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The Full Returns to the Choice of Occupation and Education

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Les Rendements Complets du Choix de la Profession et de l'Education [1]

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Résumé : Les informations sur les revenus et les récompenses non pécuniaires sont nécessaires pour comprendre la dispersion du bien-être entre occupations professionnelles. Nous analysons le bien-être subjectif d'un large échantillon britannique afin de construire une mesure des « revenus complets », considérée comme la somme des revenus et de la valeur des récompenses non pécuniaires, dans 90 professions différentes. L'inégalité sur le marché du travail est sous-estimée : la dispersion des revenus complets est un tiers plus grande que la dispersion des revenus. De même, les écarts entre les sexes et les groupes ethniques sur le marché du travail sont plus importants que ceux des gains seuls, et le rendement total de l'éducation sur le marché du travail est sous-estimé. Ces résultats sont similaires dans les données sur les travailleurs américains. Nous ne trouvons pas de preuves de différentiels de compensation dans les données en coupe transversale et dans les données de panel.

Mots-clés : profession, salaires, avantages non pécuniaires, inégalités

The Full Returns to the Choice of Occupation and Education

Abstract : Information on both earnings and non-pecuniary rewards is needed to understand the occupational dispersion of wellbeing. We analyse subjective wellbeing in a large UK sample to construct a measure of "full earnings", the sum of earnings and the value of non-pecuniary rewards, in 90 different occupations. Labour-market inequality is underestimated: the dispersion of full earnings is one-third larger than the dispersion of earnings. Equally, the gender and ethnic gaps in the labour market are larger than those in earnings alone, and the full returns to education on the labour market are underestimated. These results are similar in data on US workers. In neither cross-section nor panel data do we find evidence of compensating differentials.

Keywords : occupation, wages, non-pecuniary benefits, inequality

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1 Introduction

The distribution of rewards to labour is a fundamental issue in economics. In the labour market, this corresponds to the distribution of the rewards from the job. While there is an extremely large literature on wages, the focus on monetary earnings misses out the value and distribution of non-pecuniary rewards (Williams and Zhou, 2020). The theory of compensating differentials (Rosen, 1986) suggests that these latter are negatively correlated with wages (so that measuring monetary earnings alone will overstate inequality on the labour market). But it is just as likely that workers will prefer to take their labour-market rents partly in monetary form and partly in non-monetary form: in this case the monetary and non-monetary value of jobs will move hand in hand.

Research on wages and non-pecuniary amenities in the labour market has largely been inconclusive (Brown, 1980; Krueger and Summers, 1986, 1988; Carruth et al., 2004; Clark and Senik, 2006; Fehr and Gächter, 2008). The first major difficulty is that many of the amenities that workers find important are unobservable or, if observable, measured with error. The second is that even were amenities to be measurable and accurate, we still need to know how important they are to workers in order to make statements about their labour-market value. Helliwell and Huang (2010) attempt to bypass the second challenge by using life satisfaction to calculate compensating differentials for a number of non-pecuniary job characteristics. Related approaches have been taken by Freeman (1980) and Solnick et al. (1991) using job quits instead of life satisfaction. However, none of these contributions address the first issue, as they focus on the particular values of a restricted set of observable job attributes. Therefore, the challenges remain substantial.

In a novel approach, we here propose to capture the job amenities that matter to workers, and account for the different values that they may put on them, by outsourcing the task to the workers themselves. The wellbeing (net of income) associated with each occupation, as reported by those who work in it, measures the value of its non-pecuniary job amenities. The sum of monetary earnings and this value of non-pecuniary amenities yields a measure of full earnings on the labour market.

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 this is a key choice that individuals make in the labour market, and is stickier than the choice of industry where people can more easily switch. We find substantial variation in both earnings and the non-pecuniary aspects of occupations, with the two being positively correlated. The standard deviation of full earnings in the labour market is one-third larger than the documented dispersion in wages, so that labour-market inequality calculated from wages only is an underestimate. This general conclusion also applies to the gaps between demographic groups. The full earnings gaps by gender and ethnicity are larger than those in wages, and the returns to education are higher. These results are unchanged in panel data when controlling for time-invariant unobserved characteristics, such as ability, by looking at those who switch occupations over time. We reproduce these cross-section and panel findings using two different sources of American data.

The remainder of the paper is organised as follows. Section 2 describes the data and Section 3 presents the summary figures for earnings inequality and a discussion on estimation challenges. Section 4 discusses how the ranking of occupations changes as we move from earnings to full earnings, and Section 5 shows how these rankings depend on education. Section 6 reconsiders the returns to education on the labour market in the light of full earnings, and Section 7 measures the gender and ethnic gaps. Section 8 then replicates our UK results in the US labour market, and Section 9 discusses the correlation between earnings and job amenities. Last, Section 10 concludes.

2 Data

To measure full earnings, we require not only data on income from work but also a means of calculating the monetary value of the non-pecuniary aspects of different jobs. We will establish the latter from the relationship between a summary measure of well-being (life satisfaction) and dis-aggregated occupations, holding labour earnings and some exogenous individual characteristics constant.

Our main source of data is the Annual Population Survey (APS),[1] 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 socio-economic variables at local levels, including 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 (LFS), giving it the largest coverage of any UK household survey. We make use of the five most-recent APS waves (2014-2018), which contain detailed information on all of the questions that are relevant to our analysis.

Our sample consists of respondents aged 18 to 65 who are in full-time employment. We apply this latter restriction as the earnings distribution has a different significance for full and part-time workers. We also exclude the self-employed, as both the earnings and non-pecuniary amenities of this group are to a greater extent within their control. Of the 18-65 age group in employment, 85% are employees, 14% self-employed, and 1% 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% of the distribution of earnings. Our final sample from the five APS waves contains information on roughly 210,000 full-time employees.[2]

Our key outcome variable is life satisfaction. Following the OECD Guidelines (OECD, 2013), we use life satisfaction as a summary measure of overall individual well-being. We mostly focus on life satisfaction, as opposed to job satisfaction, because it is the former that matters to individuals when they make choices over their lives, not the satisfaction felt in only one domain of their lives. Since 2011, the UK Office for National Statistics (ONS) has asked APS respondents four personal wellbeing questions with the answers being considered to be official national statistics. The first of these 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 an average life satisfaction score of 7.76, with a standard deviation of 1.43.[3]

Earnings are measured by the logarithm of real hourly earnings. Hourly earnings in the APS are a derived variable, based on responses to gross weekly earnings and usual hours of work and overtime pay. All earnings figures in this paper are deflated using the UK Consumer Price index to produce real figures. The sample mean value of real log hourly earnings is 2.64 (corresponding to hourly pay of £14.01), with a standard deviation of 0.51. We use a relatively dis-aggregated measure of occupation, at the 3-digit

[1] More information about the APS can be found at https://www.ons.gov.uk/.

[2] There are initially 1,480,000 observations in the five APS waves we use. Restricting the sample by age and to those in employment brings this figure down to 630,000; keeping only full-time employees further reduces the sample to 460,000 observations. The remaining observations are lost due to non-response. Earnings data is 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.

