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Do wages underestimate the inequality in workers' rewards? The joint distribution of job quality and wages across occupations

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Abstract

Information on both wages and job quality is needed in order to understand the occupational dispersion of well-being. We analyse subjective wellbeing in a large UK sample to construct a measure of 'overall reward', the sum of wages and the value of job quality, in 90 different occupations. If only wages are included, then labour market inequality is underestimated: the dispersion of overall rewards is one-third larger than the dispersion of wages. Our findings are similar, and stronger, in data on US workers. We find a positive correlation between job quality and wages in all specifications, both between individuals in the cross-section and within individuals in panel data. The gender and ethnic gaps in the labour market are larger than those in wages alone, and the overall rewards to education on the labour market are underestimated by earnings differentials alone.

1 | INTRODUCTION

The distribution of rewards to workers is a fundamental issue in economics. But while there is a very large literature on wages, the focus on monetary rewards misses out the value and distribution of job quality (Williams and Zhou 2020). There is less evidence on the quality of different jobs, and almost none that brings the two together to show the inequality of 'overall rewards' at work. This is a serious gap since the quality of jobs is hugely important and varies widely among people (Clark *et al.* 2018). Differences in human relationships at work, autonomy, job security, the danger of the work, and its interest all have a big impact.

Does this mean that the overall inequality of rewards exceeds the inequality of wages? Not necessarily. For any given type of workers, compensating differentials will ensure that wages and

This paper is part of the Economica 100 Series. Economica, the LSE "house journal" is now 100 years old. To commemorate this achievement, we are publishing 100 papers by former students, as well as current and former faculty. Maria Cotofan is a research Associate at the CEP. Andrew E. Clark obtained his mSc and PhD from the LSE and is a research Associate at the CEP. Richard layard is the Founder-Director at the CEP and is the co-Director of the Centre's programme on Community Wellbeing.

quality of work are negatively connected (Rosen 1986). Thus if all workers had the same set of opportunities available to them, with each opportunity offering a different pair of wages and job quality, then wages could be negatively correlated with job quality across workers, and wage inequality would overstate the overall inequality among them. But where there are large ability differences among workers, it becomes more likely that wages and job quality are positively correlated, because workers with better opportunities can choose combinations that include both higher wages and better job quality.

But how different is the resulting inequality of overall rewards compared with the inequality of wages? In this paper, we aim to show the value of occupations in terms of overall reward as compared with wages, and to estimate the implied inequality of overall rewards. We do this by looking at how a person's wellbeing is affected by their occupation, after excluding the effects of wages: this provides a measure of the value of job quality within the individual's occupation. We then combine wages and the value of job quality to obtain a measure of this individual's 'overall reward'. We carry out this calculation in large representative samples of the UK population, measuring occupation at the 3-digit level. We focus on occupation as it is a key choice that people make in the labour market.[1]

We find that people's wages and the job quality of their occupation are positively correlated, with the inequality of (log) overall rewards being one-third higher than the inequality of (log) wages. This holds in both cross-section and panel data. We also find that wage differences understate the overall differences in reward across genders and across ethnicities, and the returns to education are higher when job quality is also accounted for. Finally, for the USA, we obtain findings very similar to those in the UK (in both the cross-section and the panel).

The remainder of the paper is organized as follows. Section II describes the data, and Section III presents our main estimates for the inequality of overall rewards across occupations, as well as a discussion of estimation problems. Section IV considers how the ranking of individual occupations changes when overall rewards are the focus, and Section V repeats the ranking within education groups. Section VI shows how the returns to education increase when measured by overall reward, and Section VII discusses differences between genders and between ethnic groups. Section VIII replicates our results on US data, and Section IX revisits the correlation of wages with job quality. Finally, Section X concludes.

2 | DATA

To measure workers' overall rewards, we require not only data on their income from work, but also a means of calculating the monetary value of the non-pecuniary aspects of the different jobs that they occupy. We will establish the latter from the relationship between a summary measure of wellbeing (life satisfaction) and disaggregated occupations, holding wages and some exogenous individual characteristics constant.[2]

Our main source of data is the Annual Population Survey (APS),[3] a large representative repeated cross-section survey of the UK population. The APS started in 2004, and its main purpose is to provide information on important social and socioeconomic variables at local levels, including on a wide range of labour market outcomes, as well as housing, ethnicity, religion, health and education. The APS uses data from the Labour Force Survey, giving it the largest coverage of any UK household survey. We make use of the five most recent APS waves (2014–18), which contain detailed information on all of the questions relevant to our analysis.

Our sample consists of respondents aged 18–65 who are in full-time employment. We apply this latter restriction as the wage distribution has a different significance for full- and part-time workers. We also exclude the self-employed, as both the wages and non-pecuniary amenities of this group are to a larger extent within their control. Of the 18–65 age group in employment, 85% are employees, 14% are self-employed, and 1% are unpaid family workers or part of a government

training scheme. Employees are then divided into 75% full-time and 25% part-time. Finally, we drop those respondents whose reported hourly wage is in the bottom 1% in the distribution of wages. Our final sample from the five APS waves contains information on roughly 210,000 full-time employees.[4]

Our key outcome variable is life satisfaction. Following the OECD Guidelines, we use life satisfaction as a summary measure of overall individual wellbeing. We focus mostly on life satisfaction, as opposed to job satisfaction, because it is the former that matters to individuals when they make life choices, not the satisfaction felt in only one domain of their lives.[5] Since 2011, the UK Office for National Statistics has been asking APS respondents four personal wellbeing questions, with the answers being considered as official national statistics. The first of these wellbeing questions refers to life satisfaction. Respondents are asked 'Overall, how satisfied are you with your life nowadays?', with answers on an 11-point scale (0 corresponding to 'Not at all satisfied', and 10 to 'Completely satisfied'). Our sample of full-time employees reports average life satisfaction score 7.76, with standard deviation 1.43.[6]

Wages are measured by the logarithm of the real hourly wage. Hourly wages in the APS are a derived variable, based on responses to gross weekly wages and to usual hours of work and overtime pay. All wage figures in this paper are deflated using the UK Consumer Price Index to produce real figures. The sample mean value of real log hourly wages is 2.64 (corresponding to hourly pay of £14.01), with standard deviation 0.51. We use a relatively disaggregated measure of occupation, at the 3-digit level in the SOC2010 classification. This produces over 90 different occupations. A detailed account of the SOC2010 classification is provided in Appendix C.[7]

The APS also contains information on individual demographics and employment-related variables. Our empirical analysis will focus on gender, age, ethnicity and education. Gender is a dummy variable taking value 1 for women and 0 for men, age will be entered as a quadratic in the empirical analysis, and there are 11 ethnicity categories. One of our main variables of interest here is educational attainment, which we code as follows: (1) respondents with a degree; (2) respondents with other higher education (but not a degree) or A level qualifications; and (3) respondents with GCSE qualifications or lower. These three categories correspond broadly to 16 (or more) years of education, 13 years or 11 years (the minimum amount of compulsory education in the UK, from ages 5 to 16). Additional information on educational classifications in the UK is provided in Appendix. The descriptive statistics for life satisfaction, demographics and wages in our APS sample appear in Appendix Table A1.

One limitation of the APS is that it is a cross-section, so individuals cannot be followed over time. We thus complement our cross-sectional results with the analysis of panel data from Understanding Society.[8] This survey started in 2009, and interviews around 40,000 households per year; we will here make use of all nine of its available waves.

Understanding Society measures both respondent life satisfaction and job satisfaction, coded on a 7-point scale where an answer 1 corresponds to 'Completely dissatisfied', and an answer 7 to 'Completely satisfied'. The survey also includes information on gender, age, ethnicity and education, as well as occupation, using the ISCO88 classification coded at the 3-digit level.[9] The logarithm of hourly wages is calculated from individual monthly labour wages and hours worked, including paid hours of overtime work, and deflated by the Consumer Price Index. Appendix Table A2 lists the descriptive statistics for the key variables in Understanding Society.

3 | THE INTERPERSONAL DISPERSION OF OVERALL REWARDS

We begin our analysis by asking how individual wellbeing is related to personal characteristics, wages and occupation. We do so by estimating an OLS equation where the dependent variable is a measure of individual life satisfaction.

Some have argued that if measures of life satisfaction, such as the ones that we use here, are ordinal and discrete, then using this type of estimation may in fact lead to measurement error. However, Krueger and Schkade (2008) provide some evidence that wellbeing answers are in fact cardinal by showing that test–retest errors are similar at all points in the scale, and Ferrer-i-Carbonell and Frijters (2004) show that measurement error introduced this way is at most minor in most empirical applications. Another criticism of using life satisfaction in this way comes from a recent study by Bond and Lang (2019), who argue that if models are heteroscedastic, then reversibility of the results from ordered models is possible when using a measure of subjective wellbeing as a dependent variable.

We address these issues using two robustness checks, which are presented in more detail in Appendix E. On the issue of measurement error, we estimate ordered probit models and show that the coefficients are comparable in both size and magnitude, and that our main conclusions remain unchanged using this specification. On the issue of heteroscedasticity, we follow the approach developed by Chen *et al.* (2022), who suggest that the results of ordered models can be re-interpreted by looking at the effects at the median rather than the mean. The intuition behind this approach is that in these types of ordered models, the mean and the median of the underlying latent variable coincide due to the symmetric nature of logistic and normal distributions. They show that when using an ordinal heteroscedastic probit model, effects on the median can be estimated under very weak conditions and are not susceptible to the reversibility argument put forward by Bond and Lang (2019). In Appendix E, we show that our estimates are robust to this alternative specification, so that our conclusions are not dependent on the estimation method.

We estimate the equation

$$W_{ijt} = \alpha_0 + \alpha_1\ X_{it} + \alpha_2\ LogWage_{it} + \sum_j \alpha_3^j\ Occupation_{ijt} + \tau_t + \varepsilon_{ijt}, \tag{1}$$

where W_{ijt} is the life satisfaction of the ith individual in the jth occupation at time t, X_{it} is a vector of exogenous control variables (gender, ethnicity, and a quadratic term in age), $LogWage_{it}$ is the logarithm of respondent hourly pay, and there is a dummy variable for each occupation j. The α_3^j coefficients capture the non-pecuniary advantage of each occupation j, and τ_t is a wave fixed effect.

Because we are interested in the joint distribution of wages and amenities across occupations, we add only this limited set of variables that are truly exogenous, and refrain from controlling for choice variables such as education, marital status or region of residence. Later in this section, we will address explicitly the identifying assumptions underpinning equation (1) and the issue of selection based on unobservable characteristics. And in Section VI, we also consider the choice of education in more detail.

In order to evaluate the interpersonal dispersion of workers' overall rewards across occupations, we combine each respondent's logarithm of hourly wages with the monetary value of the non-pecuniary advantages of the occupation in which they work.[10] We thus rewrite equation (1) as

$$W_{ijt} = \alpha_0 + \alpha_1\ X_{it} + \alpha_2\ OverallRewards_{ijt} + \tau_t + \varepsilon_{ijt}, \tag{2}$$

where overall rewards are given by

$$OverallRewards_{ijt} = LogWage_{it} + \sum_j \frac{\alpha_3^j}{\alpha_2}\ Occupation_{ijt}. \tag{3}$$

Equation (3) shows that the overall rewards of each worker are composed of a monetary element and a term capturing the non-pecuniary aspect of occupations. The former is $LogWage_{it}$,

TABLE 1 An equation of predicted life satisfaction.

	Life satisfaction (0–10)	
Log wage	0.250***	(0.010)
Female	0.057***	(0.010)
Age	−0.050***	(0.003)
Age squared/100	0.050***	(0.003)
Ethnicity	Yes	
Occupation fixed effects	Yes	
Wave fixed effects	Yes	
R^2	0.02	
F-value	21.49	
N	209,672	
SD dependent	1.43	

Notes: These are OLS regressions. Life satisfaction is measured on an 11-point scale, where 0 corresponds to 'Not at all satisfied' and 10 to 'Completely satisfied'. 'Log wage' is the logarithm of hourly wages. The regression controls for 90 different occupations at the 3-digit level using the SOC2010 classification. The sample is respondents aged 18–65 in full-time employment in five waves of APS data (2014–18), excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-adjusted robust standard errors appear in parentheses. The sample is weighted using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions.
***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: APS.

and the latter is the coefficient α_3^j for each occupation j transformed into monetary terms when divided by α_2.

Table 1 presents the estimation results for equation (1), showing how individual life satisfaction is correlated with exogenous personal characteristics and wages, with wages being the logarithm of hourly pay, while holding the choice of occupation constant.[11] To make the interpretation of the coefficients on the occupation dummies easier, and avoid having to interpret each α_3^j relative to some arbitrary baseline occupation, we follow Krueger and Summers (1988) and express the occupation coefficients as deviations from an employment-share-weighted mean.[12] This regression explains about 2% of the variation in life satisfaction. This rather low R^2 figure reflects both our frugal set of right-hand-side variables and the fact that we analyse a homogeneous group, namely adults aged 18–65 in full-time employment.

The estimated coefficient on the logarithm of wages is 0.250. This is a fairly standard type of figure in the literature. It implies that doubling hourly wages would increase life satisfaction by 0.175 on the 11-point scale (as doubling wages causes log wages to rise by 0.7), corresponding to 0.12 of a standard deviation of life satisfaction. Women report higher life satisfaction than do men in the APS data (this is also a common finding), although the estimated coefficient is not large. The estimated U-shaped relationship between life satisfaction and age in the APS data is well established in the empirical subjective wellbeing literature. The sizes of the age coefficients are such that, holding all else constant, life satisfaction is estimated to drop by just under 0.2 points between the ages of 30 and 50.

The estimated coefficients (α_3^j) on the 90 occupation dummies in Table 1 capture the non-pecuniary aspects of work.[13] We divide these coefficients by the coefficient on the logarithm of wages α_2: the resulting coefficient α_3^j/α_2 measures the non-pecuniary aspects of occupations in units of log wages.

Table 2 presents information on the standard deviation of wages, the non-pecuniary job rewards (α_3^j/α_2) and overall rewards. The distribution of workers' rewards on the labour market is substantially larger once we take their non-pecuniary element into account; this is our main

TABLE 2 Important standard deviations.

	Log wage	α_3^j	α_3^j/α_2	Overall rewards	Sample size
SD	0.51	0.10	0.38	0.68	209,672

Notes: These figures are calculated for respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. 'Log wage' is the logarithm of hourly wages. α_3^j/α_2 are the non-pecuniary work rewards estimated in equation (1) divided by the coefficient on log wages. Our measure of overall rewards is described in equation (3). Source: APS.

finding. The interpersonal dispersion in terms of wages is 0.51, but that of overall rewards is one-third higher, with standard deviation 0.68.[14] Appendix Table A7 shows that the results in Table 2 are robust if we restrict our analysis to the 61 occupations where the associated coefficients are statistically significant at least at the 10% level.

The source of this substantial difference between wages and overall rewards can be understood easily by noting that

$$\mathrm{Var}(\mathit{OverallRewards}) = \mathrm{Var}(\mathit{LogWage}) + \mathrm{Var}(\alpha_3^j/\alpha_2) + 2\ \mathrm{Cov}(\mathit{LogWage}, \alpha_3^j/\alpha_2),$$

where the covariance is given by

$$\mathrm{Cov}(\mathit{LogWage}, \alpha_3^j/\alpha_2) = \mathrm{SD}(\mathit{LogWage}) \times \mathrm{SD}(\alpha_3^j/\alpha_2) \times \rho(\mathit{LogWage}, \alpha_3^j/\alpha_2).$$

The correlation ρ is positive, but only quite small, at 0.14. We then calculate

$$\mathrm{Var}(\mathit{OverallRewards}) = 0.51^2 + 0.38^2 + 2 \times 0.51 \times 0.38 \times 0.14 = 0.68^2.$$

Table 2 underlines that there is greater dispersion in wages (0.51) in the UK labour market than in non-pecuniary job rewards (0.38). It may not be surprising that the impact of non-pecuniary work attributes on life satisfaction is less than that of wages. While individuals' wages affect many domains of their life, and are also relevant outside of work, work amenities may be less important for non-work aspects of life.

The APS survey is cross-sectional, and the above results could be biased without controlling for the unobserved personal characteristics of individuals in different occupations. The identifying assumption in equation (1) is that people do not select into different occupations based on unobserved characteristics such as ability, or based on their life satisfaction. However, these assumptions may be violated for some people. In Appendix Figure A1, we illustrate how those with higher ability may want to take part of their labour market rewards in wages, and part in amenities. This can easily produce a positive correlation between amenities and wages in cross-section analysis that cannot adequately control for (unobserved) ability. Furthermore, our method relies on estimating amenities indirectly, through the life satisfaction of an individual. If people with high levels of life satisfaction have both better amenities and higher wages, then a positive correlation in the cross-section may also emerge.

We address the question of unobserved ability and selection with panel data from Understanding Society. By adding individual fixed effects to equation (1), we control for any time-invariant unobserved individual characteristics, and identify the occupational coefficients from those individuals who switch occupations over time. However, we note that we refrain from using the Understanding Society results as our main estimation for two reasons. First, Understanding Society is a much smaller dataset, such that both the overall sample size and occupation-level cell sizes are comparatively limited. Specifically, while the average occupational-wave cell in the APS includes 948 observations, in Understanding Society this figure is only 360 people. Furthermore, only 22% of the sample switch occupation at least once throughout our panel. Second, results in the panel, which are estimated by looking at those respondents

who switch occupation over time, are able to capture only the transitory variation across occupations. As such, these results cannot capture the overall inequality of rewards across all individuals in the UK, nor are they directly comparable with the cross-sectional estimates.

In our Understanding Society results, for comparison purposes we adjust the 7-point scale measure of life and job satisfaction in Understanding Society to be on an 11-point scale, where 0 corresponds to 'Not at all satisfied' and 10 corresponds to 'Completely satisfied'.[15] Columns (1) and (2) of Appendix Table A3 show that the Understanding Society cross-section standard deviations of wages, non-pecuniary amenities and overall rewards are remarkably similar to those in the cross-section APS.

