The Role of Flexible Wage Components in Gender Wage Differences

István Boza[1], Balázs Reizer[1,2]

[1] Centre for Economic and Regional Studies, Budapest, Hungary
[2] Corvinus University Budapest, Budapest, Hungary

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A main driver of the gender wage gap is that women earn a lower firm-specific wage premium than men. We document the role of flexible wage components in driving both within-firm and between-firm gender differences in firm premia. For this purpose, we link wage survey data on performance payments and overtime to an administrative linked employer-employee dataset from Hungary. We find that the gender gap in firm premia is negligible at firms that do not pay either performance payments or overtime, while it is more than 11 percent at firms where all employees receive performance- and overtime payments. These patterns are also present when we control for differences in the labor productivity of firms or after composition differences are accounted for using AKM models. Finally, a decomposition exercise shows that performance payments and overtime payments contribute 60 percent to the gender gap in firm premia and 25 percent to the overall gender gap.

Keywords: wage inequality, bargaining, sorting, overtime, performance payments

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Corresponding author: Balázs Reizer, reizer.balazs@krtk.hu

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1 Introduction

The gender wage gap has been falling rapidly in industrialized countries since the Second World War (Olivetti & Petrongolo, 2016). This trend, however, slowed down during the last two decades (England et al., 2020). The main reason is that women have a lower chance to enter firms with the highest wage premia, and even when they do, they tend to earn less than their male co-workers (Barth et al., 2021; Bruns, 2019; Card et al., 2016; Casarico & Lattanzio, 2023). What is more, the gender gap in firm premia is even increasing in many countries (Bruns, 2019; Masso et al., 2022; Palladino et al., 2021).

We add to the existing literature above by investigating the extent to which bonuses and overtime payments contribute to the gender gap in firm-specific wage premia and to the overall gender wage gap. This exercise is important for two reasons. First, high-paying firms offer performance payments (Bloom & Van Reenen, 2007, 2010) and require overtime hours (Reizer, 2022) more often. Second, women are shown to earn less at occupations where overtime payments (Goldin, 2014) or bonuses (Albanesi & Olivetti, 2009) are more prevalent. Still, it is not clear how much of the gender gap in these occupations is caused by the sorting of workers. For example, high-paying firms with bonuses and overtime payments may attract high-productivity men more than high-productivity women.

We use Hungarian linked employer-employee social security data with information on the employment history of 50 percent of the Hungarian population between 2003 and 2017. The novelty of the database is that it can be linked to information on the prevalence of performance and overtime payments at private sector firms. This data structure enables us to follow workers between firms with and without overtime payments and bonuses. This way, we can estimate a two-way fixed effect model to quantify the contribution of bonuses and overtime payments to the gender wage gap after controlling for unobserved individual heterogeneity in wages.

Our analysis is carried out in three steps. We start by estimating firm- and gender-specific wage premia. Then, we estimate the relationship between the gender gap in firm premia and overtime and performance payments. Finally, we calculate the actual contribution of performance and overtime payments to the gender gap.

We estimate gender-specific wage premia using an Abowd, Kramarz, Margolis (1999) (AKM) model integrating individual fixed effects that reflect individual earning potential as well as gender- and year-specific firm fixed effects. The latter terms reflect the wage premia of firms available to men and women. We show that the total gender wage gap in the private sector is 23.4 percent, which is somewhat larger than the national-level wage gap (14.6 percent) and the 20 percent OECD average (OECD, 2012). Following the methodology of Card et al. (2016), we find that 9.5 percentage points of the total gender gap can be attributed to the gender difference in firm-specific wage premia. Using Oaxaca-Blinder decomposition, we show that 4.2 percentage points of this difference is due to the fact that women work at firms with a lower (overall) wage premium (*sorting effect*). The remaining 5.3 percentage points can be attributed to the *bargaining effect*, i.e., women receiving a lower share of the firm premium than their male co-workers even within the same firm.

As the second step of the empirical analysis, we focus on performance and overtime payments. We show that the allocation of performance and overtime payments is not random, as women are slightly less likely to work in flexible-wage jobs. For instance, only 63.4% of women in our data receive overtime payments compared to 68.4% of men. This difference is mostly due to composition effects, as women are more likely to work at occupations where flexible wage schemes are less prevalent.

Investigating the wage effect of flexible wages, we show that the gender gap in firm premium is only 1.1 percent at firms where workers do not receive any flexible wage components, while the gender gap is linearly increasing in the share of workers with overtime or performance payments. This difference is not solely driven by composition effects, as it remains significant even if we control for differences in sector, size or the productivity of the firms. We find that the gender gap in firm premium is 5.5 percentage points larger at firms where every worker receives performance payments compared to firms where no worker receives performance payments. 3.4 percentage points of that difference can be attributed to a between-firm (sorting) effect, as women are less likely to work at firms where the share of performance payments is high or where overtime is frequent, and the remaining 2.1 percentage points to the within-firm effect (*bargaining*). Furthermore, women receive a 3.8 percentage points lower firm premium where every worker receives overtime payments compared to firms where no worker receives overtime payments. All of this difference comes from the between-firm effect, i.e., that women are less likely to work at high premium firms requesting overtime. The estimated contribution of overtime and performance payments is significant in economic terms. For instance, a 10 percent increase in firm productivity, conditional on firm size and wage structure, corresponds only to a 0.1 percent increase in the gender gap in firm premium.

In the last step of the analysis, we use Oaxaca-Blinder decomposition to quantify the contribution of flexible wage components to the gender gap. We find that the contribution of performance payments and overtime payments to the gender wage gap is 3.7 percentage points and 7 percentage points, respectively. This adds up to

45.5 percent of the total wage gap. Furthermore, performance payments and overtime payments provide 6.5 percentage points of the 9.8 percentage points difference in gender-specific wage premium. This result indicates that one-quarter of the total gender wage gap comes from the fact that women receive a lower firm-specific wage premium at firms that offer either performance payments or overtime payments. Finally, 5 percentage points of the gender gap in firm premium is associated with the sorting effect, i.e., that women are less likely to work at firms with proportionately high overtime payments and flexible payments. 1.5 percentage points is the bargaining effect, or women receiving a lower share of the firm-specific wage premium than their male co-workers if the firm pays performance payments or overtime.

We contribute to multiple strands of the literature. First, we enhance the literature on flexible wages. There is widespread evidence that flexible wages increase worker productivity, and firms that measure and reward worker effort are on average more productive and profitable (Bender et al., 2018; Bloom et al., 2016; Ichniowski et al., 1997). However, the cost of these work arrangements is increased income inequality within the firm (Bandiera et al., 2007; Bidwell et al., 2013; Lazear, 2000; Lemieux et al., 2009; Shearer, 2004). We add to the literature by showing that this increase in inequality hurts women disproportionately.

Second, we contribute to the literature on the phenomenon that the gender wage gap at the top of the wage distribution is much larger than the average gender wage gap (Albrecht et al., 2003; Arulampalam et al., 2007; Christofides et al., 2013). There are various contributing factors behind this glass ceiling effect, such as lower work experience because of motherhood (Bütikofer et al., 2018; England et al., 2016), less working hours (Azmat & Ferrer, 2017; Goldin, 2014) or gender differences in social interactions (Cullen & Perez-Truglia, 2019). We add to the literature by showing that the gender gap is much smaller at firms that do not use performance or overtime payments.

Our results are relevant for the literature on the gender difference in rent-sharing as well. As others in the literature (Card et al., 2016; Criscuolo et al., 2021), we find that the within-firm gender wage gap increases with labor productivity. At the same time, our findings show that women end up at firms of slightly higher average rents. Because of these two offsetting mechanisms, we find that gender differences in rent-sharing have only a small contribution to the overall gender gap compared to the contribution of flexible wage components.

Finally, Biasi & Parsons should be mentioned (2022) whose results are the closest to ours. Using a policy reform in Wisconsin, their study provides causal evidence that flexible wages increase the gender gap among teachers. They show that an important mechanism contributing to the gender gap is that women negotiate for wages less often. We add to their paper by going beyond a single occupation in our analysis and showing that flexible wages increase the gender gap at the level of the whole economy as well.

The rest of this paper is structured as follows. Section 2 presents stylized facts about the Hungarian labor market and the two datasets we use. Section 3 introduces our methodological framework for decomposing the gender wage gap and quantifying the role of flexible wage components. Section 4 discusses the results of our empirical exercises and Section 5 the conclusions of our paper.

2 Institutional background and data

2.1 Institutional background

Hungarian employment contracts must specify whether the worker is salaried and paid monthly or by the hour. A compulsory element of every wage contract is the monthly or hourly base wage which can be decreased only with the written consent of workers. If the worker is salaried, the baseline working time must be set in their contract. Firms may require additional working hours above the regular schedule of salaried workers as well. In this case, the firm must pay overtime payments on an hourly basis for the additional hours. The hourly overtime wage for salaried workers is regulated and it must be higher than the monthly base wage divided by normal working hours. On top of the base wage and overtime payments, firms can pay additional bonuses, premia or allowances. These additional side payments are entirely determined by the employer and are not regulated in the Labor Code. The share of overtime payments and performance payments in the total wage bill is approximately 10 percent, which is similar in magnitude to other countries in the European Union (Druant et al., 2009; Kézdi & Kónya, 2011).

The wage-setting institutions in Hungary are similar to those in Anglo-Saxon countries. The share of union members is low (OECD, 2012), wage bargaining takes place at the individual level (Rigó, 2012), and it is relatively easy to lay off workers compared to other Western-European countries (Tonin et al., 2009).

2.2 Data

We use two main data sources for our empirical investigation. The first dataset is the ADMIN3, the administrative linked employer-employee dataset of the Centre for Economic and Regional Studies (Sebők, 2019). The ADMIN3 contains the work history of a 50 percent random sample of the Hungarian population from 2003 to 2017. The sample includes approximately 5.4 million distinct individuals, of whom 3.4 million are observed for at least one month as working at a private firm or a public employer. The database records the employment status of individuals on the 15$^{\text{th}}$ day of every month and their monthly gross earnings based on social security contribution payments.

On the firm side, the ADMIN3 contains information on the balance sheet and income statement of the employing firm. The source of the balance sheet data are the yearly corporate income tax returns collected by the National Tax and Customs Administration. In Hungary, every firm must report their financial data as part of the tax declaration forms, therefore, the balance sheet of every firm which employed at least one person in the worker sample of ADMIN3 is observed.

A shortcoming of the ADMIN3 is that it is limited to total salary, without any information on specific wage components. For this reason, we match ADMIN3 data with the Hungarian Structure of Earnings Survey (HSES). Structure of Earnings Surveys are available in every country of the European Union and contain detailed information on the specific wage components earned by workers in a specific month of the year. In contrast to most other countries, the Hungarian version is conducted yearly instead of every four years.

The HSES uses a stratified sampling design, and contains yearly information on 10 thousand firms and 170 thousand workers. At firm level, the HSES has a panel structure. Participation is compulsory every year for firms with more than 50 employees, while only a random sample of firms between 5 and 50 employees are required to report the wages of their workers. The participating firms report detailed aggregate employment statistics (e.g., number of workers, share of skilled workers, etc.). At worker level, the HSES has a repeated cross-sectional structure. We observe every worker whose firm has less than 50 employees and a 6-10 percent random sample of workers whose firm has more than 50 workers.[1] The firms must report demographic information and the amount of the base wage, overtime, regular bonuses and premia earned in May. Besides the wage elements paid on a monthly basis, firms must report the amount of occasional bonuses and premia paid in the previous year.[2]

In the rest of the paper, we consider a worker to have performance payments

[1] The sample covers 6.6% of physical workers and 9.9% of white-collar workers, based on their date of birth.