[3] Slightly above the figure of 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#annual-personal-well-being-estimates.

level in the SOC2010 classification. This produces over 90 different occupations. A detailed account of the SOC2010 classification appears in Appendix C.

The APS also contains information on individual demographics. Our empirical analysis will focus on gender, age, ethnicity, and education. Gender is a dummy variable taking on the 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 broadly correspond to 16 (or more) years of education, 13 years, and 11 years (the minimum duration of compulsory education in the UK, from ages 5 to 16). Additional information on educational classifications in the UK is provided in Appendix B. The descriptive statistics for life satisfaction, demographics and earnings in our APS sample appear in Appendix Table A1.

One limitation of the Annual Population Survey is that it is a cross-section, so that individuals cannot be followed over time. We thus complement our cross-sectional analysis with the analysis of panel data from Understanding Society.[4] This survey started in 2009, and interviews the adults in around 40,000 households per year. We will here make use of all of the nine available waves of Understanding Society.

Understanding Society measures both respondent life satisfaction and job satisfaction, coded on a 7-point scale where an answer of 1 corresponds to "completely dissatisfied" and an answer of 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 (this yields 97 occupations). The logarithm of hourly earnings is calculated from individual monthly labour earnings and hours worked, including paid hours of overtime work, and deflated by the Consumer Price Index. Table A2 in the Appendix lists the descriptive statistics for the key variables in Understanding Society. The mean and standard deviation of real log hourly earnings in Understanding Society is exactly the same as that for the APS in Table A1.

3 Main Results on Full Earnings

3.1 Cross-Section Results from the APS

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

We estimate the following equation:

$$W_{ijt} = \alpha_0 + \alpha_1 X_{it} + \alpha_2 LogEarnings_{it} + \sum_j \alpha_3^j Occupation_{ijt} + \tau_t + \varepsilon_{ijt} \quad (1)$$

where W_{ijt} is the life satisfaction of the i-th individual in the j-th occupation, X_{it} is a vector of exogenous control variables (gender, ethnicity, and a quadratic term in age[5]), $LogEarnings_{it}$ 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 advantages of these j occupations, and τ_t is a wave fixed effect.

[4] More information about Understanding Society can be found at https://www.understandingsociety.ac.uk/.

[5] None of the regression results in this paper change if we instead enter age a series of age-category dummies.

As we are interested in the full inequality of earnings and amenities across occupations, we only consider this limited set of truly-exogenous variables instead of controlling for variables that are more the result of individual choice, such as education, marital status and region of residence. Later on in this section we will explicitly address the identifying assumptions underpinning Equation (1) and the issue of selection based on unobservable characteristics. And in Section 6 we will turn to the choice of education in more detail.

We evaluate the interpersonal dispersion of full earnings across occupations by combining each respondent's logarithm of hourly earnings with the monetary value of the non-pecuniary advantages of the occupation in which they work. We thus re-write Equation (1) as:

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

where full earnings are given by:

$$FullEarnings_{ijt} = (LogEarnings_{it} + \sum_j \frac{\alpha_3^j}{\alpha_2} Occupation_{ijt}) \tag{3}$$

Equation (3) shows that the full earnings of each worker are composed of a wage element and a term capturing the non-pecuniary value of occupations. The former is $LogEarnings_i$ and the latter 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 earnings, with earnings being the logarithm of hourly pay, while holding the choice of occupation constant.[6] To make the interpretation of the coefficients on the occupation dummies simpler, 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.[7] 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 variables and that we analyse a homogeneous group: adults aged 18 to 65 in full-time employment.

The estimated coefficient on the logarithm of earnings is 0.250. This is a fairly standard type of figure in the literature. It implies that doubling hourly earnings would increase life satisfaction by 0.175 on the 11-point scale (as doubling earnings causes log earnings 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 well-being literature. The size 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.[8] We divide these coefficients by the coefficient on the logarithm of earnings α_2: the

[6] Our results remain unchanged if we use the logarithm of monthly earnings, as opposed to hourly earnings.

[7] 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.

[8] We reject the null hypothesis that all of the α_3^j coefficients are jointly zero with a $p-value < 0.001$ and an F

resulting coefficient $\frac{\alpha_3^j}{\alpha_2}$ measures the non-pecuniary aspects of occupations in units of log earnings.

Table 1: An Equation of Predicted Life Satisfaction

	Life Satisfaction (0-10)
Log Earnings	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

Source: Annual Population Survey.
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 earnings" is the logarithm of hourly earnings. The regression controls for 90 different occupations, at the 3-digit level, using the SOC2010 classification. The sample is respondents aged 18 to 65 in full-time employment in five waves of APS data (2014-2018), excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-adjusted robust standard errors appear in parentheses. The sample is weighted using the *NPWT18* population weights in the Annual Population Survey, designed for the analysis of the sample completing wellbeing questions. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table 2 presents information on the standard deviations of earnings, non-pecuniary job rewards ($\frac{\alpha_3^j}{\alpha_2}$), and full earnings. The distribution of rewards on the labour market is substantially wider once we take their non-pecuniary element into account. The interpersonal dispersion in terms of earnings is 0.51, but that of full earnings is one-third higher, with a standard deviation of 0.68.[9] Table A6 in the Appendix 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.

statistic of 6.69

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

Table 2: Important Standard Deviations

	Log earnings	α_3^j	α_3^j/α_2	Full earnings	Sample size
SD	0.51	0.10	0.38	0.68	209,672

Source: Annual Population Survey.
Notes. These figures are calculated for respondents aged 18 to 65 in full-time employment in five waves of APS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. "Log earnings" is the logarithm of hourly earnings. α_3^j/α_2 are the non-pecuniary work rewards estimated in Equation (1) divided by the coefficient on log earnings. Our measure of full earnings is described in Equation (3).

The source of this substantial difference between earnings and full earnings can easily be understood by noting that:

$$Var(FullEarnings) = Var(LogEarnings) + Var(\alpha_3^j/\alpha_2) + 2Cov(LogEarnings, \alpha_3^j/\alpha_2)$$

where the covariance is given by

$$Cov(LogEarnings, \alpha_3^j/\alpha_2) = SD(LogEarnings).SD(\alpha_3^j/\alpha_2).\rho(LogEarnings, \alpha_3^j/\alpha_2)$$

In our data the correlation coefficient ρ is positive and equal to 0.14, so that:

$$Var(FullEarnings) = 0.51^2 + 0.38^2 + 2.(0.51).(0.38).(0.14) = 0.68^2$$

Table 2 underlines that there is greater dispersion in earnings (0.51) in the UK labour market than in non-pecuniary job rewards (0.38). It may be unsurprising that the impact of non-pecuniary work attributes on life satisfaction is less than that of earnings. While individuals' earnings affect many domains of their life, and are thus relevant outside of work, work amenities may be less important for non-work aspects of life.

3.2 Panel Results from Understanding Society

The APS survey is cross-sectional, and the above results could be biased as they do not control 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, nor based on their life satisfaction. However, these assumptions may be violated for some people. In Figure A1 in the Appendix we illustrate how those with higher ability may want to take part of their labour-market rewards in earnings and part in amenities. This can easily produce a positive correlation between amenities and earnings in the cross-section, where we cannot adequately control for (unobserved) ability.

