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DISCUSSION PAPER SERIES

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ABSTRACT

The Disability Pay Gap Within and Across Firms*

We assess the extent to which the UK disability pay gap is a consequence of the distribution of workers across firms and within-firm disability pay gaps. We do so by applying decomposition methods to newly-linked data which matches high quality information from employer payroll records to Census data on disability. Our findings indicate that the distribution of disabled and non-disabled employees across firms acts to reinforce within-firm disability-related pay inequality in England and Wales. However, both the disability pay gap and unexplained disability pay gap predominately exist within rather than between firms, supporting the introduction of employer disability pay gap reporting in the UK.

JEL Classification: J31, J71

Keywords: disability pay gap, wage discrimination, linked employer-employee data

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1. Introduction

Despite being both pronounced and persistent, the disability pay gap (hereinafter, DPG) has received limited attention internationally, especially in comparison to the literature on gender or ethnicity. Moreover, while attention has grown on the role of the distribution of employees across firms in driving earnings inequality, including in relation to gender (Card *et al.* 2016; Jewell *et al.*, 2020) and race (Carrington and Troske, 1998; Hellerstein and Neumark 2008; Phan *et al.*, 2023; Forth *et al.*, 2023), relatively few studies have considered this in relation to disability.[1] This is at least in part a consequence of the available data. While information on disability is routinely collected in household surveys, it is less typically collected as part of business surveys or formal administrative record keeping by employers.[2]

As a result, previous studies on the DPG have tended to adopt an individual focus, trying to quantify discrimination by distinguishing that part of the DPG which can be explained by other personal and work-related characteristics from a residual unexplained element, the causes of which are typically debated (DeLeire, 2001; Jones *et al.*, 2006; Longhi *et al.*, 2012; Malo and Pagan, 2012; Kruse *et al.*, 2018). Insights on the relevance of the organizational context are normally limited in such studies. Schur *et al.* (2009) provide an exception. Using data on 14 US companies from 2001-2006 they find considerable variation across firms in disability-related in-work indicators, including the DPG, consistent with an important role for 'corporate culture'. To our knowledge, however, Jones and Latreille (2010) provide the only prior evidence on within-workplace DPGs for a representative sample of employees. Their focus was exploring variation by workplace policies/practice. Using matched employer-employee data from the British Workplace Employment Relations Survey (2004) (WERS) they find that accounting for the distribution of

[1] We use the term firm interchangeably with employer, acknowledging that our sample contains public and private sector enterprises.

[2] Where employers collect information on disability it is typically for monitoring their own equality objectives and not made publicly available. As such, disability it is often collected in an ad-hoc and non-comparable manner between employers. The reluctance of employees to disclose disability to the employer also increases measurement error within firms.

employees across workplaces reduces the unexplained DPG, but that the majority (80%) of the unexplained DPG exists *within* workplaces (see Jewell *et al.*, 2020 and Forth *et al.*, 2023 for similar conclusions with respect to the gender and ethnicity pay gaps respectively).[3]

By applying well-established Oaxaca-Blinder (OB) decomposition methods (Oaxaca, 1973, Blinder, 1973) to newly linked data which match high quality information on disability from the 2011 Census in England and Wales to detailed employer payroll records in the Annual Survey of Hours and Earnings (ASHE) we enhance and extend this prior analysis in several ways. First, the employer payroll data from ASHE provide more reliable and detailed information on earnings and hours than that based on employee self-reports, improving the accuracy of analysis of the DPG and enabling analysis of multiple measures of pay.[4] Second, we have information for a far larger sample of employees and employers than Jones and Latreille (ibid.) or Schur *et al.* (ibid.); this permits exploration of heterogeneity across employees, such as by firm size, gender and sector of employment. Third, our matched data allow us to explore within and between disability pay gaps across firms rather than workplaces and it is the former which are likely to determine wage setting within the organisation (see Phan *et al.*, 2023). Fourth, in our data, information on disability is taken from a household survey which is not administered or accessible by employers, thereby avoiding biases which might result from workplace disclosure (see von Schrader *et al.*, 2014) and hence affect the validity of employer records on disability.

Building on recent insights on the role of the firm from the broader pay equality literature we focus on separating the influence of the distribution of employees across firms (for example, if disabled employees are concentrated in low paying firms) from DPGs that exist among co-workers within the same organisation. We do this at the mean, and across the earnings distribution

[3] The studies by Jones and Latreille (2010) and Forth *et al.* (2023) utilise cross-sectional samples of employees nested in firms, and so seek to account for firm wage effects by comparing co-workers. Jewell *et al.* (2020), on the other hand, utilises longitudinal linked employer-employee data to identify employee and firm wage effects via employee mobility across firms and are thus able to account for unobservable heterogeneity of both workers and firms in an AKM-style model (Abowd *et al.*, 1999). Our study follows the former approach as we do not have access to longitudinal information on employees' disability status.

[4] The earnings data utilised by Jones and Latreille (2010) is self-reported and banded into 14 earnings intervals.

applying quantile regression methods (Firpo and Pinto, 2016; Firpo *et al.*, 2018) given recent evidence of a pronounced 'glass ceiling' in the UK DPG (Jones, 2024b) and the potential for within and between-firm effects to vary across the distribution (Phan *et al.*, 2023). Consistent with the literature we also decompose the mean DPG to identify the contribution of differences in personal, job and firm characteristics between disabled and non-disabled employees, and use the matched nature of our data to further separate the unexplained DPG into that which exists within and between firms. We further build on the existing literature which has recognised the role of the components of pay, particularly performance-related pay (PRP), on gender (Jones and Kaya, 2024) and ethnic pay gaps (Green *et al.*, 2014), and analyse the DPG across multiple measures of hourly pay.[5]

Our analysis therefore extends existing evidence of within and between pay gaps for other protected characteristics (see for the UK, Jewell *et al.*, 2020 and Phan *et al.*, 2023) and contributes important new evidence on the role of worker allocation across firms to the international literature on the DPG (see, for example, Jones *et al.*, 2006 and Longhi *et al.* 2012). Such evidence is also fundamental to employers, and to policymakers seeking to reduce national DPGs, in deciding whether resources should be targeted at addressing within-organisation disability-related pay inequality or, differences in hiring and retention which may result in disabled workers being concentrated in lower paying firms. The latter is a particularly pertinent question given the recently announced plans (Prime Minister's Office and His Majesty King Charles III, 2024) to extend gender pay gap transparency in the UK to disability, whereby employers with more than 250 employees are required to publicly report within-firm pay gaps.

[5] In the context of disability, Hallock *et al.* (2022) provide a rare analysis of total reward in the US private sector, including pecuniary benefits such as health insurance and pension contributions. However, due to data constraints they rely on occupation-level measures of non-wage benefits whereas our analysis utilises the detailed individual level measures of PRP, pension contributions and overtime pay in ASHE. We therefore contribute new evidence on the extent to which the DPG is sensitive to the measurement of pay, and the extent to which consideration of various pay components influences estimates of within and between firm DPGs.

In common with workers in countries such as the US and Australia, disabled people in the UK are protected from discrimination under equality legislation (the Equality Act, 2011) which also requires employers to provide reasonable accommodations to prevent disabled employees from being disadvantaged. Our evidence is also timely given the rising prevalence of disability among employees in the UK (see Jones, 2024b), increasing recognition of the role of employers (see, for example, the UK National Disability Strategy, HM Government, 2021), recommendations to government to monitor the national DPG (House of Commons Work and Pensions Committee, 2021) and the proposed extension of gender pay gap transparency to disability mentioned above.[6]

Our findings suggest that the size of the DPG is fairly consistent across alternative measures of hourly pay due to the dominance of basic pay to total pay. Differences in the allocation of workers across firms act to increase both the raw DPG and unexplained DPG. However, the majority of the raw and unexplained DPG exits within firms, or between co-workers, supporting the employer focus of current proposals for DPG transparency. We further find that the within firm DPG is larger among firms with more than 250 employees, consistent with the proposed targeting at larger firms.

The remainder of this paper is structured as follows. Section 2 introduces the linked ASHE-Census data and outlines our measures and approach. Section 3 presents our initial regression estimates and explores heterogeneity in the patterns, including by firm size and across the earnings distribution. Section 4 provides a more detailed decomposition analysis of the DPG at the mean. Section 5 briefly concludes.

[6] In Wales, there is a target to eliminate the DPG by 2050.

2. ASHE-Census Data

Our ASHE-Census data (Office for National Statistics, 2023) links payroll data from ASHE 2011 to the 2011 Census and contains observations for around 0.45 percent of employee jobs in England and Wales (a total of 120,416 observations). The Census supplements the detailed information on pay, hours and job characteristics in ASHE with information on a broader range of personal and household characteristics, including employee-reported disability. The ASHE has been extensively used in the analysis of earnings inequality in the UK, particularly in relation to gender (see, for example, Jewell *et al.* 2020) with the ASHE-Census recently used to explore ethnicity pay gaps (see Phan *et al.*, 2023).[7] The information on disability provides a rare opportunity to explore the DPG using linked employee-employer data, and with a larger sample and more reliable and detailed data on earnings than WERS. The focus on 2011 reflects the most recent data available, but there is no evidence that the DPG has diminished in the UK since then (see Jones, 2024b).