In column (3) of Table A3, we ask how our results change when introducing individual fixed effects in equation (1). The standard deviations of the unadjusted non-pecuniary attributes α_3^j are remarkably similar with and without controlling for individual fixed effects (0.15 in the cross-section, and 0.17 in the panel), so that individual selection into different occupations does not appear to be the main driver of this variation.

Despite the similarity in the standard deviations of the α_3^j, the standard deviations of the α_3^j/α_2 in Table A3 (i.e. the non-pecuniary attributes translated into monetary terms) do differ between the cross-section and the panel (at 0.32 and 0.80, respectively). This reflects almost entirely the lower value of α_2 in the panel regressions than in the cross-section, a finding that is common in existing research.[16] Consequently, the dispersion in overall rewards is also one-third larger in the panel than in the cross-section.

Our main analysis is in terms of life satisfaction. The Understanding Society survey also includes information on job satisfaction, and we suspect that non-pecuniary work attributes are more important in the work setting than in the life setting. In the analysis of life satisfaction in Table A3, there is greater dispersion in wages than in non-pecuniary job aspects in both the APS and Understanding Society data. On the contrary, the analysis of job satisfaction in columns (4) and (5) of Table A3 produces much larger standard deviations in non-pecuniary work rewards. Notably, in both the cross-section and panel job satisfaction analyses, the standard deviation of work amenities is substantially larger than that of log wages.

4 | OVERALL REWARDS IN DIFFERENT OCCUPATIONS

We now list individual occupations in terms of overall rewards, and compare this ranking to that obtained using only information on hourly pay. This comparison will indicate the role of non-pecuniary amenities in the wellbeing experienced by workers in different occupations.

Figure 1 depicts the wages and overall rewards in a number of occupations; here, we plot only the results for occupations employing at least 0.17% of the respondents[17] to reduce misleading results due to measurement error. To avoid choosing an arbitrary baseline, the non-pecuniary aspects of each occupation are expressed in terms of deviations from the sample mean. Overall rewards, which are the sum of hourly wages and the the monetary value of the non-pecuniary amenities in that occupation, are represented by the horizontal bars; hourly wages are represented by the black crosses. The gap between hourly and overall rewards then reveals the monetary value of non-pecuniary amenities in that occupation. A black cross that is to the right of the bar indicates a below-average value of amenities in that occupation.

There is a general positive correlation between overall rewards and wages: both broadly trend downwards when reading from the top to the bottom of Figure 1. Some low-paid occupations, such as customer service, shop assistants and low-skilled labourers, also have the worst non-pecuniary aspects, resulting in overall rewards that are lower than actual wages. Equally, a number of occupations towards the top of Figure 1 have both high wages and a positive value of amenities. However, the correlation is far from perfect. For example, some elementary

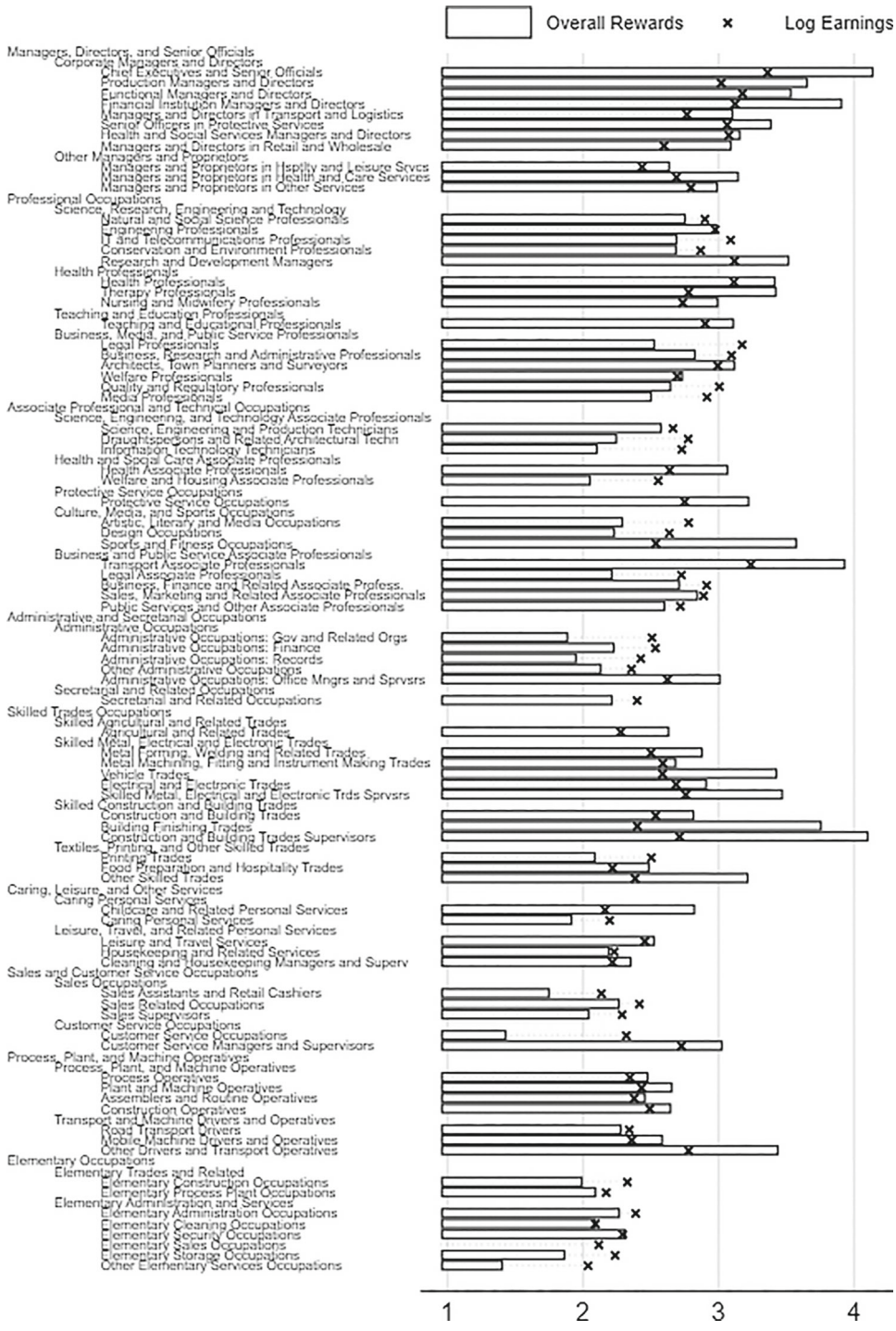

FIGURE 1 Wages and overall rewards in different occupations. *Notes*: Occupations are listed in the order of the SOC2010 classification: the leftmost entries show the 1-digit classification, the first indent the 2-digit classification, and the rightmost entries that at the 3-digit level. It is for these latter that log wages and overall rewards are depicted. To avoid outliers, we do not plot occupations under the 1st percentile in terms of share of the population employed. To avoid choosing an arbitrary baseline, the non-pecuniary aspects of each occupation are expressed in terms of deviations from the sample mean. The figure is based on respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Source: APS.

construction and agricultural workers have higher overall rewards, once the value of amenities is taken into account.

The patterns in Figure 1 underline the importance of carrying out the analysis at the 3-digit level. In the first 1-digit group (Managers, Directors and Senior Officials), overall rewards are systematically larger than wages. But in the second group (Professional Occupations), some 3-digit occupations have overall rewards above wages (Health and Teaching), while for others (in Business), the inequality is opposite. The same point can be made in a number of other 1-digit occupational groups.

As the gap between wages and overall rewards widens when introducing individual fixed effects (as can be seen from columns (2) and (3) of Table A3), Appendix Figures A2 and A3 replicate Figure 1 in cross-section and panel estimations, respectively, using Understanding Society data.[18] The coefficients in the panel analysis are determined by respondents who switch occupations, and as such can be noisy in occupations where respondents do so only infrequently. Figures A2 and A3 hence illustrate the 30 most popular occupations in our data. While there are substantial differences between the two figures, the gap between wages and overall rewards is broadly wider in the panel analysis in Figure A3 than in the cross-section analysis in Figure A2, reflecting the larger standard deviation of overall rewards in the panel as opposed to the cross-section, as seen in Appendix Table A3. The correlation coefficient between the α_3^j in the cross-section and the α_3^j in the panel shows the extent to which the 'best occupations' in the cross-section remain the 'best occupations' in the panel. We find this correlation coefficient to be 0.42 when looking at the 30 most popular occupations. This figure likely reflects the additional noise in panel estimation and the fact that those workers who switch occupations are not always representative of the sample.

In Appendix D, we evaluate how different job attributes feed into both the monetary and non-monetary components of overall rewards, by complementing our sparse set of job characteristics from the APS with richer occupation-level data from the Labour Force Survey and the Workplace Employment Relations Study.

5 | OVERALL REWARDS IN DIFFERENT OCCUPATIONS: BY EDUCATIONAL ATTAINMENT

While Figure 1 provides insights into how wages and non-pecuniary amenities differ across occupations, it does not address the fact that not all occupations are available equally to all individuals. In particular, educational attainment plays a large part in determining career trajectories and the jobs that people occupy. Furthermore, even within the same occupation, higher-educated respondents will likely have different roles and responsibilities, access to amenities, and wages.[19]

We address this heterogeneity by classifying respondents into three educational attainment categories: those who have tertiary degrees (38%), A levels or a similar higher education qualification (35%), and GCSEs, a similar qualification, or less (27%). Table 3 presents a correlation matrix summarizing the relationship between life satisfaction, educational attainment, wages, non-pecuniary amenities and overall rewards.[20] Education in Table 3 is captured by years of education, with the baseline category of GCSE qualifications or less being set to 0, A levels to 2, and a degree to 5.[21] Life satisfaction is positively correlated with educational attainment, wages, non-pecuniary aspects and overall rewards. However, all of these coefficients are only small in size, so that a substantial share of what determines life satisfaction remains unexplained. On the contrary, we find a strong correlation between education and wages, as expected, as well as with non-pecuniary work aspects, and therefore also with overall rewards.

While Table 3 indicates that the better educated enjoy better average labour market outcomes, it says nothing about the dispersion in these outcomes. Table 4 investigates by comparing

TABLE 3 Important correlations.

	Life satisfaction	Education	Log wage	α_3^j/α_2	Overall rewards
Life satisfaction	1.000				
Education	0.023	1.000			
Log wage	0.072	0.408	1.000		
α_3^j/α_2	0.063	0.057	0.135	1.000	
Overall rewards	0.090	0.341	0.832	0.663	1.000

Notes: These correlations are calculated on respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wages distribution. Life satisfaction is measured on an 11-point scale, where 0 corresponds to 'Not at all satisfied' and 10 to 'Completely satisfied'. Education is captured here by years of education, with the baseline category of GCSE qualifications or less being set to 0, A levels to 2, and a degree to 5. 'Log wage' is the logarithm of hourly wages. α_3^j/α_2 are the occupational non-pecuniary amenities estimated from equation (1) adjusted by the coefficient on log wages. Our measure of overall rewards is described in equation (3).
Source: APS.

TABLE 4 Important standard deviations.

	Log wage (1)	α_3^j/α_2 (2)	Overall rewards (3)
Degree			
SD	0.51	0.56	0.84
Sample size	75,175		
A levels			
SD	0.46	0.39	0.63
Sample size	69,169		
GCSE or less			
SD	0.41	0.29	0.53
Sample size	53,736		

Notes: The standard deviations are calculated for respondents aged 18–65 in full-time employment in five waves of the APS, excluding those whose hourly wages are in the 1st percentile of the wages distribution. 'Log wage' is the logarithm of hourly wages. α_3^j/α_2 are the occupational non-pecuniary amenities estimated in equation (1) adjusted by the coefficient on log wages. Our measure of overall rewards is described in equation (3).
Source: APS.

the standard deviations of wages, non-pecuniary amenities and overall rewards across the three different education groups, by estimating equation (1) across educational groups.

The dispersion of wages is fairly similar across education categories. However, as we have discussed above, data on wages alone substantially underestimate the overall level of inequality in the rewards to employees on the labour market. Columns (2) and (3) of Table 4 show that there is substantial variation in terms of the non-pecuniary aspects of work and overall rewards. The standard deviation of overall rewards is 29% larger than that of wages for the lowest educated, with analogous figures of 37% for those with A levels, and a striking 65% for respondents with a degree. As a result, the dispersion of overall rewards exhibits a far more substantial education gradient than does that of wages.

This pattern of dispersion by education merits further discussion. Appendix Table B1 shows that average life satisfaction varies less for the high educated, reflecting greater wellbeing inequality for the less educated. However, we also see that the dispersion of non-pecuniary amenities and overall rewards is highest for respondents with a degree. This pattern is not evident

in the life satisfaction figures, and appears only weakly in the wages figures. The distribution of overall rewards that we uncover helps to inform how educational decisions affect labour market outcomes and the overall level of inequality in labour market rewards.

Appendix Figures A4,A5 and A6 reproduce Figure 1, but now separately for our three education groups. Overall rewards (in the bars) are again compared to wages (the black crosses), but now for the 30 most populated occupations within each education category. The overall rewards figure in some occupations, such as corporate managers, is high regardless of educational attainment, while in others, such as customer service, it is always low. In general, the gap between wages and overall rewards, whether negative or positive, is largest in absolute size for those with a degree, and lowest for the least educated. In line with the figures in Table 4, the dispersion of overall rewards, and consequently the inequality in labour market outcomes, is substantially higher for the better educated.

We can reap additional insights into the ranking of occupations across education by looking at the subset of 13 occupations that appear in the 30 most popular for all three education categories. There is a clear pattern by education in the overall rewards gap in these same occupations. The higher educated tend to experience better amenities in managerial and professional occupations, as compared to the less well educated in the same occupations, and consequently higher overall rewards. The reverse pattern is seen in (lower ranked) administrative occupations, where amenities are better for the less well educated, producing higher overall rewards for this group. Overall rewards then partly reflect the match of education to occupation.

6 | THE OVERALL REWARDS TO EDUCATION IN THE LABOUR MARKET

In this paper, we focus on the choice of occupation because it is one of the key choices that individuals make on the labour market. Another key choice that people make that has consequences for the labour market is the decision to become more educated. And while we observe only three educational categories in our analysis, in this section we explore further how the choice of education impacts the labour market outcomes of individuals.

Here, we analyse formally the overall rewards to education on the labour market, and how these are related to wages, overall rewards and respondents' personal characteristics. To do so, we decompose the effects of demographics and educational attainment on overall rewards into their effect on (i) wages and (ii) the non-pecuniary amenities in each occupation. We estimate the following three equations:

$$LogWage_{ikt} = \gamma_0 + \gamma_1\ X_{it} + \sum_k \gamma_{2,k}\ Educ_{ikt} + \tau_t + \nu_{ijt}, \tag{4}$$

$$(\alpha_3^j/\alpha_2)_{ikt} = \delta_0 + \delta_1\ X_{it} + \sum_k \delta_{2,k}\ Educ_{ikt} + \tau_t + \upsilon_{ijt}, \tag{5}$$

$$OverallRewards_{ikt} = \beta_0 + \beta_1\ X_{it} + \sum_k \beta_{2,k}\ Educ_{ikt} + \tau_t + \eta_{ijt}, \tag{6}$$

where $(\alpha_3^j/\alpha_2)_{ikt}$ in equation (5) results from estimating equation (1), and k indexes the three educational categories. The coefficient vectors in equations (4) and (5) by design sum to the coefficients in equation (6), so $\gamma_{2,k} + \delta_{2,k} = \beta_{2,k}$ for all k.

Table 5 shows the resulting estimates of γ_2, β_2 and δ_2 in equations (4)–(6).[22] As the α_3^j/α_2 do not vary across individuals and across waves, in Appendix Table A5 we show how our results change if we estimate equation (5) at the occupation level instead. The results in Table 5 show that wages rise in education, with those with a degree earning 70% more than those with the lowest education level. These rewards to education are found to be even larger when non-pecuniary job

TABLE 5 The overall rewards to education in the labour market.

	Log wage (1)	α_3^j/α_2 (2)	Overall rewards (3)
Degree	0.247***	0.009***	0.256***
	(0.002)	(0.001)	(0.002)
A levels	−0.086***	0.020***	−0.066***
	(0.002)	(0.002)	(0.002)
GCSE or less	−0.281***	−0.041***	−0.322***
	(0.002)	(0.002)	(0.003)
Gender	Yes	Yes	Yes
Age quadratic	Yes	Yes	Yes
Ethnicity	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes
R^2	0.31	0.02	0.24
F-value	2671.62	120.63	1766.75
N	198,080	198,080	198,080
SD dependent	0.51	0.38	0.68

Notes: These are OLS regressions. In column (1), 'Log wage' is the logarithm of hourly wages. In column (2), α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. The dependent variable in column (3) is our measure of overall rewards. The coefficients on education category are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988); as such, there is no omitted education category. The sample covers respondents aged 18–65 in full-time employment in five waves of the APS, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions.
***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: APS.

amenities are taken into account. The return to further two years of education after the end of compulsory schooling (i.e. A levels or equivalent) is one-third larger in terms of overall rewards than in terms of wages alone.

Comparing the coefficients in Table 5 to the dispersion of wages and overall rewards in Table 4 reveals that while the expected value of a degree is slightly higher in terms of overall rewards, it is also a riskier choice: the dispersion of overall rewards is substantially larger for the best-educated respondents as compared to their less-educated counterparts, despite there being only a small difference in wage dispersion. In the data that we analyse here, the overall rewards of a respondent with only a GCSE qualification are higher than those of a respondent with a degree in almost half of occupations, and a similar result is found for respondents with A levels. Taking both wages and the value of job amenities into account provides a more complete, and perhaps a little unexpected, picture of the overall rewards to education on the labour market. However, we note that these results do not apply to the overall rewards to education in terms of life satisfaction, but simply capture the part of these overall rewards that comes via the labour market.

7 | RE-EXAMINING THE GENDER AND ETHNIC GAPS

We now ask how gender and ethnicity relate to both overall rewards and their monetary and non-monetary components. As for education above, we first split the sample by sex: Appendix Figures A7 and A8 plot the logarithm of wages and our measure of overall rewards for both women and men, at the occupation level.[23] These figures are analogous to those in Figure 1 for the

whole sample.[24] Overall, the same positive correlation between wages and the value of amenities is observed for both sexes. Women in managerial jobs earn less than men do, but have higher amenity values. Equally, both the positive amenity value in the Health and Education sectors and the negative amenity value in Elementary jobs seem to be higher for women.