We address the question of unobserved ability and selection using 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. We do not use Understanding Society data for our main results as it is a smaller dataset: while the average occupation-wave cell in the Annual Population Survey contains 948 observations, the analogous figure in Understanding Society is only 360. In addition, only 22% of the sample switches occupation at least once throughout this panel, and it is these switchers who identify the occupation coefficients in panel regressions. Even so, we will show below that the fixed-effect analysis in Understanding Society produces figures for the inequality in full earnings that are comparable to those found in the cross-section for all individuals in the APS.

For comparison purposes, our Understanding Society results come from analyses where we adjust the 7-point scale measures of life and job satisfaction to be on an 11-point scale (as in the APS), where 0 corresponds to "not at all satisfied" and 10 corresponds to "completely satisfied".[10] The first two columns of Table A3 show that the Understanding Society cross-section standard deviations of earnings, non-pecuniary amenities, and full earnings are remarkably similar to those in the cross-section APS.

Column 3 of Table A3 then shows the results when introducing individual fixed effects into Equation (1). The standard deviations of the unadjusted non-pecuniary attributes α_3^j are remarkably similar both 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 in the levels of life satisfaction that are associated with different occupations.

Despite the similarity in the standard deviations of the α_3^j's, the standard deviations of the α_3^j/α_2's 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 0.70, respectively). This reflects the smaller estimated value of α_2 in the panel regressions, a finding which is common in existing research. Consequently, the dispersion in full earnings is also one-third larger in the panel than in the cross-section.

While 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 will be more important in the work than in the life setting. In the cross-sectional analysis of life satisfaction in Table A3, there is greater dispersion in earnings than in non-pecuniary job aspects in both the APS and Understanding Society data. On the contrary, the analysis of job satisfaction in column 4 of Table A3 produces a much larger standard deviation in non-pecuniary work rewards. Notably, in both the cross-section and the panel, the standard deviations of work amenities in the job-satisfaction regressions are substantially larger than those in the life satisfaction regressions.

3.3 Issues in Estimation

In this section we discuss potential concerns regarding the estimation method used, how these might affect our conclusions, and how we address them. Specifically, we consider estimation issues with respect to life satisfaction, earnings and occupation.

Life Satisfaction

It has been argued that subjective well-being measures, such as as those we use here, are ordinal and discrete, so that OLS estimation may produce measurement error. However, Krueger and Schkade (2008) have provided some evidence that well-being 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) conclude that the measurement error introduced this way is at most minor in most empirical applications. A second

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

criticism of the regression analysis of subjective variables has recently been made by Bond and Lang (2019), who note that the sign of the estimated coefficients in these regressions can be reversed if the dependent variable is heteroskedastic.

We address these issues via two robustness checks that are presented in detail in Appendix Tables E1 and E2. Regarding measurement error, we estimate ordered probit models and show that our main conclusions continue to hold with this specification, as the estimated coefficients are comparable in both sign and magnitude to those from OLS. Regarding heteroskedacity, we follow Chen et al. (2019) who suggest that the results of ordered models can be re-interpreted by looking at the effects at the median rather than at the mean. The intuition 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 the effects at the median in heteroskedastic ordered probit models can be estimated under very weak conditions that are not susceptible to the reversal argument put forward by Bond and Lang (2019). Appendix Table E2 shows that our conclusions continue to hold when using this alternative median estimation method.

Occupation

There is a concern about measurement error in occupation that could affect the associated estimated coefficients. Understanding Society uses dependent interviewing, where for some variables individuals are supplied with the information that they provided at the previous wave (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.

The fact that our cross-section Understanding Society results, which are then less likely to suffer from occupational measurement error, are almost identical to those from the APS indicates that measurement error in occupation in the latter may not play a large role.

Earnings

One of our main findings is that earnings and the non-pecuniary aspects of occupations are positively correlated with each other, so that labour-market earnings alone underestimate inequality. We then evaluate the extent of this greater inequality by using the estimated coefficient on earnings to express an occupation's non-pecuniary aspects in monetary terms. The two main concerns regarding the estimation of the earnings coefficient are measurement error and omitted-variable bias.

Regarding measurement error in earnings, both Understanding Society and its predecessor, the British Household Survey Panel (BHPS), have a number of checks that are designed to minimise this. In the BHPS a share of respondents are asked to provide a payslip at the time of the survey, which is used to record earnings. In Understanding Society, respondents are encouraged to check a recent payslip (but it is not recorded whether they do so) and interviewers perform further checks when respondents report a net income that is larger than or equal to gross income. Appendix Table E3 shows the results from our main specification in both the full BHPS Sample and the restricted sample of respondents who provided a payslip. We carry out this analysis in both the cross-section and in the panel. Table E3 shows that our results are robust to only using payslip-verified earnings information, and are in fact larger in size.

Although these checks are not employed in the Annual Population Survey, Appendix Tables A1 and A2 show that both the mean and the distribution of hourly earnings in Understanding Society are identical to those in the APS. Furthermore, our main estimates are remarkably similar in both samples when we estimate our equations in the cross-section.

Finally, regarding measurement error in earnings, it may be that our estimated occupation coefficients do not only reflect job amenities but also mis-measured earnings. Note that this does not affect our main conclusion, which is that real labour-market inequality is larger than that evaluated using reported earnings only.

For the second concern, the bias from time-invariant omitted variables would seem to produce underestimates of labour-market inequality rather than the opposite. In our panel estimates above, which control for time-invariant individual characteristics, the coefficient on earnings is about half as large as that found in the cross-section, as would be expected if there is a positive correlation between earnings and unobserved characteristics, such as ability.[11] As our approach implies that a smaller income coefficient will mechanically translate into a larger level of full labour-market inequality, our cross-sectional estimates are a lower bound on the extent of inequality that we find.

A small number of contributions have attempted to address causality issues directly via the analysis of exogenous movements in income. Specifically, these papers have calculated the effect of windfall income on life satisfaction (such as winning the lottery or receiving an inheritance) in order to identify the exogenous effect of income on life satisfaction. The findings in these studies are mixed. Ambrey and Fleming (2014) and Buason et al. (2021) find a much larger income coefficient, while that in Kim and Oswald (2021) is considerably lower (at 0.1 on an 11-point scale) and that in Lindqvist et al. (2020) is, when re-scaled, similar to our OLS estimate (at 0.38 on an 11-point scale).

Direct comparisons here are not immediate, however, as these contributions are limited to those who play the lottery (or receive an inheritance), who are generally unrepresentative of the general population, and our contribution is based on those in full-time employment only. Taking a different approach, Frijters et al. (2004) exploit an exogenous increase in household income in Germany following re-unification and find coefficients that are roughly twice as large as ours. How such a coefficient would translate outside of the German re-unification context remains uncertain. While a larger coefficient on income would reduce our estimate of full-labour market inequality, it would not affect our finding that the correlation between earnings and amenities is always positive in all of our estimations and across all data sources, such that we find no evidence of compensating differentials in our data.

