percent for the firm size intervals 1–9, 10– 49, 50–199, 200– 499, and 500–, respectively. Approximately %50 of private sector workers is included every year. If a firm is sampled in a given year, all workers belonging to all establishments are included. The wage measure reflects the employee's wage during the sampling month expressed in full-time monthly equivalents. All wage components, e.g., piece-rate and performance pay, except overtime pay, are included. All salaries are calculated for full-time in order to be able to make comparisons for the time unit month. Thus, we compute hourly wages and daily wages using this full-time equivalent wages. In practice, we divide full-time equivalent monthly wages by 165 to get hourly wages. Occupation codes are available for workers sampled in the WSS throughout. However, there is a change in occupation codes over the analysis period. Until 2013 these data use codes based on ISCO-96. Starting from 2014, the coding structure switches to ISCO-08. The codes are not linked across 2013-2014 as this is hard to do with any confidence.

Data access. Data is accessed through an online portal provided by Statistics Sweden. Other researchers can purchase the data from Statistics Sweden, conditional on the same protocol as the research group. We can provide access to the data for replication purposes.

[38] This part closely follows Fredriksson et al. (2018)

C. Descriptive Statistics For Various Samples

TABLE A.3. Descriptive Statistics of employees in the LEHD Washington Data, 2001-2014

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.18	2.96	3.18	2.97	.	.
Std. dev.	0.61	0.58	0.62	0.58	.	.
Mean age	38	38	38	38	.	.
Part-time (%)	29	36	27	34	.	.
Separation (%)	37	35	36	35	.	.
Mean firm size	40	44	60	62	.	.
Movers per firm	32	24	54	40	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.28	0.61	0.30	0.58	.	.
Social care sector	0.05	0.25	0.06	0.24	.	.
Number person-year obs.	7,347,937	5,273,601	6,672,957	4,834,157	.	.
Number of persons	909,428	655,301	881,293	636,486	.	.
Number of firms	198,159	184,497	102,682	102,682	.	.

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.18	2.97	3.18	2.98	.	.
Std. dev.	0.61	0.57	0.61	0.57	.	.
Mean age	38	38	38	38	.	.
Part-time (%)	28	35	27	34	.	.
Separation (%)	36	35	36	34	.	.
Mean firm size	42	46	62	65	.	.
Movers per firm	33	25	56	41	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.28	0.61	0.31	0.58	.	.
Social care sector	0.09	0.28	0.09	0.27	.	.
Number person-year obs.	7,620,364	5,501,359	6,948,795	5,064,925	.	.
Number of persons	935,626	670,911	909,709	653,639	.	.
Number of firms	198,997	185,297	103,910	103,910	.	.

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.4. Descriptive Statistics of employees in the German IAB Data, 2010-2014

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	2.94	2.70	3.01	2.76	.	.
Std. dev.	0.58	0.51	0.58	0.51	.	.
Mean age	41	41	41	41	.	.
Part-time (%)	8	36	8	34	.	.
Separation (%)	20	22	20	21	.	.
Mean firm size	19	17	40	40	.	.
Movers per firm	11	7	25	18	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.27	0.66	0.30	0.60	.	.
Social care sector	0.05	0.28	0.06	0.26	.	.
Number person-year obs.	63,632,434	50,469,849	51,567,306	38,815,012	.	.
Number of persons	16,598,280	13,875,416	13,705,691	10,893,235	.	.
Number of firms	1,738,457	1,919,018	609,772	609,772	.	.

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	2.94	2.71	3.01	2.77	.	.
Std. dev.	0.58	0.51	0.58	0.51	.	.
Mean age	41	41	41	41	.	.
Part-time (%)	8	36	8	34	.	.
Separation (%)	20	21	20	21	.	.
Mean firm size	19	17	40	40	.	.
Movers per firm	11	8	25	18	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.27	0.66	0.30	0.61	.	.
Social care sector	0.06	0.29	0.07	0.28	.	.
Number person-year obs.	64,295,621	51,756,313	52,195,295	40,044,585	.	.
Number of persons	16,761,236	14,183,963	13,861,589	11,194,899	.	.
Number of firms	1,749,865	1,930,254	617,654	617,654	.	.