The overall linkage rate between the ASHE and the 2011 Census is 74% of ASHE job observations (Forth *et al.*, 2022).[8] We weight our estimates by sampling weights designed to correct for the non-random linkage, ensuring that our estimation sample is representative of employees in England and Wales. We focus on a working-age sample throughout, defined as 16-64 for both women and men. We further restrict our analysis to jobs in the matched sample where the employee is paid an adult rate, has earnings in the reference period that are unaffected by absence and has basic weekly hours in the range 1-99 hours. We also exclude observations with missing information on any of our variables of interest (see below). These exclusions yield a sample of 102,818 jobs from 100,448 employees across 33,216 firms. Given our focus on the firm, we condition our sample on having a minimum of two employees within each employer to estimate

[7] For a more detailed discussion of the ASHE-Census dataset see Forth *et al.* (2022).
[8] As Forth *et al.* (2022) show, conditional on other characteristics, matching rates are lower for older and younger workers than middle-aged workers, higher among male employees than female employees, and lower for those working in London than in the other regions of England and Wales.

firm-specific wage effects (that is, the component of wages common to co-workers in the same firm).[9] Our remaining sample is 78,037 jobs from 76,505 employees in 8,435 firms. This estimation sample is necessarily skewed towards larger firms (see Appendix Table A.1).

Disability

Disability is defined in the Census 2011 using a single question aligned to the activity limiting definition applied in the 2010 Equality Act. Individuals are asked "*Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? Include problems related to old age".* Individuals who answer *Yes, limited a lot* or *Yes, limited a little* are defined as disabled and remaining employees are all classed as non-disabled.[10] Rates of disability based on the 2011 Census measure have been shown to correspond closely to prevalence rates in the Family Resources Survey (ONS, 2013). Within our estimation sample, the (weighted) prevalence of disability among employees is 5.3% (with 0.8% limited a lot and 4.5% limited a little), lower than comparable rates in WERS (9.7%) or the Quarterly Labour Force Survey (QLFS) (11.9%) (see Jones *et al.*, 2021).

Our measure shares limitations with self-reported measures typically utilised in the literature including individual measurement error, likely to downward bias estimates of the DPG, and justification bias, where disability is used to justify inferior economic outcomes. The latter will be limited by the focus on employees, but will act to upward bias the absolute size of the DPG. Since disability is reported separately and anonymously through the Census, it is unrelated to the collection of employer payroll information in ASHE. In this respect, the linked nature of the data has several advantages over other sources, including that there is no requirement that the disability

[9] The resulting sample necessarily over-represents jobs in larger firms, but reassuringly the prevalence of disability (5.2%) is similar to that found in the full working sample, and the raw DPG and unexplained DPG are also similar across the two samples (compare Table 2 with Appendix Table A.5).
[10] This is consistent with the current Equality Act definition in the UK Labour Force Survey (see ONS, 2021). We explore variation by self-reported intensity of limitation in Section 3.

is disclosed to the employer, minimising the potential influence of the workplace equality environment on disability reporting.[11]

Hourly earnings

Information on hourly earnings is derived from ASHE. Our initial hourly earnings measure is based on basic gross hourly pay for the reference period, excluding overtime, shift premia, PRP and other additional payments made within the April reference period.[12] However, the detailed information on different elements of earnings within ASHE allows us to explore the role of such components, as well as capturing employer pension contributions to explore a broader measure of reward.[13] While we focus on total hourly earnings as a measure most comparable to the literature, recognising the distinct nature of the additional elements of earnings, which include measures where there is discretion in uptake and value both on the part of employees (e.g. overtime pay) and employers, we consider the sensitivity of our estimates to the measurement of earnings.

Our complete set of earnings measures are (i) the basic hourly pay rate which divides basic pay by basic paid hours, (ii) basic hourly pay which divides basic pay by total paid hours, (iii) additional hourly earnings which divides additional earnings (shift pay; overtime pay; incentive pay; other pay) by total paid hours, (iv) total hourly earnings which divides total pay by total paid hours and (v) total hourly earnings plus pensions, which divides total pay plus employer pension contribution by total paid hours. Employer pension contributions are defined as any payment made by the employer to a pension scheme run or facilitated by the organisation, including defined benefit and defined contribution schemes.[14] For brevity, our main specifications focus on the

[11] Out of the entire sample of jobs held by employees of working age, less than 0.4% of observations are excluded due to missing information on disability.
[12] To avoid outliers, we also winsorize all earnings variables at the 0.5th and 99.5th percentiles.
[13] It is not possible to separate the different elements of PRP, which include among other elements bonuses and piece rates in ASHE.
[14] Lump sum contributions that cover more than one employee are excluded, as are contributions made by the employee themselves.

hourly pay rate (basic pay divided by basic paid hours) and total hourly earnings (total pay divided by total paid hours). Other measures are shown in the Appendix.

Table 1 provides descriptive statistics relating to our matched sample ASHE-Census, for these two measures of hourly earnings.[15] Figures are presented by disability, both at the mean and across selected percentiles of the distribution.[16] The mean hourly DPG is fairly similar across the alternative measures of pay at about 11%, with a wider disability gap in additional pay slightly increasing the DPG in total pay relative to basic pay at the mean.[17] More detailed analysis of the separate components of additional earnings is presented in Appendix Table A.3, where large disability gaps in the value of incentive pay, overtime pay and 'other pay' contribute to a pronounced disability gap in additional pay. However, while disability gaps in additional payments are larger in percentage terms than the gap in basic pay, the value of these additional payments is small on average, resulting in a modest impact on disability gaps in total pay. Table 1 also shows that the DPG rises across the wage distribution, particularly below the median. Indeed, the DPG is less than 2% at the bottom 10th percentile of the wage distribution.

[Table 1 here]

Explanatory variables

Our specification builds on the existing literature on the DPG (Jones *et al.*, 2006; Longhi *et al.*, 2012) and recent evidence on ethnicity using the ASHE-Census (Phan *et al.*, 2023). In terms of employees' personal characteristics, we control for sex and age (and age-squared) using data from ASHE and supplement this with additional controls available from the Census including highest educational attainment (six categories), marital status, number of children (four categories), age of youngest child (six categories), ethnicity (eight categories) and whether born in the UK.[18] We also

[15] Further measures are available in Appendix Table A.2.
[16] Kernel density plots of the entire distribution are presented in Appendix Figure A.1.
[17] The disability gap in gross weekly earnings is 14.3% but there is a disability gap in total weekly hours of 5.2%.
[18] In additional specifications we explore heterogeneity by gender (see Section 3).

control for the following job-related characteristics from ASHE: tenure (eight categories), part-time (1-29 basic hours per week), coverage of collective bargaining and whether the job is the employees' second job (defined based on the smallest number of hours). We further control for occupation measured by the Standard Occupational Classification (SOC) 2010 Minor Group (3-digit; 90 categories) but explore the sensitivity of our findings to less detailed classifications (2-digit; 25 categories).

A key advantage of ASHE is, however, that jobs within the same firm can be identified, since each job record has an enterprise (firm) identifier derived from the UK's official business register (the Inter-Departmental Business Register (hereinafter, IDBR), maintained by the Office for National Statistics).[19] This facilitates the inclusion of employer characteristics: firm size (measured by the number of employees); industry sector (measured by the 2007 Standard Industrial Classification (SIC) (15 SIC sections)); sector of ownership (private/public); and head office region using the 11 NUTS1-level regions of England and Wales. Some of these characteristics are measured in household surveys, albeit with error.

Descriptive statistics of all the explanatory variables utilised in the analysis by disability are provided in Online Appendix Table A.4. Consistent with existing literature disabled employees are on average older and less well-qualified relative to non-disabled employees. The former is reflected in longer average job tenure. Aligned to previous evidence on union membership (Jones, 2024a), disabled employees are more likely to have their pay set by collective bargaining, consistent with a greater concentration of disabled employees in public relative to the private sector employment. Disabled employees are also more likely to work part-time.

[19] An enterprise is defined as the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making within a broader enterprise group. It corresponds to the general understanding of a firm. An enterprise may operate across a number of sites (workplaces), referred to on the IDBR as local units.

Within and Between Firms

In contrast to most of the literature on the DPG, the availability of a firm identifier allows us to capture the contribution of both observed and unobserved employer characteristics in the analysis. We are therefore able to separately identify that part of the DPG which relates to pay differences between co-workers within the same firm and that part which relates to differences in the distribution of disabled and non-disabled employees between firms. As noted earlier, we condition our estimation sample on having a minimum of two employees within each firm for this purpose. Within our estimation sample, 34% of employees have no disabled coworkers who are observed in ASHE; these employees account for 77% of all firms in the sample. Within-firm DPGs are therefore estimated on a sample of 51,379 employees in 1,918 firms.

Appendix Figure A.2 presents the distribution of average hourly pay by firm, and the deviation of individual employee pay from the firm average, by disability. Disabled employees are more likely to work in firms with lower wages on average: the average firm-level hourly pay for non-disabled and disabled employees is £14.23 and £13.60 respectively (a difference of £0.63 per hour). However, within firms, on average non-disabled employees earn £0.30 more than the firm average while disabled employees earn £0.66 less (a difference of £0.96 per hour). In short, the national DPG (shown as £1.58 per hour in Table 1, or 11% of non-disabled total hourly pay) is a function of both the relative concentration of disabled employees within low wage firms and within firm DPGs.[20]

We go on to utilize the fact that a number of firms have multiple employees in the sample to construct a measure of the share of disabled employees in the firm, examining its correlation with the scale of the DPG. Since the ASHE-Census dataset captures only 0.45 per cent of all employee jobs, we observe only a small proportion of employees within any given firm and so measures at the firm level are subject to considerable measurement error. On average an employee

[20] Differences are due to rounding.

has 32 co-workers in our sample, but this figure necessarily varies greatly with the size of the firm. We therefore focus our exploration of the share disabled only among the largest firms, defined as having a minimum of 5,000 employees and minimum employee sample size of 25 (see Section 3).