4 Full Earnings in Different Occupations

We now list individual occupations in terms of their full earnings, 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 well-being experienced by workers in different occupations.

Figure 1 depicts the earnings and full earnings in a number of occupations: we here only plot the results for occupations employing at least 0.17% of the respondents[12] to deal with potential outliers. To avoid choosing an arbitrary baseline, the non-pecuniary aspects of each occupation are expressed in terms of deviations from the sample mean. Full earnings, which are the sum of hourly earnings and the the monetary value of the non-pecuniary amenities in that occupation, are represented by the horizontal bars; hourly earnings are represented by the black crosses. The gap between hourly and full earnings then reveals the monetary value of non-pecuniary amenities in that occupation. A black cross that is to the right of the bar indicates that full earnings are below hourly wages, so that the value of amenities in

[11] Luttmer (2005) also finds a fixed-effect in coefficient that is half the size of that in cross-section.

[12] This figure refers to the 1^{st} percentile in terms of the share of employment: five occupations fall below this level.

that occupation is below average.

Overall, full earnings are correlated with earnings: there is a broad negative trend in both 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 full earnings that are lower than actual earnings. Equally, a number of occupations towards the top of Figure 1 have both high earnings and a positive value of amenities. This reflects our finding in Table 2 that accounting for amenities increases the standard deviation of rewards on the labour market. However, the correlation is far from perfect: for example, some elementary construction and agricultural workers have higher full earnings once the value of amenities is taken into account.

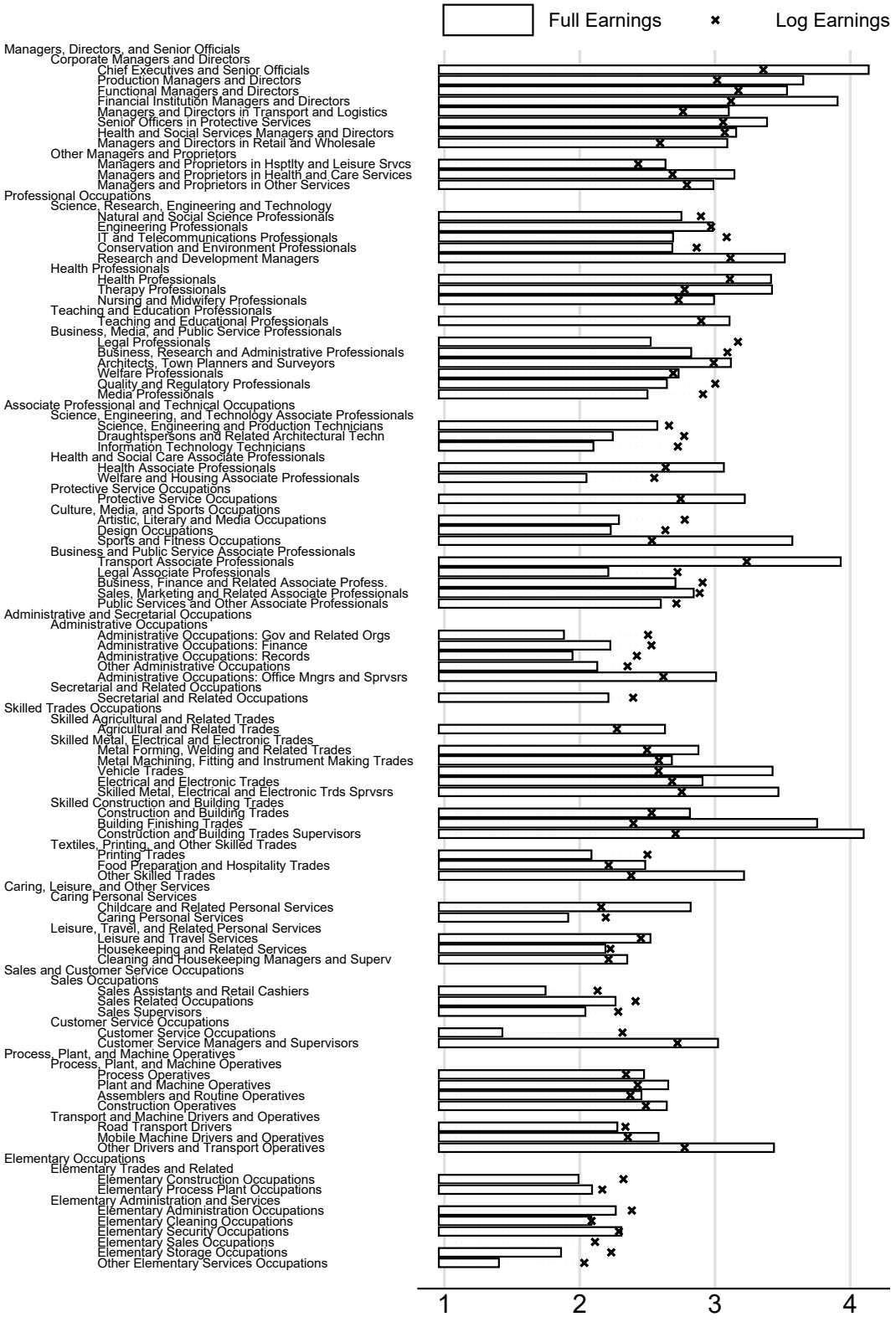
The patterns in Figure 1 underline the importance of carrying out the analysis at the 3-digit level. In the first 1-digit group (Managers, Directors and Senior Officials), full earnings are systematically larger than earnings. But in the second group (Professional Occupations), some 3-digit occupations have full earnings above earnings (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 monetary earnings and full earnings widens when introducing individual fixed effects (as can be seen from columns 2 and 3 in Table A3), Appendix Figures A2 and A3 replicate Figure 1 in cross-section and panel estimations respectively using Understanding Society data.[13] The estimated 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 depict the 30 most-popular occupations in the Understanding Society data. While there are substantial differences between the two figures, the gap between earnings and full earnings 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 full earnings in the panel as opposed to the cross-section in Table A3. The correlation coefficient between the α_3^j's in the cross-section and α_3^j's 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 cross-section sample.

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

[13] 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 the those in Figure 1. The Understanding Society Figures illustrate how full occupational earnings change once individual fixed effects are taken into account.

Figure 1: Earnings and Full Earnings in Different Occupations



Source: Annual Population Survey.
Notes. Occupations are listed in the order of the SOC2010 classification: the left-most entries show the 1-digit classification, the first indent the 2-digit classification, and the right-most entries that at the 3-digit level. It is for these latter that log earnings and full earnings are depicted. To avoid outliers, we do not plot occupations under the 1^{st} 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 to 65 in full-time employment in five waves of APS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution.

5 Full Earnings in Different Occupations: by Educational Attainment

While Figure 1 provides insights into how earnings and non-pecuniary amenities differ across occupations, it does not address that not all occupations are equally available 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 earnings.