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.5. Descriptive Statistics of employees in the Danish administrative Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.36	3.22	3.38	3.23	3.37	3.21
Std. dev.	0.42	0.36	0.42	0.36	0.41	0.36
Mean age	40	39	40	39	40	39
Part-time (%)	32	40	30	39	29	39
Separation (%)	29	29	28	29	31	31
Mean firm size	16	21	29	31	36	39
Movers per firm	23	18	45	28	48	26
Mean log VA/worker	11.30	11.26	11.32	11.27	11.32	11.27
Fraction females at firms	0.28	0.56	0.31	0.52	0.29	0.49
Social care sector	0.02	0.10	0.02	0.09	0.00	0.00
Number person-year obs.	8,242,173	5,203,158	7,135,181	4,691,183	5,581,229	3,215,829
Number of persons	1,455,142	1,034,531	1,329,023	954,218	1,153,175	736,081
Number of firms	216,907	163,733	91,532	91,532	62,903	61,854

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.36	3.23	3.37	3.23	3.37	3.21
Std. dev.	0.40	0.32	0.40	0.31	0.41	0.36
Mean age	40	41	40	41	40	39
Part-time (%)	31	34	30	34	29	39
Separation (%)	28	24	27	24	31	31
Mean firm size	24	32	41	45	34	38
Movers per firm	29	34	53	52	45	25
Mean log VA/worker	11.30	11.26	11.32	11.27	11.32	11.27
Fraction females at firms	0.35	0.65	0.38	0.64	0.29	0.49
Social care sector	0.21	0.54	0.23	0.55	0.00	0.00
Number person-year obs.	10,192,990	10,106,546	9,192,879	9,647,590	5,670,476	3,245,799
Number of persons	1,677,407	1,597,737	1,575,727	1,548,803	1,166,563	743,407
Number of firms	220,214	167,123	102,157	102,157	67,332	66,100

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.6. Descriptive Statistics of employees in the Finnish administrative Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.01	2.84	3.02	2.85	.	.
Std. dev.	0.36	0.33	0.36	0.33	.	.
Mean age	41	41	41	40	.	.
Part-time (%)	5	15	5	15	.	.
Separation (%)	23	27	22	26	.	.
Mean firm size	72	73	117	114	.	.
Movers per firm	40	36	91	72	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.30	0.63	0.31	0.61	.	.
Social care sector	0.04	0.17	0.04	0.16	.	.
Number person-year obs.	3,492,048	2,762,115	3,298,721	2,579,481	.	.
Number of persons	744,125	645,549	678,728	595,026	.	.
Number of firms	30,652	27,542	12,777	12,777	.	.

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.01	2.84	3.02	2.84	.	.
Std. dev.	0.37	0.32	0.37	0.32	.	.
Mean age	41	42	41	42	.	.
Part-time (%)	5	13	5	12	.	.
Separation (%)	22	23	22	23	.	.
Mean firm size	111	112	169	164	.	.
Movers per firm	48	75	100	139	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.38	0.72	0.39	0.72	.	.
Social care sector	0.23	0.61	0.24	0.62	.	.
Number person-year obs.	4,366,041	5,902,174	4,191,855	5,746,825	.	.
Number of persons	898,143	1,131,018	839,938	1,094,104	.	.
Number of firms	31,542	28,484	14,627	14,627	.	.

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.7. Descriptive Statistics of employees in the Hungarian administrative Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	6.65	6.56	6.76	6.63	6.79	6.64
Std. dev.	0.60	0.53	0.62	0.55	0.62	0.55
Mean age	39	39	38	39	38	39
Part-time (%)	9	17	6	13	5	12
Separation (%)	30	29	29	29	28	30
Mean firm size	15	16	35	36	39	41
Movers per firm	10	8	24	18	24	18
Mean log VA/worker	8.57	8.44	8.71	8.56	8.71	8.56
Fraction females at firms	0.27	0.65	0.33	0.59	0.33	0.57
Social care sector	0.02	0.07	0.02	0.06	0.01	0.02
Number person-year obs.	5,356,135	4,175,305	4,006,827	3,218,526	3,397,627	2,627,123
Number of persons	1,058,806	896,003	851,128	726,755	764,169	626,041
Number of firms	286,586	270,098	86,745	86,745	65,497	65,088