[2] Bonuses and premia which are paid at less than monthly frequency are considered occasional bonuses.

if she received either monthly or occasional bonuses, premia, or allowances. We consider a worker to have overtime payments if she received additional payments for overtime hours or for weekend and night shifts. For the sake of simplicity, workers receiving either overtime payments or performance payments are uniformly referred to as workers receiving flexible wages.

As it is not possible to merge the two datasets at individual level, we match them at firm-year level with probabilistic matching. This is feasible to do with high precision, as certain firm-level information from the HSES survey on aggregated labor data (including total number of workers and the number of full-time / part-time workers, white-collar / blue-collar categories) are available for firms in the administrative dataset as well. We consider a firm in a given year the same in the two distinct datasets if they were both unique and identical with respect to these common variables.

Utilizing the panel structure of both datasets, we match firms based on data from all the fifteen years observed. This greatly decreases the number of cases where observable characteristics do not uniquely identify firms. To make the method robust for potential data errors, we allow the variable vectors of firms to differ between the two datasets in one out of the fifteen years. This way, we can unambiguously match 99.1-99.9% of employers from the HSES wage survey to employers in the ADMIN3 dataset in the years between 2004 and 2016. Match quality was 96.6% for observations from 2003, and it was only 85.7% for 2017. Therefore, we omit observations for year 2017 from the sample. As we cannot link the public sector part of the HSES to the ADMIN3 due to administrative reasons, we use the public sector from the ADMIN3 only for the estimation of individual and firm fixed effects in the AKM model. Then, we restrict attention to the private sector in the main analysis.

After creating the link between the two datasets, we calculate the number of workers receiving performance payments (bonuses, premia) or overtime payments by firm-gender-occupation-year cells in the HSES. Then, we match these cell-level numbers to the ADMIN3, and calculate the firm-year and firm-gender-year level shares used in our analyses.

Sample selection

From the ADMIN3 dataset, we keep all workers who had an employment contract for the full month, either in the private or in the public sector. For computational feasibility, we use only the monthly observations from January, April, June and October. As we aim to utilize AKM firm effects, we must restrict the sample to firms in the largest connected set in the worker mobility network. The reason for this is that the estimated firm parameters are comparable on the same scale only across firms which are connected by the movement of workers.[3] We identify these mobility sets separately for male and female workers. Firms which are included in the giant components in both the male and female mobility networks formed the dual-connected set, as in Card et al. (2016). To decrease the potential effect of the limited mobility bias problem (Andrews et al., 2008), we removed employment spells at firms with less than 2 mobility events (hires or separations) on average per year throughout the entire period.[4] We included the public sector observations in the estimation of firm and individual fixed effects in the AKM model even though we do not have information on wage schemes in the public sector. This way, we observe more job-to-job mobility and we can estimate the wage premium of private sector firms more precisely. However, we restrict attention to the private sector in the main analysis.

2.3 Descriptive statistics

Table 1 shows the average characteristics of men and women in the whole sample and of workers whose employer is observed in the HSES as well. Women in Hungary earn 13.5 log points (around 14.5 percent) less, while this difference is 21 log points (23.4 percent) in the sample in which we observe the HSES firms. The reasons for this difference are that small firms are underrepresented in the HSES survey and it does not contain information on the public sector where the gender wage gap is smaller. In line with this, the gender difference in firm-level wage premium is smaller in the whole sample than at firms observed in the HSES as well.

Women in Hungary work at slightly larger firms than men. The average firm size of women is around 323 and only around 282 in the case of men. This is in contrast to Portugal (Card et al., 2016) or the United States (Papps, 2012) where women work at slightly smaller firms. As explained before, the average firm size in the HSES subsample is larger because of the sampling design. Still, the average firm size of women is slightly larger also in this subsample. By contrast, the value added per worker (by 17.6 log points), the share of exporting firms (by 5.3 log points) and the firm-level wage premium (by 4 log points) are all larger among firms where men work. These differences are similar for the whole sample and for firms which we also observe in the HSES.

[3] As Torres et al. (2018) note, if a third set of high-dimensional fixed effects such as occupation is included in the model, three-way connected sets should be identified. We followed the approach of Weeks and Williams (1964) to obtain these sets.

[4] This restriction approximately corresponds to the sample restriction made for instance in Bonhomme et al. (2020).

Table 1: Average characteristics of male and female workers

	Whole sample				The firm is observed in the HSES			
	Women	Men	diff	t-score	Women	Men	diff	t-score
Log(wage)	6.458	6.579	0.121	23.94	6.614	6.821	0.208	23.88
	(0.461)	(0.512)			(0.436)	(0.440)		
Firm-unit level premium	0.176	0.215	0.040	9.49	0.247	0.333	0.086	15.20
	(0.291)	(0.347)			(0.262)	(0.296)		
Log(value added/worker)	8.115	8.291	0.176	16.11	8.412	8.599	0.187	9.94
	(1.094)	(1.023)			(0.989)	(0.904)		
Export	0.43	0.483	0.053	10.76	0.614	0.673	0.058	6.23
	(0.495)	(0.5)			(0.487)	(0.469)		
Average firm size	322.84	281.84	-41.00	-3.75	577.66	528.60	-49.06	-2.72
	(530.53)	(487.98)			(615.3)	(586.5)		
Individual observations	19979820	28847806			8934613	12763126		
Firm obs.	277044	305379			31270	32595		

Note: The table shows the average characteristics of men and women in the whole sample, and at firms which we observe also in the HSES.

Table 2 shows that men are more likely to earn performance payments (68.4 vs 63.4 percent) as well as overtime payments (56.2 vs 54 percent). However, we do not find these differences within occupational categories. What is more, female managers are likely to earn overtime payments with a 9 percentage points higher probability than male managers. Consequently, men are more likely to earn overtime payments and flexible payments because they have occupations where these wage components are more prevalent. Similarly, the share of men and women receiving flexible wages is similar within and between industry categories (Table A2). The only notable heterogeneity we observe is across firm size categories. Table A3 highlights that the share of workers with flexible wages is strictly increasing in firm size. At firms with less than 10 employees, the share of workers with flexible wages is less than 20 percent, while it is around 70 percent at firms with more than 500 workers. In contrast to these differences across firm size, the share of men and women receiving flexible wages is similar within firm size categories.

Table 2: Prevalence of overtime and performance payments by gender and occupation

	Received overtime payments		Received performance payments	
	Women	Men	Women	Men
Political/religious/NGO leader (Nace 1*)	53.1%	55.6%	46.9%	41.8%
Top manager (Nace 1*)	27.7%	26.9%	41.8%	40.5%
Other manager (Nace 1*)	60.5%	51.9%	61.4%	61.7%
Professional (Nace 2)	49.5%	51.5%	62.2%	62.2%
Other white-collar (Nace 3-4)	54.1%	57.6%	60.8%	60.1%
Skilled blue-collar (Nace 5-7)	71.0%	70.1%	46.2%	53.6%
Machine operators (Nace 8)	86.2%	84.7%	58.9%	60.2%
Unskilled laborer (Nace 9)	56.4%	60.4%	32.4%	37.4%
Total	63.4%	68.4%	54.0%	56.2%

Note: The table shows the share of workers receiving performance payments and overtime payments by occupational category.

Appendix Table A4 illustrates differences by gender across occupations in the share of overtime and performance payments within the total wage bill. Unlike in Table 2, we see more prominent differences in overtime payments in this measure. In all occupations, the share of overtime payments for men is slightly larger than for women. At the same time, the average gap in overtime payments is larger than within-occupation gaps because of the higher presence of men in overtime-intense occupations (such as machine operators). We do not see such clear patterns in performance payments. However, the table suggests that the share of non-regular wage components is somewhat higher for women.

3 Methods

This section shortly summarizes the framework we adopt. Building on Abowd et al. (1999), Card et al. (2013), Lachowska et al. (2019), and Torres et al. (2018), we estimate the following three-way AKM model:

$$ln\ w_{ijtg} = \boldsymbol{X_{ijtg}}\boldsymbol{\beta} + \theta_i + \Psi_{jgt} + \lambda_{k(ijt)} + \varepsilon_{ijtg} \tag{1}$$

where the dependent variable is the wage earned by worker i of gender g at firm j at year t. $\boldsymbol{X_{ijtg}}$ denotes the time-varying individual characteristics, θ_i the worker fixed effect, ψ_{jgt} the gender and year-specific firm fixed effects, and $\lambda_{k(ijt)}$ the occupation of worker i at firm j in year t .

Most previous research assumes that firm effects may vary across workers of different types in the same firm, but they do not change over time within the same firm unit. Relying on the work of Lachowska et al. (2019), we relax this assumption and allow firm fixed effects to vary between years. This lets us consider changes in firm-specific wage premium or in flexible wage components. Following Torres et al. (2018), we also augment the model with occupation fixed effects to capture the non-random selection of male and female workers into high or low-wage occupations. This way, we can filter out the effect of occupational selection from firm-specific components.

After defining the largest connected sets (in mobility networks) separately for male and female workers in the estimation sample[5], we estimate the fixed effects model on all firms that are part of *either* the female or the male connected sets. The estimated gender-specific firm-year effects are initially comparable on the same scale

[5]We used the algorithm of Weeks and Williams (1964) as proposed by Torres et al. (2018) for cases of more than two high-dimensional fixed effects.

only within the male or the female connected set – as there is no mobility between the gender components of the labor mobility network. To overcome this issue, we follow the strategy of Card et al. (2016), and assume that there are no differences in firm-specific premia by gender among the set of firms with the lowest productivity.[6]

As a second step, the estimated and rescaled firm-gender effects can be decomposed into an average gender difference in firm-specific wage premium and (baseline) firm effects that are already cleaned from the gender composition of the firm:

$$\Psi_{jgt} = G_g \tilde{\beta}_G + \tilde{\psi}_{jt} + \varepsilon^G_{jgt} \tag{2}$$

$\tilde{\psi}_{jt}$ is the (baseline) firm-year specific effect. The average within-firm effect of gender ($\tilde{\beta}_g$) is identified on the set of dual-connected firms which are included in *both* the male and female connected sets in the mobility network. ε^G_{jgt} has an expected value of zero. Its variation captures how much firm-gender specific effects change over time conditional on the average gender difference and firm fixed effects.

In this second stage, we provide an alternative to the decomposition of Card et al. (2016) by taking the difference of Equation 2 across gender groups G.

$$\frac{\partial \Psi_{jgt}}{\partial G_g} = \tilde{\beta}_G + \frac{\partial \tilde{\psi}_{jt}}{\partial G_g} \tag{3}$$

The left side of Equation 3 shows the overall gender wage gap in firm premium. The parameter $\tilde{\beta}_G$ indicates the within-firm gender gap in firm premium, while the last part is the gender gap in firm premium across firms.

