ORIGINAL ARTICLE

Economica LSE

The UK gender pay gap: Does firm size matter?

Melanie Jones[1] | Ezgi Kaya[2]

[1]Cardiff University and IZA

[2]Cardiff University and GLO

Correspondence
Ezgi Kaya, Cardiff Business School,
Cardiff University, Aberconway Building,
Colum Drive, Cardiff CF10 3EU, Wales
Email: kayae@cardiff.ac.uk

Abstract

Motivated by the introduction of the UK Gender Pay Gap Reporting legislation to large firms, defined as over 250 employees, we use linked employee–employer panel data from the Annual Survey of Hours and Earnings to explore pre-legislation variation in the gender pay gap by firm size. In doing so, we contribute to the evidence on the relationship between two prominent empirical regularities in the labour economics literature, namely the gender pay gap and the firm-size wage premium. We find that both the raw and adjusted gender pay gaps increase with firm size in the UK private sector, even after controlling for unobserved worker heterogeneity, consistent with the legislation being targeted effectively. However, this conclusion changes after accounting for unobserved firm-level heterogeneity. Large firms have smaller within-firm raw gender pay gaps and similar adjusted gender pay gaps when compared to smaller firms. Our findings are not specific to the current definition of large firms but hold more generally, including at alternative proposed size thresholds.

1 | INTRODUCTION

Gender pay gap (GPG) transparency legislation has formed part of a strategy across many industrialized countries to encourage employers to explore and address the drivers of their GPG. In the UK, GPG reporting requirements were introduced in 2017 for employers with 250 or more employees (which we refer to as 'large' firms throughout). The introduction of the legislation, and the associated publication of more than 10,000 raw firm-level GPGs attracted considerable media and public attention, and initial evaluation suggests that it has narrowed the GPG (Duchini *et al.* 2022).[1] However, even before its introduction, the employment size threshold and resulting partial coverage of the legislation was questioned.[2] This debate was revived by a recent (October 2022) increase in the government definition of a small business to 500 employees, aimed at stimulating growth by reducing the burden on business, although the implications for the UK GPG reporting threshold are as yet unknown.[3] In contrast, previous proposals have universally

advocated the extension to smaller employers.[4] Indeed, corresponding GPG transparency legislation internationally provides examples of smaller firm-size thresholds—for example, Denmark, with a minimum of 35 employees (Bennedsen *et al.* 2022), and Switzerland, with a minimum of 100 employees (Vaccaro 2018)—and broadening scope of the legislation over time (see, for example, Austria, where the threshold employer size fell from 1000 to 150 between 2011 and 2014 (Gulyas *et al.* 2023), and planned widening in Ireland from 150 to 50 employees).[5]

In this paper, we contribute to this debate by providing the first evidence on differences in the magnitudes of the raw and adjusted GPGs (estimated before and after controlling for personal and work-related characteristics, respectively) across and within firms (defined as excluding and including firm fixed effects, respectively), by employment size. In doing so, we explore the extent to which the UK legislation is effectively targeted at firms with larger GPGs, and consider the implications of proposed changes in the firm-size threshold. Moreover, our analysis makes a broader contribution to the literature relating to two key empirical regularities within labour economics, namely the GPG and the firm-size wage premium, by providing new evidence on variation in the GPG by firm size, and variation in the firm-size premium by gender.

While there are multiple reasons to target transparency on larger firms, including based on statistical reliability of the metrics and administrative costs, such targeting should consider the trade-offs in terms of narrowing the GPG. The benefits of the policy are likely to increase with the coverage of workers and, all else constant, with effective targeting of firms with larger GPGs, where the rationale for transparency is greatest.[6] Theoretical models of discrimination predict greater gender pay inequality in larger firms if they have more power in product (Becker 1957) or input (Robinson 1933) markets, but despite the potential relationship between this and firm size, international evidence on the relationship between firm size and the GPG is scarce. We address this evidence gap by using linked panel employee–employer data from the UK Annual Survey of Hours and Earnings (ASHE), to assess whether the pre-transparency GPG in the private sector varies by firm size, and the extent to which this is also true for within-firm GPGs that are the focus of the legislation. By controlling for a comprehensive set of individual and work-related characteristics, we further explore how such firm-size variation relates to adjusted GPG, more aligned to pay equality and discrimination theory, and typically the focus of equality legislation and the economics literature.

We find that whether firm size matters for the GPG depends critically on whether comparisons are undertaken *within* or *across* firms. We find that the raw and adjusted GPGs increase with firm size, consistent with the effective targeting of the UK legislation. However, controlling for unobserved firm-level heterogeneity overturns this result, with a smaller raw within-firm GPG in large firms, and no relationship between firm size and the within-firm adjusted GPG. Based on the within-firm measure of the GPG applied in the legislation, the firm-size threshold cannot therefore be justified based on effective targeting of the GPG or gender pay inequality. Importantly, we show that this result is not specific to the current firm-size threshold but also holds at proposed alternative firm-size thresholds. Differences in pay inequality by firm size therefore provide neither a motivation for the original threshold nor justification for a change.

The remainder of the paper is organized as follows. By exploring the intersection between literature on the GPG and firm-size wage premium, Section II considers how firm size may affect the GPG, and illustrates the importance of this evidence for policy development. Section III presents a description of data from the ASHE, our sample and variables. Section IV explores variation in the raw and adjusted GPGs by firm size. In Section V, we perform a similar exercise but account for unobserved firm-level heterogeneity and focus on the within-firm GPG, the metric used in the legislation. Key to ongoing debates on the UK legislation, we consider the more specific relationship between the GPG and the existing large firm-size threshold, as well as proposed alternative thresholds, in Section VI. Concluding remarks are given in Section VII.

2 | FIRM SIZE AND THE GPG

Our interest in the relationship between the GPG and firm size lies at the intersection of two established fields within labour economics, namely the firm-size wage premium and the GPG, from which we explore the theoretical and empirical insights for our analysis.[7]

In terms of the firm-size wage premium, the literature finds consistent evidence that large firms pay substantially higher wages than smaller firms to observationally equivalent employees—see, for example, Brown and Medoff (1989) for the USA, Schmidt and Zimmermann (1991) for West Germany, Main and Reilly (1993) for Britain, Lallemand *et al.* (2007) for five European countries, and Colonnelli *et al.* (2018) for a comparison across four countries.[8] The reasons for this, however, remain debated. Theoretical explanations include unobserved worker heterogeneity, employer characteristics such as market power and capital intensity, and mechanisms such as rent sharing and avoidance of unionization, as well as efficiency wages, compensating wage differentials and differences in the return to managerial skills (for reviews, see Troske 1999; Oi and Idson 1999). Despite some of these explanations having potentially differential implications by gender—including, for example, where gender differences in bargaining behaviour (Card *et al.* 2016) affect rent sharing, where there is product market power (for previous evidence, see Nekby 2003), and monopsony power, where wages depend on the elasticity of labour supply to the firm—analysis comparing groups of employees has been limited.[9]