Table 6 shows the estimated coefficients on gender, age and ethnicity from equations (4), (5) and (6): these are the same wages, amenities and overall reward equations as used for the analysis of education categories in Table 5. In Appendix Table A5, we show how our results change if we estimate equation (5) at the occupation level.

The gender gap is 31% larger when considering overall rewards than with wages alone. Appendix Table A6 shows the results without the education variables of Table 5, which does not materially affect this conclusion. As our sample is restricted to respondents in full-time employment, the gender gap in Table 5 is not explained by gender differences in the prevalence of part-time work.

Equally, the wages of ethnic minorities can understate the gaps in terms of overall rewards. Almost all ethnic minority groups fare considerably worse once the non-pecuniary aspects of work are taken into account, suggesting that some disadvantaged groups both earn less and have worse job amenities at the same time. For example, the 'Pakistani', 'Bangladeshi' and 'Black' ethnic groups are paid substantially less than the average respondent, but their overall rewards are actually 46%, 47% and 40% lower, respectively, than the wage gap alone would suggest. The estimated coefficients in columns (1) and (2) of Table 6 produce this pattern for 8 out of the 11 ethnic groups in the APS, so the ethnic gap is significantly underestimated without information on job amenities.

In unreported results, we also estimated the ethnic wage gaps in Table 6 separately for men and women, to allow for different coefficients on the other demographic controls. These show that the ethnic gaps in Table 6 are larger for men, while these gaps were less pronounced (and in some cases entirely absent) for women. As such, the ethnic and gender gaps are intertwined. This gender split also reveals that women are more likely to be penalized for not having a degree. Non-degree education is associated with lower wages for both men and women, but for men these are partially compensated through non-pecuniary amenities, while on the contrary they are accentuated for women.

8 | RESULTS FROM THE USA

Nationally representative large datasets that contain subjective wellbeing questions in combination with detailed information on respondent income and occupation are relatively scarce. This is even more the case for panel surveys. For these data reasons, our main analysis above referred to workers in the UK.

We here complement this UK analysis with two datasets from the USA. The best data sources for this purpose are the General Social Survey (GSS) and the Panel Study of Income Dynamics (PSID).[25] The GSS is a repeated cross-section survey (but not a panel) that is representative of the US population. There are two subjective wellbeing questions in the GSS, referring to happiness and job satisfaction; these appear in 29 waves, with 2300 observations each, on average, between 1974 and 2016. Additionally, the GSS records respondents' yearly income as a continuous variable (which is released in constant US dollars, using 1986 as the base), as well as the occupations of those in employment.

The advantage of the GSS is that it is representative of the US population and is a long time series, which allows us to better account for changes in the labour market over time. The downside is its cross-sectional nature and the small yearly sample size. A such, we complement our analysis with data from the PSID, a panel of US respondents. The PSID goes back to 1968

TABLE 6 Re-examining the gender and ethnic gaps.

	Log wage (1)	α_3^j/α_2 (2)	Overall rewards (3)
Female	−0.172***	−0.052***	−0.224***
	(0.002)	(0.002)	(0.003)
Age	0.078***	0.018***	0.096***
	(0.001)	(0.001)	(0.001)
Age-squared/100	−0.081***	−0.019***	−0.099***
	(0.001)	(0.001)	(0.001)
Ethnicity			
White British	0.012***	0.009***	0.021***
	(0.001)	(0.001)	(0.001)
White Irish	0.123***	0.044***	0.167***
	(0.015)	(0.016)	(0.023)
Other White	−0.061***	−0.020***	−0.081***
	(0.005)	(0.004)	(0.007)
Mixed group	0.039**	−0.026**	0.013
	(0.014)	(0.013)	(0.019)
Indian	0.032***	−0.083***	−0.051***
	(0.008)	(0.007)	(0.011)
Pakistani	−0.145***	−0.067***	−0.211***
	(0.014)	(0.012)	(0.031)
Bangladeshi	−0.141***	−0.067***	−0.208***
	(0.022)	(0.019)	(0.031)
Chinese	0.049***	−0.056***	−0.007
	(0.019)	(0.014)	(0.024)
Other Asian	−0.124***	−0.023**	−0.147***
	(0.015)	(0.012)	(0.020)
Black	−0.132***	−0.052***	−0.183***
	(0.008)	(0.007)	(0.011)
Other group	−0.067***	−0.013	−0.080***
	(0.013)	(0.010)	(0.017)
Education	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes
R^2	0.31	0.02	0.24
F-value	2671.62	120.63	1766.75
N	198,080	198,080	198,080
SD dependent	0.51	0.38	0.68

Notes: These are OLS regressions. In column (1), 'Log wage' is the logarithm of hourly wages. In column (2), α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. In column (3), the dependent variable is our measure of overall rewards. The ethnicity coefficients are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988); as such, there is no omitted ethnicity category. The sample covers respondents aged 18–65 in full-time employment in five waves of the APS, excluding those whose hourly wages are in the 1st percentile of the wages distribution. Heteroscedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions.
***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: APS.

and has a sample of over 18,000 individuals living in 5000 families in the USA. Information on these individuals and their descendants has been collected continuously, including data covering employment and income. Since 2009, the PSID has asked the household reference person a question on life satisfaction in every wave. We restrict our analysis to the 6772 reference persons who can be tracked over the six waves from 2009 onwards. Since the question on life satisfaction is not asked of each family member, our sample is not fully representative of the US population.[26] Appendix Table A8 provides some descriptive statistics on the GSS and PSID data.

In both datasets, occupations are recorded at the 4-digit level, using the 2010 Census Occupational Category. In total, there are over 500 different occupations at this levels. Given the relatively small sample size resulting from all our restrictions,[27] we avoid small occupational cells by recoding this variable into 23 broader categories, in line with the 2-digit classification in the 2010 Census Occupational Category.[28] Log wages are the logarithm of annual income in constant US$ in the GSS and the logarithm of hourly pay in the PSID. For the PSID, we deflate wages by the Consumer Price Index indices for the USA in order to obtain real figures.

Table 7 shows the US results from estimating equation (1) with the GSS and PSID data. As in Table 1, the sample is restricted to respondents aged 18–65 in full-time employment. The different columns refer to the different wellbeing measures. To render the coefficients comparable in size to those for the APS in Table 1, we recode all of them to be on an 11-point scale. In the GSS, general happiness is measured originally on a 3-point scale, where 1 corresponds to 'Not too happy' and 3 to 'Very happy', and job satisfaction is measured on a 4-point scale, where 1 corresponds to 'Very dissatisfied' and 4 to 'Very satisfied'. In the PSID, life satisfaction is measured originally on a 5-point scale, where 1 corresponds to 'Completely dissatisfied' and 5 to 'Completely satisfied'. The coefficients in column (3) are estimated in the cross-section, while the coefficients in column (4) exploit the panel dimension of the data by adding individual fixed effects to equation (1).

TABLE 7 How wages and personal characteristics affect worker wellbeing in the USA.

	Happiness (GSS) (1)	Job satisfaction (GSS) (2)	Life satisfaction (PSID) (3)	Life satisfaction (PSID) (4)
Log wage	0.374***	0.329***	0.343***	0.282***
	(0.038)	(0.032)	(0.027)	(0.028)
Age polynomial	Yes	Yes	Yes	Yes
Gender	Yes	Yes	Yes	Yes
Race	Yes	Yes	Yes	Yes
Occupation fixed effects	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes
Individual fixed effects	No	No	No	Yes
R^2	0.03	0.05	0.04	0.03
F-value	7.40	14.40		
Chi-squared				318.54
N	20,475	20,513	20,217	20,217
SD dependent	2.98	2.56	2.02	2.02

Notes: These are OLS regressions. The sample includes respondents aged 18–65 in full-time employment in 29 waves of GSS data, between 1974 and 2016 (columns (1) and (2)), and in 6 waves of PSID data, between 2009 and 2019. The regressions exclude those whose yearly real income is in the 1st percentile of the income distribution. 'Log wages' is the logarithm of each respondent's real yearly income. To be consistent with the results from the APS, we stretch all three wellbeing measures onto an 11-point scale. The sample in columns (1) and (2) is re-weighted using the population weights in the GSS.

***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

Source: GSS and PSID.

TABLE 8 Important standard deviations in the USA.

	Log wage (1)	α_3^j (2)	α_3^j/α_2 (3)	Overall rewards (4)	Sample size (5)
Cross-section					
SD (from Happiness, GSS)	0.75	0.21	0.55	1.01	20,475
SD (from Job satisfaction, GSS)	0.75	0.30	0.92	1.27	20,513
SD (from Life satisfaction, PSID)	0.67	0.17	0.49	0.92	20,217
Panel					
SD (from Life satisfaction, PSID)	0.67	0.16	0.56	1.01	20,217

Notes: These figures are calculated for respondents aged 18–65 in full-time employment in 29 waves of GSS data, between 1974 and 2016, and in 6 waves of PSID data, between 2009 and 2019. The regressions exclude those whose yearly real income is in the 1st percentile of the income distribution. 'Log wage' is the logarithm of each respondent's real yearly income. α_3^j/α_2 are the non-pecuniary work rewards estimated in equation (1) divided by the coefficient on log wages. Our measure of overall rewards is described in equation (3).
Source: GSS and PSID.

The coefficient on 'Log wage' in column (1) of Table 7 is 0.374, so doubling wages increases happiness by 0.262 on the 11-point scale. The coefficients on 'Log wage' in columns (2) and (3) are very similar. In line with our findings from the UK, the income coefficient in the panel (column (4)) is also somewhat smaller than values from the cross-section analysis.

Table 8 lists the key standard deviations in the two sources of US data. Wages are more dispersed in the USA than in the UK: in column (1), the standard deviation of US wages is 0.75 in the GSS and 0.67 in the PSID, roughly 50% higher than the UK figure of 0.51 in Table 2. The dispersion in US non-monetary rewards (α_3^j/α_2) is also significantly larger than in the UK (0.55 or 0.49 against 0.38). Finally, the dispersion in overall rewards in the USA in column (3) is one-third higher than that of wages, a ratio that is robust in both the GSS and the PSID, and that is remarkably similar to our findings for the UK. In the USA, the correlation between wages and amenities is roughly 0.2 (0.19 in the GSS, and 0.24 in the PSID). This relationship is slightly stronger for the USA, but in line with our UK findings in order of magnitude.

When calculating the dispersion in amenities in the panel, the results are remarkably similar to those in the cross-section. As such, as in the UK market, controlling for time-invariant unobserved characteristics such as ability does not change our main conclusions and confirms that the large dispersion in overall rewards cannot be explained away by selection into occupations.

In line with our UK results, we also find that there is more dispersion in amenities than in wages when we take job satisfaction as the wellbeing measure, and consequently that the dispersion in overall rewards is also larger.

Appendix Figure A9 illustrates how wages and overall rewards compare across different occupations in the GSS. While in the top occupations overall rewards are often greater than wages (revealing above-average non-pecuniary rewards), this does not hold for Computer and Mathematics, nor for Legal occupations. Towards the bottom, non-pecuniary rewards are notably lower in Food Preparation, and Buildings and Maintenance.

Table 9 estimates equations (4)–(6) to assess the overall rewards to education on the labour market in the USA. In both datasets, the rewards to a degree (16 years or more of education) are greatly underestimated when not taking non-monetary rewards into account. Compared to people with 12 years of education, the rewards to an undergraduate degree or above are twice as high as wages data alone would suggest. The rewards to a high school diploma (12 years of education) compared with fewer than 12 years education are also underestimated without taking data on wellbeing into account. The underestimation of the rewards to a degree in the USA is substantially larger than that in the UK (in Table 5), as non-pecuniary rewards play a far larger role in the rewards to education in the US labour market.

TABLE 9 The overall rewards to education in the USA.

	Log wage (GSS) (1)	α_3^j/α_2 (GSS) (2)	Overall rewards (GSS) (3)	Log wage (PSID) (4)	α_3^j/α_2 (PSID) (5)	Overall rewards (PSID) (6)
Years of education						
16 years or more	0.363***	0.336***	0.699***	0.326***	0.134***	0.459***
	(0.009)	(0.006)	(0.010)	(0.006)	(0.005)	(0.015)
13–15 years	0.002	−0.006	−0.005	−0.048***	−0.061***	−0.109***
	(0.008)	(0.006)	(0.011)	(0.007)	(0.005)	(0.008)
12 years	−0.149***	−0.163***	−0.312***	−0.211***	−0.076***	−0.288***
	(0.007)	(0.005)	(0.009)	(0.007)	(0.005)	(0.009)
Fewer than 12 years	−0.435***	−0.329***	−0.764***	−0.435***	−0.074***	−0.508***
	(0.013)	(0.009)	(0.016)	(0.012)	(0.008)	(0.015)
Gender	Yes	Yes	Yes	Yes	Yes	Yes
Age polynomial	Yes	Yes	Yes	Yes	Yes	Yes
Race	Yes	Yes	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.33	0.21	0.37	0.33	0.10	0.33
F-value	198.13	125.88	245.21	712.84	162.07	733.28
N	20,226	20,226	20,226	20,145	20,145	20,145
SD dependent	0.75	0.55	1.01	0.67	0.49	0.92

Notes: These are OLS regressions. In column (1), 'Log wage' is the logarithm of real yearly income. In column (2), α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. The dependent variable in column (3) is our measure of overall rewards. The coefficients on education category are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988); as such, there is no omitted education category. The sample covers respondents aged 18–65 in full-time employment in 29 waves of the GSS and 6 waves of PSID data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the population weights in the GSS.
***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: GSS and PSID.

Table 10 presents the gender and racial gaps in the US labour market, once overall rewards are accounted for. Women earn significantly less than men: the wage gap is more than twice as large as that for the UK in Table 5. However, unlike in the UK, in the GSS, women are partly compensated through better amenities. As a result, women in the USA fare better in terms of overall rewards than their wages would suggest, but even so, a large gender gap persists and is about one-third larger than that in the UK. This difference results partially from our GSS sample spanning a longer time period, and therefore picking up changing trends for women in the labour market. With respect to race, Black respondents earn substantially less than Whites, and also experience worse non-pecuniary rewards. The results for 'Other' racial minorities are more mixed. In line with our UK results, the racial gaps on the labour market are larger than those revealed by wages alone.

9 | THE CORRELATION BETWEEN WAGES AND NON-PECUNIARY REWARDS

Above, we have considered in detail the dispersion of both wages and non-pecuniary job rewards, which together make up overall rewards. But a long-running question in the literature concerns

TABLE 10 Re-examining the gender and ethnic gaps in the USA.

	Log wage (GSS) (1)	α_3^j/α_2 (GSS) (2)	Overall rewards (GSS) (3)	Log wage (PSID) (4)	α_3^j/α_2 (PSID) (5)	Overall rewards (PSID) (6)
Female	−0.439***	0.134***	−0.305***	−0.227***	−0.178***	−0.405***
	(0.010)	(0.008)	(0.013)	(0.008)	(0.007)	(0.011)
Age	0.102***	0.015***	0.116***	0.073***	0.018***	0.091***
	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)
Age squared	−0.100***	−0.014***	−0.114***	−0.071***	−0.019***	−0.090***
	(0.004)	(0.003)	(0.005)	(0.003)	(0.002)	(0.003)
Race						
White	0.024***	0.008***	0.033***	0.095***	0.029***	0.124***
	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.005)
Black	−0.127***	−0.021**	−0.148***	−0.118***	−0.035***	−0.154***
	(0.013)	(0.010)	(0.017)	(0.005)	(0.004)	(0.007)
Other	−0.042*	−0.062***	−0.104***	−0.014	−0.006	−0.020
	(0.023)	(0.015)	(0.029)	(0.013)	(0.011)	(0.017)
Education	Yes	Yes	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.33	0.21	0.37	0.33	0.10	0.33
F-value	198.13	125.88	245.21	712.84	162.07	733.28
N	20,226	20,226	20,226	20,145	20,145	20,145
SD dependent	0.75	0.55	1.01	0.67	0.49	0.92

Notes: These are OLS regressions. In columns (1) and (4), 'Log wage' is the logarithm of each respondent's real yearly income. In columns (2) and (5), α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. In columns (3) and (6), the dependent variable is our measure of overall rewards. The race coefficients are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988); as such, there is no omitted race category. The sample covers respondents aged 18–65 in full-time employment, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the population weights in the GSS. ***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: GSS and PSID.

how these two rewards are related. Do the best-paid jobs also have good working conditions? Or instead, do higher wages compensate for bad working conditions, as in the theory of compensating wage differentials? In Section III, the interpersonal dispersion of overall rewards was determined by the dispersion of hourly wages and that of job amenities, and of the correlation between these two, which was found to be 0.14. This latter figure indicates a positive association between wages and job amenities on the UK labour market.

To investigate the relationship more formally, we estimate the wage equation

$$LogWage_{ijt} = \beta_0 + \beta_1 X_{it} + \sum_j \beta_2^j Occupation_{ijt} + \tau_t + \eta_{ijt}, \quad (7)$$

where the vector X_{it} in equation (7) also includes educational attainment (but the vector X_{it} in equation (1) did not). In this equation, β_2^j measures occupational earnings (*ceteris paribus*).

TABLE 11 Correlation coefficient of wages with amenities (α_3^j/α_2).

	Overall (1)	Private sector (2)	Public sector (3)
Individual wages	0.14	0.16	−0.01
Individual wages (conditional on X_{it})	0.09	0.10	−0.01
Occupation wages (conditional on X_{it})	0.19	0.23	−0.01

Notes: These correlations (ρ) are based on a sample of respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. The α_3^j/α_2 are the occupational job amenities from equation (1) adjusted by the coefficient on log wages.
Source: APS.