The above components can be obtained by estimating a set of linear regressions. The left hand side term, representing the overall gender difference in estimated firm-group effects, can be obtained from the following regression:

$$\Psi_{jgt} = G_g \tilde{\beta}_{\text{OA}} + \varepsilon_{jg} \tag{4}$$

Then, repeating this regression by incorporating fixed effects for all firm-year pairs yields an estimator of within-firm differences in gender-specific premia (denoted by $\tilde{\beta}_G$ in Equation 3):

$$\Psi_{jgt} = G_g \tilde{\beta}_{\text{WI}} + \tilde{\psi}_{jt} + \varepsilon^G_{jg} \tag{5}$$

Finally, we run a second-stage regression on the firm effects of Equation 5. This regression provides the between-firm average difference of the firm-group

[6] We explain the rescaling of firm effects in Section 4.1.

parameters, capturing the effect of sorting across firms.

$$\tilde{\psi}_{jt} = G_g \tilde{\beta}_{\text{BW}} + \epsilon_{jt} \tag{6}$$

Note that $\tilde{\beta}_{\text{OA}} = \tilde{\beta}_{\text{WI}} + \tilde{\beta}_{\text{BW}}$, as it is reflected in Equation 3. As Boza (2022) discusses in detail, this specification is a close alternative to the decomposition of Card et al. (2016), with some convenient features.[7]

4 Results

We start the presentation of our results by explaining the normalization which makes male and female firm premia comparable. We continue with baseline facts about the gender gap in firm premia. Then, we augment the baseline approach to quantify how flexible wage components contribute to the whole gender wage gap.[8]

4.1 Normalization of firm premia

We cannot identify directly comparable firm-gender(-year) effects since male and female workers cannot belong to the same connected set in the mobility network if firm-gender(-year) units are treated separately (Abowd et al., 2002). Therefore, we normalize firm-specific wage premia before the empirical investigation. We follow the strategy of Card et al. (2016) and Bruns (2019), and assume that the least productive

[7]Card et al. (2016) proposes the following Oaxaca-Blinder decomposition of the differences in observed firm-gender fixed effects.

$$E(\Psi_{j\text{M}}|\text{M}) - E(\Psi_{j\text{F}}|\text{F}) = \underbrace{E(\Psi_{j\text{M}}|\text{M}) - E(\Psi_{j\text{M}}|\text{F})}_{\text{Sorting}} + \underbrace{E(\Psi_{j\text{M}}|\text{F}) - E(\Psi_{j\text{F}}|\text{F})}_{\text{Bargaining}} = \tag{7}$$

$$\underbrace{E(\Psi_{j\text{M}}|\text{M}) - E(\Psi_{j\text{F}}|\text{M})}_{\text{Bargaining}} + \underbrace{E(\Psi_{j\text{F}}|\text{M}) - E(\Psi_{j\text{F}}|\text{F})}_{\text{Sorting}} \tag{8}$$

This decomposition utilizes two counterfactual states for the midpoint of the decompositions. It either allocates the firm premia received by female workers to the male workers of their firms, or it takes the female distribution over firms as a given and assumes that the female group would receive the same premia as male workers. Bruns (2019) argues that the latter specification is more relevant, while Casarico and Lattanzio (2023) simply report the arithmetic mean of the elements in the two different decompositions proposed. Boza (2022), on the other hand, provides a regression-based formulation of the problem which provides an unambiguous decomposition of firm-group-specific wage components into a within-firm (bargaining) and a between-firm (sorting) component. This approach also has the advantage of being easily generalizable into differences across multiple groups, and it also allows for the inclusion of control variables or other parameters of interest.

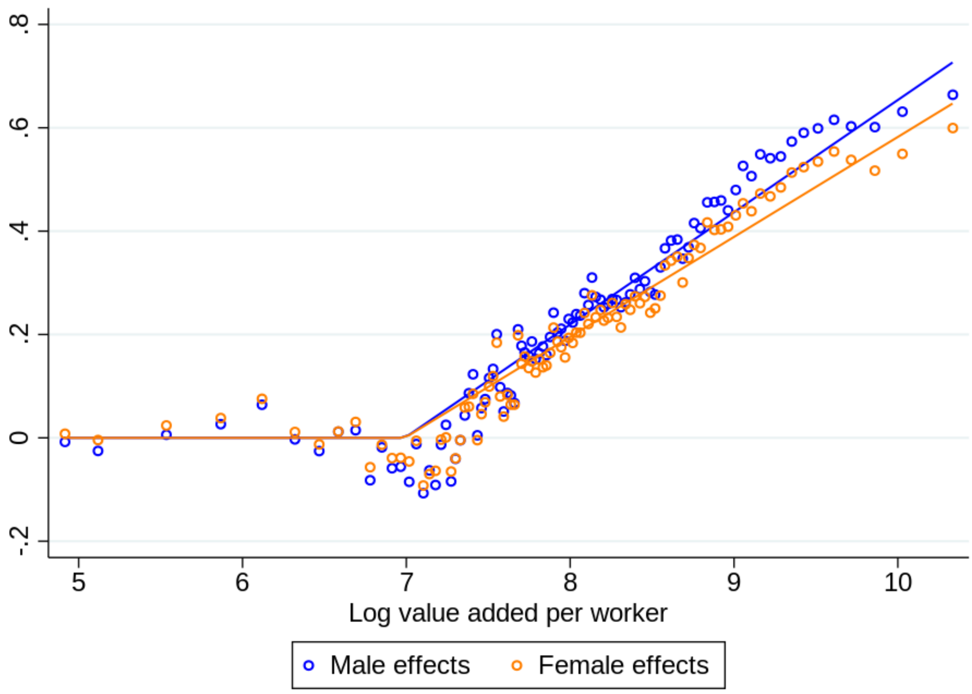
[8]Appendix B contains illustrations on the model fit of our time-varying, grouped AKM estimation with occupation effects. Based on the presented exercises, the estimated firm-gender-year unit effects provide a reliable measure of unit-specific wage premia.

firms provide (on average) the same firm-level wage premium to both men and women, because these firms do not have any rent to share with the workers. At the same time, we assume that firms of a higher productivity can provide positive, albeit different premia to men and women.

In line with our normalization assumption, Figure 1 shows that the wage premium does not co-move with productivity in the set of low-productivity firms, while it increases among firms of a higher productivity. In line with the Portuguese (Card et al., 2016) and German (Bruns, 2019) estimates, we find that the fitted linear regression line for women is flatter. This means that women receive a lower share of any firm premium than men.

Finally, for precise normalization, we should find the kink point where firm-level wage premium starts to increase with productivity. For this purpose, we fit multiple kinked regressions, changing the kink point by increments of 0.01 between them. Then, we choose the kink point producing the best fit from the specification (lowest RMSE across the separately fitted male and female regressions).

Figure 1: Rescaled gender-firm-year effects versus log value added per worker of firms



Notes: The data points are means of the estimated firm-gender fixed effects corresponding to percentiles of firm-year observations along the distribution of the log value added per worker for firms. Firm-gender-year effects are normalized to have a zero mean in both genders for observations below the log value added of 6.99 – the threshold that provided the best fit for the kinked function presented on the graphs.

4.2 Bargaining and sorting

As the second step of the empirical analysis, we calculate the contribution of firms to the gender wage gap. For this purpose, Table 3 reports the parameters from Equations 4, 5 and 6. The first row uses the whole time period. Then, we split the sample into two distinct time periods (rows 2 and 3) to illustrate the evolution of the gender gap over time. Finally, row 4 shows the difference between the earlier and the later time period.

Table 3: Decomposition of the gender wage gap

	Gender gap log(wage)	Overall firm premium Ψ_{jgt}	WI (bargaining) Ψ_{jgt}	BW (sorting) $\tilde{\psi}_{jt}$
2003-2016	-0.236***	-0.098***	-0.054***	-0.044***
	(0.003)	(0.002)	(0.000)	(0.002)
2003-2009	-0.251***	-0.112***	-0.062***	-0.050***
	(0.004)	(0.002)	(0.001)	(0.002)
2010-2016	-0.222***	-0.086***	-0.046***	-0.040***
	(0.004)	(0.002)	(0.001)	(0.002)
Difference	0.029***	0.026***	0.016***	0.010**
	(0.005)	(0.003)	(0.001)	(0.003)
Observations	98,829	98,829	98,829	98,829
Firm effects	*x*	*x*	✓	*x*
Number of FE units			52148	

Notes: The table shows the contribution of firm wage premia to the gender wage gap using the modified method of Card et al. (2016), presented in Section 3 and in Boza (2022). Row 1 is based on regressions on the whole time period; rows 2 and 3 are regressions with distinct parameters for the two subperiods defined. Row 4 contains the difference of rows 2 and 3. See Section 3 for the details. Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05

The table reveals that the gender wage gap was 23.6 log points (21.1 percent) in the whole period. During the 2000s, the gender gap was 25.1 log points (22.2 percent), which decreased by 2.9 percentage points in the 2010s. The contribution of differences in firm premium explained 9.8 log points from the whole gender wage gap. 5.4 log points (around a quarter) of the total gender wage gap is attributable to the fact that women earn less than men at the same firm, even after controlling for occupational selection and differences in individual earning potential (*bargaining channel*). Differences in *sorting*, i.e., the fact that women work at firms with a lower firm-specific wage premium explain 4.4 log points of the total wage gap. Finally, we see that not only the total gender gap decreased between the two decades but also the difference in firm-specific wage premium. The bargaining effect decreased by 1.6 percentage points, while the sorting effect decreased only by 1.0 percentage point.

The latter result indicates a slight increase in the relative importance of the sorting channel.

4.3 The role of flexible wage components

To better understand the role of flexible wage components, we split our sample into three parts based on the share of flexible wage components at firm level. Panel A of Table 4 shows workers of firms where more than 95 percent of the workforce receive flexible wage components. In Panel B, this ratio is between 5 and 95 percent, while Panel C shows the observations where less than 5 percent of the workers receive flexible wage components.

The main message of the table is that the higher the share of workers with flexible wages at the firm is, the wider the gender wage gap. In Panel A, where the prevalence of flexible wage components is very high, the gender wage gap is 25.7 log points (22.7 percent), while in Panel C, where flexible wage components are rare, this difference is only 13.1 log points (12.2 percent). Furthermore, the table highlights that this difference in the gender wage premium is driven mostly by gender-specific firm premia. At firms where almost everybody receives flexible wage components, the gender difference in firm premium is 11 log points (10.5 percentage points). Half of the gender difference in firm premium comes from sorting across firms, and the other half comes from bargaining, i.e., the gender gap in firm premium across workers of the same firm. By contrast, we find only a small, 1 percentage point difference in gender-specific firm premium at firms that do not rely on flexible wage components. These findings are in line with Lemieux et al. (2009) who argue that flexible wages are the main drivers of within-firm wage differences.