Our analysis contributes to this evidence gap by providing information on gender differences in the firm-size wage premium. Internationally, such evidence is scarce. Green *et al.* (1996) provide an important exception by exploring gender when testing the predictions of a dynamic monopsony model as an explanation for the firm-size premium, where wages are hypothesized to be a positive function of the quantity of labour supplied due to search frictions. They find a larger firm-size wage premium for women in the UK private sector compared to men. However, their results are based on historical data from cross-sectional surveys, namely, the British Household Panel Survey of 1991 and the General Household Survey of 1983. Moreover, they focus on establishment rather than firm size, measured in bands, and use self-reported information on pay. This paper updates and extends this evidence by utilizing payroll data, a continuous measure of *firm* size, and critically, accounts for individual and firm-level unobserved heterogeneity using matched longitudinal data. The latter has been highlighted as important in both the firm-size (e.g. Green *et al.* 2021) and GPG literature (e.g. Card *et al.* 2016).

In terms of the GPG, our results contribute to the extensive international literature (for reviews, see Altonji and Blank 1999; Blau and Kahn 2017), which, despite recent attention on the importance of the firm, including in terms of workforce composition (see, for example, Bayard *et al.* 2003; Mumford and Smith 2009; Theodoropoulos *et al.* 2022), ownership (Magda and Sałach, 2021), and between and within-firm GPGs (see, for example, Card *et al.* 2016; Hara 2018; Bruns 2019; Jewell *et al.* 2020; Kaya 2021), has neglected explicit consideration of firm size. Yet, according to the Becker (1957) model of discrimination, large firms would be predicted to exhibit greater gender pay inequality if they possess product market power that makes them more able to discriminate (see Meng (2004) for supporting empirical evidence). Similarly, Robinson (1933) suggests that if the labour supply of women is less elastic than that of men, then monopsony power will give rise to an adjusted GPG (see Hirsch *et al.* (2010) for supporting empirical evidence). To some extent, these forces might be offset by more formalized human resource management systems and transparent salary scales in larger firms, and greater external scrutiny (see Holzer (1998) for a discussion in relation to ethnicity), which means that the relationship between firm size and the GPG is an important empirical question.

Where it exists, the international evidence on the link between firm size and GPG is limited and even sometimes contradictory—see Mitra (2003) for the USA, Akar *et al.* (2013) for Turkey, and Heinze and Wolf (2010) for Germany. This is perhaps a consequence of differences

in data and country coverage, the measure of 'firm' size, which confuses the firm and establishment, and selection of specific sectors and/or occupations in these studies. Moreover, only Heinze and Wolf (2010) consider the relationship between size and the within-firm GPG—typically the focus of legislation—and to our knowledge, no previous study simultaneously addresses concerns relating to unobserved individual and firm heterogeneity as we do here.[10]

The international evidence thereby offers limited insights or justification for the range of firm-size thresholds employed in GPG transparency legislation across countries. While the associated incomplete coverage has been useful to evaluation studies adopting a quasi-experimental difference-in-differences approach where small firms provide a control group (Bennedsen *et al.* 2022; Duchini *et al.* 2022; Gulyas *et al.* 2023), there has been limited scrutiny of the appropriateness or implications of the threshold. By international standards, the restriction to 250 or more employees in the UK, while consistent with existing provisions in the Equality Act 2010, is high. Indeed, it exceeds the European Commission recommendation of 50 employees, and current thresholds in Denmark (Bennedsen *et al.* 2022), Switzerland (Vaccaro 2018) and Austria (Gulyas *et al.* 2023).

Justification for the existing UK size threshold has been on three main grounds (see UK Parliament 2015). First, there has been repeated concern that smaller employers would face disproportionate administrative costs in collecting the information required. Second, proposed extensions to smaller employee samples heighten concerns about statistical reliability of the metrics and their sensitivity to relatively small changes in employment. Finally, the public nature of the information in the UK also gives rise to additional concerns about disclosure of individual salaries. Any decision on the size threshold therefore reflects a trade-off between the anticipated benefits of transparency and these costs. The benefits of transparency are likely to increase if the legislation is able to target firms that are affected disproportionately. While this is difficult to establish *a priori*, recent evidence suggests that consistent with the mechanisms underlying the motivation for transparency, firms with larger GPGs have experienced greater narrowing since implementation (Jones and Kaya 2022).[11] Our evidence thereby contributes to assessing this latter case.

3 | DATA

Our main source of data is the ASHE, which is well-established to be the most reliable source of information on individual pay in the UK (Office for National Statistics (ONS) 2021).[12] These linked employee–employer data, which are based on mandatory reporting by employers to the ONS, cover a 1% sample of employee jobs from each year. These data have previously been used to explore the GPG (see, for example, Duchini *et al.* 2022) and the firm-size wage premium (see, for example, Colonnelli *et al.* 2018) separately, and are ideal in this context since the ASHE contains an accurate measure of firm (rather than establishment) size, consistent with the threshold for legislation. Although these data are available from 1997 to 2021, they are subject to a series of discontinuities. We focus on data from ASHE 2011–16, immediately prior to the introduction of the legislation in April 2017, over which period we are able to trace employees and their firms to analyse the GPG by firm size.[13] We restrict our sample to observations with non-missing information on individual and enterprise identifiers, that relate to the main job, that are paid an adult rate, and with earnings not affected by absence. Following the convention in the firm-size wage premium literature, we focus on private sector employees, who represent two-thirds of the employee sample.[14] Finally, after imputation of time-invariant employee information over the panel, and firm characteristics across multiple employees within year (see Online Appendix A for details), we drop observations where the data are miscoded or have missing values for any of the variables used in the analysis.[15] We further remove singleton observations (i.e. sample units—e.g. individuals or firms—observed only once), which are excluded

from our most comprehensive two-way fixed effects estimates (see below for details).[16] Our final sample includes 558,795 observations from 148,511 employees and 58,398 firms. Since ASHE calibration weights are applicable only to cross-sectional analysis, our estimates are unweighted throughout.

Our dependent variable is (the natural logarithm of) gross hourly pay.[17] The ASHE includes detailed information on the employee's earnings and hours during the pay period (the week or the month depending on whether the employee is paid weekly or monthly) that includes the survey reference date in April, as well as the gross annual earnings and performance related pay (PRP) received during the preceding year. As such, it is possible to measure pay in multiple ways. Our benchmark hourly pay GPG measure is the ONS recommended measure and is aligned to the GPG reporting requirement. It is based on gross hourly pay for the reference period, excluding overtime, but including PRP paid within the reference period.[18,19]

Key to our analysis, firm size is measured by the number of employees in the enterprise on the Inter-Departmental Business Register, where an enterprise may have multiple local units. Aligned to the literature on the firm-size premium, we first use the natural logarithm of employment size (see, for example, Green *et al.* 2021) to capture a general relationship between the GPG and firm size. However, as the Equality Act 2010 (Gender Pay Gap Information) Regulations 2017 require only firms with 250 employees or more to report their GPG, we also focus subsequently on this more specific threshold and generate a large-firm indicator that takes value 1 if the number of employees in the enterprise is 250 or more, and 0 otherwise.