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%). The correlation matrix in Table 3 summarises the relationship between life satisfaction, educational attainment, earnings, non-pecuniary amenities, and full earnings.[14] 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. [15] Life satisfaction is positively correlated with educational attainment, earnings, non-pecuniary aspects, and full earnings. 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 earnings, as expected, as well as with non-pecuniary work aspects, and therefore also with full earnings.

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

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

Table 3: Education – Important Correlations

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

Source: Annual Population Survey.
Notes. These correlations are calculated on respondents aged 18 to 65 in full-time employment in five waves of APS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings 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 here 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. "Log earnings" is the logarithm of hourly earnings. α_3^j/α_2 are the occupational non-pecuniary work amenities estimated from Equation (1) adjusted by the coefficient on log earnings. Our measure of full earnings is described in Equation (3).

While Table 3 indicates that the better-educated enjoy better average labour-market outcomes, it says nothing about the dispersion in these outcomes within education categories. Table 4 investigates by comparing the standard deviations of earnings, non-pecuniary amenities, and full earnings across the three different education groups, from the separate estimation of Equation (1) by educational group.

Table 4: Education – Important Standard Deviations

	Log earnings	α_3^j/α_2	Full earnings
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		

Source: Annual Population Survey.
Notes. The standard deviations are calculated for respondents aged 18 to 65 in full-time employment in five waves of the APS, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. "Log earnings" is the logarithm of hourly earnings. α_3^j/α_2 are the occupational non-pecuniary amenities estimated in Equation (1) adjusted by the coefficient on log earnings. Our measure of full earnings is described in Equation (3).

Strikingly, the dispersion of earnings is fairly similar across education categories, with only a slight positive education gradient. However, as we have discussed above, data on earnings alone substantially underestimate the full level of inequality in the labour market. The second and third columns show

that there is substantial variation in terms of the non-pecuniary aspects of work and full earnings. The standard deviation of full earnings is 29% larger than that of earnings for the lowest-educated, with analogous figures of 37% for those with A-levels and a notable 65% for respondents with a Degree. As a result, the dispersion of full earnings exhibits a far more substantial education gradient than does that of earnings.

This pattern of full-earnings 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 full earnings is highest for respondents with a Degree. This pattern is not evident in the life-satisfaction figures, and appears only weakly in the earnings figures. The distribution of full earnings that we uncover helps inform how educational decisions affect labour-market outcomes and the full level of labour-market inequality.

Figures A4, A5, and A6 in the Appendix reproduce the ranking of occupations in Figure 1, but now separately for our three education groups. Full earnings (in the bars) are again compared to earnings (the black crosses), but now for the 30 most-populated occupations within each education category. The full-earnings 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 earnings and full earnings, 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 full earnings, 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 by looking at the subset of 13 occupations that are amongst the 30 most-popular for all three education categories. There is a clear pattern by education in the full-earnings gap in these 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 Full Earnings. The reverse pattern is seen in (lower-ranked) administrative occupations, where there is a clear gradient in better amenities for the less-well educated, producing higher Full Earnings for this group. Full earnings then partly reflect the match of education to occupation.

6 The Full Rate of Return to Education in the Labour Market

Our analysis focuses on the choice of occupation as this is both one of the key choices that individuals make on the labour market and, from an empirical perspective, there are almost 100 different occupations at the three-digit level. A second key individual choice with labour-market consequences is that of education, even though there are only few categories here. This section further explores how the choice of education impacts individual labour-market outcomes.

We begin by estimating our life-satisfaction equation including controls for education. The results in columns (1) and (2) of Table 5 refer to regressions with and without occupation dummies respectively.[16] Table 3 indicated that life satisfaction rose slightly with education in the raw data. Once we control for exogenous characteristics and earnings in Table 5, life satisfaction falls with education whether occupa-

[16]The pattern of the estimated occupation dummies in column 2 of Table 5 is very similar to that in Table 1, where there are no controls for education. As such, the estimated amenities in different occupations do not reflect the occupational distribution of education.

tion is introduced or not. This reflects that earnings are positively correlated with both education and life satisfaction, and the confounding role of the demographic variables (younger respondents are both more-educated and have higher life satisfaction, for example).

Table 5: Life Satisfaction, Earnings and Education

	Life Satisfaction (0-10)	**Life Satisfaction** (0-10)
Log Earnings	0.307***	0.277***
	(0.009)	(0.011)
Degree	-0.055***	-0.068***
	(0.006)	(0.006)
A-levels	0.030***	0.029***
	(0.006)	(0.006)
GCSE or less	0.050***	0.070***
	(0.008)	(0.009)
Gender	Yes	Yes
Age quadratic	Yes	Yes
Ethnicity	Yes	Yes
Occupation Fixed Effects	No	Yes
Wave fixed effects	Yes	Yes
R^2	0.02	0.02
F-value	82.46	20.76
N	198,080	198,080
SD dependent	1.47	1.47

Source: Annual Population Survey.
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 earnings" is the logarithm of hourly earnings. The coefficients on education category are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988). The regression in column 2 controls for 90 different occupations, at the 3-digit level using the SOC2010 classification. The sample is respondents aged 18 to 65 in full-time employment in five waves of APS data (2014-2018), excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-adjusted robust standard errors appear in parentheses. The sample is weighted using the *NPWT18* population weights in the Annual Population Survey, designed for performing analysis on the sample completing wellbeing questions. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

The education coefficients in Tables 3 and 5 refer to the life satisfaction of individuals over all domains of their life. In what follows, we shall formally analyse the labour-market returns to education with respect to (i) earnings, (ii) the non-pecuniary amenities in each occupation, and (iii) full earnings. We estimate the following three equations:

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

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

$$FullEarnings_{ikt} = \beta_0 + \beta_1 X_{it} + \sum_k \beta_{2,k} Educ_{ikt} + \tau_t + \eta_{ijt} \quad (6)$$

where the coefficient vectors in Equations (4) and (5) by design sum up to the coefficients in Equation (6), so that $\gamma_{2,k} + \delta_{2,k} = \beta_{2,k}$ for all of the k education categories.

Table 6 lists the resulting estimates of γ_2, β_2 and δ_2 in Equations (4) to (6), showing the labour-market returns to education. As the α_3^j/α_2 do not vary across individuals and waves, Appendix Table A4 shows how our results change if we instead estimate Equation (5) at the occupation-level. The results in Table 6 show that earnings rise in education, with those with a Degree earning 70% more that those with the lowest education level. These returns to education are even larger when non-pecuniary job amenities are taken into account. The improvement in terms of non-pecuniary amenities is particularly notable for those with A-level or equivalent qualifications. The return to two years more of education after the end of compulsory schooling (i.e. A-levels or equivalent) is over one-third larger in terms of full earnings than in terms of earnings alone. The returns to education are then even higher than the data on earnings alone suggests.