Below, we show how earnings are correlated with amenities (given by the α_3^j/α_2 measure derived previously). In Table 11, the first row shows the correlation with individual wages in the raw data, the second row shows the correlation with individual wages conditional on demographics (X_{it}), and the final row shows the correlation with occupation-level wages conditional on the same demographics (X_{it}). There is a positive correlation between the conditional occupational distribution of wages and that of job amenities: occupations with better amenities also have higher wages. Columns (2) and (3) in Table 11 reveal that this positive correlation is driven entirely by the private sector. Again, the differences in labour market outcomes across individuals are more profound than their wages alone suggest.[29]

The estimation of the correlations in Table 11 using cross-sectional data may produce biased coefficients due to unobserved individual-level characteristics. Appendix Figure A1 illustrates why this could be the case. Specifically, the idea of compensating differentials is the menu of wages and amenities across occupations offered to the same individual. In the cross-section, we expect individuals of higher ability to have both higher wages and higher amenities. That is because the unobserved distribution of ability will bias the correlation between wages and amenities upwards. Once we remove the effect of ability, we would expect the correlation to be less positive. This is in line with what we find in the cross-section analysis of APS data in Table 11. Even so, the correlation coefficient ρ remains positive.

In Table 12, we look at the same correlation between wages and amenities using Understanding Society, the GSS and the PSID. For Understanding Society and the PSID, we can also correlate wages and amenities exploiting the panel dimension of our data, which holds all time-invariant individual characteristics constant.

The results in Table 12 indicate that our cross-sectional APS findings are similar to the cross-sectional results in both Understanding Society and the two US data sources. The cross-section correlation between occupation wages and α_3^j/α_2 in Understanding Society is positive but larger, at 0.34. The corresponding correlation using job satisfaction as opposed to life satisfaction yields a cross-section correlation coefficient 0.16. Very similar figures are found for the US labour market. Again, controlling for X_{it} renders the correlation coefficient less positive.

The panel correlation between occupational wages and α_3^j/α_2 in Understanding Society is 0.01 (while the corresponding figure using job satisfaction is 0.17). However, in the US labour market, the panel correlation between occupational wages and α_3^j/α_2 is 0.50. We conclude that even within individuals, the correlation between wages and job amenities as measured using job satisfaction is positive, while that using life satisfaction is close to zero in the UK but large and positive in the USA.

As with any empirical analysis, even in panel data, we cannot exclude entirely the possibility that unobserved time-varying individual-level controls may still play a role in the determination of wages and amenities. Panel data with more detailed information on specific job amenities and individual circumstances would likely help to contribute to this debate.

TABLE 12 Correlation coefficient of wages with amenities (α_3^j/α_2) in Understanding Society, the GSS and the PSID.

	Correlation (ρ)
Panel A: Cross-section	
Life satisfaction (Understanding Society)	
Individual wages	0.22
Individual wages (conditional on X_{it})	0.15
Occupation wages (conditional on X_{it})	0.34
Job satisfaction (Understanding Society)	
Individual wages	0.12
Individual wages (conditional on X_{it})	0.07
Occupation wages (conditional on X_{it})	0.16
Happiness (GSS)	
Individual wages	0.19
Individual wages (conditional on X_{it})	0.04
Occupation wages (conditional on X_{it})	0.23
Life satisfaction (PSID)	
Individual wages	0.24
Individual wages (conditional on X_{it})	0.09
Occupation wages (conditional on X_{it})	0.37
Panel B: Panel	
Life satisfaction (Understanding Society)	
Individual wages	0.04
Individual wages (conditional on X_{it})	0.04
Occupation wages (conditional on X_{it})	0.01
Job satisfaction (Understanding Society)	
Individual wages	0.16
Individual wages (conditional on X_{it})	0.15
Occupation wages (conditional on X_{it})	0.17
Life satisfaction (PSID)	
Individual wages	0.34
Individual wages (conditional on X_{it})	0.31
Occupation wages (conditional on X_{it})	0.50

Notes: These correlations are based on a sample of respondents aged 18–65 in full-time employment, excluding those whose hourly wages are in the 1st percentile of the wage distribution. The α_3^j/α_2 are the occupational job amenities from equation (1) adjusted by the coefficient on log wages.
Source: Understanding Society, GSS and PSID.

10 | CONCLUSION

We have analysed the values of different occupations to workers. We consider occupations at the 3-digit level, and calculate the distribution of life satisfaction across occupations controlling for wages; this provides us with a measure of the value of unobserved job amenities to workers by occupation. These can be converted to monetary values using information on the impact of wages on life satisfaction. A worker's overall rewards are then her wages plus the monetary value of the amenities in her occupation.

Our key finding is that the distribution of overall rewards is more unequal than that of wages. The dispersion of overall rewards is one-third larger than the dispersion of wages. In addition, both the gender gap and ethnic gaps on the labour market are substantially larger in terms of overall rewards than in terms of wages alone.

We carry out a number of exercises to establish the relationship between wages and the value of job amenities. We consider both cross-sectional and panel data, and both life satisfaction and job satisfaction as our measure of the hedonic return to work. The gap between wages and overall rewards does not reflect measurement error, as it exhibits strong systematic patterns in the data. These findings could have implications for the large literature on rent-sharing (two recent contributions are Bell *et al.* 2024; Hirsch and Mueller 2020); in particular, rent-sharing may be underestimated by focusing only on wages.

Occupation is one of the most important decisions that an individual makes. Another is education. We first show that wages alone underestimate the overall rewards to education. Moreover, the ranking of occupations (in terms of their overall rewards) is not identical in each education group. While managerial jobs provide substantial rewards for workers at all levels of education, lower-ranked administrative positions are associated with positive job amenities for the less educated, but negative amenities for the better educated. Finally, the variance in non-pecuniary amenities is strikingly larger for those with a degree. While education provides larger rewards on average, it is also more risky in terms of labour market rewards.

Even though our main results are for the UK, they are replicated using two sources of US data, and in both the cross-section and the panel. Compared to the UK, US workers experience more dispersion in both wages and amenities. However, equivalent to our key finding from the UK, the dispersion of overall rewards is one-third larger than the dispersion of wages, and controlling for time-invariant unobserved characteristics does not alter our conclusions for the USA either. Similarly, the overall rewards to education in the labour market are also larger, although the differences between people with different educational attainment are starker in the USA. Finally, differences in wages also underestimate the racial gap in the USA, while the picture for women in the US labour market is less clear. Our systematic finding in both countries is that the labour market is more unequal than wages alone would suggest.

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ENDNOTES

[1] Using direct questions on different aspects of work, Clark *et al.* (2018) find that one standard deviation in the individual quality-of-work index increases life satisfaction by 0.2 standard deviations. Compared to that, in this paper, a one standard deviation increase in the indirectly measured occupational quality raises life-satisfaction by 0.1 standard deviations. See Clark *et al.* (2018, p. 74) and Table 2 of this paper.

[2] It would also be of interest to evaluate the correlation between wages and directly measured job amenities at the firm level. It is, however, difficult to identify large-scale datasets at the firm level that would allow this analysis to be carried out.

[3] More information about the APS can be found at https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/methodologies/annualpopulationsurveyapsqmi (accessed 14 February 2024).

[4] There are initially 1,480,000 observations in the five APS waves that we use. Restricting the sample by age and to those in employment brings this figure down to 630,000; keeping only full-time employees reduces the sample further to 460,000 observations. The remaining observations are lost due to non-response. Wage data are missing for about 150,000 people, and another 100,000 have missing values for (mostly) life satisfaction or some of the demographics in Table 1. This produces a final analysis sample of 210,000.

[5] Jobs may well have effects on overall wellbeing (here life satisfaction) that do not appear sufficiently in job satisfaction measures: for example, work–life balance, relationship quality and commuting. We will, however, present some analysis with job satisfaction as the dependent variable in Sections VIII and IX.

[6] This is slightly above the figure 7.67 for all ages and labour market statuses in the UK over the same period; see https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/methodologies/personalwellbeingquarterlyestimatestechnicalreport (accessed 5 February 2024).

[7] There is evidence of non-negligible variation in job quality at the occupation level. In the 2015 International Social Survey Programme data on job quality analysed by Clark and Kozák (2023), when controlling for country dummies, 3-digit occupations explain about 10% of the variance in Stressful work and Good job content, and about 30% of that in Hard work.

[8] More information about Understanding Society can be found at https://www.understandingsociety.ac.uk (accessed 5 February 2024).

[9] Understanding Society uses dependent interviewing, where for some variables, individuals are supplied with the information that they provided at the previous wave; see Lynn and Sala (2006). This is the case for occupation. Perales (2014) calculates occupational-mobility rates in the predecessor of Understanding Society, the British Household Panel Survey, before and after the introduction of dependent interviewing in 2006. He finds a very sharp fall in occupational mobility, suggesting that dependent interviewing reduced measurement error.

[10] Our analysis here refers to the joint dispersion in wages and amenities for employed workers. It therefore does not capture the inequality over all individuals in a society that is associated with labour force status, which would include information on the unemployed and the inactive.

[11] In unreported robustness checks, we also added partner status and education to the list of personal characteristics. We find that the former reduces the coefficient on wages ($\alpha_2 = 0.206$), while the latter increases it somewhat ($\alpha_2 = 0.277$). However, our main findings are robust to these alternative specifications. Equally, our results remain unchanged by the use of the logarithm of monthly wages, as opposed to hourly wages.

[12] One potential issue with this approach is that the standard errors on the occupation dummies may be downward-biased in small samples. Haisken-De New and Schmidt (1997) show that this is not a concern in large samples, where the standard errors are virtually equivalent to those estimated by dropping a reference category. Our analysis sample here easily exceeds their definition of a large sample and, as expected, the standard errors using the two methods are very similar.

[13] We reject the null hypothesis that all the α_3^j coefficients are jointly zero with p-value < 0.001 and F-statistic 6.69.

[14] These figures are more correctly the dispersion of real wages over both individuals and the five waves of the APS. The single-year figures, which reveal only the dispersion between individuals, are almost identical.

[15] We do so by deducting 1 from the Understanding Society 1–7 satisfaction score, and then multiplying the resulting number by 10/6.

[16] While this difference may partly reflect greater measurement error in panel data, Understanding Society has a number of checks in order to minimize this. First, respondents are strongly encouraged to provide a payslip at the time of the survey. Second, the survey flags those respondents whose reported net pay is greater than or equal to their reported gross pay, which happens in only 0.3% of our sample.

[17] This figure refers to the 1st percentile in terms of the share of employment; five occupations fall below this level.

[18] Understanding Society uses the ISCO88 occupational classification. The occupations listed in Figures A2 and A3 do not then have a one-to-one correspondence with those in Figure 1. The Understanding Society figures illustrate how the overall occupational rewards change once individual fixed effects are taken into account.

[19] Appendix Table A4 shows the individual-level correlations between the overall rewards calculated using information from all respondents and those calculated using information from low-, medium- and high-educated respondents (estimating equation (1) separately within each education category).

[20] In a more formal approach, we also estimated equation (1) separately by education group. The estimated coefficient on log wages falls with education, such that a certain percentage rise in wages has a greater impact on the life satisfaction of the least educated.

[21] These numbers correspond to the additional number of years required to attain these qualifications, as compared to a GCSE qualification.

[22] We also investigated what happens when we instead include education directly in equation (1), to ensure that the estimated values of the job amenities, α_3^j, are not capturing part of the effect of education on life satisfaction. The conclusions are similar in this alternative specification, although the magnitude of the coefficients is larger than in Table 5.

[23] We do not carry out this exercise for ethnic groups, due to the small cell sizes when disaggregating ethnic groups across 90 different occupations.

[24] In the separate estimations of equation (1), the log hourly wage coefficients (the α_2) are 0.174 for women and 0.291 for men.

[25] Other well-known data sources with subjective wellbeing information in the USA are the Behavioral Risk Factor Surveillance System (BRFSS) and the Gallup World Poll. The income and occupation information in both the BRFSS and the Gallup World Poll is sub-optimal. Income is reported in only eight bands in the BRFSS. The Gallup questionnaire contains a continuous measure of household income, but it provides no measure of individual income,

and occupation is recorded only in 11 broad categories. As such, both these datasets provide insufficiently detailed information, given the level of disaggregation required for our analysis. Neither the BRFSS nor Gallup is a panel survey.

[26] Since life satisfaction is recorded only for the individual answering the family set of questions, we restrict our sample to those instances in which the household head is the respondent.

[27] Similar to our analysis of the APS and Understanding Society, we restrict the sample to those aged between 18 and 65, in full-time employment. We also exclude those who are self-employed and those whose wages are below the 1st percentile in the income distribution.

[28] Our results are robust, and stronger, when we use instead the most popular occupations at the 4-digit level; by most popular we mean those that are above the 25th percentile in terms of the share of the population employed.

[29] Ouimet and Tate (2023) find a positive correlation between wages and health insurance, retirement and leave benefits at the firm level, using US administrative data.

[30] See https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2020/soc2020volume1structureanddescriptionsofunitgroups#:~:text=SOC%202020%20has%20nine%20major,groups%20and%20412%20unit%20groups (accessed 14 February 2024).

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APPENDIX A. ADDITIONAL TABLES AND FIGURES

TABLE A1 Descriptive statistics in the APS.

	Mean	SD	*N*
Life satisfaction	7.76	1.43	209,672
Gender and age			209,672
Female	0.45	0.50	
Age	43.02	11.37	
Ethnicity			209,672
White British	0.84	0.36	
White Irish	0.01	0.08	
Other White	0.06	0.24	
Mixed ethnic	0.01	0.09	
Indian	0.02	0.15	
Pakistani	0.01	0.09	
Bangladeshi	≤ 0.01	0.05	
Chinese	≤ 0.01	0.06	
Other Asian	0.01	0.09	
Black	0.02	0.15	
Other ethnic	0.01	0.10	
Education			198,080
Degree	0.38	0.49	
Other higher	0.12	0.32	
A level	0.23	0.42	
GCSE	0.18	0.38	
Other qualification	0.06	0.24	
No qualification	0.03	0.18	
Didn't know	≤ 0.01	0.03	
Wage			
Log hourly pay	2.64	0.51	209,672

Notes: The means and standard deviations are calculated from the sample of respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution.
Source: APS.

TABLE A2 Descriptive statistics in Understanding Society.

	Mean	SD	*N*
Life satisfaction	7.03	2.21	100,948
Job satisfaction	7.05	2.33	100,948
Age and gender			100,948
Female	0.37	0.48	
Age	40.95	11.75	
Ethnicity			100,948
White British	0.87	0.34	
White Irish	0.01	0.11	
Gypsy or Irish traveller (white)	≤ 0.01	0.01	
Other white	0.04	0.20	
White and black Caribbean (mixed)	≤ 0.01	0.06	
White and black African (mixed)	≤ 0.01	0.04	
White and Asian (mixed)	≤ 0.01	0.05	
Other (mixed)	≤ 0.01	0.05	
Indian	0.02	0.15	
Pakistani	0.01	0.08	
Bangladeshi	≤ 0.01	0.05	
Chinese	≤ 0.01	0.06	
Other Asian	0.01	0.09	
Caribbean	0.01	0.08	
African	0.01	0.10	
Other black	≤ 0.01	0.03	
Arab	≤ 0.01	0.04	
Other ethnic	≤ 0.01	0.05	
Education			100,464
Degree	0.35	0.48	
Other higher	0.13	0.34	
A level	0.23	0.42	
GCSE	0.19	0.39	
Other qualification	0.07	0.25	
No qualification	0.03	0.16	
Wage			100,948
Log hourly pay	2.63	0.51	

Notes: For a more straightforward comparison with the APS, life satisfaction and job satisfaction in Understanding Society have been adjusted to an 11-point scale, where 0 corresponds to 'Not at all satisfied' and 10 to 'Completely satisfied'. The means and standard deviations are calculated from the sample of respondents aged 18–65 in full-time employment in nine waves of Understanding Society data, excluding those whose hourly wages are in the 1st percentile of the wage distribution.
Source: Understanding Society.

TABLE A3 Important standard deviations in the APS and Understanding Society.

	Life satis. (APS) Cross-section (1)	Life satis. (U. Soc.) Cross-section (2)	Life satis. (U. Soc.) Panel (3)	Job satis. (U. Soc.) Cross-section (4)	Job satis. (U. Soc.) Panel (5)
Log wage	0.51	0.51	0.51	0.51	0.51
α_3^j	0.10	0.15	0.17	0.26	0.36
α_3^j/α_2	0.38	0.32	0.80	0.88	1.26
Overall rewards	0.68	0.66	0.96	1.07	1.43
Sample size	209,672	100,948	100,948	100,948	100,948

Notes: These standard deviations are restricted to respondents aged 18–65 in full-time employment in the APS and nine waves of Understanding Society data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. 'Log wage' is the logarithm of hourly wages. α_3^j/α_2 are the non-pecuniary work aspects estimated in equation (1) adjusted by the coefficient on log wages. Our measure of overall rewards is described in equation (3). The standard deviations of income and overall rewards capture the dispersion of real wages over both individuals and the five waves of the APS or of Understanding Society. The single-year figures are almost identical with both datasets.
Source: APS and Understanding Society.

TABLE A4 Correlations between overall rewards in the full sample and overall rewards by education in the APS.

	Life satisfaction
$\text{Corr}(\alpha_3^j, \alpha_3^{j\ Degree})$	0.91
$\text{Corr}(\alpha_3^j, \alpha_3^{j\ Alevel})$	0.94
$\text{Corr}(\alpha_3^j, \alpha_3^{j\ GCSE})$	0.90

Notes: These correlations are calculated using a sample of respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Life satisfaction is measured on an 11-point scale, where 0 corresponds to 'Not at all satisfied', and 10 corresponds to 'Completely satisfied'. Our measure of overall rewards is described in equation (3).
Source: APS.

TABLE A5 The overall rewards to education and the gender and ethnic gaps at the occupation level.