Table 1 presents selected summary sample statistics by gender and firm size. About 60% of private sector employees work in large firms and would be covered by the legislation.[20] Firms have on average 18,449 employees, and while the average firm size is greater for women, the proportion employed in large firms is similar across genders. The average number of employees in a smaller firm is 59, compared to 30,697 in large firms, consistent with substantial variation in employment size between large and smaller firms.[21] The data confirm a GPG of 21% for all employees (calculated as a percentage of hourly pay for males), which is comparable to the existing literature (see, for example, Jones and Kaya 2019). The GPG is, however, greater in large (22%) relative to smaller (19%) firms, and provides the first indication of a potentially effective targeting of legislation.

In Online Appendix Table B1, we present a full set of descriptive statistics for the explanatory variables employed in our analysis by the firm size threshold and gender. These variables, which are common in both the GPG and firm-size literatures, control for elements of

TABLE 1 Sample Statistics for Key Variables by Gender and Firm-size Threshold

	All			Smaller firms			Large firms		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Hourly pay (£)	14.33	11.35	13.03	13.63	11.08	12.50	14.79	11.53	13.38
Log hourly pay	2.53	2.31	2.43	2.49	2.31	2.41	2.55	2.32	2.45
Firm size (number of employees)	16,002.21	21,607.58	18,449.83	63.25	54.55	59.40	26,418.71	36,311.13	30,696.51
Log firm size	6.56	6.63	6.59	3.48	3.27	3.39	8.57	8.93	8.73
Number of observations	314,793	244,002	558,795	124,416	98,953	223,369	190,377 [60.48]	145,049 [59.45]	335,426 [60.03]

Notes: Authors' calculations using data from the ASHE 2011–16. Large firms are defined as 250 or more employees. Figures in brackets are the percentage of employees in large firms by gender.

human capital, job amenities and firm characteristics. In terms of personal characteristics, we include age (and age squared) and work region (using the 11 NUTS level-1 regions of Great Britain). Work-related characteristics include tenure measured by the total number of years working at current employer (and tenure squared), part-time (a binary indicator that takes value 1 if the job is part-time, and 0 otherwise), temporary employment (a binary indicator that takes value 1 if the job is temporary/casual, and 0 otherwise), collective bargaining (a binary indicator that takes value 1 if the employee's pay is set with reference to a collective agreement, and 0 otherwise), and occupation measured by the SOC2010 major groups (nine categories).[22]

The figures in Online Appendix Table B1 confirm well-established gender differences in the nature of employment (e.g. the concentration of women with part-time contracts) and occupation, with females' over-representation in administrative and secretarial occupations, caring, leisure and other service occupations, and sales and customer service occupations. This is reflected similarly in industrial segregation, with men being over-represented in manufacturing and construction, and females dominating public administration and defence, compulsory social security, education, and human health and social work activities, the latter being more pronounced among smaller firms than large firms.

Employees in large firms are younger but have slightly longer tenure, consistent with lower employee turnover in large firms, possibly due to there being greater opportunities for promotion. The geographic distribution is similar across smaller and large firms, except for London, where there is a concentration of employees in large firms. Skilled trade occupations (dominated by men) are over-represented among smaller firms (despite the exclusion of self-employment), and the reverse is true for sales and customer service occupations (where females are over-represented). Consistent with this, there is an over-representation of employment in the construction industry among smaller firms, and wholesale and retail trade, repair of motor vehicles and motorcycles, and accommodation and food service activities among large firms. Coverage by a collective agreement is also more prevalent in large relative to smaller firms.

4 | THE GPG BY FIRM SIZE

To explore how the GPG varies by firm size, we estimate a pooled ordinary least squares (POLS) wage equation that includes observations from both male and female employees as follows:

$$\ln W_{ijt} = \alpha + \mu F_i + \delta \ln S_{ijt} + \gamma F_i \ln S_{ijt} + X_{ijt}\beta + \theta_t + \varepsilon_{ijt}. \tag{1}$$

where i indexes the individual, j indexes the firm, and t denotes the year. The natural logarithm of hourly pay ($\ln W_{ijt}$) is regressed on a binary indicator of (female) gender (F_i), the natural logarithm of the number of employees ($\ln S_{ijt}$), the interaction between gender and firm size ($F_i \ln S_{ijt}$), and a vector of year fixed effects (θ_t). The firm-size wage premium for men (measured as an elasticity) is given by δ, and γ measures the gender difference in the firm-size premium (equivalently interpreted as the difference in the GPG by firm size).

Table 2 presents the coefficient estimates for the key variables of interest.[23] The raw private sector GPG is captured in column (1), and in column (2), we control for gender, firm size and an interaction term between gender and firm size to identify variation in the raw GPG by firm size. To explore variation in the adjusted GPG by firm size, we successively add additional control variables (X_{ijt}) across specifications starting with personal characteristics (column (3)), then work-related characteristics (column (4)), and ultimately a full set of individual fixed effects (column (5)). In the latter most comprehensive specification, the individual fixed effects absorb time-invariant characteristics, including the female indicator, therefore we estimate a version of equation (1) as follows:

TABLE 2 The GPG by Firm Size

	(1)	(2)	(3)	(4)	(5)
Female	–0.213***	–0.153***	–0.155***	–0.044***	—
	(0.003)	(0.005)	(0.005)	(0.004)	
Log firm size	—	0.004***	0.005***	0.016***	0.006***
		(0.001)	(0.001)	(0.000)	(0.001)
Female × Log firm size	—	–0.009***	–0.008***	–0.010***	–0.004***
		(0.001)	(0.001)	(0.001)	(0.001)
Personal characteristics	No	No	Yes	Yes	Yes
Work-related characteristics	No	No	No	Yes	Yes
Individual fixed effects	No	No	No	No	Yes
Adjusted R^2	0.051	0.052	0.185	0.543	0.923

Notes: Authors' calculations based on the ASHE 2011–16. Dependent variable is the natural logarithm of gross hourly pay. Log firm size is the natural logarithm of the number of employees. Individual-level clustered standard errors in parentheses (148,511 clusters). Personal characteristics include age, age squared, and work region dummies. Work-related characteristics include tenure, tenure squared, an indicator for part-time employment, an indicator for temporary employment, collective bargaining, and occupation (major group) dummies. All models include year fixed effects and a constant term. The number of observations is 558,795 throughout.
*, **, *** indicate significance levels 0.05, 0.01, 0.001, respectively.

$$\ln W_{ijt} = \alpha_i + \delta \ln S_{ijt} + \gamma F_i \ln S_{ijt} + X_{ijt}\beta + \theta_t + \varepsilon_{ijt}, \tag{2}$$

where the fixed effect for individual i is given by α_i.[24] In this way, we adjust the firm-size GPG differential, for productivity-related characteristics between men and women, including time-varying observed characteristics and time-invariant unobserved employee characteristics. The latter would include differences in ability, personality or innate preferences for firm size/amenities, an important determinant of sorting of employees into firms of different size (among others, see Green *et al.* 2021).