3. Within and Between Firm DPGs

We first estimate an equation of log earnings which pools observations from both disabled and non-disabled employees as follows:

$$ln\, W_{ij} = \alpha + \mu D_{ij} + X_{ij}\beta + F_j\gamma + \varepsilon_{ij} \quad (1)$$

The natural logarithm of each measure of hourly earnings (W_{ij}) for individual i in firm j is regressed on a constant (α) and a binary indicator of disability (D_{ij}). The DPG is therefore given by μ. We successively build up the specification to include observable employee personal and job characteristics (X_{ij}) and employer-related (firm) (F_j) control variables outlined above. As such, we estimate both raw and adjusted measures of the DPG in log earnings. The latter are based on differences between more comparable disabled and non-disabled employees in more comparable jobs and, which we interpret as closer to a measure of disability-related wage inequality.[21]

To measure the within-firm DPG in log earnings, we replace F_j in equation (1) with a set of variables that capture the firm in which the worker is employed, where the coefficients (φ_j) capture earnings differences common to employees within the firm. In this way we are capturing the influence of observable and unobservable firm characteristics.

$$ln\, W_{ij} = \alpha + \omega D_{ij} + X_{ij}\delta + \varphi_j + \varepsilon_{ij} \quad (2)$$

As in the case of Equation (1), we estimate both unadjusted and adjusted within-firm DPGs where the latter include the observable employee personal and job characteristics (X_{ij})

[21] Unobserved employee-level heterogeneity between disabled and non-disabled employees which affects earnings remains a potential bias.

mentioned above. The average raw within-firm DPG (ω_j), estimated without X_{ij}, would be comparable to the employer metric used in gender pay gap reporting, whilst the adjusted within-firm DPG, estimated after including X_{ij}, is a more sophisticated measure of within-firm disability-related earnings inequality. In the within-firm specifications we are comparing disabled and non-disabled employees within the same firm and so removing the influence of between-firm segregation (that is, differences in the distribution of disabled and non-disabled employees across high and low wage employers).

Table 2 presents the coefficient estimates for disability from alternative specifications of equation (1) and (2) for both measures of earnings.[22] In column (1) we present the raw mean DPG whereas in column (2) we present the raw within firm DPG. In column (3) we include employee personal and job characteristics, column (4) further adds observable firm characteristics, while firm characteristics are replaced by within firm estimates in column (5). Column (4) therefore represents the adjusted DPG typically analysed in the literature while column (5) can be interpreted as a within-firm adjusted DPG. We interpret a narrower adjusted DPG as an indication of greater disability-related wage equality but refrain from making inferences in relation to discrimination due to the potential influence of unobservables (see DeLeire, 2001, Jones *et al.*, 2006 and Longhi *et al.*, 2016).

Throughout we interpret log points as approximate percentage differences. Consistent with Table 1 the raw DPG (column (1)) is between 9% and 10% depending on the precise measure of hourly pay. The inclusion of covariates across columns (2)-(5) has a fairly similar influence across the hourly pay measures and so we focus our attention on total pay given its widespread use in the literature. The within-firm raw DPG at 6.8% (column (2), is nearly 3 percentage points narrower than the raw DPG, consistent with nearly one-third of the raw DPG reflecting disabled

[22] The specifications shown in columns (1), (3) and (4) of Table 2 can also be estimated on the full working sample, including firms with just one employee observation; the raw DPG and unexplained DPG are similar in this broader sample – see Online Appendix Table A.5. A full set of estimates for total hourly pay, showing all covariates, is included in Online Appendix Table A.6.

employees, relative to non-disabled employees, working in lower paid firms on average. Turning to the adjusted DPG, disability-related differences in personal and job characteristics (column (3)) play an important role with a considerably narrower (4.0%) adjusted gap relative to the raw DPG. The inclusion of observable firm characteristics plays only a small additional narrowing role (column (4)). Similarly, the additional contribution of accounting for unobserved firm effects is fairly modest with a within firm adjusted DPG of 3.2%, suggesting the majority of unexplained wage inequality between disabled and non-disabled employees (about 80%) exists within rather than between firms (that is column (5) compared to column (3)). In this respect, our initial estimates suggest the proposed focus of reporting on the within-firm DPG is well-placed. It further suggests that existing estimates in the literature which are based on household surveys either including or excluding firm characteristics are likely to slightly overestimate disability-related wage inequality by a factor of 12-20% or 0.4-0.8 percentage points (that is column (4) or column (3), compared to column (5)).

[Table 2 here]

We explore the robustness of our benchmark estimates based on total hourly earnings to a series of changes in specification and sample, including restricting the sample to full-time employees, removing the survey weights and replacing 3-digit controls for occupation with less detailed 2-digit controls (see Online Appendix Table A.7). The findings are robust to these changes. While the DPG for full-time employees is narrower than among all employees and the between-firm effects play an even more modest role.

We further explore heterogeneity in our estimates for total hourly earnings by selected characteristics of the disability, personal characteristics and firm characteristics. First, we disaggregate our measure of disability to distinguish the DPG among those limited 'a little' and limited 'a lot'. Second, we allow the estimates to vary by gender. In terms of firm characteristics, we consider sector (following Jones, 2024b), where the public sector is distinguished from the

private sector (including the voluntary sector) and coverage of collective bargaining (following Jones, 2024a).

These results are presented in Appendix Table A.8. The raw and adjusted DPG is larger for those restricted 'a lot' rather than 'a little' but the within firm adjusted estimates are relatively similar to the adjusted DPG across both severity measures. The adjusted DPG is larger for males than females and the narrowing that arises from accounting for between-firm effects appears to predominately operate for males. Surprisingly given the evidence in Jones (2024b), there is no significant difference in the adjusted DPG between the private and public sector. Consistent with Jones (2024a), however, there is minimal evidence that the adjusted DPG is different for employees who are and who are not covered by a collective agreement.

Given the proposed 250-employee threshold for DPG reporting we also consider heterogeneity by firm size (see Jones and Kaya, 2023 for corresponding analysis by gender). These results are presented in Table 3. In the upper panel we explore heterogeneity across the 250-employee threshold, whereas in the lower panel we further distinguish between large firms on size.

In ASHE, 66% of non-disabled and 68% of disabled working-age employees are employed in firms with 250 or more employees. The first row of Table 3 shows that the raw DPG in total hourly pay in these firms is 9.2% and the raw within-firm DPG is 7.1%. The adjusted within-firm DPG is 3.5%. The non-significant interaction term in column (1) shows that the raw DPG is not significantly different among smaller firms. However, the within-firm raw DPG and within-firm adjusted DPGs are narrower in this group (see columns (2) and (5)). The lower panel of Table 3 sets the smallest firms as the reference group in order to explore variation in the DPG by firm size in greater detail, indicating that the within-firm raw DPG and within-firm adjusted DPG are broadly increasing increase in firm size. In this respect, our analysis suggests that proposed pay gap reporting legislation would be correctly targeted at larger disability pay gaps within larger firms.

[Table 3 here]

Aligned to the existing literature on gender segregation (Mumford and Smith, 2009), for a smaller subsample of the largest firms (as defined above) we also consider the role of disability workforce composition at the firm.[23] These results are presented in Appendix Table A.9. While pay for non-disabled workers is lower where the share of disabled employees is greater than 2.5%, even after controlling for employee composition and firm characteristics, the share of disabled workers has no relationship with the DPG. Put simply, we find no evidence that the concentration of disabled employees within the firm influences the DPG.

Given recent evidence that the DPG varies across the distribution, we replicate our analysis of the DPG at the mean across the unconditional wage distribution, presenting corresponding estimates at the 10th, 25th, 50th, 75th and 90th percentile. We do this using recentred influence function (RIF)-OLS earnings equations (see Firpo and Pinto, 2016; Firpo *et al.*, 2018; Rios-Avila, 2020).[24] In this way we can identify the presence of 'sticky floors' or 'glass ceilings' (see, Arulampalam *et al.*, 2007) in the DPG and the within-firm DPG. We present the corresponding estimates to the mean DPG (see specifications in Table 2) across the distribution for total hourly pay in Figure 1.[25]

Consistent with recent evidence from the QLFS (Jones, 2024b), the raw and adjusted DPG increase across the wage distribution, suggesting greater disability-related wage inequality among higher earners. In keeping with analysis at the mean, the DPG is smaller after adjusting for personal and job characteristics and, the proportion of the DPG explained by these characteristics is most pronounced at the 50th and 75th percentiles. While the additional contribution of observable employer characteristics is modest throughout, the allocation of disabled and non-disabled

[23] As noted above, since we observe only a small proportion of employees within any given firm, we seek to reduce measurement error in disability prevalence by restricting this analysis to firms defined as having a minimum of 5,000 employees. Such firms are likely to have at least 25 employees in our sample and we enforce this restriction; with this in place, a firm-level estimate of 5% disabled employees will have a standard error of 4 percentage points. Firms with 5,000 or more employees account for almost two-fifths (38%) of all employees in employment (see Table A.1). The distribution of the share of disabled employees across these larger firms is presented in Appendix Figure A.3.
[24] In this case the firm wage effects are estimated at a specific quantile.
[25] The corresponding coefficient estimates are presented in Appendix Table A.10.

employees across firms appears to have a greater influence on the adjusted DPG among high earners, at least in absolute terms. At the 90th percentile the adjusted DPG is about 2 percentage points lower when estimated within firms (6.7% vs. 8.5%). Nevertheless, there is evidence of a significant within-firm adjusted DPG across the upper half of the pay distribution; that is, outside of lower-paid work, observationally-similar disabled employees receive less pay per hour than their non-disabled co-workers in the same firm.