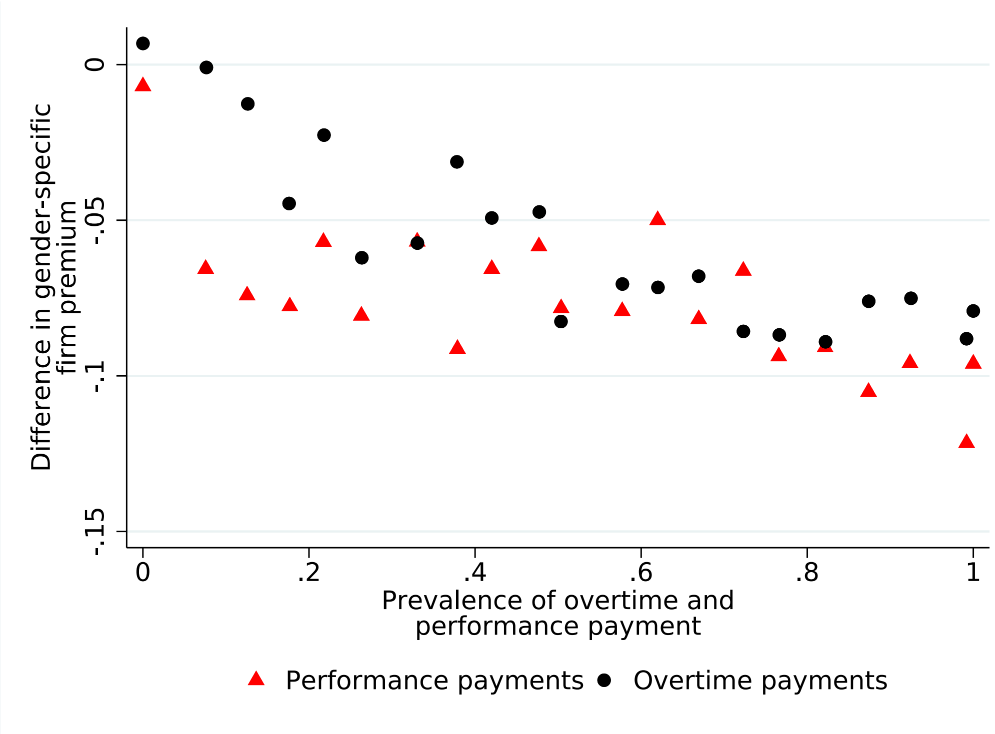
Table 4: Decomposition of the gender gap – by the share of flexible wages

	Gender gap lnw	Overall firm premium Ψ_{jgt}	WI (bargaining) Ψ_{jgt}	BW (sorting) $\tilde{\psi}_{jt}$
Panel A. Flexible share ≥ 95%				
Female	-0.257***	-0.112***	-0.058***	-0.054***
	(0.004)	(0.003)	(0.001)	(0.003)
Observations	29,124	29,124	29,124	29,124
R-squared	0.124	0.062	0.968	0.016
Firm-year effects	*x*	*x*	✓	*x*
Number of FE units			15605	
Panel B. Flexible share: 5-95%				
Female	-0.217***	-0.085***	-0.055***	-0.031***
	(0.004)	(0.002)	(0.001)	(0.002)
Observations	50,137	50,137	50,137	50,137
R-squared	0.057	0.026	0.964	0.004
Firm-year effects	*x*	*x*	✓	*x*
Number of FE units			25934	
Panel C. Flexible share ≤ 5%				
Female	-0.131***	-0.012**	-0.010***	-0.003
	(0.006)	(0.004)	(0.002)	(0.004)
Observations	19,568	19,568	19,568	19,568
R-squared	0.021	0.000	0.945	0.000
Firm-year effects	*x*	*x*	✓	*x*
Number of FE units			10609	

Notes: See Section 3 for the methodology of the decomposition. Flexible shares are defined as the share of workers receiving either overtime or performance payments at a given firm in a given year. Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

Figure 2 investigates the effect of overtime payments and performance payments on the gender-specific firm premium separately. For this purpose, we order firm-gender-occupation cells by the prevalence of overtime payments and the prevalence of performance payments. Then, we plot the difference in gender-specific firm premium by 0.05 unit bins. The figure suggests that the female firm premium is linearly decreasing compared to the male firm premium in the share of both overtime and performance payments. We do not find any difference in gender-specific firm premium across workers who do not receive overtime or performance payments if we apply the normalization explained at the beginning of this section. As in Table 4, we find that the gender gap in firm-specific wage premium is approximately 10 percentage points across workers where everybody receives either overtime payments or performance payments. This magnitude is significant in economic terms since the total gender wage gap is approximately 22 percent in our sample.

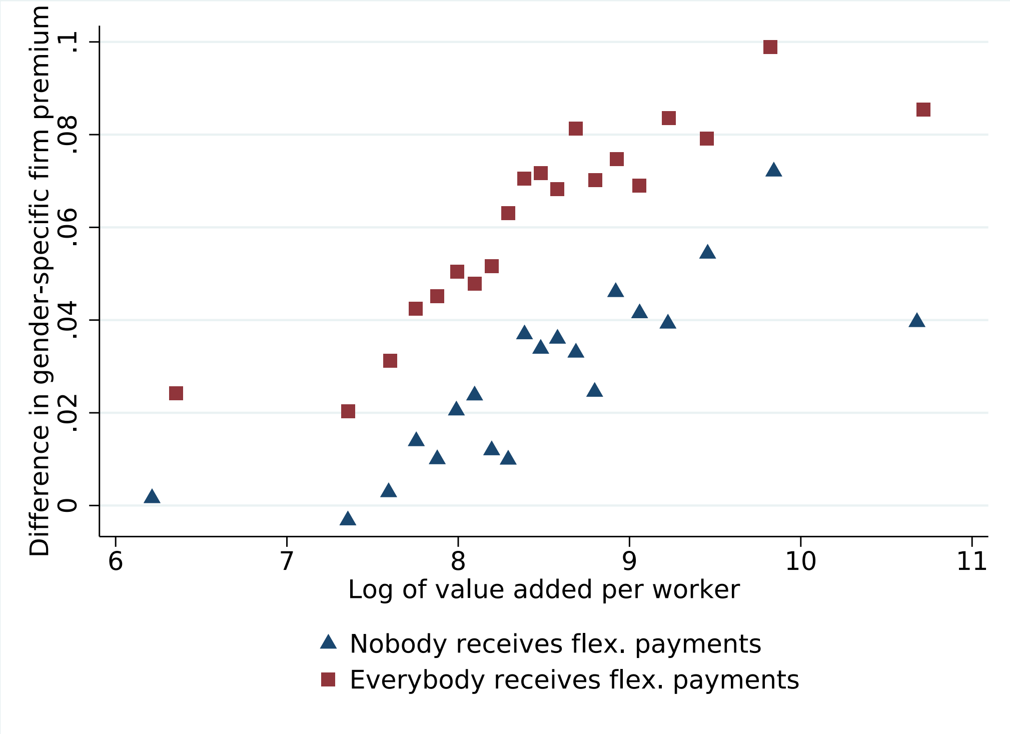
Figure 2: Wage premium and the prevalence of flexible wages



Note: The horizontal axis shows the share of workers at the firm who receive performance or overtime payments and the vertical axis shows the gender difference in firm-specific wage premium.

It is important to note that the differences found in Table 4 and Figure 2 cannot be interpreted as a causal effect of flexible wage components on the gender-specific firm premium. The reason for this is that low-productivity firms which offer lower firm-specific wage premia are also less likely to offer flexible wage components. Therefore, we investigate the relationship between labor productivity, flexible wage components and the gender wage gap in Figure 3. For this purpose, we ordered firms by labor productivity and made twenty equally sized bins. Then, we plotted the average gap in gender-specific wage premium at firms where every worker receives flexible wages and at firms where no worker receives flexible wage components.

Figure 3: Flexible wage payments and the gap in gender-specific wage premium by firm productivity



Note: The figure shows the difference in gender-specific wage premium among workers who do and do not receive flexible wage components

The results are in line with previous findings (Card et al., 2016), and show that the gender gap in firm premium is increasing with labor productivity. This relationship holds for firms with and without flexible wage components. Most importantly, the results show that the firm-specific wage premium is always larger at flexible-wage firms than at firms of the same productivity but without flexible wage components. This applies even to low-productivity firms where only low rents are generated and therefore a gender gap is less probable to emerge.

We systematically investigate the factors contributing to the gender gap in firm-specific wage premium at flexible-wage firms by extending the decomposition method introduced in Section 3. The aim of this exercise is to quantify the relationship between bonuses, overtime payments, and the gender gap in the firm wage premium. In particular, we add control variables to Equations 4, 5 and 6:

$$\Psi_{jgt} = \beta_G^{OA} G_g + \beta_X^{OA} X_{j(g)t} + \beta_{GX}^{OA} G_g X_{j(g)t} + \theta_{s(j)} + \epsilon_{gjt} \tag{9}$$

$$\Psi_{jgt} = \beta_G^{WI} G_g + \beta_X^{WI} X_{j(g)t} + \beta_{GX}^{WI} G_g X_{j(g)t} + \tilde{\psi}_{jt} + \varepsilon_{jgt}^G \tag{10}$$

$$\tilde{\psi}_{jt} = \beta_G^{BW} G_g + \beta_X^{BW} X_{j(g)t} + \beta_{GX}^{BW} G_g X_{j(g)t} + \theta_{s(j)} + \varepsilon_{jt} \qquad (11)$$

where G_g corresponds to a gender dummy and X_{jt} to observable firm characteristics such as productivity or the share of workers with overtime and performance pay components.

We demean the control variables and therefore the β_G^{OA}, β_G^{WI} and β_G^{BW} parameters correspond to the overall, within-firm (*bargaining*) and between-firm (*sorting)* gender differences in the firm-specific wage premium in a firm with average characteristics after controlling for worker composition. The β_X^{OA}, β_X^{WI} and β_X^{BW} parameters capture the relationship between firm premia and productivity and the prevalence of flexible wage components. These control variables also have a within-firm margin.

Finally, the β_{GX}^{OA}, β_{GX}^{WI} and β_{GX}^{BW} parameters capture whether a higher share of flexible components or higher productivity corresponds to a higher gender wage gap. Again, the gender differences can be generated within firms (e.g., if productivity rents are shared differently within the same firm) or between firms (e.g., if women sort into firms where the returns to productivity or flexible wages are higher), as noted by Boza (2022).

Table 5: The relationship between flexible wages and firm premia

VARIABLES	(1) Overall $\ln w_{jgt}$	(2) Overall Ψ_{jgt}	(3) Within Ψ_{jgt}	(4) Between $\tilde{\psi}_{jt}$
Female	-0.186***	-0.057***	-0.045***	-0.012***
	(0.002)	(0.001)	(0.001)	(0.001)
Labor productivity	0.318***	0.170***		0.170***
	(0.001)	(0.001)		(0.001)
Share of performance payments	0.189***	0.125***	0.039***	0.086***
	(0.003)	(0.002)	(0.003)	(0.002)
Share of overtime payments	0.047***	0.096***	0.034***	0.062***
	(0.004)	(0.002)	(0.002)	(0.002)
Female#(labor prod.)	0.005**	-0.005***	-0.016***	0.011***
	(0.002)	(0.001)	(0.001)	(0.001)
Female#(performance payments)	-0.053***	-0.055***	-0.021***	-0.034***
	(0.004)	(0.003)	(0.001)	(0.003)
Female#(overtime payments)	-0.103***	-0.038***	-0.001	-0.036***
	(0.005)	(0.003)	(0.002)	(0.003)
Constant	6.766***	0.290***	0.340***	-0.050***
	(0.001)	(0.001)	(0.000)	(0.001)
Observations	98,823	98,823	98,823	98,823
R-squared	0.669	0.586	0.969	0.585
Firm-year effects	*x*	*x*	✓	*x*
Number of FE units			52145	

Notes: The regressions are estimated based on Equations 9, 10 and 11, and include 1-digit sector and year fixed effects besides the presented variables. Standard errors are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

The results are presented in Table 5. The first column shows that, conditional on firm characteristics, the gender wage gap at firms with average characteristics is 18.6 log points. The second column shows that 5.7 log points of this difference can be attributed to the gender difference in the firm-specific wage premium. An important change compared to the raw differences is that, conditional on firm characteristics, the between-firm difference in the gender-specific wage premium is only 1.2 percent. In other words, we do not see evidence that women are more likely to work at firms with a substantially lower firm-specific wage premium. Previous differences in this sorting component are attributable instead to differences in the observable firm characteristics of Table 5.