	α_3^j/α_2	
A levels	0.087*	(0.044)
GCSE or less	−0.071**	(0.032)
Female	−0.020	(0.023)
Age	0.424*	(0.249)
Age squared	−0.005	(0.003)
White Irish	0.249**	(0.108)
Other white	0.006	(0.010)
Mixed group	−0.013	(0.094)
Indian	−0.068***	(0.018)
Pakistani	0.020	(0.055)
Bangladeshi	0.094	(0.124)
Chinese	−0.209	(0.125)
Other Asian	0.117**	(0.058)
Black	−0.091***	(0.027)
Other group	0.197**	(0.076)
R^2	0.48	
F-value	10.12	
N	90	
SD dependent	0.38	

Notes: These are OLS regressions, estimated at the occupation level. The coefficients are interpreted as a 10% increase in the occupation-level proportion of females and respondents with each education level, a 1-year increase in the average age in each occupation, and a 1% increase in the occupation-level proportion of each ethnicity. α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. The sample covers respondents aged 18–65 in full-time employment in five waves of the APS, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-robust standard errors appear in parentheses. Data at the occupation level are collapsed using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions. The regression results are weighted based on the number of respondents in each occupation.

***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

Source: APS.

TABLE A6 Decomposition of overall rewards in the APS, as shown in Table 5, but without controls for education.

	Log wage (1)	α_3^j/α_2 (2)	Overall rewards (3)
Female	−0.146***	−0.052***	−0.197***
	(0.003)	(0.002)	(0.004)
Age	0.090***	0.018***	0.108***
	(0.001)	(0.001)	(0.001)
Age squared/100	−0.099***	−0.019***	−0.118***
	(0.001)	(0.001)	(0.001)
Ethnicity	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes
R^2	0.15	0.03	0.13
F-value	1271.25	112.30	961.25
N	209,672	209,672	209,672
SD dependent	0.51	0.38	0.68

Notes: These are OLS regressions. In column (1), 'Log wage' is the logarithm of hourly wages. In column (2), α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. In column (3), the dependent variable is our measure of overall rewards. The sample covers respondents aged 18–65 in full-time employment in five waves of the APS, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions.
***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: APS.

TABLE A7 Important standard deviations with statistically significant α_3^j.

	Log wage	α_3^j/α_2	Overall rewards	Sample size
SD	0.51	0.30	0.64	175,188

Notes: These figures are calculated for respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. 'Log wage' is the logarithm of hourly wages. α_3^j/α_2 are the non-pecuniary work rewards estimated in equation (1) divided by the coefficient on log wages. Our measure of overall rewards is described in equation (3). This table keeps only those α_3^j coefficients that are statistically significant at the 10% level, pertaining to 61 different occupations.
Source: APS.

TABLE A8 Descriptive statistics in the GSS and the PSID.

	Mean (GSS)	SD (GSS)	*N* (GSS)	Mean (PSID)	SD (PSID)	*N* (PSID)
Happiness	6.18	2.98	20,475			
Job satisfaction	7.71	2.56	20,226			
Life satisfaction				6.94	2.01	20,217
Demographics			20,475			20,217
Female	0.45	0.50		0.42	0.49	
Age	39.52	11.61		0.40	12.42	
Race						
White	0.81	0.40		0.51	0.50	
Black	0.14	0.34		0.40	0.49	
Other	0.06	0.24		0.09	0.28	
Years of education	13.54	2.87	20,460	13.89	2.25	20,145
Wage						
Log real yearly income	9.83	0.77	20,475			
Log real hourly wage				3.01	0.67	20,217

Notes: The means and standard deviations are calculated from the sample of respondents aged 18–65 in full-time employment in 29 waves of GSS data and six waves of the PSID, excluding those whose wages are in the 1st percentile of the wage distribution.
Source: GSS and PSID.

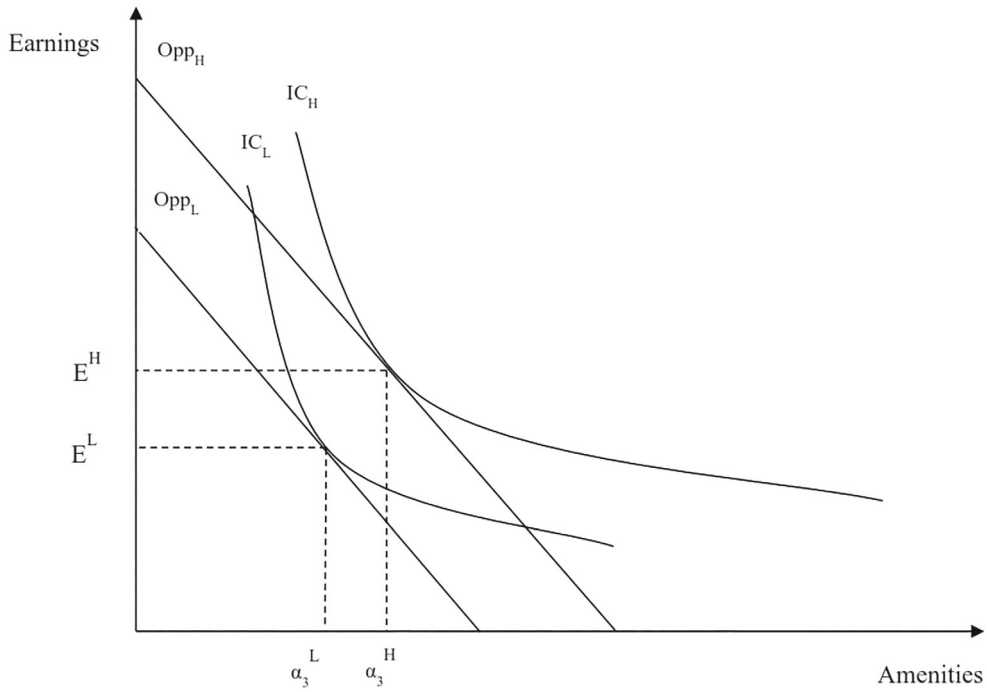

FIGURE A1 Indifference curves and market opportunities between wages and amenities, for two individuals with different abilities.

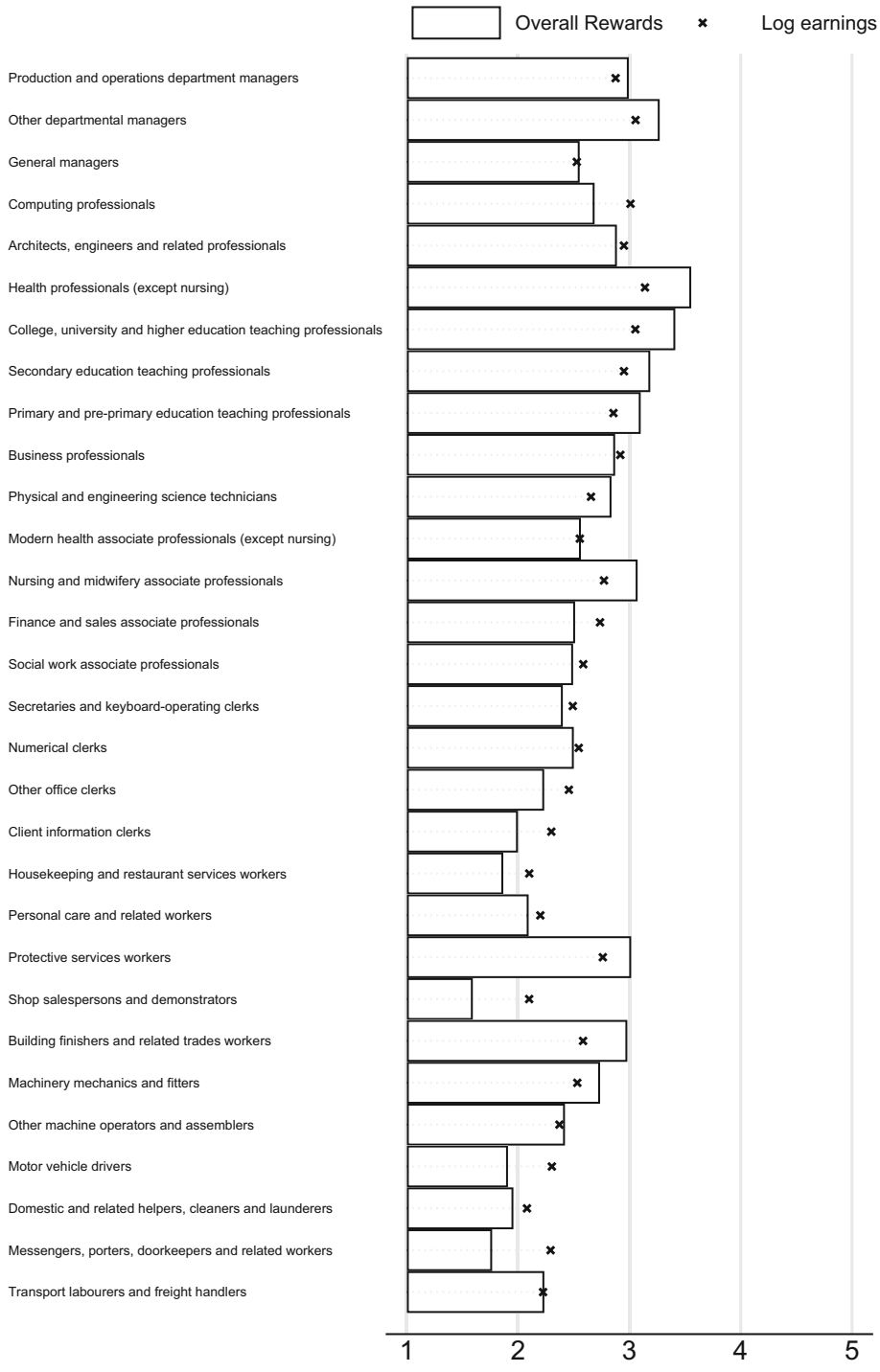

FIGURE A2 Wages and overall rewards in different occupations: cross-section. *Notes*: The bars depict overall rewards in each occupation, and the black crosses the logarithm of wages. Occupations are listed in order of the ISCO88 classification. To avoid outliers, we do not plot occupations under the 1st percentile in terms of share of the population employed. Overall rewards in each occupation are expressed in terms of deviations from the sample mean. The figure is based on respondents aged 18–65 in full-time employment in nine waves of Understanding Society data. Source: Understanding Society.

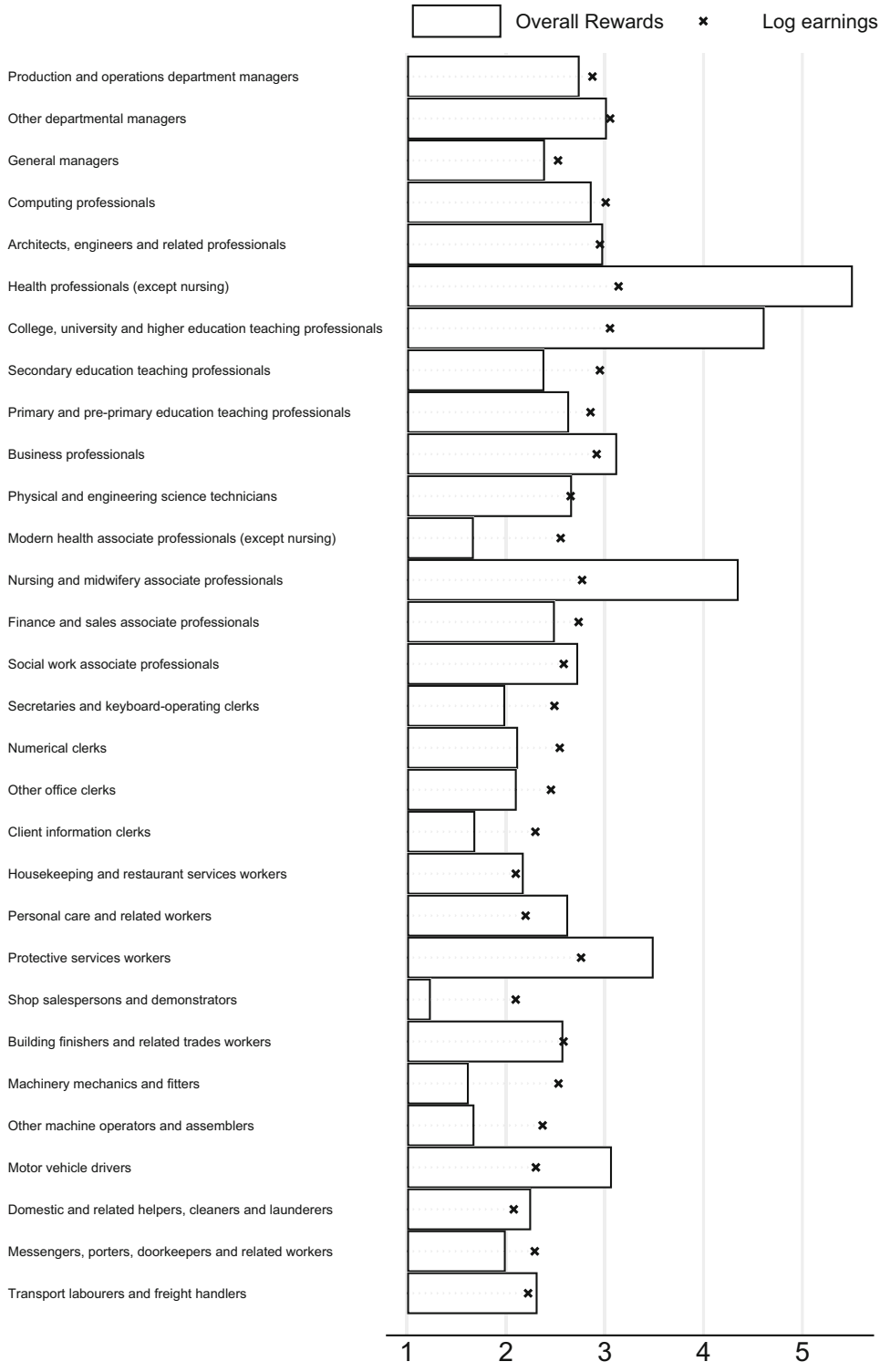

FIGURE A3 Wages and overall rewards in different occupations: panel. *Notes*: See Figure A2. Source: Understanding Society.

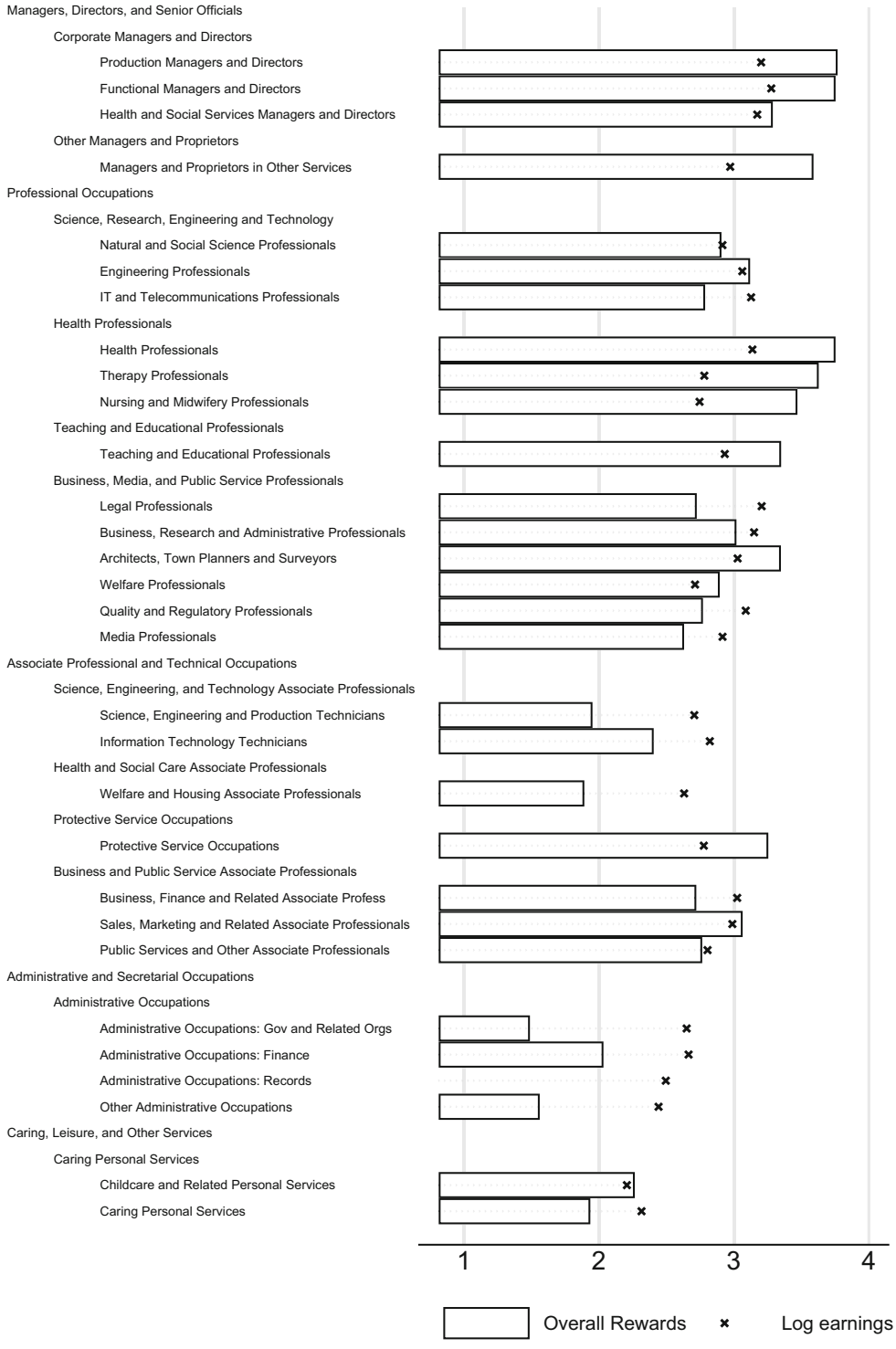

FIGURE A4 Wages and overall rewards across occupations: respondents with a degree. *Notes*: Occupations are listed in order of the ISCO88 classification. To avoid focusing on outliers, we plot only the 30 most popular occupations. Overall rewards in each occupation are expressed in terms of deviations from the sample mean. The figure comes from respondents aged 18–65 in full-time employment in five waves of the APS. Source: APS.