[Figure 1 here]

4. Decomposition Analysis

We provide a more detailed analysis of the mean DPG in total hourly pay by applying OB decomposition (Oaxaca, 1973, Blinder, 1973) methods. This allows us to decompose the raw DPG into the components that are attributable due to the differences in the observable characteristics of employees and their jobs, differences in the firms they work for, and a remaining unexplained component. We first undertake a decomposition analysis that relies solely on observable characteristics, as in Equation (1). We then take advantage of the matched employee-employer nature of the data by undertaking a second decomposition analysis in which we also take account of unobservable firm characteristics, as in Equation (2). In both variants, we follow the approach proposed by Fortin *et al.* (2008, 2011), in which the reference wage structure is obtained from a pooled wage regression that includes a dummy variable to identify disabled employees. This has the advantage that the decompositions are then fully compatible with estimates provided in column (4) and column (5) of Table 2.[26]

First, following Equation (1), we decompose the raw DPG into three parts:

[26] See Fortin *et al.* (2011: 47-48) for a discussion of the choice of reference wage structure. An alternative approach which estimated the reference wage structure solely among non-disabled employees would require us to restrict the estimation sample to those firms with at least two non-disabled employees in the sample (in order to estimate φ_j in Equation 2); this would skew the sample towards larger firms with fewer disabled employees. Estimating separate wage structures for non-disabled and disabled employees would be even more restrictive, since most of the disabled employees in the sample are only observed alongside non-disabled co-workers.

$$E\left[lnW_{ij}\middle|D=1\right]-\ E\left[lnW_{ij}\middle|D=0\right]=\{E\left[X_{ij}\middle|D=1\right]-\ E\left[X_{ij}\middle|D=0\right]\}\hat{\beta}$$
$$+\{E\left[F_j\middle|D=1\right]-\ E\left[F_j\middle|D=0\right]\}\hat{\gamma}+\mu \qquad (3)$$

The first two components represent those parts of the DPG explained by differences in (1) observed personal and job characteristics and (2) observed firm characteristics respectively. The unexplained component of the DPG is given by μ and is typically considered to reflect differences in the returns to these characteristics between disabled and non-disabled employees, but it may also reflect omitted variables, something we go on to consider in Equations 4 and 5.

We present these estimates in Panel A of Table 4, where we further separate the role of highest qualifications and occupation. Almost half of the raw DPG (48% or 0.045 log points) is explained by differences in personal and job characteristics. The role of (detailed) occupation dominates (and is partially offset by other job characteristics); that is, relative to non-disabled employees, disabled employees are concentrated in lower paying occupations on average. Observable firm characteristics make a significant additional contribution, accounting for around one seventh (14%) of the DPG. Nevertheless, that about two-fifths (38%) of the DPG (3.6 percentage points) is unexplained is consistent with the literature and, as in Section 3, provides evidence consistent with disability-related wage inequality.[27]

[Table 4 here]

Our second decomposition, based on Equation (2), goes further, examining how those parts of the raw DPG attributed to differences in observed characteristics change when we take account of unobservable firm characteristics, and separately identifying the within-firm component of the unexplained DPG from the between-firm component. For this second decomposition, we build on Phan *et al.* (2023) and do this in two stages. First, in a similar way to the discussion above we decompose a version of Equation (2) as follows:

[27] A decomposition which estimates the reference wage structure solely among non-disabled employees gives very similar results (Table A.11).

$$E\left[lnW_{ij}\middle|D=1\right]-\ E\left[lnW_{ij}\middle|D=0\right]=\{E\left[X_{ij}\middle|D=1\right]-\ E\left[X_{ij}\middle|D=0\right]\}\hat{\beta}$$
$$+\{E\left[\ \hat{\varphi}_j\middle|D=1\right]-\ E\left[\ \hat{\varphi}_j\middle|D=0\right]\}+\omega \qquad (4)$$

In a similar manner to above, the first component reflects that explained by differences in personal and job characteristics, but the observable firm characteristics are replaced by estimates of the average adjusted firm wage effects $\left(\widehat{\varphi_j}\right)$, which account for observable and unobservable firm characteristics. In this case, the second term in Equation (4) captures that part of the DPG that is explained by the distribution of disabled and non-disabled employees across firms and, ω is the unexplained *within-firm* DPG. In a similar manner to above we can separate the first component into personal characteristics, job characteristics and occupation. However, it is further possible to separate the contribution of the firm into that which relates to observable firm characteristics and that which reflects unexplained between firm variation. We do this by running the additional employee-level regression:

$$\hat{\varphi}_{ij}=\delta+\theta D_{ij}+F_j\vartheta+\rho_{ij} \qquad (5)$$

and then decomposing the estimates of the firm wage effects as follows:

$$E\left[\ \hat{\varphi}_{ij}\middle|D=1\right]-\ E\left[\ \hat{\varphi}_{ij}\middle|D=0\right]=\{E\left[F_j\middle|D=1\right]-\ E\left[F_j\middle|D=0\right]\}\hat{\vartheta}+\ \theta \qquad (6)$$

The first term in Equation (6) measures the role of observable firm characteristics in explaining the raw DPG and θ is that part of the raw DPG attributable to differences in unobserved workplace characteristics (that is, differences in wages between firms that hire more or fewer disabled employees, that are not explained by the components of F_j).

We present these estimates in Panel (B) of Table 4. Here, observed employee characteristics account for 47% of the raw DPG and observed firm characteristics account for a further 10%. Around one third (34%) of the gap is accounted for by unexplained differences in

wages between co-workers within firms, and 9% by unexplained differences in wages between firms that employ more or fewer disabled workers.

The comparison between the two decomposition approaches indicates the additional value of matched employer-employee data relative to household surveys which typically contain selected employer information (see, for example, Jones *et al.*, 2006; Jones, 2024b). First, in Panel B, we show that the within-firm unexplained DPG is large relative to most other factors, suggesting an important role for within firm disability-related wage inequality, and supporting the within-employer focus of the proposed DPG reporting. Second, Panel B also suggests an important role for worker allocation across firms, accounting for 1.9 percentage points (19%) of the 9.5 percentage point DPG.

5. Conclusion

Newly linked ASHE-Census data provide a rare opportunity to explore how the allocation of workers across firms contributes to the DPG in England and Wales. The data further contain high quality information on earnings and disability, and allows us to account for a comprehensive range of personal and job-related characteristics. In doing so we extend existing international evidence on the DPG which has almost exclusively relied on self-reported employee information on earnings from household surveys containing limited information on the firm in which the worker is employed. Given the detailed information on earnings available, we are further able to explore multiple measures of pay to better understand how the DPG varies depending on the measurement of earnings.

We find that the DPG is fairly consistent across pay measures reflecting that, while disability gaps in additional payments (including incentive pay and overtime) are large, their value relative to basic pay is small, resulting in a modest impact on total pay.

Using regression and decomposition methods we show that the allocation of disabled and non-disabled employees across firms reinforces the within-firm DPG and unexplained DPG. Our

evidence suggests that estimates based on typical specifications in the literature, which are unable to account fully for wage differences across firms, will overestimate disability-related wage inequality by 12-20% (0.4-0.8 percentage points). Given the dominance of within-firm gaps to both the DPG and unexplained DPG our evidence supports the proposed extension of employer pay gap reporting to disability. Analysis of heterogeneity by firm size further indicates that the proposed firm size threshold of 250 employees will target the legislation at firms with a larger within-firm DPG.

In terms of policy and practice our findings provide clear evidence of the importance of addressing within-firm DPGs. However, they also demonstrate a need to consider the reinforcing effect of the allocation of workers across firms and the potential disability-related barriers in this regard. This is consistent with calls for DPG reporting to explicitly include a measure of disability prevalence among the workforce to better measure the distribution of disabled employees across firms.

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Table 1: Descriptive statistics on earnings (£/hour), by disability

	Basic rate	Total pay
Non-disabled		
Mean	13.92	14.53
Percentiles		
10th	6.42	6.57
25th	7.91	8.30
50th	11.27	11.96
75th	17.36	17.97
90th	24.62	25.46
N	*73,815*	*73,815*
Disabled		
Mean	12.46	12.95
Percentiles		
10th	6.34	6.45
25th	7.46	7.81
50th	10.00	10.61
75th	15.32	16.11
90th	21.73	22.11
N	*4,222*	*4,222*
DPG (%)		
Mean	-10.51	-10.88
Percentiles		
10th	-1.19	-1.73
25th	-5.64	-5.86
50th	-11.27	-11.31
75th	-11.78	-10.35
90th	-11.72	-13.15

Notes: Weighted sample statistics calculated from ASHE-Census 2011. DPG calculated as the difference between the wages of disabled employees and non-disabled employees, expressed as a percentage of the non-disabled wage, or the simple difference where the original values are percentages. Differences may not sum due to rounding.

Table 2: Raw and adjusted DPG, across and within firms

	Raw	Raw: within-firm	Adjusted: employee and job characteristics	Adjusted: employee, job and firm characteristics	Adjusted: employee and job characteristics within-firm
	(1)	(2)	(3)	(4)	(5)
Basic rate	-0.091 ***	-0.064 ***	-0.036 ***	-0.033 ***	-0.028 ***
	(0.008)	(0.007)	(0.005)	(0.005)	(0.004)
Number of observations	*78,037*	*78,037*	*78,037*	*78,037*	*78,037*
Adjusted R-squared	*0.002*	*0.378*	*0.662*	*0.695*	*0.747*
Total pay	-0.095 ***	-0.068 ***	-0.040 ***	-0.036 ***	-0.032 ***
	(0.008)	(0.007)	(0.005)	(0.005)	(0.005)
Number of observations	*78,037*	*78,037*	*78,037*	*78,037*	*78,037*
Adjusted R-squared	*0.002*	*0.377*	*0.650*	*0.685*	*0.737*

Notes: OLS regression coefficients, estimated from ASHE-Census 2011. DPG calculated as the difference in log points between the log hourly wages of disabled employees and non-disabled employees. Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1.