The results confirm the presence of a raw GPG within the private sector of approximately 21.3% (column (1) of Table 2).[25] The estimates in column (2) confirm a difference in the raw GPG by firm size, with a significantly wider GPG in larger firms. Put differently, the raw firm-size premium varies by gender. While for males a 1% increase in employment size is associated with a 0.004% increase in hourly pay, for women the raw firm size premium is 0.009 percentage points smaller.[26] In other words, the firm-size premium benefits men exclusively. The inclusion of personal characteristics leaves the firm-size premium and GPG firm-size differential largely unchanged (column (3)). The inclusion of work-related characteristics (tenure, tenure squared, part-time, temporary employment, collective bargaining and occupation), which are important determinants of earnings (as reflected in the adjusted R^2 in columns (3) and (4)), increases the male firm size premium to 0.016 (column (4)). The inclusion of individual fixed effects to capture unobserved time-invariant employee heterogeneity (column (5)) reduces both the male firm-size premium and GPG differential by firm size, suggesting that both are partially driven by unobserved factors. Nevertheless, both the male firm-size premium and GPG differential by firm size remain significant after accounting for this. The adjusted GPG differential by firm size, or what might be considered as a measure closer to pay inequality, is wider in large firms, consistent with discrimination theory. An equivalent interpretation is that, in contrast to previous evidence from Green *et al.* (1996), women do not benefit from the firm-size premium that is evident for men, possibly reflecting females being employed in large firms with less market power and/or being less effective in bargaining for this rent.

We provide an extensive set of robustness tests for our most comprehensive specification in Online Appendix Table B4(a), where we explore differences in the definition of hourly pay, sample and model specification. In terms of the measure of hourly pay, in column (1) we retain hourly pay

outliers, in column (2) we focus on basic pay and exclude PRP, in column (3) we include overtime in the hourly pay measure, and in column (4) we derive hourly pay from annual pay rather than pay in the reference week. In relation to the sample, we restrict our analysis to full-time workers in column (5), exclude observations with imputed data in column (6), and focus on only those of working age and over the age of 25 in columns (7) and (8), respectively. In terms of specification, column (9) controls for more detailed occupational groups, columns (10)–(12) include controls for industry, and column (13) excludes age (and age squared) given the potential relationship with year fixed effects. We further explore the impact of clustering standard errors at the firm rather than individual level in column (14). In all cases, we find evidence of that the adjusted GPG is greater in large firms.

Given evidence in the literature that the firm-size premium is larger for those with supervisory or managerial responsibility (Fox 2009; Green *et al.* 2021), and the potential interaction between this and gender, we further explore the sensitivity of our estimates to the exclusion of managers, directors and senior officials from the sample, but our results remain unchanged—see Online Appendix Table B4(a), column (15). Given the diversity in firm size within the sample, we further consider whether the findings are driven by very small or very large firms in the sample. In column (16), we exclude outliers in terms of firm size, but our estimates are robust to this. We further confirm that the patterns are evident nearer the firm-size threshold and are not driven by the inclusion of larger firms in the sample, albeit the adjusted GPG is significantly wider in large firms only when the sample is at least 1000 employees around the threshold (columns (17)–(20)).

5 | THE WITHIN-FIRM GPG BY FIRM SIZE

The matched employee–employer panel nature of the ASHE data unusually allows us to consider the within-firm GPG consistent with recent attention in the GPG literature (see, for example, Card *et al.* 2016), and the firm-level measures targeted by legislation. In a manner similar to equation (1), we model the natural logarithm of hourly pay, and build up to a more comprehensive model, including personal and work-related characteristics. However, here firm fixed effects are included as follows:

$$\ln W_{ijt} = \alpha + \mu F_i + \delta \ln S_{ijt} + \gamma F_i \ln S_{ijt} + X_{ijt}\beta + \omega_j + \theta_t + \varepsilon_{ijt}, \tag{3}$$

The notation mirrors equation (1), with the exception that firm fixed effects ω_j control for firm characteristics common to all employees, which might otherwise affect sorting into, and wages within, firms. Our most comprehensive specification, which Green *et al.* (2021) consider as 'ideal' in identifying the firm-size premium, therefore includes both individual and firm fixed effects, and accounts for unobserved worker and firm heterogeneity, which might otherwise drive the GPG differential by firm size.[27,28] This specification, which forms our preferred estimate of the adjusted GPG, is set out as follows:

$$\ln W_{ijt} = \alpha_i + \delta \ln S_{ijt} + \gamma F_i \ln S_{ijt} + X_{ijt}\beta + \omega_j + \theta_t + \varepsilon_{ijt}. \tag{4}$$

The results, which we now refer to as within-firm GPGs, are presented in Table 3 and confirm a raw within-firm GPG, which is smaller in magnitude than that estimated across firms (column (1)).[29] However, in contrast to Table 2, men experience a within-firm raw firm-size pay penalty (column (2)). Women experience this less than men, which narrows the raw within-firm GPG in larger relative to smaller firms. However, the inclusion of controls for employee personal and work-related characteristics in columns (3) and (4) changes the results. The inclusion of personal characteristics reduces the magnitude of male firm-size penalty, which is not significantly different

TABLE 3 The Within-firm GPG by Firm Size

	(1)	(2)	(3)	(4)	(5)
Female	–0.131***	–0.153***	–0.126***	–0.066***	—
	(0.003)	(0.009)	(0.008)	(0.006)	
Log firm size	—	–0.009***	–0.006**	–0.001	0.010***
		(0.002)	(0.002)	(0.001)	(0.001)
Female × Log firm size	—	0.003*	–0.001	–0.003***	–0.001
		(0.001)	(0.001)	(0.001)	(0.001)
Personal characteristics	No	No	Yes	Yes	Yes
Work-related characteristics	No	No	No	Yes	Yes
Individual fixed effects	No	No	No	No	Yes
Adjusted R^2	0.593	0.593	0.631	0.747	0.928

Notes: Authors' calculations based on the ASHE 2011–16. Dependent variable is the natural logarithm of gross hourly pay. Log firm size is the natural logarithm of the number of employees. Individual-level clustered standard errors in parentheses (148,511 clusters). Personal characteristics include age, age squared, and work region dummies. Work-related characteristics include tenure, tenure squared, an indicator for part-time employment, an indicator for temporary employment, collective bargaining, and occupation (major group) dummies. All models include year and firm fixed effects, and a constant term. The number of observations is 558,795 throughout. *, **, *** indicate significance levels 0.05, 0.01, 0.001, respectively.