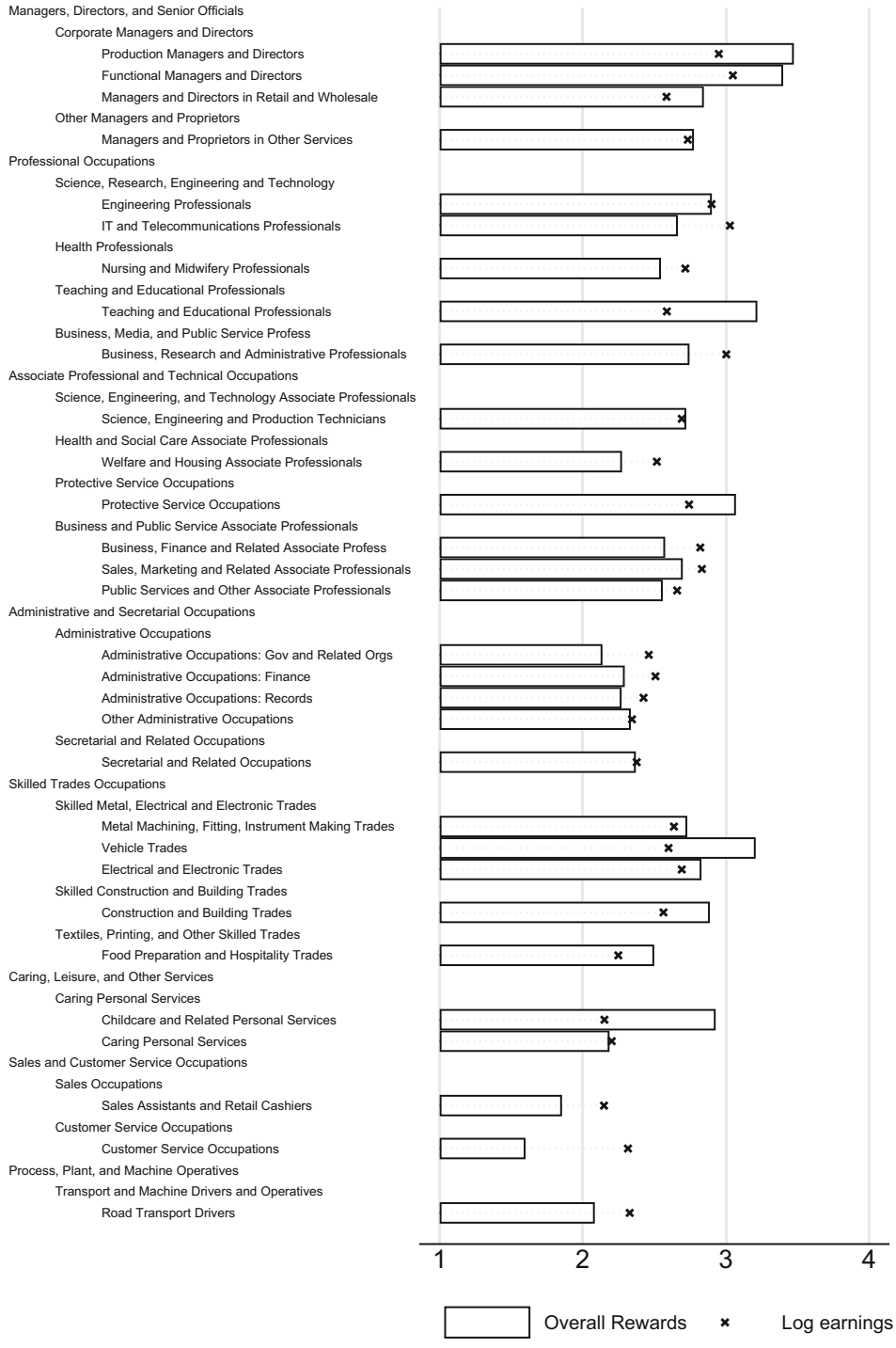

FIGURE A5 Wages and overall rewards across occupations: respondents with A levels. *Notes*: Occupations are listed in order of the SOC2010 classification: the leftmost entries show the 1-digit classification, the first indent the 2-digit classification, and the rightmost entries that at the 3-digit level. It is for these latter that log wages and overall rewards are depicted. To avoid focusing on outliers, we plot only the 30 most popular occupations. Overall rewards in each occupation are expressed in terms of deviations from the sample mean. The figure comes from respondents aged 18–65 in full-time employment in five waves of the APS. Source: APS.

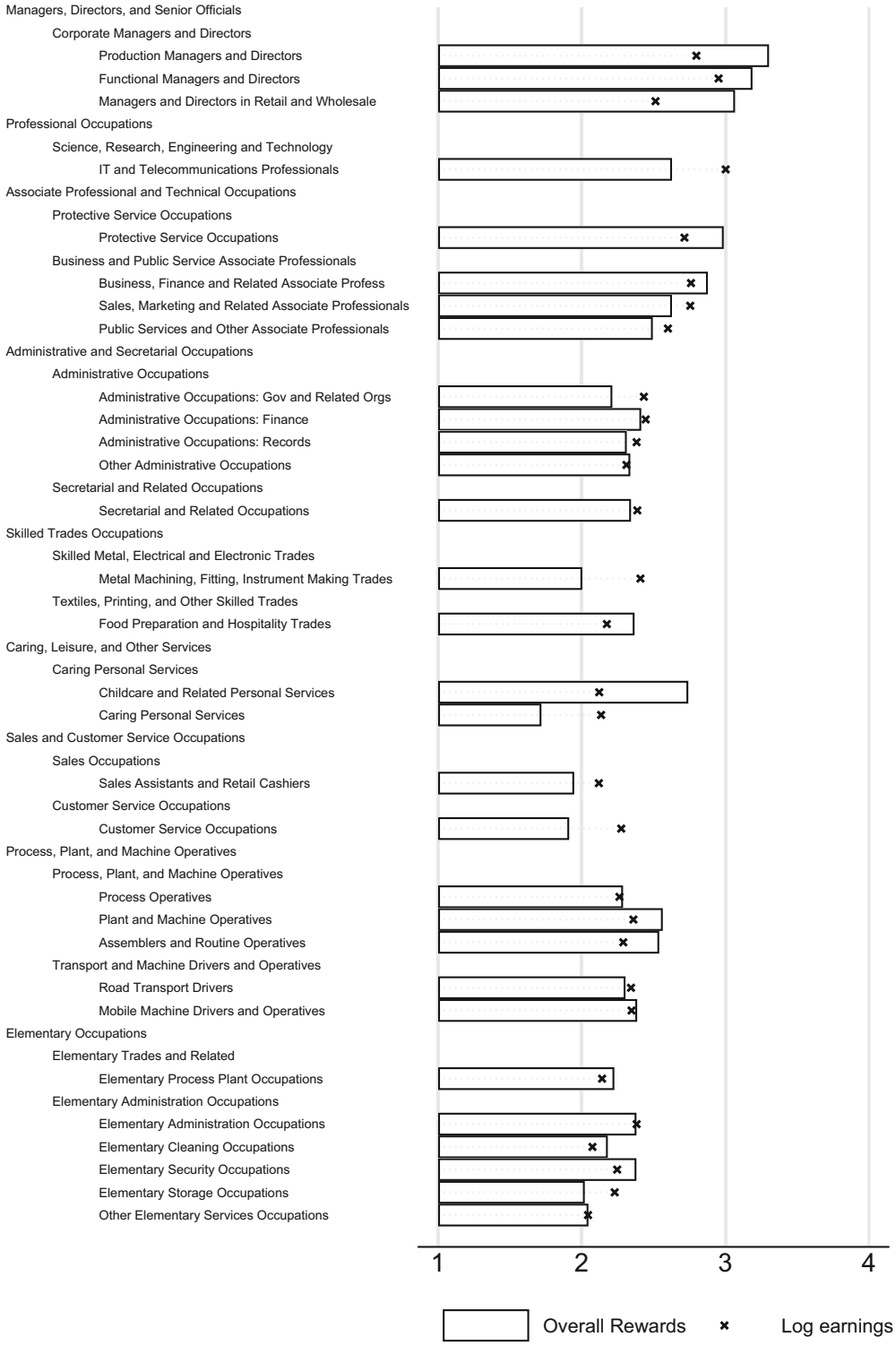

FIGURE A6 Wages and overall rewards across occupations: respondents with GCSE or less. *Notes*: See Figure A5. Source: APS.

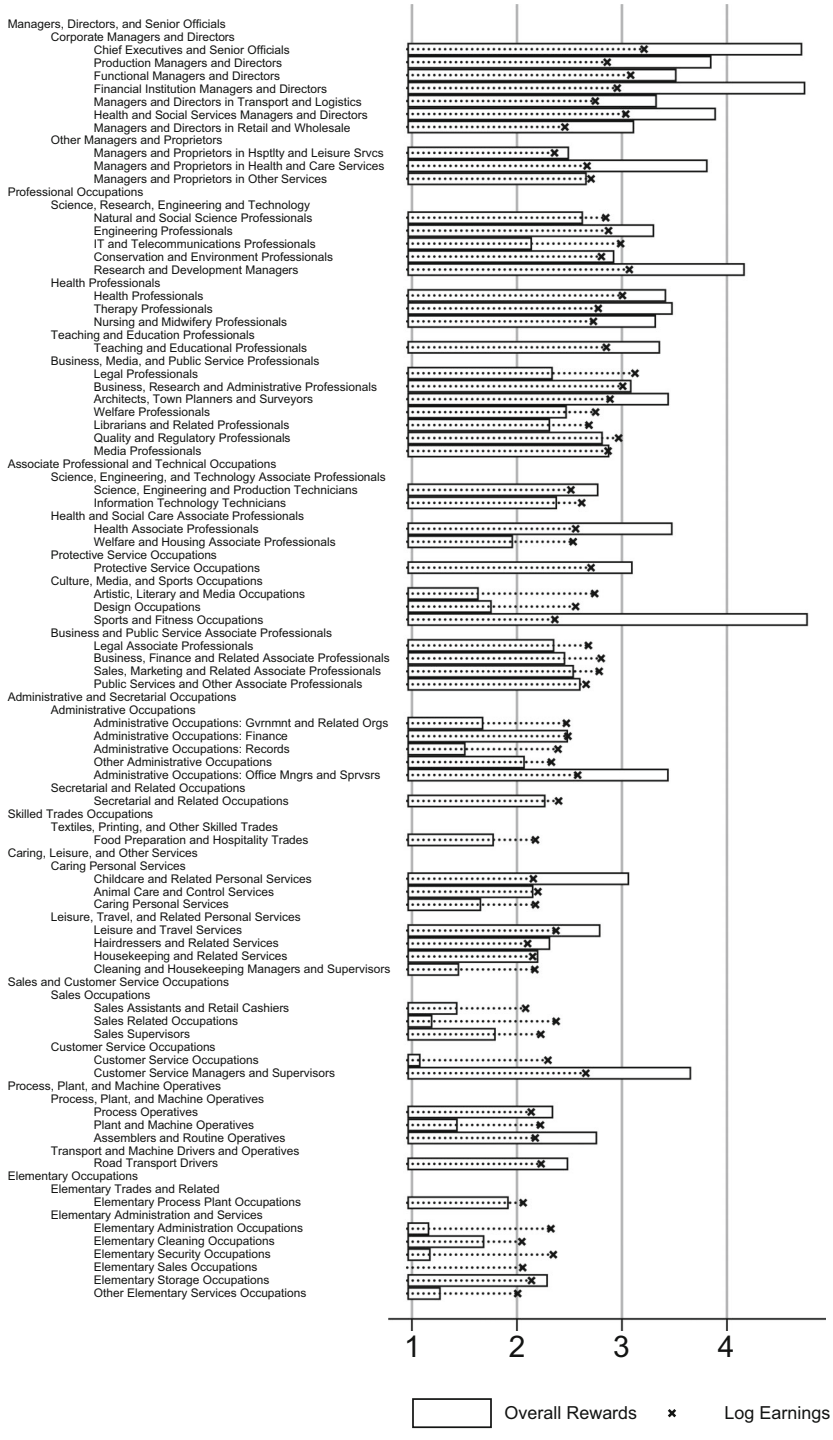

FIGURE A7 Wages and overall rewards across occupations: women. *Notes*: Occupations are listed in order of the SOC2010 classification: the leftmost entries show the 1-digit classification, the first indent the 2-digit classification, and the rightmost entries that at the 3-digit level. It is for these latter that log wages and overall rewards are depicted. To avoid focusing on outliers, we do not plot occupations below the 1st percentile in terms of share of the population employed. Overall rewards in each occupation are expressed in terms of deviations from the sample mean. The figure comes from respondents aged 18–65 in full-time employment in five waves of the APS. Source: APS.

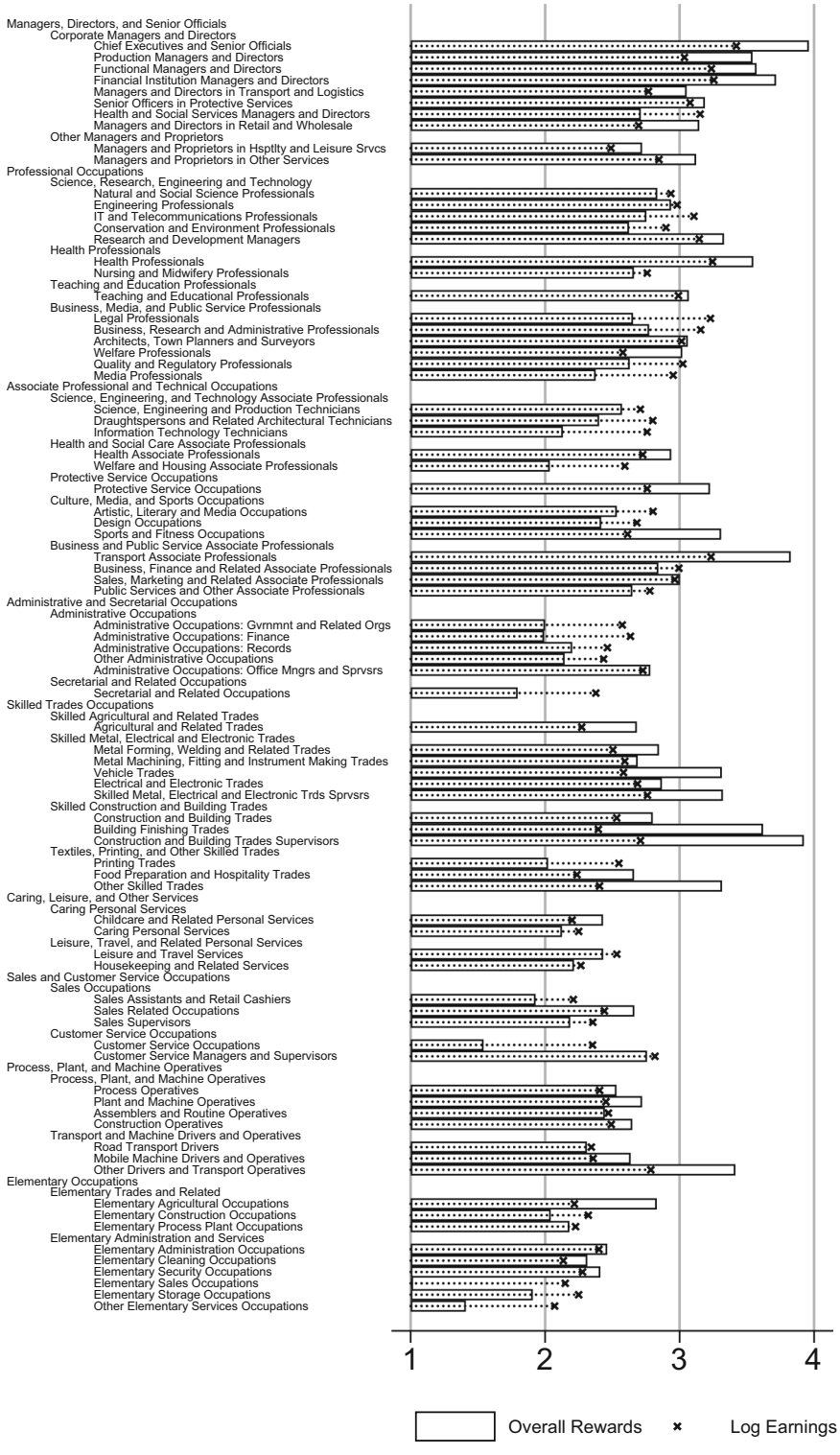

FIGURE A8 Wages and overall rewards across occupations: men. *Notes*: See Figure A7. Source: APS.