Table 6: The Full Returns to Education in the Labour Market

	Log earnings	α_3^j/α_2	**Full earnings**
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

Source: Annual Population Survey.
Notes. These are OLS regressions. In column (1) "Log earnings" is the logarithm of hourly earnings. In column (2) α_3^j/α_2 is the value of non-pecuniary work amenities estimated in Equation (1) and adjusted by the coefficient on log earnings. The dependent variable in column (3) is our measure of full earnings. The coefficients on education category are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988). The sample covers respondents aged 18 to 65 in full-time employment in five waves of the APS, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the *NPWT18* population weights in the Annual Population Survey, designed for performing analysis on the sample completing wellbeing questions. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Comparing the coefficients on the level of earnings and full earnings in Table 6 to those on their dispersion in Table 4 reveals that, while the expected value of a Degree is slightly higher in terms of full earnings, it is also a riskier choice: the dispersion of full earnings is substantially larger for the best-educated respondents as compared to their less-educated counterparts, despite there being only a small

difference in the dispersion of earnings alone. In the data that we analyse here, the full earnings of a respondent with only a GCSE qualification are higher than those of a respondent with a Degree in almost half of the occupations, with a similar figure being found for respondents with A-levels. Taking both earnings and the value of job amenities into account then provides a more complete, and perhaps a little unexpected, picture of the full returns to education on the labour market.

7 The Gender and Ethnic Gaps in Full Earnings

We now ask how gender and ethnicity relate to both full earnings and its monetary and non-monetary components. Table 7 shows the estimated coefficients on gender and ethnicity from Equations (4), (5) and (6): these are the same equations as those behind the education coefficients displayed in Table 6. In Appendix Table A4 we show how our results change if we estimate Equation (5) at the occupation level.

The gender gap in full earnings is 31% larger than that in earnings alone. Appendix Table A5 shows the results when we drop education from Table 6: doing so does not materially affect this conclusion. As our sample is restricted to respondents in full-time employment, the gender gap in Table 6 is not explained by gender differences in the prevalence of part-time work.

Equally, the earnings of ethnic minorities understate the gap in terms of full earnings. 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. For example, the "Pakistani", "Bangladeshi" and "Black" ethnic groups are paid substantially less than the average respondent, but their full earnings gap is 46%, 47% and 40% larger, respectively, than that in monetary pay. The estimated coefficients in columns 1 and 2 reveal this pattern for 8 out of the 11 ethnic groups in the APS, so that ethnic gaps are in general significantly underestimated if they do not include information on job amenities.

In unreported results, we also estimated the ethnic wage gaps in Table 7 separately for men and women, to allow for the coefficients on the other demographic controls to differ by sex. The resulting ethnic gaps in Table 7 are larger for men, and are 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 penalised 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 they are on the contrary accentuated for women.

Table 7: The Full Gender and Ethnic Gaps

	Log earnings	α_3^j/α_2	**Full earnings**
Female	-0.172***	-0.052***	-0.224***
	(0.002)	(0.002)	(0.003)
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)
Age quadratic	Yes	Yes	Yes
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

Source: Annual Population Survey.
Notes: These are OLS regressions. In column (1) "Log earnings" is the logarithm of hourly earnings. 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 earnings. In column (3) the dependent variable is our measure of full earnings. The ethnicity coefficients are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988). The sample covers respondents aged 18 to 65 in full-time employment in five waves of the APS, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the *NPWT18* population weights in the Annual Population Survey, designed for performing analysis on the sample completing wellbeing questions. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

8 Results from the United States

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 United Kingdom.

We here complement this UK analysis with two data sets from the United States. The best data sources for this purpose are the General Social Survey (GSS) and the Panel Study of Income Dynamics (PSID).[17] The GSS is a repeated cross-section survey (but not a panel) that is representative of the US population. This survey started in 1972 and 30 waves of data are currently available. There are two

[17] Other well-known US data sources with subjective wellbeing information are the 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

subjective wellbeing questions in the GSS, referring to happiness and job satisfaction: these appear in 29 waves, with an average of 2,300 observations per wave, 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 occupation of those in employment.

The advantage of the GSS is that it is representative of the US population and provides a longer-run picture of the US labour market. The downside is its cross-sectional nature and the small yearly sample size. As such, we complement our analysis with data from the PSID, the longest-running panel in the United States. The PSID goes back to 1968 and has a sample of over 18,000 individuals living in 5,000 families in the United States. Information on these individuals and their descendants has been collected continuously, including data covering employment and income. The PSID survey has asked the household reference person about their life satisfaction in every wave since 2009. The reference person within a household may change from one wave to another, and we here restrict our analysis to the 6,772 reference individuals who can be tracked over the six available biennial waves since 2009. As the life-satisfaction question is not asked of each family member, our sample is not fully representative of the US population. Table A7 in the Appendix provides some descriptive statistics for the GSS and the PSID data.

Occupations in both datasets are recorded at the 4-digit level, using the 2010 Census Occupational Classification. There are over 500 different occupations at this level. Given the relatively small sample size after our data-analysis restrictions have been applied,[18] we avoid small cells by re-coding occupation into 23 broader categories, in line with the 2-digit 2010 Census Occupational Classification.[19] Log earnings 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 calculate real earnings by deflating using US CPI figures.

Table 8 below shows the US results from estimating Equation (1) with the GSS and the PSID. As in Table 1, the sample is restricted to respondents aged 18 to 65 in full-time employment. The first two columns refer to the two GSS wellbeing measures: general happiness on a 3-point scale, where 1 corresponds to "not too happy" and 3 to "very happy", and job satisfaction on a 4-point scale, where 1 corresponds to "very dissatisfied" and 4 to "very satisfied". The third and fourth columns show the results for life satisfaction in the PSID, measured on a 5-point scale from 1 ("completely dissatisfied") to 5 ("completely satisfied"). The estimated coefficients in column 3 come from cross-section analysis, and those in column 4 from panel estimation. To render the coefficients comparable in size to those for the APS in Table 1, all well-being variables have been re-coded to be on an 11-point scale.

The coefficient on Log Earnings in Column (1) is 0.374, so that doubling earnings increases happiness by 0.262 on the 11-point scale; the coefficients on Log Earnings in Columns (2) and (3) are very similar. In line with our UK findings, the panel income coefficient (column (4)) is somewhat smaller than those in the cross-section.

income but provides no measure of individual income, and occupation is only recorded in 11 broad categories. As such, both these data sets provide insufficiently-detailed information, given the level of dis-aggregation required for our analysis. Neither the BRFSS nor Gallup is a panel survey.

[18] As for the APS and Understanding Society, we restrict the sample to those aged between 18 and 65, in full-time employment, not self-employed, and with earnings above the 1^{st} percentile of the income distribution.

[19] Our results are robust, and stronger, to the use of the most-popular occupations at the 4-digit level: by most-popular we mean those that are above the 25^{th} percentile in terms of the share of the population employed.