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	6.70	6.63	6.78	6.68	6.79	6.64
Std. dev.	0.60	0.53	0.61	0.53	0.61	0.55
Mean age	39	41	39	41	39	39
Part-time (%)	9	13	6	11	5	12
Separation (%)	28	30	28	30	27	29
Mean firm size	22	23	49	51	41	43
Movers per firm	13	14	30	34	25	18
Mean log VA/worker	8.54	8.41	8.65	8.51	8.65	8.51
Fraction females at firms	0.32	0.67	0.37	0.64	0.32	0.57
Social care sector	0.24	0.42	0.28	0.45	0.13	0.11
Number person-year obs.	6,803,003	6,489,473	5,542,910	5,565,750	3,937,903	2,940,621
Number of persons	1,245,083	1,214,861	1,073,387	1,082,499	852,974	688,395
Number of firms	293,040	279,417	101,122	101,122	72,294	71,818

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.8. Descriptive Statistics of employees in the Italian administrative Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	6.29	6.12	6.32	6.14	6.35	6.15
Std. dev.	0.45	0.39	0.46	0.40	0.45	0.39
Mean age	40	39	40	39	41	40
Part-time (%)	12	43	11	41	10	41
Separation (%)	23	25	22	25	22	24
Mean firm size	12	13	21	22	31	33
Movers per firm	18	13	34	24	46	31
Mean log VA/worker	4.20	3.94	4.18	3.93	4.18	3.93
Fraction females at firms	0.26	0.59	0.30	0.55	0.29	0.54
Social care sector	0.01	0.04	0.01	0.04	0.01	0.03
Number person-year obs.	36,000,212	22,522,202	30,185,614	19,646,139	26,102,586	16,264,324
Number of persons	5,189,126	3,436,846	4,752,469	3,196,238	4,478,546	2,927,114
Number of firms	1,180,801	995,334	471,994	471,994	264,771	262,589

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.9. Descriptive Statistics of employees in the Dutch administrative Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	2.99	2.84	2.99	2.85	.	.
Std. dev.	0.54	0.44	0.54	0.44	.	.
Mean age	39	39	39	39	.	.
Part-time (%)	19	62	19	61	.	.
Separation (%)	25	24	25	24	.	.
Mean firm size	31	40	59	62	.	.
Movers per firm	31	41	67	67	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.32	0.66	0.34	0.65	.	.
Social care sector	0.10	0.41	0.11	0.42	.	.
Number person-year obs.	32,584,734	30,749,153	29,741,250	28,771,664	.	.
Number of persons	4,974,289	4,598,875	4,674,479	4,405,345	.	.
Number of firms	632,961	472,518	264,784	264,784	.	.

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.01	2.86	3.01	2.87	.	.
Std. dev.	0.54	0.44	0.53	0.44	.	.
Mean age	40	39	40	39	.	.
Part-time (%)	18	61	18	60	.	.
Separation (%)	24	23	24	23	.	.
Mean firm size	32	42	62	65	.	.
Movers per firm	33	43	72	70	.	.
Mean log VA/worker	0.00	0.00	0.00	0.00	.	.
Fraction females at firms	0.32	0.65	0.34	0.64	.	.
Social care sector	0.17	0.45	0.18	0.46	.	.
Number person-year obs.	35,090,534	32,567,438	32,258,553	30,602,528	.	.
Number of persons	5,237,841	4,766,050	4,943,251	4,575,668	.	.
Number of firms	633,906	473,445	266,714	266,714	.	.

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.10. Descriptive Statistics of employees in the Norwegian administrative Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.17	2.94	3.19	2.95	3.20	2.97
Std. dev.	0.51	0.52	0.51	0.52	0.50	0.52
Mean age	39	39	39	39	39	38
Part-time (%)	10	27	10	27	9	25
Separation (%)	22	25	22	25	23	26
Mean firm size	17	23	32	35	31	34
Movers per firm	26	21	53	34	53	31
Mean log VA/worker	4.14	3.94	4.17	3.97	4.17	3.97
Fraction females at firms	0.26	0.61	0.29	0.59	0.27	0.55
Social care sector	0.03	0.13	0.03	0.12	0.03	0.14
Number person-year obs.	9,278,563	6,143,324	8,030,981	5,586,205	7,235,250	4,307,144
Number of persons	1,468,298	1,109,677	1,329,434	1,033,191	1,239,629	831,199
Number of firms	204,582	148,635	81,396	81,396	70,640	70,064