for females (column (3)). Additionally controlling for work-related characteristics removes the significance of the male firm-size penalty but introduces an adjusted firm-size differential for women, who now experience a firm-size penalty (column (4)). The latter is consistent with the within-firm adjusted GPG increasing in firm size. This is not, however, robust to the inclusion of employee fixed effects, and in our preferred, most comprehensive, specification (column (5)), a male large-firm premium is evident, but within-firm gender pay inequality exhibits no significant variation by firm size. Our conclusions with respect to the firm-size GPG differential or gender differences in the firm-size premium therefore depend critically on whether we control for unobserved individual and firm heterogeneity. After accounting for unobserved firm heterogeneity, the within-firm raw GPG is smaller among larger firms. After adjusting for personal and work-related characteristics, and individual fixed effects, there is no evidence of a firm-size differential in the within-firm adjusted GPG. That is, firm size does not affect within-firm gender wage inequality. Therefore, when focusing on within-firm measures, neither the GPG nor gender pay inequality provides a rationale for an employment size threshold as imposed by legislation.

We provide a corresponding set of robustness tests for our most comprehensive within-firm specification in Online Appendix Table B4(b), where we present further estimates based on individual × firm fixed effects where identification is achieved from changes in firm size within firms alone. In all cases, we find no evidence of a firm-size differential in the within-firm adjusted GPG. We further consider whether the findings are driven by specific industries by performing separate analysis for nine broad industry groupings based on the Standard Industry Classification (SIC) in Online Appendix Table B5(b), but find that the pattern is largely common.[30] The only exception is a wider within-firm adjusted GPG in large relative to smaller firms in Mining and quarrying, Electricity, gas, steam and air conditioning supply (SIC sections B, D, E—see panel A). Finally, we also confirm that our findings are not unique to the private sector and are also evident among firms within the public and non-profit sectors, despite substantial differences in the average employer size between sectors, and likely drivers of a 'firm' size premium (see Online Appendix Table B6). While a male large within-firm size premium is not evident in the public sector, the within-firm adjusted GPG shows no variation by size in the private, public or non-profit sector.

6 | THE GPG BY FIRM SIZE THRESHOLD

Up to this point, we have assessed variation in the GPG by firm size rather than the specific threshold defined by UK legislation. Here, we focus on the current firm-size threshold and consider proposed changes, given their particular relevance to the ongoing debate about the appropriate targeting of legislation.[31] We perform this analysis in two stages.

First, in equations (1)–(4) we replace the logarithm of firm size with a binary large-firm indicator as defined by 250 or more employees, consistent with the legislation. These coefficient estimates are presented in Table 4, where panels A and B present estimates before and after accounting for firm fixed effects, respectively. Confirming the above evidence, we find that the raw across-firm GPG is approximately 4.9% more in large compared to smaller firms (panel A, column (1)). This relationship remains evident across specifications that control for personal and work-related characteristics, and individual fixed effects (panel A, columns (2)–(4)), with the GPG differential by firm size narrowing by more than 50% after the inclusion of employee fixed effects suggesting that some of this differential reflects unobserved individual

TABLE 4 The GPG and Within-firm GPG, by Firm Size Threshold

	(1)	(2)	(3)	(4)
Panel A: GPG				
Female	–0.183***	–0.183***	–0.082***	—
	(0.004)	(0.003)	(0.003)	
Large firm	0.062***	0.062***	0.095***	0.023***
	(0.003)	(0.003)	(0.003)	(0.003)
Female × Large firm	–0.049***	–0.035***	–0.046***	–0.017***
	(0.005)	(0.005)	(0.003)	(0.004)
Personal characteristics	No	Yes	Yes	Yes
Work-related characteristics	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes
Firm fixed effects	No	No	No	No
Adjusted R^2	0.054	0.187	0.543	0.923
Panel B: Within-firm GPG				
Female	–0.144***	–0.143***	–0.079***	—
	(0.005)	(0.005)	(0.004)	
Large firm	–0.015**	–0.011*	0.000	0.007*
	(0.005)	(0.005)	(0.004)	(0.003)
Female × Large firm	0.014*	0.009	–0.010*	–0.002
	(0.006)	(0.006)	(0.005)	(0.005)
Personal characteristics	No	Yes	Yes	Yes
Work-related characteristics	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.593	0.631	0.747	0.928

Notes: Authors' calculations based on the ASHE 2011–16. Dependent variable is the natural logarithm of gross hourly pay. Large firms are defined as 250 or more employees. Individual-level clustered standard errors in parentheses (148,511 clusters). Personal characteristics include age, age squared, and work region dummies. Work-related characteristics include tenure, tenure squared, an indicator for part-time employment, an indicator for temporary employment, collective bargaining, and occupation (major group) dummies. All models include year fixed effects and a constant term. The number of observations is 558,795 throughout.
*, **, *** indicate significance levels 0.05, 0.01, 0.001, respectively.

heterogeneity (panel A, column (4)). After controlling for unobserved firm heterogeneity, the patterns remain consistent with Section V. Raw within-firm GPGs are smaller among large relative to smaller firms (panel B, column (1)), but after accounting for personal characteristics, there is no significant variation in the GPG between large and smaller firms (panel B, column (2)). In contrast, adding work-related characteristics to the specification (panel B, column (3)) suggests that the adjusted GPG is wider among large firms, but the further inclusion of individual fixed effects provides evidence of an adjusted wage premium for working in a large firm but no GPG differential between large and smaller firms. Collectively, the evidence from the most comprehensive specifications therefore suggests an adjusted male firm-size wage premium measured both *across* and *within* firms, albeit the latter is smaller in magnitude. When measured *across* firms, females appear not to benefit equally, leading to a wider GPG in large firms. However, this seems to be a consequence of unobserved firm heterogeneity, or worker sorting; that is, the large firms in which women are employed have unobserved characteristics associated with lower wages. When conditioning on the same firm, our *within*-firm estimates suggest no GPG differential between large and smaller firms, or a common large-firm wage premium by gender, and so provide no support for the existence of gender differences in bargaining or the impact of monopsony power.