Besides the average gender difference in the firm-specific wage premium, we also see important heterogeneity across the firms. In line with previous findings in the literature, wage levels increase with the productivity of the firm. For example, men who work at a firm of 1 percent higher productivity earn 0.32 percent more on average. Most importantly, men who work at firms where every male worker receives performance payments earn 18.9 log points more than men who work at firms where no male worker receives performance payments. In contrast to this, men working at firms where everybody receives overtime payments earn only 4.7 log points more than men who work at firms where nobody receives overtime payments.

We also see large gender differences in the wage effects of firm characteristics. For example, women gain less than men from working at firms where the share of performance payments is larger. What is more, women do not earn more at firms where overtime payments are more prevalent.

The most important results of our table are presented in Column (2). It shows that the firm-specific wage premium of men increases by 0.125 percentage point if the share of workers with performance payments increases by 1 percentage point. This difference is of a similar magnitude as the wage premium of a firm of 1 percent higher labor productivity. The wage premium of overtime payments has a similar magnitude. Men receive a 0.96 percentage point higher firm-specific wage premium at firms where the share of workers with overtime payments is higher by 10 percentage points.

Regarding the gender gap, the column shows that women receive a much lower firm-specific wage premium than men if they work at firms where flexible wages are more prevalent. For example, if the share of workers with performance payments increases from 0 to 1, the firm-specific wage premium of women increases 5.5 percentage points less than the wage premium of men. This difference is significant in economic terms since it is more than a fifth of the total gender wage gap. We also find a significant difference in the returns to overtime payments. Men receive a 9.6 percentage points higher firm-specific wage premium at firms where everybody receives overtime payments compared to a firm where no worker receives overtime payments. This gain in premium is smaller by 3.8 percentage points in the case of women.

Finally, the comparison of Column (3) and (4) reveals that both the within- and between-firm difference contribute to the gender gap in firm premium.[9] Firms where men tend to work pay 8.6% higher wages to everyone if they pay performance payments to every worker compared to firms offering no performance payments. This between-firm difference in wage premium is 3.4% smaller for firms where female workers tend to work. As opposed to this, firm characteristics have a much lower effect

[9]Note: As labor productivity does not vary within firm-year cells, we cannot estimate a separate parameter for men and women.

on within-firm differences in the firm-specific wage premium. For instance, Column (3) reveals that the wage premium of men increases by around 3.9% if the share of workers with performance payments changes from 0 to 1. We see a gender gap in this margin as well because female wages increase only by 1.8 percent if the share of workers with performance payments increases from 0 to 1.

Overtime payments have a much larger contribution to the between-firm wage gap in firm premium (3.6 percentage points) than in the case of the within-firm wage premium (0.1 percentage point). One possible explanation for this result is that women are less likely to enter high-premium firms if the firm requests (much) overtime, but conditional on entering such a firm, the average overtime done by men and women is similar. In the case of productivity, within-firm rent-sharing differences – 1.6 percentage points lower returns to productivity for women than men in the same firm – are actually partly offset by women sorting into firms with higher productivity.

4.3.1 Robustness

An important concern is that large firms which pay more performance and overtime payments are overrepresented in the HSES sample. To address this concern, we reweight the HSES sample to represent the population of firms in ADMIN3. Specifically, we use as weights the ratio of all observed workers in the ADMIN3 dataset in a given industry-size cell (based on 1-digit industry codes and 5 firm size categories) to the number of workers represented in the HSES data in the same cell. The results in Appendix Table A5 show that the magnitude of the parameters, and hence the implications of our findings remain the same.

As the second robustness check, we add gender-firm fixed effects to Table 5. The results in Table A6 show that the change in labor productivity or the change in the share of workers with flexible wages has only a small effect on the gender gap in firm premium within firm-gender cells. At the same time, the large between-effect in Column (4) implies that flexible wage firms in general offer a lower firm premium to women compared to men.

Finally, in Appendix C, we also directly test whether women earn less when receiving overtime or performance payments using individual level data from the HSES survey data. The strength of this approach is that we observe performance and overtime payments at individual level. The drawback of the approach is that the HSES uses repeated cross-sectional data at worker level, so we cannot apply individual fixed effects to filter out unobserved heterogeneity across workers. The results shows that women receiving overtime or performance payments earn less than men of the same firm, occupation, and educational level. This relationship holds if we control for the possibility that the return to flexible wages differs by educational level and occupation.

4.4 Decomposition of the gender wage gap

We use the Oaxaca-Blinder approach to decompose the total contribution of differences with respect to firm-year(-gender) related characteristics X_{jgt} into an endowments (levels) and a returns (coefficients) component. For this purpose, we add and subtract $\gamma_F E(X_{jtg}|M)$ from equation 4, 5 and 6. Then, we apply the Oaxaca-Blinder decomposition formula, where we use the counterfactual level $\gamma_F E(X_{jtg}|M)$ as the midpoint in the decomposition:

$$\begin{aligned} E(\gamma_M X_{jtg}|M) - E(\gamma_F X_{jtg}|F) &= \gamma_M E(X_{jtg}|M) - \gamma_F E(X_{jtg}|F) = \\ &\gamma_M E(X_{jtg}|M) - \gamma_F E(X_{jtg}|M) + \gamma_F E(X_{jtg}|M) - \gamma_F E(X_{jtg}|F) = \\ &(\gamma_M - \gamma_F) E(X_{jtg}|M) + \gamma_F (E(X_{jtg}|M) - E(X_{jtg}|F)) \end{aligned} \quad (12)$$

[10]

Accordingly, the decomposition of the total difference in gender-specific firm premia is expressed as

$$\begin{aligned} E(\Psi_{jtM}) - E(\Psi_{jtF}) = \\ \underbrace{\beta_M}_{\text{Unexp.}} + \sum_{x \in X} (\underbrace{(\gamma^x_M - \gamma^x_F) E(X^x_{jtg}|M)}_{\text{Difference in returns to X}} + \underbrace{\gamma^x_F (E(X^x_{jtg}|M) - E(X^x_{jtg}|F))}_{\text{Difference in level of X}}) + \\ \underbrace{\sum_{y \in Y} (E(\delta^y|M) - E(\delta^y|F))}_{\text{Difference in sector and size}} \end{aligned} \quad (13)$$

This decomposition can be applied to every column in Table 5. Regarding firm characteristics, it shows the contribution of flexible wages and productivity differences to the gender gap in wages and firm-specific wage premia. Furthermore, we decompose firm premia also into a within- and a between-firm channel. [11]

Table 6 presents the results of the decomposition. The table is organized into three blocks. The upper block of the table includes two parts. The first is the contribution of the sector, year, and firm-size effects. The second part is the contribution of unexplained differences that could not be attributed to the observable

[10] Or, alternatively, $(\gamma_M - \gamma_F) E(X_{jtg}|F) + \gamma_M (E(X_{jtg}|M) - E(X_{jtg}|F))$.

[11] Note: The total differences across these margins are equal to the results presented in Table 3

firm characteristics, such as the individual fixed effects in the AKM. These unexplained differences are important only in the case of the gender gap in total wages, while they play only a marginal role when explaining the gender gap in firm premia.

The middle block shows the contribution of different endowments to the gender gap. For example, 4.6 percentage points of the total gender gap emerges from the fact that men work at more productive firms than women.

The lower block shows the contribution of returns in flexible wages and firm productivity to the gender gap. The first column shows that 9.6 percentage points of the total gender wage gap is due to the fact that performance payments (2.9 percentage points) and overtime payments (6.7 percentage points) have a lower return for women than for men. This difference is significant in economic terms, as it exceeds 40 percent of the total gender wage gap.

Table 6: Contributions to the gender gap

	Overall $\ln w_{jgt}$		Overall Ψ_{jgt}		Within Ψ_{jgt}		Between $\tilde{\Psi}_{jt}$	
	diff.	share(%)	diff.	share(%)	diff.	share(%)	diff.	share(%)
Total difference	0.236	100	0.098	100	0.053	100	0.045	100
Sector, year, size	-0.007	-2.8	0.003	3.4	0.000	0.0	0.003	7.4
Unexplained	0.098	41.6	-0.003	-3.5	0.011	21.3	-0.015	-32.2
Diff. in endowments								
labor prod.	0.046	19.3	0.024	24.8	0.000	0.0	0.024	53.5
performance pay	0.008	3.4	0.005	5.3	0.002	3.1	0.004	7.9
overtime	0.003	1.3	0.006	6.2	0.002	4.1	0.004	8.6
Diff. in returns								
labor prod.	-0.008	-3.5	0.008	8.0	0.025	47.4	-0.017	-37.6
performance pay	0.029	12.4	0.030	31.0	0.012	22.4	0.019	40.9
overtime	0.067	28.4	0.024	24.8	0.001	1.7	0.023	51.5

Note: The estimations are based on the parameters presented in Table 5.

Turning to the decomposition of the gender gap in firm premia, the lower average productivity of firms where women work contributes 2.4 percentage points to the 9.8 percentage points total gender gap in firm premia. At the same time, only a 0.8 percentage point difference is attributable to the lower return of firm productivity on female wages. Further decomposition of the return of firm productivity into between- and within-firm differences provides important insights. First, 2.5 percentage points of the gap in firm premia is coming from the different extent to which productivity-related rents are shared within firm. This is clear evidence for a bargaining effect, in line with the findings of Card et al. (2016). 1.7 percentage points of this gap is offset by the sorting of women into firms that generally have a larger rent-sharing elasticity towards all workers. To the best of our knowledge, we are the first in the literature to differentiate between the within- and between-firm margins of differential rent-sharing, and to show that sorting with respect to average rent-sharing may be an important factor in this scenario.

The table also highlights that flexible wages contribute to the gender gap in firm premia significantly. 3 percentage points of the gender wage gap in firm premia can be attributed to the lower return of performance payments to women. Overtime payments account for 2.4 percentage points in this respect. At the same time, the difference in endowments plays a less important role. The fact that women are less likely to receive performance or overtime payments contributes 1.1 percentage points to the gender gap in firm premia. Taken together, the contribution of flexible payments to the gender gap is 6.5 percentage points, which is more than 60 percent of the gender gap in firm premia and more than a quarter of the total gender wage gap.

The decomposition of the firm premium into within- and between-firm margins offers interesting insights. First, it reveals that the contribution of overtime payments to the gender gap comes from between-firm differences, while overtime payments do not contribute to the within-firm gender gap in firm premia. A possible explanation for this is that women are less willing to enter firms that request overtime hours, but if they do enter such firms, their total working hours do not differ from the working hours of male co-workers. In the case of performance payments, both within- and between-firm margins add to the gender wage gap in firm premia. This implies that women are less likely to enter high-paying firms with performance payments and firms with performance payments pay a lower premium to women compared to men.

In general, Table 6 shows that the differences in the returns to flexible wages explain a much larger share of the gender wage gap than the differences in endowments. Our favored explanation for this is that men and women do not differ much in the probability of receiving flexible wages, but if they receive flexible wages, men receive more.

To investigate this possibility, we repeat the decomposition exercise by using the share of performance payments and overtime payments in the total wage bill in the firm-gender-year cells as the measure of flexible wage components.

The results in Appendix Table A8 are in line with our favored explanation. If we use the share of overtime payments in the total wage bill as the measure of overtime, gender differences in endowments contribute twice as much to the gender gap in firm premium than the differences in returns. In line with this, men and women have the same returns to receiving more overtime or performance payments. All of these results corroborate that men receive a larger amount of overtime and performance payments than women, conditional on receiving any of these.

Heterogeneity

Finally, we turn our attention to the heterogeneity across occupations and firm types. We present a simplified version of the Oaxaca-Blinder decompositions to make the presentation of the results more concise. We keep firm premia as the only outcome and do not differentiate between within- and between-firm margins.[12]

Table 7 contains the results by firm size and for two large sectors separately.