Table 3: Heterogeneity in the DPG by firm size (number of employees)

	Raw		Raw: within-firm		Adjusted: employee and job characteristics		Adjusted: employee, job and firm characteristics		Adjusted: emp. and job chars. within-firm	
	(1)		(2)		(3)		(4)		(5)	
By firm size (summary):										
Disabled	-0.092	***	-0.071	***	-0.041	***	-0.038	***	-0.035	***
	(0.008)		(0.007)		(0.005)		(0.005)		(0.005)	
Small firm (<250 employees)	-0.023	***			-0.046	***	-0.044	***		
	(0.006)				(0.004)		(0.004)			
Disabled * Small firm	-0.026		0.046	**	0.014		0.015		0.037	**
	(0.027)		(0.022)		(0.017)		(0.016)		(0.014)	
Adjusted R-squared	*0.002*		*0.377*		*0.650*		*0.685*		*0.737*	
By firm size (detailed):										
Disabled	-0.118	***	-0.025		-0.027	*	-0.023		0.002	
	(0.026)		(0.021)		(0.016)		(0.015)		(0.014)	
250-999 employees	0.060	***			0.032	***	0.031	***		
	(0.008)				(0.005)		(0.005)			
1,000-4,999 employees	0.081	***			0.059	***	0.052	***		
	(0.007)				(0.005)		(0.004)			
5,000+ employees	-0.015	**			0.044	***	0.045	***		
	(0.007)				(0.004)		(0.004)			
Disabled * 250-999 employees	0.027		-0.032		-0.002		-0.002		-0.022	
	(0.034)		(0.028)		(0.022)		(0.021)		(0.019)	
Disabled * 1,000-4,999 employees	0.035		-0.048	*	-0.020		-0.021		-0.047	***
	(0.031)		(0.026)		(0.019)		(0.018)		(0.017)	
Disabled * 5,000+ employees	0.027		-0.048	**	-0.015		-0.016		-0.036	**
	(0.028)		(0.023)		(0.017)		(0.016)		(0.015)	
Adjusted R-squared	*0.008*		*0.377*		*0.651*		*0.685*		*0.737*	
Number of observations (both specifications)	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	

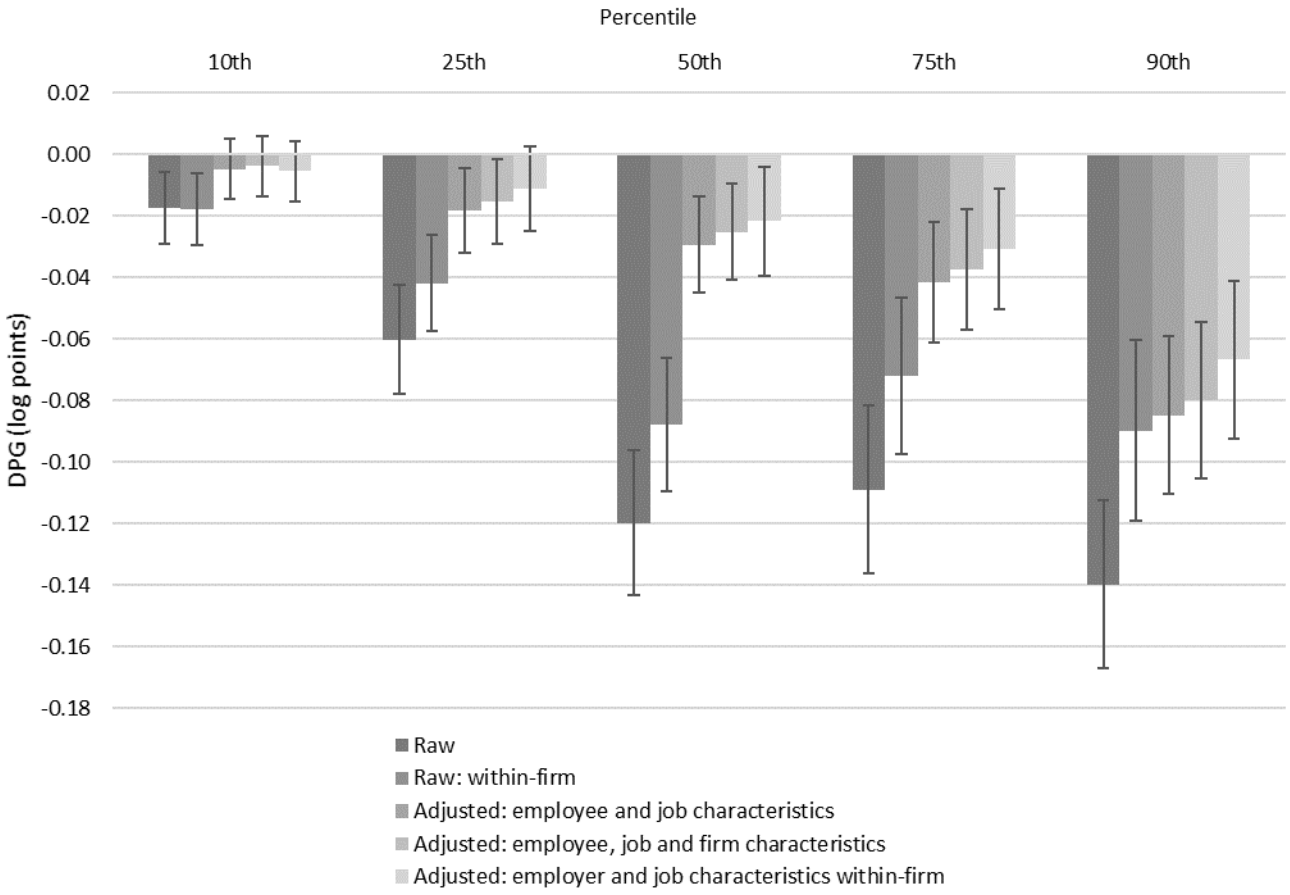
Notes: OLS regression coefficients for total hourly earnings, estimated from ASHE-Census 2011. Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1.

Table 4: Decomposition of DPG at the mean

			% of DPG	
Raw DPG	-0.095	***		
	(0.008)			
Panel A: DPG Decomposition using observables				
Demographic characteristics	0.015	***	-15%	
	(0.002)			
Highest qualifications	-0.021	***	23%	
	(0.002)			48%
Occupation	-0.049	***	52%	
	(0.004)			
Job characteristics, other than occupation	0.011	***	-11%	
	(0.001)			
Firm characteristics	-0.013	***	14%	
	(0.002)			
Unexplained	-0.036	***	38%	
	(0.005)			
Panel B: DPG Decomposition using unobserved workplace characteristics				
Demographic characteristics	0.014	***	-15%	
	(0.001)			
Highest qualifications	-0.019	***	20%	
	(0.002)			47%
Occupation	-0.047	***	49%	
	(0.004)			
Job characteristics, other than occupation	0.007	***	-7%	
	(0.001)			
Unexplained within firm	-0.032	***	34%	
	(0.004)			
Firm characteristics	-0.010	***	10%	
	(0.002)			
Unexplained between firms	-0.009	***	9%	
	(0.003)			

Notes: Estimates based on OB decomposition methods, as set out in the text, applied to total hourly earnings. Robust standard errors estimated via the delta method and reported in parentheses. Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1. Components may not sum to raw DPG due to rounding errors.

Figure 1: Raw and adjusted DPG, across and within firms, across the wage distribution



Notes: Error bars show 95% confidence intervals. The underlying coefficient estimates are presented in Table A.10.

Online Appendix: The Disability Pay Gap Within and Across Firms

Table A.1: Distribution of full ASHE-Census sample and estimation sample by firm size

Firm size (number of employees):	Observations (unweighted)		Proportions (weighted)	
	Full sample	Estimation sample	Full sample	Estimation sample
1-249	32,039	8,504	0.327	0.116
250-999	11,905	10,706	0.120	0.144
1,000-4,999	17,813	17,767	0.177	0.236
5,000+	41,061	41,060	0.375	0.503
Total	*102,818*	*78,037*	*1*	*1*

Notes: Full sample comprises observations in all firms, after restricting on working age (16-64) and excluding cases with missing values on the variables of interest. Estimation sample is the subset of these observations in firms with at least two non-disabled workers in the sample.

Table A.2: Descriptive statistics on earnings, by disability, estimation sample

	Basic pay/basic paid hours	Basic pay/all paid hours	Any additional pay	Additional pay	Total pay	Any pension contribution	Pension contrib.	Total pay + pension contrib.
	(£/hour)	(£/hour)	(%)	(£/hour)	(£/hour)	(%)	(£/hour)	(£/hour)
Non-disabled								
Mean	13.92	13.68	43.26	0.84	14.53	57.35	1.30	15.83
10th percentile	6.42	6.20		0.00	6.57		0.00	6.68
25th percentile	7.91	7.61		0.00	8.30		0.00	8.68
50th percentile	11.27	11.02		0.00	11.96		0.77	12.88
75th percentile	17.36	17.12		1.10	17.97		2.17	19.93
90th percentile	24.62	24.53		2.95	25.46		3.46	28.45
Number of observations	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*
Disabled								
Mean	12.46	12.27	40.02	0.68	12.95	58.49	1.24	14.19
10th percentile	6.34	6.13		0.00	6.45		0.00	6.56
25th percentile	7.46	7.27		0.00	7.81		0.00	8.20
50th percentile	10.00	9.74		0.00	10.61		0.89	11.49
75th percentile	15.32	15.17		0.76	16.11		2.07	17.88
90th percentile	21.73	21.67		2.45	22.11		3.15	25.03
Number of observations	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*
Disability pay gap (%)								
Mean	-10.51	-10.35	-7.50	-19.46	-10.88	1.99	-4.40	-10.35
10th percentile	-1.19	-1.19		0.00	-1.73		0.00	-1.77
25th percentile	-5.64	-4.47		0.00	-5.86		0.00	-5.55
50th percentile	-11.27	-11.61		0.00	-11.31		15.46	-10.74
75th percentile	-11.78	-11.40		-30.55	-10.35		-4.29	-10.25
90th percentile	-11.72	-11.63		-16.87	-13.15		-9.05	-12.02

Notes: Weighted sample statistics calculated from ASHE-Census 2011. Disability pay gap calculated as the difference between the wages of disabled employees and non-disabled employees, expressed as a percentage of the non-disabled wage, or the simple difference where the original values are percentages. Differences may not sum due to rounding.