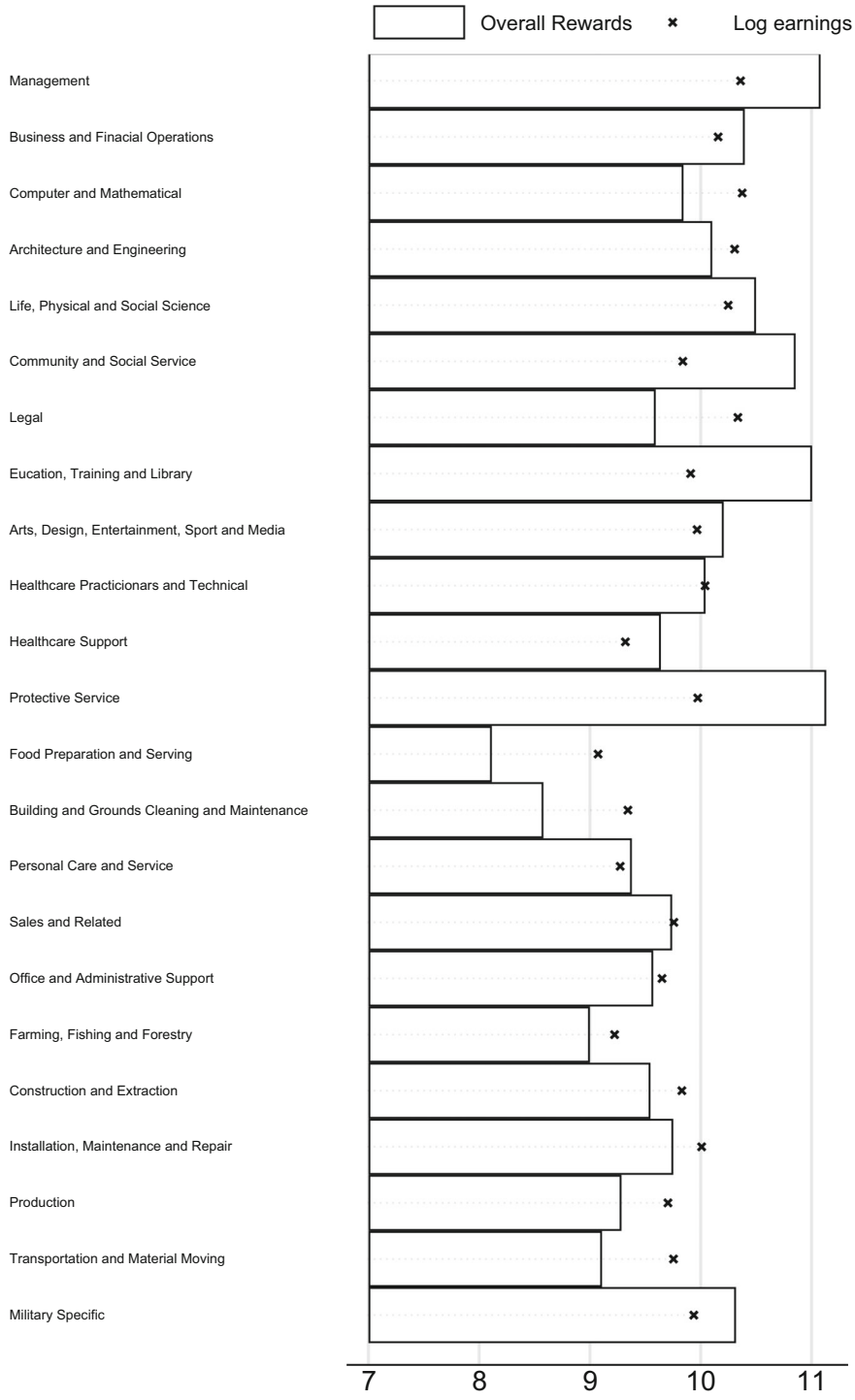

FIGURE A9 Wages and overall rewards in different occupations in the GSS. *Notes*: Occupations are listed in the order of the 2010 Census Occupational Category, aggregated at the 2-digit level. To avoid choosing an arbitrary baseline, the non-pecuniary aspects of each occupation are expressed in terms of deviations from the sample mean. The figure is based on respondents aged 18–65 in full-time employment in 29 waves of GSS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Source: GSS.

APPENDIX B. UK EDUCATION CLASSIFICATIONS

The APS classifies educational attainment into six different categories: 'Degree', 'Other higher', 'A levels', 'GCSEs', 'Other qualifications' and 'No qualifications'. Respondents in 'Degree' are those who completed some form of tertiary education. This includes at the very minimum an undergraduate degree, obtained commonly over a period of three years, but also includes those who pursue graduate degrees. 'Other higher' education includes respondents with some post-secondary educational attainment but below degree level, such as foundational degrees and post-secondary professional education. 'A levels' (advanced levels) are a non-compulsory school-leaving qualification obtained when leaving secondary education at age 18. A level courses take two years, and the qualification is awarded upon the completion of multiple nationally standardized examinations at age 18. 'GCSE' (General Certificate of Secondary Education) qualifications are obtained at age 16, at the end of compulsory education. GCSE courses take between two and three years, depending on the subject, and are awarded based on national-level standardized examinations. Respondents with 'Other qualifications' generally have different lower-skilled professional qualifications. A small group of respondents in this category have foreign qualifications that it was not possible to classify under the UK qualifications system. However, after a major restructuring of the APS classification system in 2011, only a very small share of foreign qualifications remained unclassified in 'Other qualifications'. Finally, respondents who hold no formal qualifications appear in the 'No qualifications' category.

In our analysis, we recode educational attainment into three broad groups: (i) respondents in 'Degree'; (ii) respondents with 'Other higher' education (but not a degree) or 'A level' qualifications; and (iii) respondents with 'GCSE' qualifications, 'Other qualifications' or 'No qualifications'. These three categories correspond broadly to 16 (or more) years of education, 13 years of education, and 11 years of education or fewer. In our sample, 38% of respondents are in the first category, 35% in the second, and 27% in the third. Table B1 shows how life satisfaction and hourly wages differ across these three broad educational attainment categories. In unreported robustness checks, we also investigate how our results change if we exclude respondents with 'Other qualifications' from the lowest education category. Our conclusions are virtually unchanged by this exclusion.

TABLE B1 Descriptive statistics by education.

	Mean	SD
Degree (38%)		
Life satisfaction	7.79	1.30
Log hourly pay	2.88	0.52
A levels (35%)		
Life satisfaction	7.77	1.44
Log hourly pay	2.55	0.48
GCSE and below (27%)		
Life satisfaction	7.71	1.61
Log hourly pay	2.39	0.43

Notes: The means and standard deviations are calculated from the sample of respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution.
Source: APS.

APPENDIX C. SOC2020 CLASSIFICATION BY MAJOR GROUPS (1-DIGIT) AND SUB-COMPONENT (2-DIGIT)

The following list is taken from the SOC2020 classification, available on the ONS website.[30]

1. MANAGERS, DIRECTORS AND SENIOR OFFICIALS
   This major group covers occupations whose tasks consist of planning, directing and coordinating resources to achieve the efficient functioning of organisations and businesses. Working proprietors in small businesses are included, although allocated to separate minor groups within the major group.
   Most occupations in this major group will require a significant amount of knowledge and experience of the production processes, administrative procedures or service requirements associated with the efficient functioning of organisations and businesses.
   11. CORPORATE MANAGERS AND DIRECTORS
   Job holders in this sub-major group formulate government policy; direct the operations of major organisations, local government, government departments and special interest organisations; organise and direct production, processing, maintenance and construction operations in industry; formulate, implement and advise on specialist functional activities within organisations; direct the operations of branches of financial institutions; organise and co-ordinate the transportation of passengers, the storage and distribution of freight, and the sale of goods; direct the operations of the emergency services, revenue and customs, the prison service and the armed forces; and co-ordinate the provision of health and social services.
   12. OTHER MANAGERS AND PROPRIETORS
   Job holders in this sub-major group, either as employees or proprietors, manage agriculture related services; manage and co-ordinate the operations of health service general practices, residential and day care establishments and domiciliary care services; co-ordinate and direct the activities of businesses such as restaurants, hotels, entertainment establishments, sports and leisure facilities, travel and property agencies, independent shops, garages, waste disposal and environmental services, hairdressing establishments, and agencies providing services outsourced by other organisations.
2. PROFESSIONAL OCCUPATIONS
   This major group covers occupations whose main tasks require a high level of knowledge and experience in the natural sciences, engineering, life sciences, social sciences, humanities and related fields. The main tasks consist of the practical application of an extensive body of theoretical knowledge, increasing the stock of knowledge by means of research and communicating such knowledge by teaching methods and other means.
   Most occupations in this major group will require a degree or equivalent qualification, with some occupations requiring postgraduate qualifications and/or a formal period of experience-related training.
   21. SCIENCE, RESEARCH, ENGINEERING AND TECHNOLOGY PROFESSIONALS
   Professionals in this sub-major group undertake research and consultancy activities within the physical and social sciences and in the humanities; technically supervise the development, installation and maintenance of mechanical, chemical, structural and electrical systems; advise upon and direct the technical aspects of production programmes; provide consultancy and development services in the provision and utilisation of information technology and telecommunications; direct and advise upon the conservation and protection of the environment; and direct and advise upon the research and development operations of an organisation.

22. HEALTH PROFESSIONALS

Health professionals provide medical treatments and diagnosis for people and animals, conduct research into treatment and drugs, dispense pharmaceutical compounds, provide therapeutical treatments for medical conditions, and administer nursing and midwifery care.

23. TEACHING AND EDUCATIONAL PROFESSIONALS

Teaching and educational professionals plan, organise and undertake teaching and research activities within educational establishments; plan, organise, direct and co-ordinate the administrative work and financial resources of these establishments; and inspect and advise schools and training establishments.

24. BUSINESS, MEDIA AND PUBLIC SERVICE PROFESSIONALS

Job holders in this sub-major group advise and act on behalf of clients in legal matters, preside over judicial proceedings, collect and analyse financial information, perform accounting duties, advise on business and management matters, and perform a variety of other professional occupations within the public, welfare, regulatory and voluntary sectors, and within the media.

3. ASSOCIATE PROFESSIONAL AND TECHNICAL OCCUPATIONS

This major group covers occupations whose main tasks require experience and knowledge of principles and practices necessary to assume operational responsibility and to give technical support to Professionals and to Managers, Directors and Senior Officials.

The main tasks involve the operation and maintenance of complex equipment; legal, business, financial and design services; the provision of information technology services; providing skilled support to health and social care professionals; serving in protective service occupations; and managing areas of the natural environment. Culture, media and sports occupations are also included in this major group. Most occupations in this major group will have an associated high-level vocational qualification, often involving a substantial period of full-time training or further study. Some additional task-related training is usually provided through a formal period of induction.

31. SCIENCE, ENGINEERING AND TECHNOLOGY ASSOCIATE PROFESSIONALS

Science, engineering and technology associate professionals perform a variety of technical support functions to scientists, technologists, engineers and architects, prepare technical drawings, undertake building inspections, provide technical support for IT operations and users.

32. HEALTH AND SOCIAL CARE ASSOCIATE PROFESSIONALS

Health and social care associate professionals provide a variety of technical support functions and services for health professionals in the treatment of patients to assist physical and psychological recovery, and provide social care and related community services.

33. PROTECTIVE SERVICE OCCUPATIONS

Workers in protective service occupations serve in the armed forces, the police force, fire service, prison service and perform other protective service roles.

34. CULTURE, MEDIA AND SPORTS OCCUPATIONS

Workers in this sub-major group create and restore artistic works; write, edit and evaluate literary material; perform in acts of entertainment; arrange and perform musical compositions; produce television, film and stage presentations; present television and radio broadcasts; operate camera, sound and lighting equipment; design commercial and industrial products; compete in sporting events for financial reward; and provide training and instruction for sporting and recreational activities.

35. BUSINESS AND PUBLIC SERVICE ASSOCIATE PROFESSIONALS

Business and public service associate professionals command and control the movement of air and sea traffic; organise the administrative work of legal practices; perform specialist financial tasks; purchase goods and materials; provide technical sales advice to clients; undertake market research; arrange for the trading and leasing of property on behalf of clients; organise

conferences and related events; undertake recruitment, training and industrial relations activities; promote and maintain areas of the environment; perform administrative functions in government; and undertake statutory inspections of health and safety.

4. ADMINISTRATIVE AND SECRETARIAL OCCUPATIONS

Occupations within this major group undertake general administrative, clerical and secretarial work, and perform a variety of specialist client-orientated administrative duties. The main tasks involve retrieving, updating, classifying and distributing documents, correspondence and other records held electronically and in storage files; typing, word-processing and otherwise preparing documents; operating other office and business machinery; receiving and directing telephone calls to an organisation; and routing information through organisations.

Most job holders in this major group will require a good standard of general education. Certain occupations will require further additional vocational training or professional occupations to a well-defined standard.

41. ADMINISTRATIVE OCCUPATIONS

Workers in this sub-major group undertake administrative and clerical work in national and local government departments and non-governmental organisations; perform specialist clerical tasks in relation to financial records and transactions, the administration of pension and insurance policies, the storage and transportation of freight, the activities of libraries and of human resources operations; and perform other general administrative tasks. They also coordinate and oversee the day-to-day running of offices and supervise office staff.

42. SECRETARIAL AND RELATED OCCUPATIONS

Secretarial occupations perform general secretarial, clerical and organisational duties in support of management and other workers, and provide specialist secretarial support for medical and legal activities.

5. SKILLED TRADES OCCUPATIONS

This major group covers occupations whose tasks involve the performance of complex physical duties that normally require a degree of initiative, manual dexterity and other practical skills. The main tasks of these occupations require experience with, and understanding of, the work situation, the materials worked with and the requirements of the structures, machinery and other items produced.

Most occupations in this major group have a level of skill commensurate with a substantial period of training, often provided by means of a work-based training programme.

51. SKILLED AGRICULTURAL AND RELATED TRADES

Skilled agricultural and related trades cultivate crops, raise animals and catch fish for consumption, grow plants and trees for sale, tend gardens, parks, sports pitches and other recreational areas, and maintain areas of forestry.

52. SKILLED METAL, ELECTRICAL AND ELECTRONIC TRADES

Workers in this sub-major group shape and join metal, erect and maintain metal structures and fixtures; set up and operate metal working machinery and install and repair industrial plant and machinery; assemble parts in the manufacture of metal goods; make and calibrate precision instruments; install, test and repair air conditioning systems; maintain and repair motor vehicles; and install, test and repair industrial, domestic and commercial electrical and electronic equipment.

53. SKILLED CONSTRUCTION AND BUILDING TRADES

Skilled construction and building trades erect steel frames, lay stone, brick and similar materials, construct and repair roofs, install heating, plumbing and ventilating systems, fit windows, doors and other fixtures, and apply coverings and decorative material to walls, floors and ceilings.

54. TEXTILES, PRINTING AND OTHER SKILLED TRADES

Workers in this sub-major group weave fabrics, make articles of clothing, soft furnishings and leather goods, upholster vehicle interiors, set and operate printing machines, prepare

meat, poultry and fish, bake bread and flour-based confectionery products, prepare food and manage catering and bar operations within hotels, restaurants and other establishments, and perform a variety of other skilled trades.

6. CARING, LEISURE AND OTHER SERVICE OCCUPATIONS

This major group covers occupations whose tasks involve the provision of a service to customers, whether in a public protective or personal care capacity. The main tasks associated with these occupations involve the care of the sick, the elderly and infirm; the care and supervision of children; the care of animals; and the provision of travel, personal care and hygiene services.

Most occupations in this major group require a good standard of general education and vocational training. To ensure high levels of integrity, some occupations require professional qualifications or registration with professional bodies or relevant background checks.

61. CARING PERSONAL SERVICE OCCUPATIONS

Workers in this sub-major group assist health professionals in the care of patients; undertake caring personal services within the community; supervise the activities of pre-school age children and assist teachers with non-teaching duties; provide technical assistance to veterinarians and provide other services in the care of animals; provide funeral services; and control pests hazardous to public health.

62. LEISURE, TRAVEL AND RELATED PERSONAL SERVICE OCCUPATIONS

Workers within Leisure, Travel and Related Personal Service Occupations provide services and facilities for sporting and recreational activities; make travel arrangements for clients and provide ancillary services for travellers; provide hairdressing and beauty services; undertake domestic and care-taking duties in private households, public buildings and other establishments.

7 SALES AND CUSTOMER SERVICE OCCUPATIONS

This major group covers occupations whose tasks require the knowledge and experience necessary to sell goods and services, accept payment in respect of sales, replenish stocks of goods in stores, provide information to potential clients and additional services to customers after the point of sale. The main tasks involve knowledge of sales techniques, a degree of knowledge regarding the product or service being sold, familiarity with cash and credit handling procedures and a certain amount of record keeping associated with those tasks.

Most occupations in this major group require a general education and skills in interpersonal communication. Some occupations will require a degree of specific knowledge regarding the product or service being sold, but are included in this major group because the primary task involves selling.

71. SALES OCCUPATIONS

Workers in this sub-major group sell goods and services in retail and wholesale establishments, accept payment in respect of sales, obtain orders and collect payments for goods and services from private households, replenish stocks of goods in stores, create displays of merchandise and perform other sales related occupations.

72. CUSTOMER SERVICE OCCUPATIONS

Customer service occupations receive and respond to enquiries regarding products or services, deal with customer complaints and perform a variety of tasks in the provision of additional services to customers after the point of sale; operate switchboards and receive and direct calls in a variety of establishments; operate telecommunications equipment to transmit and receive messages; conduct market research interviews; and perform other customer service tasks.

8. PROCESS, PLANT AND MACHINE OPERATIVES

This major group covers occupations whose main tasks require the knowledge and experience necessary to operate and monitor industrial plant and equipment; to assemble products from component parts according to strict rules and procedures and to subject assembled parts to

routine tests; and to drive and assist in the operation of various transport vehicles and other mobile machinery.

Most occupations in this major group do not specify that a particular standard of education should have been achieved but will usually have a period of formal experience-related training. Some occupations require licences issued by statutory or professional bodies.

81. PROCESS, PLANT AND MACHINE OPERATIVES

Process, plant and machine operatives operate and attend machinery to manufacture, process or otherwise treat foodstuffs, beverages, textiles, chemicals, glass, ceramics, rubber, plastic, metal, synthetic and other products, operate plant and machinery to produce paper, wood and related products, extract coal and other minerals from the earth, attend and operate power generation and water treatment systems, perform routine operations in the manufacture of motor vehicles, metal goods, electrical and electronic products, clothing and other goods, and perform a variety of tasks in relation to the construction and repair of buildings, public highways, underground piping systems, railway tracks and other structures.

82. TRANSPORT AND MOBILE MACHINE DRIVERS AND OPERATIVES

Transport and mobile machine drivers and operatives drive motor vehicles to transport goods and people; drive trains and guide and monitor the movement of rail traffic; operate mechanical equipment on board boats, ships and other marine vessels; assist in the boarding, fuelling and movement of aircraft at airports; operate lifting, earth moving and earth surfacing equipment, agricultural equipment and other mobile machinery.

9. ELEMENTARY OCCUPATIONS

This major group covers occupations which require the knowledge and experience necessary to perform mostly routine tasks, often involving the use of simple hand-held tools and, in some cases, requiring a degree of physical effort.

Most occupations in this major group do not require formal educational qualifications but will usually have an associated short period of formal experience-related training.

91. ELEMENTARY TRADES AND RELATED OCCUPATIONS

Occupations in this sub-major group perform agricultural, fishing and forestry related tasks, undertake general labouring duties, assist building and construction trades workers, and perform a variety of duties in foundry, engineering and other process plant related trades.

92. ELEMENTARY ADMINISTRATION AND SERVICE OCCUPATIONS

Workers in this sub-major group collect, sort and deliver written correspondence, undertake elementary clerical tasks within offices, undertake elementary cleaning tasks, protect and supervise people and property, perform elementary sales related tasks, assist in the storage and transportation of goods, and perform a variety of carrying, preparation and serving tasks within hospitals, catering, domestic and other establishments.