We find substantially smaller gaps in firm premia at small firms, while the contribution of productivity and flexible wage measures to the gender gap has a similar magnitude at small and large firms. This leads to a large negative unexplained residual term in firm premium. Our hypothesis is that the negative residual term reflects the effect of the minimum wage. In other words, some female-dominated small firms without flexible wages would pay a much lower premium to women than to men, but the minimum wage makes this type of differentiation impossible.

Furthermore, the gender gap in firm premium is larger in the manufacturing industry compared to the service sector. The table also suggests that differences in overtime have a much greater role in industry, while bonuses or other performance-based pay components are more important in the service sector. In addition, the gap in firm wage premia depends on firm productivity to a much larger extent at manufacturing firms, while we find virtually zero effect on wage gaps in the case of services.

Table 7: Contributions to the gender gap in firm premia – by firm type

	Small firms Overall, Ψ_{jgt}		Large firms Overall, Ψ_{jgt}		Manufacturing Overall, Ψ_{jgt}		Service Overall, Ψ_{jgt}	
	diff.	share(%)	diff.	share(%)	diff.	share(%)	diff.	share(%)
Total difference	0.043	100	0.105	100	0.127	100	0.065	100
Sector, year, size	0.001	2.8	0.004	4.1	0.001	0.9	0.007	10.7
Unexplained	-0.033	-77.7	0.019	17.7	-0.003	-2.4	-0.007	-10.9
Workplace controls								
labor prod.	0.027	62.0	0.032	30.0	0.056	43.9	0.002	2.3
performance pay	0.024	56.1	0.032	30.5	0.028	22.0	0.046	71.0
overtime	0.024	56.8	0.019	17.5	0.045	35.7	0.017	26.7

Note: The estimations are based on the parameters presented in Appendix Table A10 and A11.

[12] The full decomposition tables are available upon request. The corresponding regression tables are also available in the appendix (Tables A10 and A11).

5 Discussion and conclusion

It has been documented that gender differences in firm-specific wage premia are the main drivers of the overall gender wage gap in many countries. This means that women earn less than men partially because women are less likely to work at firms with a high wage premium (*sorting effect*), and even if they can enter these firms, they tend to earn less than their male co-workers. In this paper, we investigated the extent to which overtime and performance payments contribute to this undesirable phenomenon. We used a Hungarian administrative linked employer-employee dataset combined with a wage survey containing information on individual-level performance payments (including bonuses) and overtime payments.

We found that the difference between the firm-specific wage premium of men and women (to the disadvantage of women) is 5.1 percentage points larger at firms where everybody receives performance payments compared to firms where nobody receives performance payments. This difference in the gender gap in firm-specific wage premium is 4.3 percentage points in the case of overtime payments. Furthermore, we showed that two-thirds of these differences come from between-firm differences, i.e., from the fact that women are less likely to work at firms which offer either overtime payments or performance payments to the same extent as the firms where men tend to work. These differences are considerable in economic terms, as the total gender wage gap at private sector firms is 21 percent in Hungary.

There may be several mechanisms that increase the gender gap in firm premia at flexible-wage firms. On the one hand, women may have lower bargaining power (Card et al., 2016), or they are simply discriminated (Kuhn, 1987; Sin et al., 2022) by flexible-wage firms and consequently receive only a smaller share of the firm-specific rents. These channels may increase the gender gap in within-firm premia. At the same time, it is possible that women dislike the flexible wage structure and are less willing to work at flexible-wage firms even if they offer a higher premium. For example, Carter et al. (2017), Dohmen and Falk (2011), and Gill and Prowse (2014) argue that women are risk averse and dislike the uncertainty caused by flexible wage schemes. Furthermore, women tend to dislike long working hours and therefore avoid jobs with high overtime (Cha, 2013; Goldin, 2014). Our results indicate that this preference channel may be the more important of the two mechanisms above, as the gender gap in between-firm premia is larger than the within-firm gap. However, if women indeed consider flexible wages a disamenity then the gender gap in firm premia overestimates the actual gender gap in utility (Sorkin, 2017, 2018).

The results imply that policy interventions which regulate bonuses and overtime payments could decrease the gender pay gap. More specifically, a stricter regulation of overtime work (e.g., higher taxes on overtime, or direct restrictions) would be an efficient tool for this purpose (Goldin, 2014). The regulation of paid overtime hours would not be sufficient without the limitation of unpaid working hours. The reason is that workers receiving bonuses work more unpaid overtime (Engellandt & Riphahn, 2011) and in some cases firms manipulate reported overtime hours for tax optimization purposes (Cahuc & Carcillo, 2014). However, such policies should be introduced with caution, as flexible wage components have incentive effects and increase worker productivity (Bloom & Van Reenen, 2011; Oyer & Schaefer, 2011).

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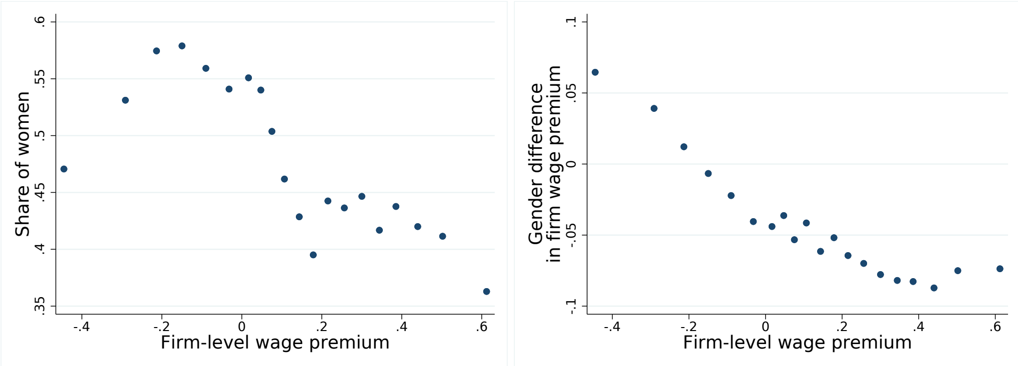
Appendices

Appendix A – Additional figures and tables

Figure A1: Gender differences in participation and wage premium by the quality of firms



Notes: The figure shows the share of women and the difference in gender-specific wage premia (female minus male) by firm-level average wage premium. See Section 3 for the estimation procedure.

Table A1: Decomposition of the gender wage gap – full sample

	OA lnw	OA Ψ_{jg}	WI Ψ_{jg}	BW $\tilde{\psi}_j$
2003-2016	-0.146***	-0.111***	-0.026***	-0.085***
	(0.001)	(0.001)	(0.000)	(0.001)
2003-2009	-0.137***	-0.114***	-0.033***	-0.081***
	(0.002)	(0.001)	(0.000)	(0.001)
2010-2016	-0.156***	-0.107***	-0.019***	-0.088***
	(0.002)	(0.001)	(0.000)	(0.001)
Difference	-0.137***	-0.114***	-0.033***	-0.081***
	(0.002)	(0.001)	(0.000)	(0.001)
Observations	475,536	475,536	475,536	475,536
Firm effects	x	x	✓	x
Number of units	1	1	73636	1

Notes: The table shows the contribution of firm pay premia to the gender wage gap using the modified method of Card et al. (2016) as presented in Section 3 and Boza (2022).

Table A2: Prevalence of overtime and performance payments by gender and industry

	Received overtime payments		Received performance payments	
	Women	Men	Women	Men
Agriculture	41.3%	46.6%	31.1%	33.2%
Manufacturing	67.4%	74.3%	57.5%	64.2%
Construction	28.7%	41.2%	38.4%	36.8%
Retail	69.3%	53.2%	43.5%	40.7%
Hospitality	52.9%	69.9%	32.8%	40.2%
Transportation	75.1%	83.8%	77.4%	64.7%
Finance	50.3%	43.2%	70.9%	68.5%
Prof. services	51.6%	58.9%	36.1%	38.4%
Health & Educ.	53.2%	42.4%	43.4%	34.6%
Others	52.8%	65.4%	51.3%	57.7%
No ind.	56.2%	60.7%	44.3%	43.6%
Total	63.4%	68.4%	54.0%	56.2%

Note: The table shows the share of workers receiving performance payments and overtime payments by industry category.

Table A3: Prevalence of overtime and performance payments by gender and firm size

	Received overtime payments		Received performance payments	
	Women	Men	Women	Men
Less than 10	17.5%	19.0%	19.4%	19.1%
Between 11 and 20	25.3%	25.2%	24.5%	22.5%
Between 21 and 50	34.8%	36.1%	33.8%	31.1%
Between 51 and 100	45.4%	48.2%	42.5%	40.1%
Between 101 and 250	53.3%	58.5%	48.5%	46.8%
Between 251 and 500	62.1%	68.9%	52.2%	56.9%
Between 501 and 1000	69.5%	75.2%	56.5%	64.8%
Above 1000	77.9%	86.2%	64.3%	69.6%
Total	63.4%	68.4%	0.0%	0.0%

Note: The table shows the share of workers receiving performance payments and overtime payments by firm size category.

Table A4: Share of overtime and performance payments in total wage bills by gender and occupation

	Wage share of overtime		Wage share of performance payments	
	Women	Men	Women	Men
Political/religious/NGO leader (Nace 1*)	0.4%	1.6%	0.2%	0.0%
Top manager (Nace 1*)	1.1%	1.4%	0.7%	0.8%
Other manager (Nace 1*)	4.6%	4.8%	2.9%	1.4%
Professional (Nace 2)	2.1%	3.1%	0.8%	1.0%
Other white-collar (Nace 3-4)	3.7%	6.4%	2.8%	3.3%
Skilled blue-collar (Nace 5-7)	8.4%	12.2%	3.1%	2.1%
Machine operators (Nace 8)	15.7%	18.1%	3.1%	2.3%
Unskilled laborer (Nace 9)	7.1%	9.5%	1.2%	2.0%
Total	7.0%	11.4%	2.6%	2.2%

Note: The table shows the share of total payments in performance or overtime payments over the total wage payments by occupational category.