Table A.3: Descriptive statistics on components of additional pay, by disability

	Any incentive pay	Incentive value	Any shift premia	Shift premia value	Any overtime payments	Overtime payment value	Any other pay	Other pay value
	(%)	(£/hour)	(%)	(£/hour)	(%)	(£/hour)	(%)	(£/hour)
Non-disabled								
Mean	6.2	0.08	10.6	0.15	18.7	0.29	20.9	0.32
N	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*	*73,815*
Disabled								
Mean	5.5	0.06	10.8	0.15	15.9	0.23	19.5	0.24
N	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*	*4,222*
Disability pay gap (%)								
Mean	-0.7	-24.66	0.2	-3.22	-2.7	-21.11	-1.4	-24.44

Notes: Incentive pay includes profit sharing, productivity, performance and other bonus or incentive pay, piecework and commission. Other pay includes any pay received for other reasons, such as car allowances paid through the payroll, on call and standby allowances, clothing, first aider or fire fighter allowances; it does not include redundancy payments, arrears of pay, tax credits, expenses or paid leave. For other notes, see Table 1.

Table A.4: Descriptive statistics for characteristics of the estimation sample, by disability

	Non-disabled	Disabled	All
Employee characteristics:			
Personal characteristics:			
Male	0.47	0.42	0.46
Age (years)	40.25	45.90	40.56
Age squared/100	17.46	22.22	17.72
Highest qualifications:			
No qualifications	0.07	0.12	0.07
GCSEs	0.32	0.33	0.32
Apprenticeship	0.02	0.03	0.02
A-level	0.15	0.15	0.15
Degree	0.40	0.33	0.40
Other/Vocational qual.	0.04	0.05	0.04
Married	0.52	0.55	0.52
Age of youngest dependent child:			
No dependent children	0.58	0.67	0.58
0-4	0.14	0.07	0.14
5-7	0.06	0.04	0.06
8-9	0.04	0.03	0.04
10-11	0.04	0.04	0.04
12-15	0.09	0.09	0.09
16-18	0.06	0.06	0.06
White ethnicity	0.90	0.92	0.90
Not born in UK	0.02	0.01	0.02
Job characteristics:			
Occupation (SOC (2010) Major Group):			
Managers, directors and senior officials	0.08	0.06	0.08
Professional occupations	0.20	0.16	0.20
Associate professional and technical occupations	0.15	0.13	0.15
Administrative and secretarial occupations	0.15	0.17	0.15
Skilled trades occupations	0.05	0.04	0.05
Caring, leisure and other service occupations	0.10	0.11	0.10
Sales and customer service occupations	0.11	0.13	0.11
Process, plant and machine operatives	0.05	0.05	0.05
Elementary occupations	0.12	0.14	0.12
Part-time hours (<30 per week)	0.26	0.33	0.27
Job tenure:			
Less than 3 months	0.01	0.01	0.01
3 months but less than 6 months	0.03	0.02	0.03
6 months but less than 12 months	0.07	0.05	0.07
1 year but less than 2 years	0.10	0.08	0.10
2 years but less than 5 years	0.25	0.21	0.25
5 years but less than 10 years	0.24	0.25	0.24
10 years but less than 20 years	0.19	0.23	0.19
20 years or more	0.11	0.15	0.11

	Non-disabled	Disabled	All
Pay set by collective agreement	0.59	0.65	0.59
Second job (defined by hours)	0.02	0.02	0.02
Firm characteristics:			
Ln(number of employees)	8.38	8.59	8.39
Industry (SIC(2007) Section):			
Agri, Mining, Manufacturing, Elec, Water	0.10	0.08	0.10
Construction	0.02	0.01	0.02
Wholesale, retail, repair of vehicles	0.16	0.16	0.16
Transport, and storage	0.06	0.05	0.06
Accommodation, and food service	0.03	0.02	0.03
Information, and communication	0.03	0.03	0.03
Financial and insurance activities	0.05	0.04	0.05
Real estate activities	0.01	0.01	0.01
Professional, scientific, and technical activities	0.04	0.02	0.04
Admin and support services	0.05	0.05	0.05
Public admin and defence	0.08	0.11	0.08
Education	0.21	0.23	0.21
Health, and social work	0.14	0.15	0.14
Art, entertainment, and recreation	0.01	0.02	0.01
Other service activities	0.01	0.01	0.01
Private sector	0.61	0.56	0.61
Workplace region:			
North East	0.05	0.05	0.05
North West	0.12	0.13	0.13
Yorkshire & Humberside	0.10	0.10	0.10
East Midlands	0.08	0.09	0.08
West Midlands	0.10	0.10	0.10
South West	0.09	0.09	0.09
East	0.10	0.10	0.10
London	0.15	0.12	0.15
South East	0.15	0.15	0.15
Wales	0.05	0.06	0.06
N	*73,815*	*4,222*	*78,037*

Notes: Unweighted sample statistics calculated from ASHE-Census 2011.

Table A.5: Raw and adjusted DPG across firms, full ASHE-Census sample

	Raw	Adjusted: employee and job characteristics	Adjusted: employee, job and firm characteristics
	(1)	(2)	(3)
Basic rate	-0.088 ***	-0.039 ***	-0.037 ***
	(0.007)	(0.004)	(0.004)
N	*102,818*	*102,818*	*102,818*
Adjusted R-squared	*0.001*	*0.634*	*0.670*
Total pay	-0.091 ***	-0.042 ***	-0.040 ***
	(0.007)	(0.004)	(0.004)
N	*102,818*	*102,818*	*102,818*
Adjusted R-squared	*0.002*	*0.623*	*0.661*

Notes: OLS regression coefficients, estimated from ASHE-Census 2011. DPG calculated as the difference in log points between the log hourly wages of disabled employees and non-disabled employees. Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1.

Table A.6: Full OLS regression estimates for main specifications

Dependent variable: Ln(Total pay per hour)	Raw		Raw: within-firm		Adjusted: employee and job characteristics		Adjusted: employee, job and firm characteristics		Adjusted: employee and job characteristics within-firm	
	(1)		(2)		(3)		(4)		(5)	
Disabled	-0.095	***	-0.068	***	-0.040	***	-0.036	***	-0.032	***
	(0.008)		(0.007)		(0.005)		(0.005)		(0.005)	
Male					0.109	***	0.102	***	0.094	***
					(0.003)		(0.003)		(0.003)	
Age					0.032	***	0.030	***	0.025	***
					(0.001)		(0.001)		(0.001)	
Age squared					-0.034	***	-0.031	***	-0.025	***
					(0.001)		(0.001)		(0.001)	
Highest qualification (Ref. None):										
GCSEs					0.066	***	0.066	***	0.057	***
					(0.004)		(0.004)		(0.004)	
Apprenticeship					0.102	***	0.106	***	0.085	***
					(0.008)		(0.008)		(0.007)	
A-level					0.128	***	0.129	***	0.112	***
					(0.005)		(0.005)		(0.005)	
Degree					0.281	***	0.274	***	0.243	***
					(0.005)		(0.005)		(0.005)	
Other/Vocational					0.071	***	0.060	***	0.068	***
					(0.007)		(0.006)		(0.006)	
Married / civil partnership					0.020	***	0.025	***	0.019	***
					(0.003)		(0.003)		(0.002)	
Age of youngest child (Ref. None):										
0-4					0.047	***	0.050	***	0.048	***
					(0.004)		(0.004)		(0.004)	
5-7					0.025	***	0.035	***	0.035	***
					(0.005)		(0.005)		(0.005)	
8-9					0.022	***	0.028	***	0.026	***
					(0.006)		(0.006)		(0.006)	
10-11					0.015	**	0.023	***	0.022	***
					(0.006)		(0.006)		(0.006)	
12-15					0.002		0.012	***	0.016	***
					(0.004)		(0.004)		(0.004)	
16-18					0.004		0.009	**	0.012	***
					(0.005)		(0.005)		(0.004)	
White					-0.002		0.066	***	0.035	***
					(0.004)		(0.004)		(0.004)	
Not UK born					-0.003		-0.023	***	-0.014	*
					(0.009)		(0.009)		(0.008)	
Part-time hours					-0.068	***	-0.054	***	-0.046	***
					(0.003)		(0.003)		(0.003)	

continued

Table A.6 continued

Dependent variable: Ln(Total pay per hour)	**Raw**	**Raw: within-firm**	**Adjusted: employee and job characteristics**	**Adjusted: employee, job and firm characteristics**	**Adjusted: employee and job characteristics within-firm**
	(1)	(2)	(3)	(4)	(5)
Job tenure (Ref. <3 months):					
3-5 months			0.049 ***	0.032 ***	0.015
			(0.012)	(0.012)	(0.012)
6-11 months			0.042 ***	0.027 **	0.012
			(0.011)	(0.011)	(0.011)
1 year			0.062 ***	0.049 ***	0.039 ***
			(0.011)	(0.010)	(0.010)
2-4 years			0.097 ***	0.080 ***	0.061 ***
			(0.010)	(0.010)	(0.010)
5- 9 years			0.144 ***	0.128 ***	0.106 ***
			(0.010)	(0.010)	(0.010)
10- 19 years			0.193 ***	0.175 ***	0.152 ***
			(0.011)	(0.010)	(0.010)
20 years +			0.243 ***	0.218 ***	0.200 ***
			(0.011)	(0.011)	(0.011)
Collective agreement			0.008 ***	0.019 ***	-0.043 ***
			(0.003)	(0.003)	(0.006)
Second job			-0.034 ***	-0.030 ***	-0.027 ***
			(0.008)	(0.008)	(0.008)
Ln(Enterprise employment)				0.005 ***	
				(0.001)	
Industry (SIC(2007) Section; Ref. Manufacturing)					
Construction				0.005	
				(0.009)	
Wholesale, retail, repair of vehicles				-0.148 ***	
				(0.006)	
Transport, and storage				0.001	
				(0.007)	
Accommodation, and food service				-0.193 ***	
				(0.008)	
Information, and communication				0.010	
				(0.009)	
Financial and insurance activities				0.061 ***	
				(0.008)	
Real estate activities				-0.067 ***	
				(0.012)	
Professional, scientific & technical activities				0.025 ***	
				(0.008)	
Admin and support services				-0.128 ***	
				(0.007)	
Public admin and defence				-0.113 ***	