    These findings are similarly robust to the wide range of sensitivity analysis discussed in Sections IV and V (see Online Appendix Tables B4(c) and B4(d)). Confirming the above analysis, the findings are not driven by specific industries (see Online Appendix Tables B5(a) and B5(b), panel B), and while the adjusted GPG is wider only in large firms in the private sector, the absence of any difference in the within-firm adjusted GPG by firm size is common across sectors

TABLE 5   The Within-firm GPG by Alternative Firm Size Thresholds

	Large firm threshold				
	50	100	150	200	500
	(1)	(2)	(3)	(4)	(5)
Panel A: Raw					
Female	–0.124***	–0.138***	–0.143***	–0.142***	–0.142***
	(0.008)	(0.007)	(0.006)	(0.006)	(0.005)
Large firm	0.014**	–0.006	–0.005	–0.011*	–0.013*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Female × Large firm	–0.008	0.007	0.013*	0.012*	0.014*
	(0.009)	(0.007)	(0.007)	(0.006)	(0.006)
Adjusted R^2	0.593	0.593	0.593	0.593	0.593
Panel B: Adjusted					
Large firm	0.010**	0.013***	0.015***	0.012***	0.013***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Female × Large firm	0.002	0.000	0.000	–0.003	–0.004
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Adjusted R^2	0.928	0.928	0.928	0.928	0.928
% Employees in large firms	75.77	68.73	65.03	62.18	53.66
% Female employees in large firms	73.92	67.26	63.88	61.39	53.75

Notes: Authors' calculations based on the ASHE 2011–16. Dependent variable is the natural logarithm of gross hourly pay. Column titles indicate the threshold for the number of employees used to define a large firm. Individual-level clustered standard errors in parentheses (148,511 clusters). All models include year and firm fixed effects, and a constant term. Panel B also includes controls for personal and work-related characteristics, and individual fixed effects. Personal characteristics include age, age squared, and work region dummies. Work-related characteristics include tenure, tenure squared, an indicator for part-time employment, an indicator for temporary employment, collective bargaining, and occupation (major group) dummies. The number of observations is 558,795 throughout.
*, **, *** indicate significance levels 0.05, 0.01, 0.001, respectively.

(see Online Appendix Table B6, panel B). The latter is important, given the broader scope of the legislation.

Second, we focus on our preferred within-firm GPG but utilize a series of alternative firm-size threshold variables to define 'large' firms.[32] More specifically, we focus on size thresholds at 50, 100, 150, 200 and 500 employees, consistent with the proposed changes. These thresholds cover different proportions of the private sector workforce, from 54% at 500 employees, to 76% at 50 employees. The coefficient estimates are presented in Table 5, where for conciseness we consider the raw within-firm GPG in panel A, and the adjusted within-firm GPG in panel B. Importantly, the evidence of a narrower raw within-firm GPG in large firms observed at 250 employees is evident only at 150, 200 and 500 employees, not at lower thresholds defined by 100 or 50 employees. Nevertheless, the within-firm adjusted GPG appears to be constant across firm size regardless of the specific threshold. Overall, therefore, we find no evidence that any of the proposed thresholds would have been more effective at targeting the current transparency legislation.

7 | CONCLUSIONS

Motivated by debate over the appropriate employment size threshold for GPG Reporting legislation in the UK, we explore differences in the magnitude and determinants of the GPG by firm size. In doing so, we contribute to two prominent fields of literature in empirical labour economics, adding evidence on firm-size differentials to extensive prior analysis of the GPG and gender differences to the literature exploring the firm-size wage premium. As such, we assess the extent to which the introduction of UK GPG Reporting legislation to large firms, defined as over 250 employees, was targeted at firms with higher GPGs, as well as how this might change if the threshold was reduced or expanded to capture employees in smaller or larger firms.

Using panel data from the ASHE covering a period prior to the legislation, we find that the raw firm-size wage premium is lower for females than males, or equivalently, the GPG increases with firm size. Importantly, this difference remains pronounced after controlling for the observed characteristics of employees and their jobs, and individual unobserved heterogeneity. In this respect, the results are consistent with predictions based on discrimination theory, and indicate that the legislation is well targeted at firms with a higher GPG and greater gender wage inequality. Put differently, the lower firm-size premium for females is not a reflection of gender differences in observed or unobserved employee characteristics, where the latter would capture differential sorting into large/smaller firms based on ability.

We further utilize the matched employee–employer nature of the ASHE to focus on within-firm GPGs aligned directly to legislation, and control for unobserved workplace heterogeneity. This would capture, for example, firm pay differentials which might otherwise bias estimates of the firm-size GPG differential. Our findings show that this is critical. The within-firm raw GPG *decreases* with firm size, and we find no evidence of a firm-size differential in the adjusted GPG. In this respect, variation in the adjusted firm-size premium by gender appears to reflect unobserved firm heterogeneity, such that workers in the same firm benefit equally from an increase in employment size, regardless of gender. Importantly, therefore, our findings provide no evidence of differential bargaining or the influence of monopsony as channels through which gender might influence the firm-size premium.

So the answer to the question posed by this paper, as to whether firm size matters for the GPG, depends fundamentally on whether we measure the GPG *within* or *across* firms. When focusing exclusively on the criteria of addressing gender wage inequality, the firm-size threshold does not provide a rationale for the initial targeting of the firm-level metrics in UK legislation. We show further that this finding holds more generally, including at different proposed firm-size thresholds. Instead, given the early evidence on the effectiveness of legislation (Duchini *et al.* 2022), a decision

on whether to change the threshold depends on comparing the relative benefits of changes in *coverage* against the costs in terms of employer administrative burden, statistical reliability and information disclosure risk.

NOTES

[1] For simplicity, we refer to the employers as firms, but both private, public and third sector organizations are covered.

[2] The main arguments supporting the exclusion of smaller firms are the administrative burden and potential for disclosure of individual salaries (see UK Parliament 2015).

[3] See https://www.gov.uk/government/news/red-tape-cut-for-thousands-of-growing-businesses (accessed 14 May 2023).

[4] This has included a recommendation from a 2018 Business, Energy and Industrial Strategy committee that the legislation be extended to those with 50 employees (see https://publications.parliament.uk/pa/cm201719/cmselect/cmbeis/928/92802.htm, accessed 14 May 2023) and a proposed reduction to 100 employees in the Equal Pay (Information and Claims) Bill 2019–21 submitted to the House of Commons (https://publications.parliament.uk/pa/bills/lbill/58-01/065/5801065_en_2.html#l1g1, accessed 14 May 2023). In Wales and Scotland, public sector employers with more than 150 employees are already obliged to publish their GPG under the Public Sector Equality Duty.

[5] For details of the legislation in Ireland, see www.justice.ie/en/JELR/Pages/PR19000069 (accessed 14 May 2023).

[6] Consistent with this, Jones and Kaya (2022) find that employers with a higher initial GPG have experienced greater narrowing post-transparency.

[7] It also aligns to broader evidence that wage inequality in the USA is rising *within* firms, particularly in large firms (see, for example, Song *et al.* 2019), and is greater in large relative to smaller firms in the UK (Mueller *et al.* 2017).

[8] Albeit recent trends in the firm-size wage premium appear to exhibit differences by country (see, for example, Bloom *et al.* 2018; Colonnelli *et al.* 2018).

[9] Such analysis has tended to focus on managerial/supervisory roles (Fox 2009; Green *et al.* 2021) and/or position in the organization hierarchy (Mueller *et al.* 2017). However, Arellano-Bover (2023) also demonstrates the lasting benefits of initially working in a large firm on future lifetime earnings.