Table A5: The relationship between flexible wages and firm premium – with firm controls; population weights

VARIABLES	(1) Overall $\ln w_{jgt}$	(2) Overall Ψ_{jgt}	(3) Within Ψ_{jgt}	(4) Between $\tilde{\psi}_{jt}$
Female	-0.154***	-0.035***	-0.030***	-0.005***
	(0.002)	(0.001)	(0.001)	(0.001)
Labor productivity	0.324***	0.172***		0.172***
	(0.001)	(0.001)		(0.001)
Share of performance payments	0.227***	0.149***	0.049***	0.100***
	(0.003)	(0.002)	(0.004)	(0.002)
Share of overtime payments	0.054***	0.105***	0.040***	0.065***
	(0.004)	(0.002)	(0.003)	(0.002)
Female#(labor prod.)	0.006**	-0.009***	-0.019***	0.010***
	(0.002)	(0.001)	(0.001)	(0.001)
Female#(performance payments)	-0.074***	-0.063***	-0.030***	-0.034***
	(0.005)	(0.003)	(0.002)	(0.003)
Female#(overtime payments)	-0.100***	-0.041***	-0.007***	-0.034***
	(0.005)	(0.003)	(0.002)	(0.003)
Constant	6.593***	0.175***	0.285***	-0.110***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	98,823	98,823	98,823	98,823
R-squared	0.662	0.587	0.961	0.587
Firm-year effects	x	x	✓	x
Number of FE units			52145	

Notes: The regressions are estimated based on Equations 9, 10 and 11, and include 1-digit sector and year fixed effects besides the presented variables. Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05. *Regressions weighted by the ratio between workers observed in ADMIN3 and workers observed in the HSES in a given (1-digit) industry and firm-size category.*

Table A6: Decomposition of the gender gap – identified within firm-gender cells

VARIABLES	(1) Overall $\ln w_{jgt}$	(2) Overall Ψ_{jgt}	(3) Within Ψ_{jgt}	(4) Between $\tilde{\psi}_{jg}$
Female	-0.186***	-0.057***		-0.044***
	(0.002)	(0.001)		(0.001)
Labor productivity	0.318***	0.170***	0.048***	0.122***
	(0.001)	(0.001)	(0.001)	(0.001)
Share of performance payments	0.189***	0.125***	0.007***	0.118***
	(0.003)	(0.002)	(0.001)	(0.002)
Share of overtime payments	0.047***	0.096***	0.028***	0.068***
	(0.004)	(0.002)	(0.002)	(0.002)
Female#(labor prod.)	0.005**	-0.005***	-0.006***	0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Female#(performance payments)	-0.053***	-0.055***	0.006**	-0.061***
	(0.004)	(0.003)	(0.002)	(0.003)
Female#(overtime payments)	-0.103***	-0.038***	-0.012***	-0.025***
	(0.005)	(0.003)	(0.003)	(0.003)
Constant	6.766***	0.290***	0.307***	-0.023***
	(0.001)	(0.001)	(0.000)	(0.001)
Observations	98,823	98,823	98,823	98,823
R-squared	0.669	0.586	0.932	0.467
Firm-gender effects	x	x	✓	x
Number of units	14	14	26806	14

Notes: The regressions are estimated based on Equations 9, 10 (with firm-gender instead of firm-year fixed effects) and 11, and include 1-digit sector and year fixed effects besides the presented variables. Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

Table A7: Contributions to the gender gap – with intensity measures

	Overall $\ln w_{jgt}$		Overall Ψ_{jgt}		Within Ψ_{jgt}		Between $\tilde{\psi}_{jt}$	
	diff.	share(%)	diff.	share(%)	diff.	share(%)	diff.	share(%)
Total difference	0.236	100	0.098	100	0.054	100	0.044	100
Sector, year, size	-0.004	-1.7	0.004	3.6	0.000	0.0	0.004	8.0
Unexplained	0.100	42.2	0.004	3.8	0.009	17.5	-0.006	-13.0
Diff. in endowments								
labor prod.	0.049	20.8	0.027	27.6	0.000	0.0	0.027	61.3
performance pay	-0.001	-0.5	-0.001	-1.4	-0.001	-1.3	-0.001	-1.6
overtime	0.017	7.1	0.025	25.1	0.011	20.0	0.014	31.2
Diff. in returns								
labor prod.	0.008	3.5	0.022	22.4	0.030	54.9	-0.008	-17.4
performance pay	0.011	4.8	0.007	7.2	0.001	1.2	0.006	14.5
overtime	0.056	23.7	0.012	11.7	0.004	7.6	0.007	16.8

Note: The estimations are based on the parameters presented in Table A8.

Table A8: The relationship between flexible wages and firm premium – with intensity measures

VARIABLES	(1) Overall $\ln w_{jgt}$	(2) Overall Ψ_{jgt}	(3) Within Ψ_{jgt}	(4) Between $\tilde{\psi}_{jt}$
Female	-0.187***	-0.043***	-0.041***	-0.002*
	(0.002)	(0.001)	(0.001)	(0.001)
Labor productivity	0.342***	0.189***		0.189***
	(0.001)	(0.001)		(0.001)
Share of performance payments	0.313***	0.370***	0.184***	0.186***
	(0.019)	(0.013)	(0.013)	(0.012)
Share of overtime payments	0.418***	0.614***	0.270***	0.344***
	(0.013)	(0.009)	(0.008)	(0.009)
Female#(labor prod.)	-0.005**	-0.014***	-0.019***	0.005***
	(0.002)	(0.001)	(0.001)	(0.001)
Female#(performance payments)	-0.445***	-0.275***	-0.026**	-0.250***
	(0.027)	(0.018)	(0.009)	(0.018)
Female#(overtime payments)	-0.827***	-0.170***	-0.060***	-0.110***
	(0.022)	(0.015)	(0.007)	(0.015)
Constant	6.760***	0.282***	0.338***	-0.056***
	(0.001)	(0.001)	(0.000)	(0.001)
Observations	98,823	98,823	98,823	98,823
R-squared	0.653	0.579	0.969	0.590
Firm-year effects	*x*	*x*	✓	*x*
Number of FE units			52145	

Notes: The regressions are estimated based on Equations 9, 10 and 11, and include 1-digit sector and year fixed effects besides the presented variables. Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05. *Overtime and performance payments are not measured by the number of workers receiving any overtime or performance payments. Instead, we use the share of performance payments and overtime payments in the total wage bill of the firm.*

Table A9: The relationship between flexible wages and firm premium – by occupation

	(1)	(2)	(3)	(4)
	Overall	Overall	Within	Between
VARIABLES	lnw_{jgt}	Ψ_{jgt}	Ψ_{jgt}	$\tilde{\psi}_{jt}$
Panel A. Managers and professionals; ISCO:1-2; N=41 542				
Female	-0.175***	-0.077***	-0.053***	-0.024***
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(labor prod.)	0.075***	0.001	-0.015***	0.016***
	(0.002)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.027***	-0.045***	-0.009***	-0.036***
	(0.006)	(0.005)	(0.002)	(0.004)
Female#(overtime payments)	-0.107***	-0.041***	0.003	-0.044***
	(0.006)	(0.004)	(0.002)	(0.004)
Panel B. Other white-collar; ISCO:3-4; N=56 307				
Female	-0.192***	-0.059***	-0.048***	-0.011***
	(0.002)	(0.002)	(0.001)	(0.002)
Female#(labor prod.)	0.001	-0.017***	-0.018***	0.001
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.021***	-0.024***	-0.007***	-0.017***
	(0.006)	(0.004)	(0.002)	(0.004)
Female#(overtime payments)	-0.024***	-0.017***	0.008***	-0.025***
	(0.006)	(0.004)	(0.002)	(0.004)
Panel C. Skilled blue-collar; ISCO:5-7; N=41 594				
Female	-0.189***	-0.059***	-0.034***	-0.025***
	(0.002)	(0.002)	(0.001)	(0.002)
Female#(labor prod.)	-0.024***	-0.005*	-0.021***	0.015***
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.048***	-0.031***	-0.023***	-0.008*
	(0.005)	(0.004)	(0.002)	(0.004)
Female#(overtime payments)	-0.050***	-0.024***	-0.019***	-0.005
	(0.007)	(0.005)	(0.003)	(0.005)
Panel D. Unskilled blue-collar; ISCO:8-9; N=44 673				
Female	-0.198***	-0.064***	-0.042***	-0.021***
	(0.002)	(0.002)	(0.001)	(0.002)
Female#(labor prod.)	-0.034***	0.001	-0.011***	0.012***
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.080***	-0.037***	-0.019***	-0.018***
	(0.005)	(0.004)	(0.002)	(0.004)
Female#(overtime payments)	-0.047***	-0.012*	-0.009***	-0.003
	(0.007)	(0.005)	(0.003)	(0.005)

Notes: The regressions are estimated *on the indicated subsamples* based on Equations 9, 10 and 11, and include 1-digit sector and year fixed effects besides the presented variables. *Only selected parameters are included.* Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

Table A10: The relationship between flexible wages and firm premium – by firm size

VARIABLES	(1) Overall lnw_{jgt}	(2) Overall Ψ_{jgt}	(3) Within Ψ_{jgt}	(4) Between $\tilde{\psi}_{jt}$
Panel A. Firms of <100 workers; N= 51 640				
Female	-0.100***	-0.013***	-0.024***	0.011***
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(labor prod.)	0.030***	-0.003	-0.023***	0.020***
	(0.004)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.104***	-0.085***	-0.049***	-0.036***
	(0.007)	(0.005)	(0.003)	(0.005)
Female#(overtime payments)	-0.086***	-0.053***	-0.010**	-0.043***
	(0.007)	(0.005)	(0.003)	(0.005)
Panel B. Firms of >=100 workers; N=47 183				
Female	-0.203***	-0.068***	-0.052***	-0.016***
	(0.002)	(0.002)	(0.001)	(0.001)
Female#(labor prod.)	0.004	-0.004*	-0.015***	0.011***
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.035***	-0.046***	-0.016***	-0.030***
	(0.006)	(0.004)	(0.002)	(0.004)
Female#(overtime payments)	-0.076***	-0.020***	0.004	-0.024***
	(0.007)	(0.005)	(0.002)	(0.005)

Notes: The regressions are estimated *on the indicated subsamples* based on Equations 9, 10 and 11, and include 1-digit sector and year fixed effects besides the presented variables. *Only selected parameters are included.* Standard errors are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

Table A11: The relationship between flexible wages and firm premium – by firm sector

VARIABLES	(1) Overall lnw_{jgt}	(2) Overall Ψ_{jgt}	(3) Within Ψ_{jgt}	(4) Between $\tilde{\psi}_{jt}$
Panel A. Industry firms; NACE: C-F; N=44 957				
Female	-0.228***	-0.069***	-0.058***	-0.011***
	(0.002)	(0.002)	(0.001)	(0.002)
Female#(labor prod.)	0.031***	-0.009***	-0.014***	0.005**
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.030***	-0.036***	-0.017***	-0.019***
	(0.006)	(0.004)	(0.002)	(0.004)
Female#(overtime payments)	-0.203***	-0.056***	-0.001	-0.055***
	(0.007)	(0.005)	(0.003)	(0.005)
Panel B. Service firms; NACE: G-S; N=49 472				
Female	-0.154***	-0.048***	-0.035***	-0.013***
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(labor prod.)	-0.005	0.001	-0.015***	0.016***
	(0.003)	(0.002)	(0.001)	(0.002)
Female#(performance payments)	-0.089***	-0.081***	-0.026***	-0.056***
	(0.006)	(0.004)	(0.002)	(0.004)
Female#(overtime payments)	-0.027***	-0.020***	0.001	-0.022***
	(0.007)	(0.005)	(0.002)	(0.005)

Notes: The regressions are estimated *on the indicated subsamples* based on Equations 9, 10 and 11, and include 1-digit sector and year fixed effects besides the presented variables. *Only selected parameters are included.* Standard errors are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Appendix B – Diagnostics of the AKM model

If there are no match-specific wage components, we expect that the mean of the residuals is close to zero at any level of the firm premium or the individual fixed effect. To test this, Figure B1 plots the mean of the residuals in the AKM model (ε_{ijtg}, Equation 1) by two dimensions. Firm-gender-year effect deciles provide one dimension and individual effect deciles the other. Accordingly, Figure B1 contains 100 bars. Each of them corresponds to a pair made up of a firm-FE decile and worker-FE decile. The mean of the residuals is below 0.01 in almost every cases, indicating a fairly negligible role of match-specific wage components. The only exception is at the lowest decile of worker fixed effects. For these cells in the joint distribution, the mean residuals could be as large as 0.02-0.04 log points, indicating 2-4% average difference between predicted and actual wages for these worker-firm pairs.