Dependent variable: Ln(Total pay per hour)	Raw		Raw: within-firm		Adjusted: employee and job characteristics		Adjusted: employee, job and firm characteristics		Adjusted: employee and job characteristics within-firm	
	(1)		(2)		(3)		(4)		(5)	
							(0.008)			
Education							-0.137	***		
							(0.006)			
Health, and social work							-0.116	***		
							(0.006)			
Art, entertainment, and recreation							-0.172	***		
							(0.011)			
Other service activities							-0.130	***		
							(0.014)			
Private sector							-0.023	***		
							(0.004)			
Head office region (Ref. Wales):										
North East							0.001			
							(0.006)			
North West							0.026	***		
							(0.005)			
Yorkshire and the Humber							0.008			
							(0.005)			
East Midlands							0.025	***		
							(0.006)			
West Midlands							0.024	***		
							(0.005)			
South West							0.030	***		
							(0.005)			
East							0.058	***		
							(0.005)			
London							0.247	***		
							(0.005)			
South East							0.085	***		
							(0.005)			
Intercept	2.533	***	2.532	***	1.485	***	1.463	***	1.672	***
	(0.002)		(0.002)		(0.018)		(0.020)		(0.018)	
N	*78,037*		*78,037*		*78 ,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.002*		*0.377*		*0.650*		*0.685*		*0.737*	

Notes: See Table 2 in main text.

Table A.7: Specification tests: full-time, unweighted regression and two-digit SOC

Dependent variable: Ln(Total pay per hour)	Raw		Raw: within-firm		Adjusted: employee and job characteristics		Adjusted: employee and job and firm characteristics		Adjusted: employee and job characteristics within-firm	
	(1)		(2)		(3)		(4)		(5)	
Full-time only:										
Disabled	-0.071	***	-0.053	***	-0.045	***	-0.041	***	-0.040	***
	(0.009)		(0.008)		(0.006)		(0.006)		(0.006)	
N	*57,177*		*56,107*		*57,177*		*57,177*		*56,107*	
Adjusted R-squared	*0.001*		*0.356*		*0.596*		*0.642*		*0.700*	
Unweighted:										
Disabled	-0.092	***	-0.067	***	-0.039	***	-0.036	***	-0.032	***
	(0.007)		(0.006)		(0.005)		(0.004)		(0.004)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.002*		*0.356*		*0.642*		*0.678*		*0.728*	
Two-digit SOC:										
Disabled	-0.095	***	-0.068	***	-0.043	***	-0.038	***	-0.034	***
	(0.008)		(0.007)		(0.005)		(0.005)		(0.005)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.002*		*0.377*		*0.612*		*0.660*		*0.718*	

Notes: Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1.

Table A.8: Heterogeneity in the DPG by: disability extent, gender, sector and pay setting

Dependent variable: Ln(Total pay per hour)	**Raw**	**Raw: within-firm**	**Adjusted: employee and job characteristics**	**Adjusted: employee and job and firm characteristics**	**Adjusted: employee and job characteristics within-firm**
	(1)	(2)	(3)	(4)	(5)
Extent of disability:					
Limited a lot	-0.155 ***	-0.098 ***	-0.066 ***	-0.060 ***	-0.060 ***
	(0.020)	(0.017)	(0.013)	(0.012)	(0.012)
Limited a little	-0.084 ***	-0.062 ***	-0.035 ***	-0.032 ***	-0.027 ***
	(0.009)	(0.007)	(0.005)	(0.005)	(0.005)
N	*78,037*	*78,037*	*78,037*	*78,037*	*78,037*
Adjusted R-squared	*0.002*	*0.377*	*0.650*	*0.685*	*0.737*
By gender:					
Disabled	-0.070 ***	-0.052 ***	-0.029 ***	-0.026 ***	-0.026 ***
	(0.010)	(0.009)	(0.006)	(0.006)	(0.006)
Male	0.201 ***	0.188 ***	0.111 ***	0.103 ***	0.094 ***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Disabled*Male	-0.032 **	-0.023 *	-0.024 **	-0.023 **	-0.015 *
	(0.016)	(0.014)	(0.010)	(0.009)	(0.009)
N	*78,037*	*78,037*	*78,037*	*78,037*	*78,037*
Adjusted R-squared	*0.039*	*0.402*	*0.650*	*0.685*	*0.737*
By sector:					
Disabled	-0.087 ***	-0.072 ***	-0.031 ***	-0.030 ***	-0.026 ***
	(0.011)	(0.011)	(0.007)	(0.007)	(0.007)
Private	-0.154 ***		0.001	-0.022 ***	
	(0.004)		(0.003)	(0.004)	
Disabled*Private	-0.030 *	0.007	-0.015	-0.010	-0.011
	(0.016)	(0.014)	(0.010)	(0.009)	(0.009)
N	*78,037*	*78,037*	*78,037*	*78,037*	*78,037*
Adjusted R-squared	*0.023*	*0.377*	*0.650*	*0.685*	*0.737*

Dependent variable: Ln(Total pay per hour)	**Raw**		**Raw: within-firm**		**Adjusted: employee and job characteristics**		**Adjusted: employee and job and firm characteristics**		**Adjusted: employee and job characteristics within-firm**	
	(1)		(2)		(3)		(4)		(5)	
By coverage of collective agreement:										
Disabled	-0.132	***	-0.064	***	-0.052	***	-0.045	***	-0.034	***
	(0.014)		(0.011)		(0.009)		(0.008)		(0.008)	
Pay set by collective agreement	0.071	***	-0.138	***	0.007	***	0.018	***	-0.043	***
	(0.004)		(0.009)		(0.003)		(0.003)		(0.006)	
Disabled*Pay set by coll. agt.	0.052	***	-0.005		0.019	*	0.014		0.002	
	(0.017)		(0.014)		(0.010)		(0.010)		(0.010)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.007*		*0.379*		*0.650*		*0.685*		*0.737*	

Notes: Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1.

Table A.9: Heterogeneity in the DPG by share disabled employees in the firm.

Dependent variable: Ln(Total pay per hour)	Raw	Raw: within-firm	Adjusted: employee and job characteristics	Adjusted: Employee, job and firm characteristics	Adjusted: employee and job characteristics within-firm
	(1)	(2)	(3)	(4)	(5)
For enterprises with 5,000+ employees:					
Disabled	-0.073	-0.047	-0.025	-0.018	-0.020
	(0.063)	(0.047)	(0.035)	(0.033)	(0.034)
Share disabled 2.5-4.9%	-0.101 ***		-0.047 ***	-0.009 *	
	(0.010)		(0.006)	(0.005)	
Share disabled 5.0-7.4%	-0.180 ***		-0.059 ***	-0.016 ***	
	(0.009)		(0.005)	(0.005)	
Share disabled 7.5%+	-0.071 ***		-0.075 ***	-0.031 ***	
	(0.010)		(0.006)	(0.006)	
Disabled * Share disabled 2.5-4.9%	-0.019	-0.049	-0.019	-0.027	-0.028
	(0.069)	(0.053)	(0.038)	(0.036)	(0.036)
Disabled * Share disabled 5.0-7.4%	-0.012	-0.031	-0.010	-0.020	-0.019
	(0.065)	(0.049)	(0.036)	(0.034)	(0.035)
Disabled * Share disabled 7.5+%	0.009	-0.017	0.017	0.012	0.011
	(0.065)	(0.050)	(0.036)	(0.034)	(0.035)
N	*39,738*	*39,738*	*39,738*	*39,738*	*39,738*
Adjusted R-squared	*0.017*	*0.325*	*0.684*	*0.720*	*0.738*

Notes: Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1.