[10] Interestingly, in their analysis explaining a widening early career GPG in Italy, Del Bono and Vuri (2011) find a key role for gender differences in the returns to moving to a large firm which they suggest is due to gender differences in wage bargaining and the valuation of other job attributes in larger firms.

[11] Of course, there may have already been benefits of the legislation outside large firms directly affected due to spillover effects (see Johnson (2020) for evidence relating to information disclosure in another context). First, the introduction of the legislation was associated with considerable media and public attention, raising the profile of gender equality among *all* UK employers. Second, smaller firms were encouraged to report the same information voluntarily. Third, given the common labour market, smaller firms might have been affected by changing expectations and bargaining of employees. Nevertheless, Duchini *et al.* (2022) find that employees in large firms experience greater narrowing of the GPG than those in smaller firms, consistent with an additional impact of the legislation on those in scope of the requirements.

[12] The analysis does not include Northern Ireland because these observations are not included in ASHE data in the Secure Data Service.

[13] In the 2011 ASHE, the Standard Occupational Classification 2010 (SOC2010) replaced the Standard Occupational Classification 2000 (SOC2000). Thus we restrict the analysis to after this change.

[14] In the ASHE, a sector is classified based on the legal status of the enterprise from the Inter-Departmental Business Register. We classify jobs in a private company, sole proprietor or partnership as private. Although firm-size effects have been observed in public and non-profit sectors (see, for example, Belman and Heywood 1990), we focus on the private sector as firm size has a less clear influence in the wage determination in the other sectors (see, for example, Main and Reilly 1993). We nevertheless consider the public and non-profit sector in Sections V and VI.

[15] Our approach is similar to that of Jewell *et al.* (2020), but we explore the robustness of our findings to imputation in Sections IV, V and VI.

[16] Reassuringly the results from a POLS model based on all observations and excluding singletons are very similar (results available on request).

[17] As per the GPG and firm-size wage premium literature, we focus exclusively on pay, recognizing that there might be other pecuniary and non-pecuniary benefits that vary across firms by size and are not considered here.

[18] To avoid outliers, we also recode pay observations as missing if hourly pay is more than the top pay percentile or less than the bottom percentile, but test the robustness of our estimates to this in Sections IV, V and VI.

[19] In Sections IV, V and VI, we explore the sensitivity of our estimates to alternative measures of pay, including hourly pay (including overtime), basic hourly pay, and following Bryson and Forth (2017), hourly pay measure derived from annual gross earnings and annual PRP.

[20] A more detailed distribution of firm size is provided in Online Appendix Figure B1. The distribution is also similar for each sample year (figures available on request). Indeed, Duchini *et al.* (2022) find no evidence that firms changed employment size to avoid being in scope of the legislation.

[21] We explore the sensitivity of our results to eliminating firm-size outliers (defined as below the 1st percentile or above the 99th percentile of the distribution) in Sections IV, V and VI, and to constraining the sample closer to the firm-size threshold in Section VI.

[22] We exclude controls for industry, given that they would be absorbed by firm fixed effects, but subsequently explore sensitivity of the across-firm estimates to their inclusion, and variation in the findings by industry. We also explore the sensitivity of the results to more detailed controls for occupation (measured by the 4-digit SOC2010 codes), which can be considered as a proxy for educational attainment that is not available in the ASHE (see, for example, Gibbons *et al.* 2014).

[23] Online Appendix Table B2 provides a full set of coefficient estimates for our most comprehensive specification.

[24] Coefficients are identified by individuals who change firm size in two ways: they remain employed within the same firm but the firm size changes, or they move between firms of differing sizes (see Online Appendix Tables B3(a) and B3(b) for sample sizes). While we observe an increase in worker mobility over time, the trends for each gender are similar. Our findings are also robust to the inclusion of individual × firm fixed effects where identification comes from changes in firm size alone (see Sections V and VI).

[25] The exact percentage is given by $\exp(\mu) - 1$, that is, 19.2%.

[26] Our estimates are lower than the estimates for all workers in Green *et al.* (2021), consistent with previous evidence of a stronger relationship between establishment rather than firm size (see, for example, Bayard and Troske 1999).

[27] In practice, Green *et al.* (2021) account for unobserved individual and firm heterogeneity separately using two different surveys.

[28] We use the Stata *reghdfe* procedure (Correia 2016) to estimate the high-dimensional fixed effects regression models.

[29] Online Appendix Table B2 provides a full set of coefficient estimates for our most comprehensive specification.

[30] The corresponding estimates for the adjusted GPG *across* firms are presented in Online Appendix Table B5(a).

[31] See note 4 for details.

[32] The corresponding findings for the GPG measured *across* firms are presented in Online Appendix Table B7.

REFERENCES

Akar, G., Balkan, B. and Tümen, S. (2013). Overview of firm-size and gender pay gaps in Turkey: the role of informal employment. *Ekonomi-tek-International Economics Journal*, **2**(3), 1–21.

Altonji, J. G. and Blank, R. (1999). Race and gender in the labour market. In O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*. Amsterdam: Elsevier Science, pp. 3143–259.

Arellano-Bover, J. (2023). Career consequences of firm heterogeneity for young workers: first job and firm size. *Journal of Labor Economics*, forthcoming; available online at https://doi.org/10.1086/723500 (accessed 16 May 2023).

Bayard, K., Hellerstein, J., Neumark, D. and Troske, K. (2003). New evidence on sex segregation and sex differences in wages from matched employee–employer data. *Journal of Labor Economics*, **21**(4), 887–922.

———— and Troske, K. (1999). Examining the employer-size wage premium in the manufacturing, retail trade, and service industries using employer–employee matched data. *American Economic Review*, **89**(2), 99–103.

Becker, G. (1957). *The Economics of Discrimination*. Chicago, IL: University of Chicago Press.

Belman, D. and Heywood, J. S. (1990). The effect of establishment and firm size on public wage differentials. *Public Finance Quarterly*, **18**(2), 221–35.

Bennedsen, M., Simintzi, E., Tsoutsoura, M. and Wolfenzon, D. (2022). Do firms respond to gender pay gap transparency? *Journal of Finance*, **77**(4), 2051–91.

Blau, F. D. and Kahn, L. M. (2017). The gender wage gap: extent, trends, and explanations. *Journal of Economic Literature*, **55**(3), 789–865.

Bloom, N., Guvenen, F., Smith, B. S., Song, J. and von Wachter, T. (2018). Inequality and the disappearing large firm wage premium. *American Economic Review (Papers and Proceedings)*, **108**, 317–22.

Brown, C. and Medoff, J. (1989). The employer size wage effect. *Journal of Political Economy*, **97**(5), 1027–59.