APPENDIX D. JOB CHARACTERISTICS

In this appendix, we use various existing data sources to evaluate how different job attributes feed into both the monetary and non-monetary components of overall rewards. A number of other contributions have taken this approach. For example, Bryson *et al.* (2012) analyse wages, effort and two measures of worker wellbeing (job satisfaction and anxiety) in British linked employer–employee data. While the positive correlation between wages and job satisfaction is attenuated by the inclusion of effort, that between wages and anxiety is not. A recent paper by Ferreira *et al.* (2023) uses data from the European Working Conditions Survey on job satisfaction to estimate the marginal rate of substitution between wages and on-the-job-risks. They find that wages and risks are negatively correlated, concluding that wages do not fully account for work disamenities. Sockin (2022) uses text analysis to classify workers' Glassdoor descriptions

of their jobs into 50 different amenities, and computes firm-specific measures of amenities, wages and job satisfaction. Similar to our results, he shows that there is a positive correlation between wages and amenities estimated in this way, and that the latter widens the compensation dispersion across firms.

One major problem in this broad approach is the scarcity of directly measured amenities, in particular in panel data. Information on all amenities is required to establish the correlation between wages and amenities. For example, taking the works cited above, (observed) effort could be compensated by unobserved longer breaks or more holidays, or job risks by greater benefits. In addition, Elliott and Sandy (1998) underline the potential endogeneity of worker-reported amenity information, if dissatisfied workers overstate workplace disamenities. They find some evidence of this in UK data, in that the difference in worker- and firm-reported amenities is correlated systematically with the residual from a wage equation (measuring overpay/underpay). Our main analysis attempts to avoid these issues by inferring the value of the amenities in an occupation from worker satisfaction scores.

We nonetheless do here analyse the relationship between a number of directly measured job characteristics and wages, our amenity estimates and overall rewards. We first appeal to the APS itself, which contains information on a number of job attributes at the individual level. In a second step, we will complement this analysis with data from the UK Labour Force Survey (LFS) and the Workplace Employment Relations Study (WERS), which contain more detailed work-related variables that we can match to the APS at the 3-digit occupation level.

We proceed by re-estimating equations (4)–(6), adding to each a vector of job characteristics Z_i. From the APS data, the Z_i will control for working any overtime, completing any job-related education or training in the past 13 weeks, working from home, permanent or temporary employment, managerial duties, and whether the job is in the public or private sectors.

We complement the APS job characteristics information with data from the LFS and WERS. The LFS is a quarterly study of the employment circumstances of the UK population. It is the largest household study in the UK, and provides the official measures of employment and unemployment. The LFS includes information on a broad set of job characteristics. Here, we consider the occupation proportions of apprenticeship and unionization, the average time travelled to work (in minutes, split by the proportion in each quartile), and work times (during the day, evening or night). This information is calculated from the sample of workers aged 18–65 in full-time employment in the LFS. While the APS and the LFS cannot be matched at the individual level, we exploit the fact that the two surveys use the same occupational classification to create objective measures of occupational quality at the 3-digit occupational level within each LFS wave. These are then merged at the occupational-wave level to each of our five APS waves.

We have additional occupation-level job characteristic information from the WERS. This is a representative sample of workplaces and is the flagship survey of employment relations in Britain. It collects information from employers, employee representatives and employees, and was undertaken six times between 1980 and 2011. The WERS is comprised of the Survey of Managers, the Survey of Employee Representatives, the Survey of Employees, and the Financial Performance Questionnaire. For the purpose of our analysis, we focus on the Survey of Employees. This consists of a self-completion survey filled in by a representative group of up to 25 employees, selected randomly in each of the workplaces participating in the survey. We use the most-recent wave of the survey (2011), which includes information from about 22,000 employees who answer a series of questions about their job and their organization. The WERS data provide us with more subjective information, offering additional insights into the job characteristics that employees find important. These characteristics are: having a job requiring hard work; never having enough time; needing to work long hours to progress; having influence over own tasks; having influence over work pace; having influence over start and finish hours; having flexitime arrangements in place; having an arrangement for paid leave to care for someone in place; sharing the organization's values; being loyal to the organization, being proud to work in the organization; and having a good

TABLE D1 Descriptive statistics for job attributes in the APS, the LFS and the WERS.

	Mean	SD
At the individual level (APS)		
Ever overtime (binary)	0.48	0.50
Training lasts 13 weeks (binary)	0.32	0.47
Works from home (binary)	0.07	0.25
Permanent job (binary)	0.96	0.20
Managerial duties (categorical)		
Manager	0.31	0.46
Foreman or supervisor	0.13	0.33
No duties	0.56	0.50
Public sector (binary)	0.27	0.44
At the occupation level (LFS)		
Tenure (years)	8.60	1.98
Proportion in apprenticeship (%)	0.01	0.01
Proportion in union	0.26	0.21
Travel to work (% 1st quartile)	0.33	0.11
Travel to work (% 2nd quartile)	0.19	0.04
Travel to work (% 3rd quartile)	0.24	0.05
Travel to work (% 4th quartile)	0.24	0.10
Proportion working days (%)	0.75	0.08
Proportion working evenings (%)	0.22	0.12
Proportion working nights (%)	0.08	0.07
Proportion work accidents (%)	0.01	0.03
Proportion bone illness, upper body (%)	0.01	0.00
Proportion bone illness, lower body (%)	< 0.01	< 0.01
Proportion back illness (%)	0.01	0.01
Proportion stress, depression, anxiety (%)	0.02	0.01
At the occupation level (WERS)		
Job: requires hard work (1 = 'Strongly disagree'; 5 = 'Strongly agree')	4.17	0.21
Job: never enough time (1 = 'Strongly disagree'; 5 = 'Strongly agree')	3.31	0.32
Job: is secure (1 = 'Strongly disagree'; 5 = 'Strongly agree')	3.52	0.26
Long hours to progress (1 = 'Strongly disagree'; 5 = 'Strongly agree')	3.28	0.27
Influence over tasks (1 = 'None; 4 = 'A lot')	3.20	0.29
Influence over work pace (1 = 'None; 4 = 'A lot')	3.10	0.26
Influence over start/finish hours (1 = 'None; 4 = 'A lot')	3.39	0.25
Job makes tense (1 = 'Never'; 5 = 'All the time')	2.67	0.22
Job makes depressed (1 = 'Never'; 5 = 'All the time')	1.83	0.17
Job makes worried (1 = 'Never'; 5 = 'All the time')	2.16	0.22
Job makes gloomy (1 = 'Never'; 5 = 'All the time')	1.92	0.17
Job makes uneasy (1 = 'Never'; 5 = 'All the time')	1.95	0.16
Job makes miserable (1 = 'Never'; 5 = 'All the time')	1.76	0.17

TABLE D1 (Continued)

	Mean	SD
Flexitime arrangement available (1 = 'No'; 2 = 'Yes, not used'; 3 = 'Yes, used')	1.69	0.34
Paid leave arrangement available (1 = 'No'; 2 = 'Yes, not used'; 3 = 'Yes, used')	1.34	0.12
Takes initiative (1 = 'Strongly disagree'; 5 = 'Strongly agree')	3.85	0.23
Shares organization values (1 = 'Strongly disagree'; 5 = 'Strongly agree')	3.76	0.30
Loyal to organization (1 = 'Strongly disagree'; 5 = 'Strongly agree')	3.91	0.26
Proud to work in organization (1 = 'Strongly disagree'; 5 = 'Strongly agree')	3.84	0.29
Good management relations (1 = 'Very poor'; 5 = 'Very good')	3.66	0.29

Notes: The means and standard deviations are calculated from the sample of respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution.
Source: APS, LFS and WERS.

relationship with the management. As for the LFS data, the job characteristic information in the WERS is matched to the APS at the 3-digit occupational level. The descriptive statistics on the job attributes measured in the APS, the LFS and the WERS are listed in Table D1.

To reduce the high dimensionality of the data in the WERS, we create three factors that are defined across three distinct categories: job design, job autonomy and organization characteristics. The job design factor includes information on having to work hard to finish tasks, facing time pressure at work, having to work long hours to progress, having flexitime, and having paid leave. The autonomy factor includes the questions on influence over your own task, the pace of work, and the hours worked. Finally, the organizational factor includes questions on taking initiative, sharing the organization's values, being loyal to the organization, being proud to work for the organization, and good relationships with the management. In addition to these three factors, we control separately for job security.

To see how job attributes affect the monetary and non-monetary aspects of overall rewards, Table D2 shows the estimated coefficients from equations (4)–(6), now with the addition of the APS individual-level job characteristics, and with the occupation-level job attributes from the LFS and the WERS, respectively. The standard errors are clustered at the occupation level.

Looking at the APS controls, working overtime, employer-provided training and managerial responsibilities are all associated with higher wages, while temporary jobs are associated with lower wages. Column (2) of Table D2 considers job amenities: these job characteristics exhibit sizeable correlations with the non-pecuniary aspects of occupations. As the coefficients in columns (1) and (2) are often of the same sign, the dispersion of overall rewards is naturally higher than that of wages.

A number of the job characteristics from the LFS are significantly correlated with both wages and amenities. Apprenticeships are not correlated with wages but are associated with much better amenities. Travelling longer to work is related to higher wages but, as expected, not to better amenities, such that the overall correlation with overall rewards is broadly zero. Union membership increases both wages and amenities, with a particularly large effect through the latter. Finally, those working during the day have higher overall rewards, most of which reflect job amenities. The same is true, although to a smaller extent, for those who work nights.

Our last, more subjective, job characteristic variables come from the WERS. Job security is not statistically significant, but the coefficient is in the expected direction. Elements of 'job design' increase wages, but not amenities. Autonomy factors increase overall rewards substantially, entirely through the non-pecuniary components. Organization-specific factors do not seem to matter, with the coefficients being both small in magnitude and noisily estimated. Table D3 estimates column (2) in Table D2 at the occupation level.

TABLE D2 The decomposition of overall rewards by job amenities at the individual (APS) and occupation (LFS and WERS) levels.

	Log wage	α_3^j/α_2	Overall rewards
	(1)	(2)	(3)
Individual-level attributes (APS)			
Ever overtime	0.060***	0.019***	0.079***
	(0.011)	(0.006)	(0.013)
Training lasts 13 weeks	0.021***	−0.013	0.008
	(0.007)	(0.010)	(0.014)
Works from home	0.015	0.000	0.015
	(0.032)	(0.013)	(0.033)
Temporary job	−0.091***	0.026	−0.065***
	(0.009)	(0.017)	(0.021)
Manager	0.201***	0.098***	0.299***
	(0.012)	(0.027)	(0.034)
Foreman or supervisor	0.040***	0.022	0.062***
	(0.010)	(0.019)	(0.022)
Public sector	−0.012	−0.029	−0.042
	(0.021)	(0.025)	(0.033)
Occupation-level attributes (LFS)			
Apprenticeship (proportion)	0.012	0.325*	0.337
	(0.049)	(0.182)	(0.212)
Union (proportion)	0.013**	0.069***	0.082***
	(0.006)	(0.023)	(0.025)
Travel time (2nd quartile)	0.487***	−1.243*	−0.756
	(0.170)	(0.683)	(0.699)
Travel time (3rd quartile)	0.978***	−1.633**	−0.655
	(0.159)	(0.642)	(0.633)
Travel time (4th quartile)	1.547***	−1.106***	0.441
	(0.123)	(0.399)	(0.432)
Works days (proportion)	0.073***	0.416***	0.489***
	(0.027)	(0.091)	(0.091)
Works evenings (proportion)	−0.016	−0.047	−0.064
	(0.010)	(0.047)	(0.048)
Works nights (proportion)	0.032**	0.154**	0.186***
	(0.012)	(0.063)	(0.065)

TABLE D2 (Continued)

	Log wage	α_3^j/α_2	Overall rewards
	(1)	(2)	(3)
Occupation-level attributes (WERS)			
Job security	−0.008	0.121	0.113
	(0.040)	(0.133)	(0.148)
Job design factors	0.051***	−0.040	0.011
	(0.017)	(0.064)	(0.069)
Job autonomy factors	0.019	0.183***	0.203***
	(0.014)	(0.054)	(0.058)
Organizational factors	−0.017	0.013	−0.004
	(0.017)	(0.062)	(0.067)
Gender	Yes	Yes	Yes
Age	Yes	Yes	Yes
Age squared/100	Yes	Yes	Yes
Education	Yes	Yes	Yes
Ethnicity	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes
R^2	0.48	0.46	0.50
F-value	296.13	9.96	59.93
N	197,055	197,055	197,055
SD dependent	0.51	0.38	0.68

Notes: These are OLS regressions. In column (1), 'Log wage' is the logarithm of hourly wages. In column (2), α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. In column (3), the dependent variable is our measure of overall rewards. The APS job attributes are at the individual level. 'Ever overtime', 'Training lasts 13 weeks', 'Works from home', 'Temporary job' and 'Public sector' are dummies. 'Manager' and 'Foreman or supervisor' are relative to the baseline category of 'No managerial responsibilities'. The LFS job attributes are at the occupation–year level and are re-weighted accordingly. 'Travel time' is in minutes and grouped into quartiles, where those in the 1st quartile travel the least. The remaining variables are expressed in percentage points and capture the occupational proportions. The WERS factors are constructed from job attributes at the occupation level in 2011, re-weighted accordingly. The variables are measured mostly on Likert scales; the questions appear in Table D1. The sample covers respondents aged 18–65 in full-time employment in five waves of the APS, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions.
Source: APS, LFS and WERS.

TABLE D3 The decomposition of α_3^j/α_2, estimated at the occupation level.

	α_3^j/α_2	
Individual-level attributes (APS)		
Ever overtime (proportion)	0.051	(0.079)
Training lasts 13 weeks (proportion)	0.077	(0.077)
Works from home (proportion)	0.119	(0.093)
Temporary job (proportion)	−0.060	(0.202)
Manager (proportion)	0.066**	(0.030)
Foreman or supervisor (proportion)	0.037	(0.065)
Public sector (proportion)	0.006	(0.036)
Occupation-level attributes (LFS)		
Apprenticeship (proportion)	0.453	(0.324)
Union (proportion)	0.079	(0.049)
Travel time (2nd quartile)	−3.484	(2.219)
Travel time (3rd quartile)	−2.050	(1.746)
Travel time (4th quartile)	−1.826*	(1.023)
Works days (proportion)	0.516***	(0.168)
Works evenings (proportion)	−0.085	(0.081)
Works nights (proportion)	0.192*	(0.108)
Occupation-level attributes (WERS)		
Job security	0.040	(0.199)
Job design factors	−0.043	(0.084)
Job autonomy factors	0.084	(0.071)
Organizational factors	0.040	(0.070)
Gender	Yes	
Age	Yes	
Age squared/100	Yes	
Education	Yes	
Ethnicity	Yes	
R^2	0.72	
F-value	4.24	
N	90	
SD dependent	0.38	

Notes: These are OLS regressions, estimated at the occupation level. α_3^j/α_2 is the value of non-pecuniary work amenities estimated in equation (1) adjusted by the coefficient on log wages. The sample covers respondents aged 18–65 in full-time employment in five waves of the APS, excluding those whose hourly wages are in the 1st percentile of the wage distribution. Heteroscedasticity-robust standard errors appear in parentheses. Data at the occupation level are collapsed using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions. The regression results are weighted using weights based on the number of respondents in each occupation.
***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: APS, LFS and WERS.

APPENDIX E. ROBUSTNESS CHECKS WITH LIFE SATISFACTION AS THE DEPENDENT VARIABLE

Table E1 re-estimates our main results using ordered probit and ordered GLM models to address issues of measurement error and heteroscedasticity, as discussed in Section III.

TABLE E1 Results with ordered probit and ordered GLM.

	Life satisfaction (0–10) (Ordered probit)	Life satisfaction (0–10) (Ordered GLM)
Log wage	0.164***	0.127***
	(0.008)	(0.007)
Female	0.055***	0.044***
	(0.007)	(0.005)
Age	−0.036***	−0.027***
	(0.002)	(0.002)
Age squared/100	0.038***	0.028***
	(0.002)	(0.002)
Ethnicity	Yes	Yes
Occupation fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
R^2	0.01	0.01
Chi-squared	1955.45	6334.53
N	209,672	209,672

Notes: These are ordered probit and ordered GLM regressions. Life satisfaction is measured on an 11-point scale, where 0 corresponds to 'Not at all satisfied' and 10 to 'Completely satisfied'. 'Log wage' is the logarithm of hourly wages. The regression controls for 90 different occupations, at the 3-digit level using the SOC2010 classification. The sample is respondents aged 18–65 in full-time employment in five waves of APS data (2014–18), excluding those whose hourly wages are in the 1st percentile of the wage distribution. Standard errors appear in parentheses. The sample is weighted using the NPWT18 population weights in the APS, designed for performing analysis on the sample completing wellbeing questions.
***, **, * indicate significance levels $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.
Source: APS.

TABLE E2 Important standard deviations—alternative estimations.

	Log wage	α_3^j/α_2	Overall rewards	Sample size
OLS (restricted sample)	0.51	0.42	0.72	209,672
Ordered probit	0.51	0.34	0.61	209,672
Ordered GLM	0.51	0.44	0.67	209,672

Notes: These figures are calculated for respondents aged 18–65 in full-time employment in five waves of APS data, excluding those whose hourly wages are in the 1st percentile of the wage distribution. 'Log wage' is the logarithm of hourly wages. α_3^j/α_2 are the non-pecuniary work rewards estimated in equation (1) divided by the coefficient on log wages. Our measure of overall rewards is described in equation (3).
Source: APS.

Coefficients on occupations are not displayed but take same signs as those in the main estimation 92% of the time under ordered probit and 87% of the time under ordered generalized linear model (GLM). For those few occupations for which the coefficient changes sign, the coefficients are either very small or estimated with a large amount of noise. In Table E2, we show that our main findings are robust when estimating the main standard deviations by OLS (while dropping these occupations from the results in the ordered probit or ordered GLM models.