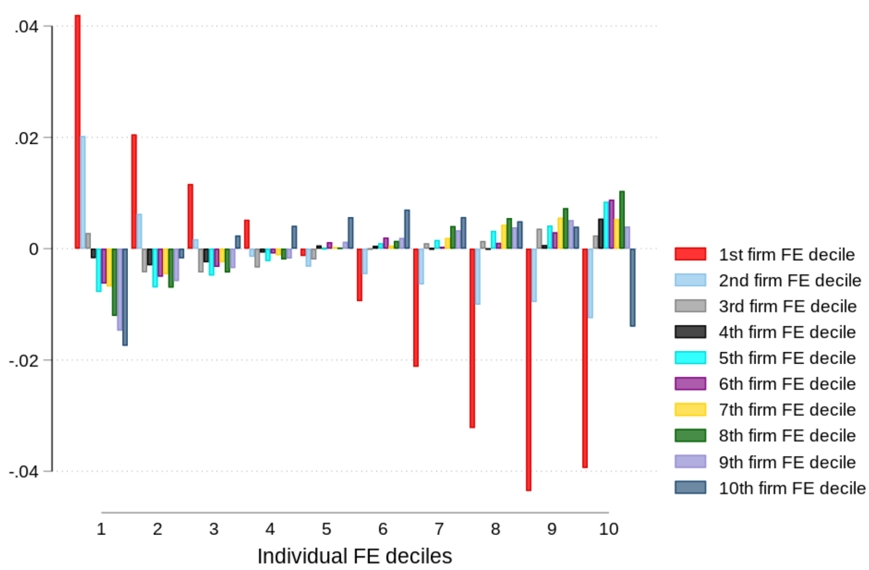


Figure B1: Residuals along firm and worker effect deciles

Notes: The figure contains the mean values of ε_{ijt} from Equation 1 along the two-dimensional distribution of firm-gender-year effect deciles (calculated within years) and individual effect deciles.

We also reproduce the event study analysis presented in Card et al. (2013), investigating the wage evolution of job switchers before and after changing their employer, looking for signs of mobility depending on transitory wage-components. If the exogenous mobility assumptions of the AKM model hold, we expect to observe similar wage gains for those who move from one wage quartile to another as the losses expected for those who take a reverse path of mobility – and no wage gains for those who remain at similar quality firms. On the other hand, no trends should be present in wages either before or after the job switches. Appendix Figure B2 presents the mobility patterns for four wage quartiles, based on AKM firm effects, in the preceding and subsequent six quarters of job switches. The presented wage profiles are mostly consistent with our expectations, showing some signs of instability only in the bottom two quartiles.

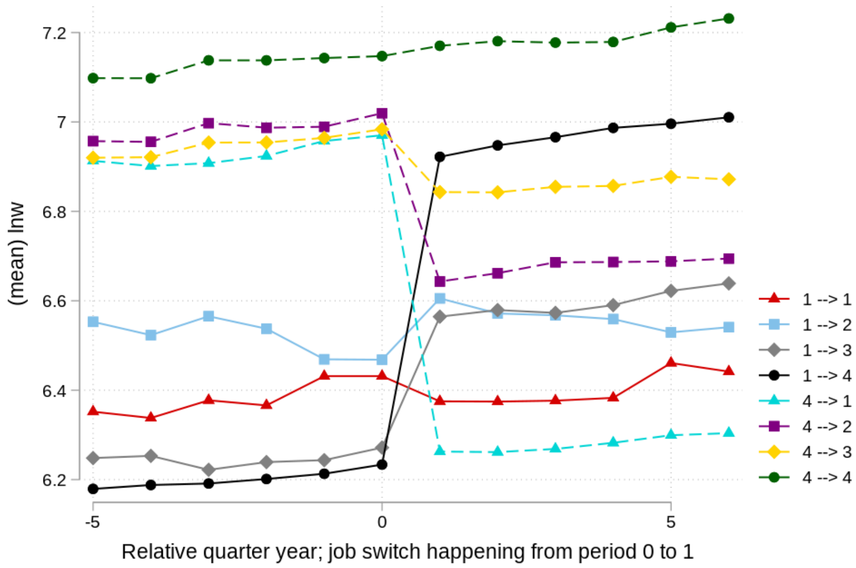


Figure B2: Event study of Card et al. (2013)

Notes: Data points represent the mean log wages of job-switchers in the 18 months before and the 18 months following a job-to-job transition (on a quarterly basis), categorized by the gender-firm-year effect quartile the worker belonged to before and after the switch. Only switches originating or arriving in the bottom or the top quartiles are included in the graph.

As we use time-varying but also gender-varying fixed effects, the serial correlation of estimated effects and the within-year correlation of male and female effects may also indicate the stability of our model fit. The latter correlation is 0.917, and as Figure B3 suggests, for most firms, the male and female wage components show a strong relation, except for the bottom and top of the distribution of the effects. We also present the serial patterns of autocorrelation in Table B1. As the table suggests, the one-lag autocorrelation of the effects is about 0.91-0.95, which is similar to what Lachowska et al. (2019) find.

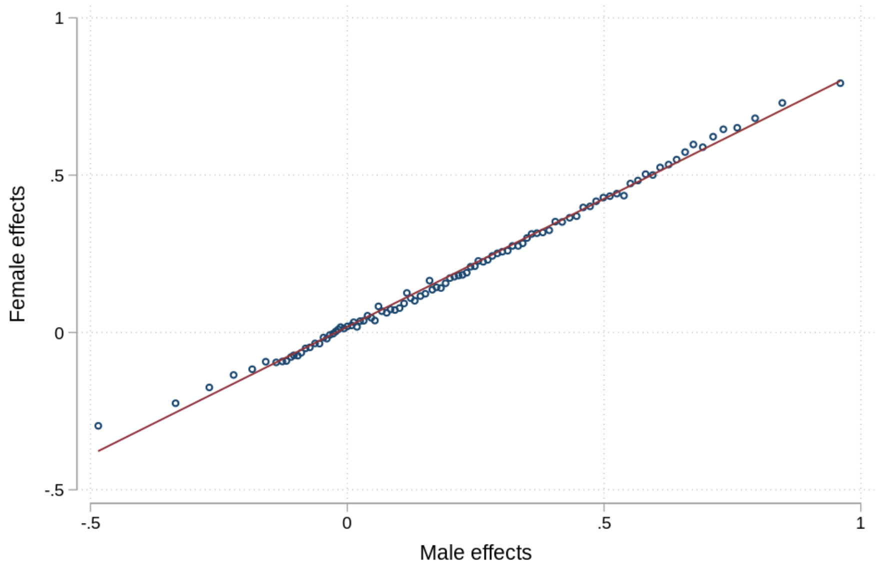


Figure B3: Correlation of male and female effects in the same year

Note: This figure is a binscatter plot of the male and female firm-gender-year effects, weighted by the overall size of the (non-segregated) firms with estimated effects available

Table B1: Autocorrelation of firm-gender-year effects

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2003	1														
2004	0.93	1.00													
2005	0.92	0.95	1.00												
2006	0.88	0.93	0.95	1.00											
2007	0.84	0.88	0.90	0.95	1.00										
2008	0.82	0.87	0.89	0.93	0.96	1.00									
2009	0.80	0.87	0.87	0.91	0.93	0.95	1.00								
2010	0.79	0.85	0.86	0.89	0.90	0.92	0.95	1.00							
2011	0.78	0.85	0.84	0.88	0.90	0.91	0.93	0.95	1.00						
2012	0.74	0.80	0.80	0.83	0.85	0.86	0.89	0.90	0.94	1.00					
2013	0.74	0.81	0.80	0.84	0.85	0.86	0.88	0.89	0.92	0.96	1.00				
2014	0.75	0.81	0.81	0.83	0.84	0.85	0.87	0.88	0.91	0.94	0.96	1.00			
2015	0.75	0.81	0.80	0.83	0.83	0.85	0.86	0.88	0.90	0.92	0.95	0.97	1.00		
2016	0.74	0.79	0.79	0.81	0.82	0.83	0.84	0.87	0.88	0.90	0.92	0.93	0.96	1.00	
2017	0.72	0.75	0.77	0.78	0.79	0.81	0.82	0.79	0.82	0.84	0.86	0.87	0.89	0.91	1.00

Notes: Autocorrelation table of the estimated firm-gender-year effects within the firm-gender units, weighted by the average size of the units.

Appendix C – The relationship between flexible wages and the gender wage gap in the HSES

An important strength of the Hungarian Structure of Earnings Survey is that we can observe bonuses and overtime payments at individual level. We utilize this feature of the data as a robustness check for the main results.[13] Table C1 is based on individual-level regressions where the dependent variable is the monthly log wage, and the main explanatory variables are dummies indicating gender and whether the worker receives bonuses or overtime payments. The first column shows that men receiving bonuses earn 47.9 percent more than men who do not receive either bonuses or overtime payments, while male workers receiving overtime payments earn 3.3 percent less than men without overtime payments. Column (2) highlights that this difference is mostly due to the composition effect, as the coefficient turns to positive if we control for occupation-fixed effects and other demographic characteristics.

Turning to the main variables of interest, Column (1) shows that women receiving bonuses earn 12.7 percent less than bonus-receiving men while this difference is 8.9 percent in the case of overtime payments. According to Column (2), the estimated wage gap does not change much if we control for gender differences in educational level, four-digit ISCO codes or worker age.

We investigate the role of selectivity in Columns (3)-(5) in more detail. In Column (3), we add firm fixed effects to control for the possibility that women are less likely to enter high-paying firms for any unobserved reason. The results show that bonus-receiving women earn 6.4 percent less than bonus-receiving men of the same occupation, firm, and educational level. This difference is 3.5 percent in the case of overtime payments.

Finally, we control for educational level–flexible wage fixed effects in Column (4) and for 4-digit occupation–flexible wage fixed effects[14] in Column (5). These fixed effects control for the possibility that women are less likely to enter occupations where the returns to bonuses and overtime payments are particularly high. The results show that bonus- and overtime-receiving women earn significantly less than their male co-workers even if we take into account that the returns to overtime and bonuses differs by educational level and occupation.

[13] Note: The HSES has a repeated cross-section structure at individual level and we cannot implement worker-fixed effects.

[14] We add a separate fixed effect for bonus and for overtime payments and interact those with either occupation or educational level.

Table C1: Gender gap and flexible payments – HSES sample

	(1)	(2)	(3)	(4)	(5)
Female	-0.030***	-0.030***	-0.050***	-0.049***	-0.061***
	(0.005)	(0.004)	(0.002)	(0.002)	(0.002)
Performance payments	0.479***	0.297***	0.111***		
	(0.012)	(0.007)	(0.004)		
Performance payments × Female	-0.127***	-0.096***	-0.064***	-0.069***	-0.055***
	(0.009)	(0.006)	(0.004)	(0.004)	(0.003)
Overtime	-0.033**	0.184***	0.069***		
	(0.013)	(0.007)	(0.005)		
Overtime × Female	-0.089***	-0.094***	-0.035***	-0.035***	-0.021***
	(0.010)	(0.007)	(0.003)	(0.003)	(0.003)
Constant	11.750***	10.390***	10.772***	11.321***	11.335***
	(0.008)	(0.026)	(0.016)	(0.013)	(0.012)
Demographic controls	No	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	Yes
Educ. × flex. wage FE	No	No	No	Yes	Yes
Occup. × flex. wage FE	No	No	No	No	Yes
Observations	2,481,948	2,481,940	2,480,269	2,480,269	2,480,247
R-squared	0.265	0.596	0.779	0.783	0.788

Note: The table shows the effect of bonuses and overtime payments on the gender wage gap using the Hungarian Structure of Earnings Survey.