Table 8: How earnings and personal characteristics affect well-being in the US

	Happiness (GSS)	**Job Satisfaction** (GSS)	**Life Satisfaction** (PSID)	**Life Satisfaction** (PSID)
Log earnings	0.374***	0.329***	0.361***	0.288***
	(0.038)	(0.032)	(0.027)	(0.030)
Age quadratic	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	22.46	
χ^2				339.28
N	20,475	20,513	19,816	19,816
SD dependent	2.98	2.56	2.02	2.02

Source: 29 waves of General Social Survey data (1974 to 2016) and 6 waves of Panel Survey of Income Dynamics data (2009 to 2019).
Notes. These are OLS regressions. The sample includes respondents aged 18 to 65 in full-time employment. The regressions exclude those whose yearly real income is in the 1^{st} percentile of the income distribution. "Log earnings" 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. Heteroskedasticity-adjusted robust standard errors appear in parentheses. The sample in columns 1 and 2 is re-weighted using the population weights in the General Social Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table 9 lists the key standard deviations in the two US surveys. Earnings are more dispersed in the US than in the UK: in Column (1) the standard deviation of US earnings is 0.75 in the GSS and 0.67 in the PSID, around 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 0.46, as against 0.38). In Column (4), the dispersion in Full Earnings in the US is one-third higher than that of earnings in both the GSS and the PSID, a rise that is remarkably similar to that found for the United Kingdom. In the United States, the correlation between earnings and amenities is roughly 0.2 (0.19 in the GSS and 0.23 in the PSID). This relationship is slightly stronger for the US, but in line with our UK findings in terms 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 labour market, controlling for time-invariant unobserved characteristics such as ability does not change our main conclusions, and confirms that the large dispersion in full earnings is not explained by selection into occupations.

In line with our UK results, we also find that there is more dispersion in amenities than in earnings when we take job satisfaction as the wellbeing measure (in the GSS data), and consequently that the dispersion in Full Earnings is also larger.

Table 9: Important Standard Deviations in the US

	Log earnings	α_3^j	α_3^j/α_2	Full earnings	Sample size
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	0.93	1.28	20,513
SD (from Life Satisfaction, PSID)	0.67	0.17	0.46	0.90	19,816
Panel					
SD (from Life Satisfaction, PSID)	0.67	0.16	0.54	0.99	19,816

Source: 29 waves of General Social Survey data (1974 to 2016) and 6 waves of Panel Survey of Income Dynamics data (2009 to 2019).
Notes. These figures are calculated for respondents aged 18 to 65 in full-time employment and exclude those whose yearly real income is in the 1^{st} percentile of the income distribution. "Log earnings" 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 earnings. Our measure of full earnings is described in Equation (3).

Figure A7 in the Appendix illustrates how earnings and Full Earnings compare across different occupations in the GSS. While full earnings in the top occupations are often greater than earnings (revealing above-average non-pecuniary rewards), this is not the case for Computer and Mathematics, or for Legal occupations. Towards the bottom, non-pecuniary rewards are notably lower in Food Preparation, and Buildings and Maintenance.

Table 10 presents the estimation results of Equations (4) to (6) assessing the full returns to education in the US labour market. In both data sets, the returns to a Degree (16 years or more of education) are considerably underestimated when non-monetary rewards are not taken into account. This underestimation in the US is substantially larger than that in the UK (in Table 6), as non-pecuniary rewards play a far larger role in the returns to education in the US labour market. Equally, the labour-market performance of High-School dropouts (as compared to those with a High-School diploma) is worse than their lower earnings alone indicates, due to their worse job amenities.

Table 10: The Full Returns to Education in the US

	Log earnings (GSS)	α_3^j/α_2 (GSS)	**Full earnings** (GSS)	**Log earnings** (PSID)	α_3^j/α_2 (PSID)	**Full earnings** (PSID)
Years of education						
16 years or more	0.363***	0.336***	0.699***	0.327***	0.118***	0.445***
	(0.009)	(0.006)	(0.010)	(0.006)	(0.005)	(0.008)
13 to 15 years	0.002	-0.006	-0.005	-0.046***	-0.053***	-0.099***
	(0.008)	(0.006)	(0.011)	(0.006)	(0.005)	(0.008)
12 years	-0.149***	-0.163***	-0.312***	-0.212***	-0.067***	-0.280***
	(0.007)	(0.005)	(0.009)	(0.007)	(0.005)	(0.009)
Less than 12 years	-0.435***	-0.329***	-0.764***	-0.436***	-0.063***	-0.499***
	(0.013)	(0.009)	(0.016)	(0.012)	(0.008)	(0.014)
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	0.34	0.10	0.34
F-value	198.13	125.88	245.21	713.22	149.85	732.38
N	20,475	20,475	20,475	19,744	19,744	19,744
SD dependent	0.75	0.55	1.01	0.67	0.46	0.90

Source: 29 waves of General Social Survey data (1974 to 2016) and 6 waves of Panel Survey of Income Dynamics data (2009 to 2019).
Notes. These are OLS regressions. The sample includes respondents aged 18 to 65 in full-time employment. The regressions exclude those whose yearly real income is in the 1^{st} percentile of the income distribution. In columns (1) and (4) "Log earnings" is the logarithm of 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) and adjusted by the coefficient on log earnings. The dependent variable in columns (3) and (6) is our measure of full earnings. The coefficients on education category are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988). Heteroskedasticity-robust standard errors appear in parentheses. The sample in columns 1 to 3 is re-weighted using the population weights in the General Social Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Last, Table 11 presents the full gender and racial gaps in the US labour market. Women earn significantly less than men, and the estimated US earnings gap is nearly twice the size of that for the UK in Table 7. However, unlike in the UK, the pattern in full earnings in the US is more mixed. In the GSS, women are partly compensated through better amenities while in the PSID this is not the case. The final full-earnings gender gap in both the GSS and the PSID is about one-third larger than that in the UK. With respect to race, Black respondents earn substantially less than Whites and also experience worse non-pecuniary rewards. The results are more mixed for the "Other" racial minorities. In line with our UK results, the full racial gaps on the labour market are larger than those revealed by earnings alone.

Table 11: The Full Gender and Ethnic Gaps in the US

(GSS)	**Log earnings** (GSS)	α_3^j/α_2 (GSS)	**Full earnings** (PSID)	**Log earnings** (PSID)	α_3^j/α_2 (PSID)	**Full earnings**
Female	-0.439***	0.134***	-0.305***	-0.231***	-0.170***	-0.401***
	(0.010)	(0.008)	(0.013)	(0.008)	(0.007)	(0.011)
Race						
White	0.024***	0.008***	0.033***	0.096***	0.028***	0.124***
	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.005)
Black	-0.127***	-0.021**	-0.148***	-0.117***	-0.033***	-0.150***
	(0.013)	(0.010)	(0.017)	(0.005)	(0.004)	(0.007)
Other	-0.042*	-0.062***	-0.104***	-0.011	-0.009	-0.020
	(0.023)	(0.015)	(0.029)	(0.013)	(0.009)	(0.017)
Age quadratic	Yes	Yes	Yes	Yes	Yes	Yes
Education	Yes	Yes	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.33	0.21	0.37	0.34	0.10	0.34
F-value	198.13	125.88	245.21	713.22	149.85	732.38
N	20,475	20,475	20,475	19,744	19,744	19,744
SD dependent	0.75	0.55	1.01	0.67	0.49	0.92

Source: 29 waves of General Social Survey data (1974 to 2016) and 6 waves of Panel Survey of Income Dynamics data (2009 to 2019).
Notes: These are OLS regressions. In columns (1) and (4) "Log earnings" 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 earnings. In columns (3) and (6) the dependent variable is our measure of full earnings. The race coefficients are expressed in terms of deviations from the sample mean, using the procedure in Krueger and Summers (1988). The sample covers respondents aged 18 to 65 in full-time employment, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the population weights in the General Survey. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

9 The Correlation between Earnings and Non-Pecuniary Rewards

We have above considered in detail the correlates of both earnings and non-pecuniary job rewards, which together make up full earnings. A long-running question in the literature is how the two are related. Do the best-paid jobs also have good working conditions? Or instead do higher earnings compensate for bad working conditions, as in the theory of compensating wage differentials? In Section 3, the interpersonal dispersion of full earnings was made up of the dispersion of hourly earnings 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 earnings and job amenities on the UK labour market.