Bruns, B. (2019). Changes in workplace heterogeneity and how they widen the gender wage gap. *American Economic Journal: Applied Economics*, **11**(2), 74–113.

Bryson, A. and Forth, J. (2017). Wage growth in pay review body occupations. Report to the Office of Manpower Economics, June.

Card, D., Cardoso, A. R. and Kline, P. (2016). Bargaining, sorting, and the gender wage gap: quantifying the impact of firms on the relative pay of women. *Quarterly Journal of Economics*, **131**(2), 633–86.

Colonnelli, E., Tag, J., Webb, M. and Wolter, S. (2018). A cross-country comparison of dynamics in the large firm wage premium. *American Economic Review (Papers and Proceedings)*, **108**, 323–7.

Correia, S. (2016). Linear models with high-dimensional fixed effects: an efficient and feasible estimator. Unpublished Working Paper; available at http://scorreia.com/research/hdfe.pdf (accessed 14 May 2023).

Del Bono, E. and Vuri, D. (2011). Job mobility and the gender wage gap in Italy. *Labour Economics*, **18**, 130–42.

Duchini, E., Simion, S., Turrell, A. and Blundell, J. (2022). Pay transparency and gender equality; available online at https://doi.org/10.2139/ssrn.3584259 (accessed 14 May 2023).

Fox, J. T. (2009). Firm-size wage gaps, job responsibility, and hierarchical matching. *Journal of Labor Economics*, **27**(1), 83–126.

Gibbons, S., Overman, H. G. and Pelkonen, P. (2014). Area disparities in Britain: understanding the contribution of people vs. place through variance decompositions. *Oxford Bulletin of Economics and Statistics*, **76**(5), 745–63.

Green, C., Heywood, J. S. and Theodoropoulos, N. (2021). Hierarchy and the employer size effect on wages: evidence from Britain. *Economica*, **88**(351), 671–96.

Green, F., Machin, S. and Manning, A. (1996). The employer size–wage effect: can dynamic monopsony provide an explanation? *Oxford Economic Papers*, **48**(3), 433–55.

Gulyas, A., Seitz, S. and Sinha, S. (2023). Does pay transparency affect the gender wage gap? Evidence from Austria. *American Economic Journal: Economic Policy*, **15**(2), 236–55.

Hara, H. (2018). The gender wage gap across the wage distribution in Japan: within- and between-establishment effects. *Labour Economics*, **53**, 213–29.

Heinze, A. and Wolf, E. (2010). The intra-firm gender wage gap: a new view on wage differentials based on linked employer–employee data. *Journal of Population Economics*, **23**(3), 851–79.

Hirsch, B., Schank, T. and Schnabel, C. (2010). Differences in labor supply to monopsonistic firms and the gender pay gap: an empirical analysis using linked employer–employee data from Germany. *Journal of Labor Economics*, **28**(2), 291–330.

Holzer, H. (1998). Why do small establishments hire fewer blacks than large ones? *Journal of Human Resources*, **33**(4), 896–914.

Jewell, S., Razzu, G. and Singleton, C. (2020). Who works for whom and the UK gender pay gap. *British Journal of Industrial Relations*, **58**(1), 50–81.

Johnson, M. S. (2020). Regulation by shaming: deterrence effects of publicizing violations of workplace safety and health laws. *American Economic Review*, **110**(6), 1866–904.

Jones, M. and Kaya, E. (2019). Understanding the gender pay gap within the UK public sector. London: Office of Manpower Economics.

——— and ——— (2022). Organisational gender pay gaps in the UK: what happened post-transparency? IZA Discussion Paper no. 15342; available online at https://docs.iza.org/dp15342.pdf (accessed 23 May 2023)

Kaya, E. (2021). Gender wage gap across the distribution: what is the role of within- and between-firm effects? *IZA Journal of Development and Migration*, **12**(1), 1–49.

Lallemand, T., Plasman, R. and Rycx, F. (2007). The establishment-size wage premium: evidence from European countries. *Empirica*, **34**, 427–51.

Magda, I. and Sałach, K. (2021). Gender pay gaps in domestic and foreign-owned firms. *Empirical Economics*, **61**, 2237–63.

Main, B. G. and Reilly, B. (1993). The employer size–wage gap: evidence for Britain. *Economica*, **60**(238), 125–42.

Meng, X. (2004). Gender earnings gap: the role of firm specific effects. *Labour Economics*, **11**(5), 555–73.

Mitra, A. (2003). Establishment size, employment, and the gender wage gap. *Journal of Socio-Economics*, **32**(3), 317–30.

Mueller, H. M., Ouimet, P. P. and Simintzi, E. (2017). Within-firm pay inequality. *Review of Financial Studies*, **30**(10), 3605–35.

Mumford, K. and Smith, P. N. (2009). What determines the part-time and gender earnings gaps in Britain: evidence from the workplace. *Oxford Economic Papers*, **61**(1), 56–75.

Nekby, L. (2003). Gender differences in rent sharing and its implications for the gender wage gap: evidence from Sweden. *Economics Letters*, **81**(3), 403–10.

Office for National Statistics (ONS) (2021). *Annual Survey of Hours and Earnings, 1997–2021: Secure Access*. [data collection], 19th edn. UK Data Service, SN 6689. https://doi.org/10.5255/UKDA-SN-6689-18

Oi, W. Y. and Idson, T. L. (1999). Firm size and wages. In O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*. Amsterdam: Elsevier Science, pp. 2165–214.

Robinson, J. V. (1933). *The Economics of Imperfect Competition*. London: Macmillan.

Schmidt, C. M. and Zimmermann, K. F. (1991). Work characteristics, firm size and wages. *Review of Economics and Statistics*, **73**(4),705–10.

Song, J., Price, D., Guvenen, F., Bloom, N. and von Wachter, T. (2019). Firming up inequality. *Quarterly Journal of Economics*, **134**(1), 1–50.

Theodoropoulos, N., Forth, J. and Bryson, A. (2022). Are women doing it for themselves? Female managers and the gender wage gap. *Oxford Bulletin of Economics and Statistics*, **84**(6), 1329–55.

Troske, K. R. (1999). Evidence on the employer size–wage premium from worker–establishment matched data. *Review of Economics and Statistics*, **81**(1), 15–26.

UK Parliament (2015). Making GPG reporting regulations work; available online at https://publications.parliament.uk/pa/cm201516/cmselect/cmwomeq/584/58411.htm#_idTextAnchor122 (accessed 11 May 2023).

Vaccaro, G. (2018). Using econometrics to reduce gender discrimination: evidence from a difference-in-discontinuity design. Paper presented at the 2nd IZA workshop: Gender and family economics, New York; available online at https://conference.iza.org/conference_files/Gender_2018/viewProgram?conf_id=3104 (accessed 24 May 2023)

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Jones, M. and Kaya, E. (2023). The UK gender pay gap: Does firm size matter?. *Economica*, 1–16. https://doi.org/10.1111/ecca.12481