Table A.10: Raw and adjusted DPG, across and within firms, across the wage distribution

Dependent variable: Ln(Total pay per hour)	**Percentile**									
	10th		25th		50th		75th		90th	
Raw	-0.017	***	-0.060	***	-0.120	***	-0.109	***	-0.140	***
	(0.006)		(0.009)		(0.012)		(0.014)		(0.014)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.000*		*0.000*		*0.001*		*0.001*		*0.001*	
Raw: within-firm	-0.018	***	-0.042	***	-0.088	***	-0.072	***	-0.090	***
	(0.006)		(0.008)		(0.011)		(0.013)		(0.015)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.337*		*0.360*		*0.296*		*0.203*		*0.150*	
Adjusted: employee and job characteristics	-0.005		-0.018	***	-0.029	***	-0.041	***	-0.085	***
	(0.005)		(0.007)		(0.008)		(0.010)		(0.013)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.309*		*0.455*		*0.534*		*0.434*		*0.263*	
Adjusted: employee, job and firm characteristics	-0.004		-0.015	**	-0.025	***	-0.037	***	-0.080	***
	(0.005)		(0.007)		(0.008)		(0.010)		(0.013)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.329*		*0.477*		*0.554*		*0.454*		*0.286*	
Adjusted: employee and job characteristics within firm	-0.005		-0.011		-0.022	**	-0.031	***	-0.067	***
	(0.005)		(0.007)		(0.009)		(0.010)		(0.013)	
N	*78,037*		*78,037*		*78,037*		*78,037*		*78,037*	
Adjusted R-squared	*0.448*		*0.544*		*0.602*		*0.502*		*0.340*	

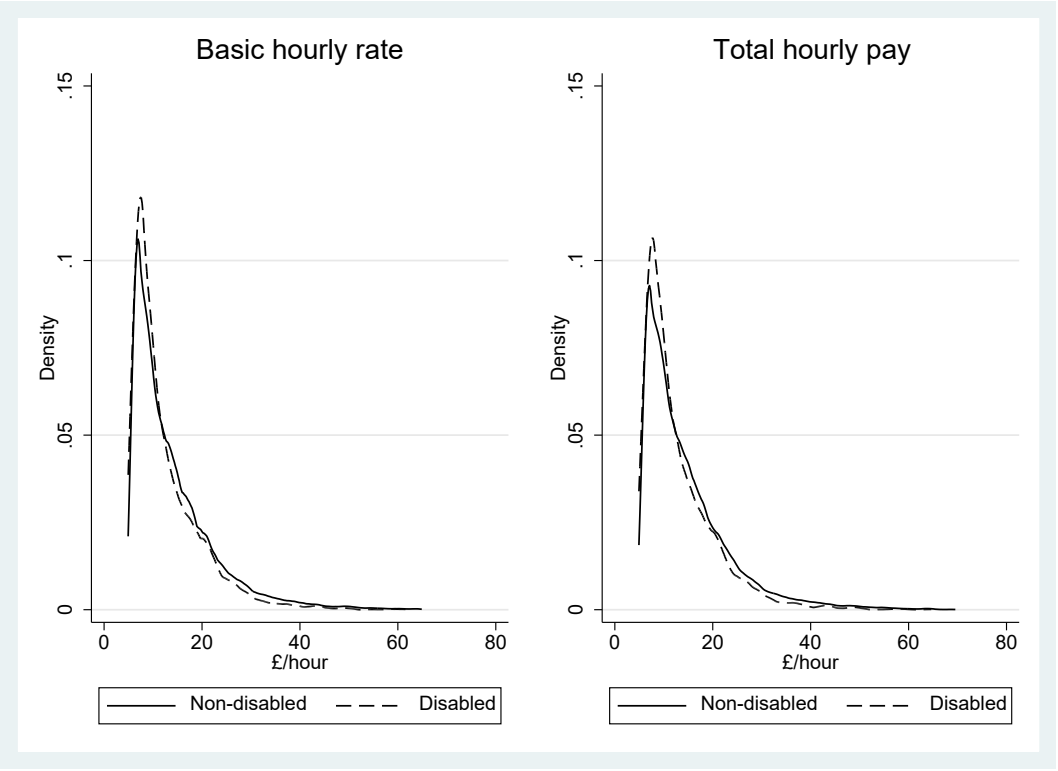
Notes: Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1.

Table A.11: Decomposition of DPG at the mean using non-disabled wage structure

Dependent variable: Ln(Total pay per hour)			**% of DPG**	
Raw DPG	-0.095	***		
	(0.008)			
Panel A: DPG Decomposition using observables				
Demographic characteristics	0.014	***	-15%	
	(0.002)			
Highest qualifications	-0.022	***	23%	
	(0.002)			48%
Occupation	-0.050	***	52%	
	(0.004)			
Job characteristics, other than occupation	0.011	***	-12%	
	(0.001)			
Firm characteristics	-0.013	***	14%	
	(0.002)			
Unexplained	-0.036	***	38%	
	(0.005)			

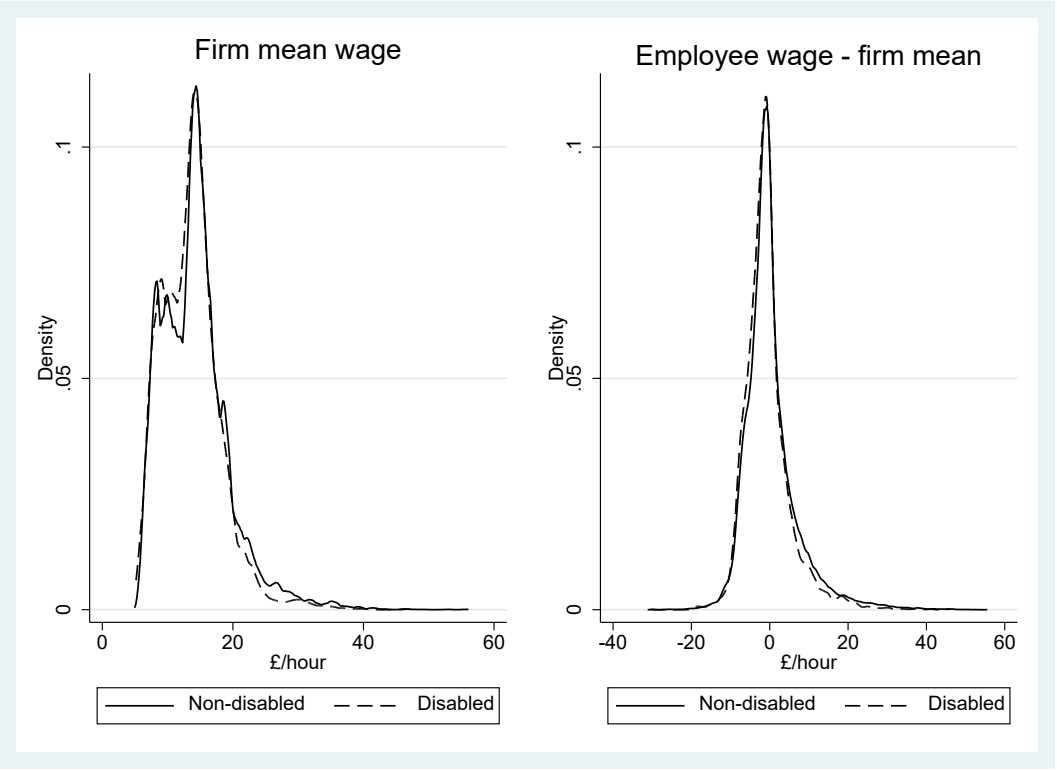
Notes: Estimates based on OB decomposition methods as set out in the text. Robust standard errors estimated via the delta method (see Jann, 2008) and reported in parentheses. Key to statistical significance: *** p<0.01; ** p<0.05; * p<0.1. Components may not sum to raw DPG due to rounding errors.

Figure A.1: Kernel density plot for basic hourly rate and total hourly pay by disability



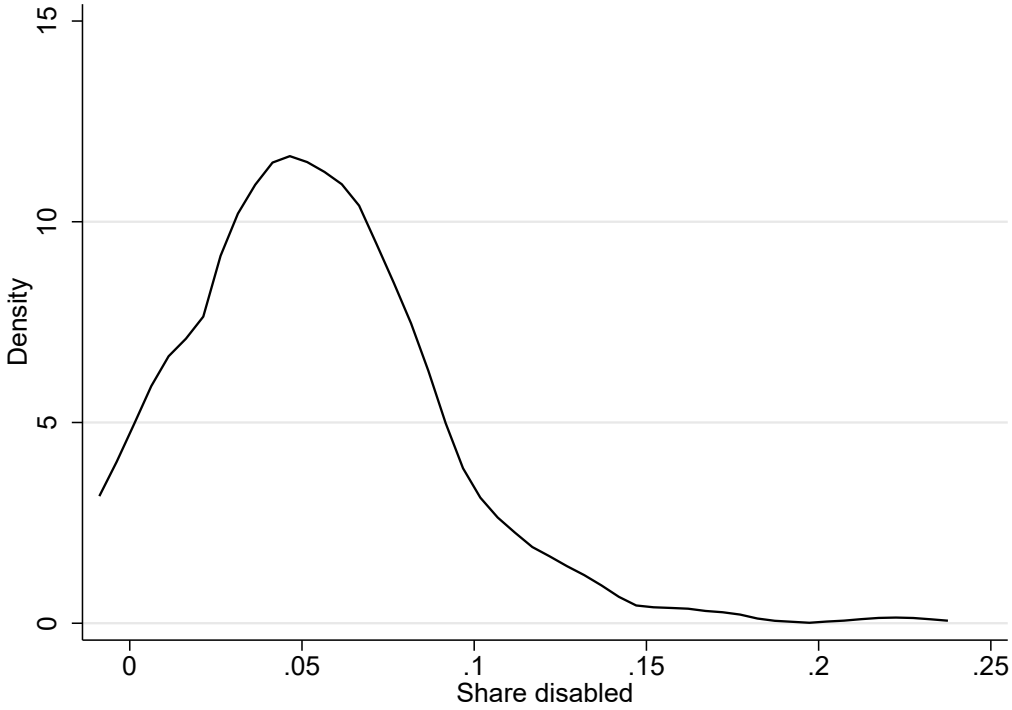
Notes: Weighted kernel density plots generated from ASHE-Census 2011.

Figure A.2: Kernel density plot for total hourly pay across and within firms by disability



Notes: Weighted kernel density plots generated from ASHE-Census 2011.

Figure A.3: Estimated share of disabled employees in firms with 5,000 or more employees



Notes: Share of disabled employees estimated in firms with 5,000 or more employees and at least 25 observations in ASHE (N=478 firms)