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	3.17	2.97	3.19	2.98	3.20	2.99
Std. dev.	0.50	0.49	0.50	0.49	0.50	0.51
Mean age	40	40	40	40	39	39
Part-time (%)	10	30	11	30	9	26
Separation (%)	22	23	22	22	22	24
Mean firm size	23	31	42	46	32	36
Movers per firm	32	43	65	69	53	33
Mean log VA/worker	4.14	3.95	4.16	3.98	4.16	3.98
Fraction females at firms	0.31	0.67	0.34	0.65	0.28	0.58
Social care sector	0.17	0.46	0.19	0.48	0.06	0.26
Number person-year obs.	10,883,236	9,981,495	9,709,357	9,452,452	7,560,102	5,051,829
Number of persons	1,613,891	1,466,074	1,491,514	1,408,656	1,280,893	933,596
Number of firms	208,228	152,352	89,013	89,013	74,200	73,602

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.11. Descriptive Statistics of employees in the Portuguese QP Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	1.73	1.59	1.80	1.63	1.80	1.63
Std. dev.	0.53	0.47	0.55	0.49	0.55	0.49
Mean age	39	39	39	38	39	38
Part-time (%)	2	6	2	6	2	6
Separation (%)	24	24	23	24	25	26
Mean firm size	14	14	29	29	29	29
Movers per firm	15	13	33	28	32	27
Mean log VA/worker	11.16	10.81	11.28	10.92	11.28	10.92
Fraction females at firms	0.29	0.68	0.33	0.64	0.32	0.63
Social care sector	0.03	0.19	0.04	0.19	0.03	0.17
Number person-year obs.	12,605,208	11,247,608	9,965,503	9,025,709	9,668,586	8,529,267
Number of persons	2,343,904	2,077,646	1,907,325	1,718,979	1,888,600	1,685,581
Number of firms	360,259	357,409	127,878	127,878	125,489	125,535

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes includes public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

TABLE A.12. Descriptive Statistics of employees in the Swedish Data, 2010-2019

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	5.33	5.24	5.33	5.24	5.32	5.23
Std. dev.	0.34	0.31	0.34	0.31	0.32	0.30
Mean age	41	41	41	41	41	41
Part-time (%)	5	21	5	21	5	22
Separation (%)	23	29	23	28	24	30
Mean firm size	156	172	227	228	253	255
Movers per firm	80	53	156	91	158	84
Mean log VA/worker	13.61	13.51	13.61	13.51	13.61	13.51
Fraction females at firms	0.29	0.51	0.30	0.51	0.28	0.50
Social care sector	0.03	0.16	0.03	0.16	0.03	0.17
Number person-year obs.	4,888,460	2,914,664	4,777,344	2,867,095	4,118,955	2,277,476
Number of persons	1,136,982	763,665	1,087,499	741,016	973,224	625,810
Number of firms	16,559	14,399	8,308	8,308	6,619	6,617

	Overall Analysis Sample		Dual-Connected Sets		With Productivity	
	Men	Women	Men	Women	Men	Women
Log Hourly Wage	5.31	5.19	5.31	5.19	5.31	5.23
Std. dev.	0.33	0.27	0.33	0.27	0.32	0.30
Mean age	42	43	42	43	41	41
Part-time (%)	7	29	7	29	5	22
Separation (%)	21	21	21	21	24	30
Mean firm size	283	309	385	387	242	244
Movers per firm	109	143	191	222	146	77
Mean log VA/worker	13.61	13.51	13.61	13.51	13.61	13.51
Fraction females at firms	0.40	0.67	0.40	0.67	0.28	0.50
Social care sector	0.28	0.69	0.28	0.69	0.03	0.17
Number person-year obs.	6,649,619	8,166,124	6,556,121	8,130,549	4,134,380	2,286,880
Number of persons	1,477,305	1,725,338	1,436,101	1,710,253	979,674	630,761
Number of firms	17,178	15,022	9,637	9,637	7,204	7,203

Notes: Overall analysis sample in columns (1)–(2) includes workers age 20–60. Wages are measured in real (2015 = 100) euros per hour. The social care sector includes include public administration, education, human health activities, residential care activities and Social work activities without accommodation (i.e NACE code 84 to 88).

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