To investigate more formally, we estimate the following earnings equation:

$$LogEarnings_{ijt} = \beta_0 + \beta_1 X_{it} + \sum_j \beta_2^j Occupation_{ijt} + \tau_t + \eta_{ijt} \tag{7}$$

where the vector X_{it} in Equation (7) also includes educational attainment (but the vector X_{it} in Equation (1) did not). The correlation between the β_2^j coefficients above and the $\frac{\alpha_3^j}{\alpha_2}$ coefficients that show the occupational distribution of well-being conditional on earnings and the X_{it} variables sheds more light on whether well-paid jobs also offer better amenities.

Table 12 lists the correlations between earnings and amenities, where amenities are given by the $\frac{\alpha_3^j}{\alpha_2}$ coefficients. The first row shows the correlation with individual earnings in the raw data, which is identical to the figure in Table 3. The second row shows that with individual earnings conditional on demographics (X_{it}) and the final row the correlation with occupation-level earnings 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 12 reveal that this positive correlation is entirely driven by the private sector. Again, the differences in labour-market outcomes across individuals are more profound than their earnings alone suggest.

Table 12: Correlation (ρ) of earnings with amenities ($\frac{\alpha_3^j}{\alpha_2}$)

	Overall ρ	Private Sector ρ	Public Sector ρ
Individual Earnings ($LogEarnings_{ijt}$)	0.14	0.16	-0.01
Individual Earnings ($LogEarnings_{ijt}$ conditional on X_{it})	0.09	0.10	-0.01
Occupation Earnings (β_2^j)	0.19	0.23	-0.01

Source: Annual Population Survey.
Notes; These correlations are based on a sample of respondents aged 18 to 65 in full-time employment in five waves of APS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. The α_3^j/α_2 are the occupational job amenities from Equation (1) and adjusted by the coefficient on log earnings.

The estimation of the correlations in Table 12 using cross-section data may produce biased coefficients due to unobserved individual-level characteristics. Figure A1 in the Appendix illustrates why this could be the case. Specifically, the idea behind compensating differentials is the trade-off in the menu of wages and amenities across occupations that is offered to the same individual. In the cross-section we expect individuals of higher ability to have both higher wages and higher amenities: the unobserved distribution of ability will then bias the correlation between wages and amenities upwards. Any bias from ability will be removed in panel estimations.

The top panel of Table 13 presents the cross-section correlations between earnings and amenities in Understanding Society, GSS and PSID data; the bottom panel then lists the analogous panel correlations in Understanding Society and the PSID. The results in the top panel of Table 13 indicate that the pattern of our cross-sectional APS findings in Table 12 is similar to that in the cross-sectional results in both Understanding Society and the two US data sources.

Table 13: The Cross-Section and Panel Correlations (ρ) of earnings with amenities ($\frac{\alpha_3^j}{\alpha_2}$) in Understanding Society, the GSS, and the PSID

	Correlation (ρ)
Panel A: Cross-section	
Life Satisfaction (Understanding Society):	
Individual Earnings	0.22
Individual Earnings (conditional on X_{it})	0.15
Occupation Earnings (conditional on X_{it})	0.34
Job Satisfaction (Understanding Society):	
Individual Earnings	0.12
Individual Earnings (conditional on X_{it})	0.11
Occupation Earnings (conditional on X_{it})	0.16
Happiness (GSS):	
Individual Earnings	0.19
Individual Earnings (conditional on X_{it})	0.27
Occupation Earnings (conditional on X_{it})	0.23
Life Satisfaction (PSID):	
Individual Earnings	0.23
Individual Earnings (conditional on X_{it})	0.28
Occupation Earnings (conditional on X_{it})	0.35
Panel B: Panel	
Life Satisfaction (Understanding Society)::	
Individual Earnings	0.07
Individual Earnings (conditional on X_{it})	0.05
Occupation Earnings (conditional on X_{it})	0.04
Job Satisfaction (Understanding Society):	
Individual Earnings	0.16
Individual Earnings (conditional on X_{it})	0.14
Occupation Earnings (conditional on X_{it})	0.13
Life Satisfaction (PSID):	
Individual Earnings	0.34
Individual Earnings (conditional on X_{it})	0.29
Occupation Earnings (conditional on X_{it})	0.45

Source: Understanding Society, the General Social Survey and the Panel Study of Income Dynamics
Notes. These correlations are based on a sample of respondents aged 18 to 65 in full-time employment, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. The α_3^j/α_2 are the occupational job amenities from Equation (1) and adjusted by the coefficient on log earnings.

The individual fixed effects in the panel estimation in the bottom panel of Table 13 naturally absorb

any time-invariant variables. The panel correlation between occupational earnings and $\frac{\alpha_3^j}{\alpha_2}$ in Understanding Society is 0.04 (while the corresponding figure using job satisfaction is 0.13). However, in the US labour market the panel correlation between occupational earnings and $\frac{\alpha_3^j}{\alpha_2}$ is 0.45. We conclude that even within-individuals, the correlation between earnings 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 US. As such, there is no evidence in panel data, from either labour market, that worse-paid jobs offer better job amenities as compensation.

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

10 Conclusion

We have here analysed the value of different occupations to workers. We consider occupations at the 3-digit level, and calculate the distribution of life satisfaction across occupations conditional on earnings: 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 earnings on life satisfaction. A worker's full earnings are then her earnings plus the monetary value of the amenities in her occupation.

Our key finding is that the distribution of full earnings is not equivalent to that of earnings, such that amenities are not fully captured in wages. We show that the dispersion of earnings underestimates the extent of inequality in the labour market by a significant margin: the dispersion of full earnings is one-third larger than the dispersion of earnings. In addition, both the gender gap and ethnic gaps on the labour market are substantially larger in terms of full earnings than in terms of earnings alone.

We carry out a number of exercises to establish the relationship between earnings and the value of job amenities. We consider both cross-section and panel data, and both life satisfaction and job satisfaction as our measure of the hedonic return to work. We also check that our main results continue to hold in ordinal estimation, and are not subject to the reversal issues raised by Bond and Lang (2019).

The gap between earnings and full earnings does not reflect measurement error, as it exhibits strong systematic patterns in the data. In particular, none of our specifications produce a negative correlation between earnings and the value of amenities, and some produce significant positive correlations, even when removing time-invariant unobserved characteristics. In other words, we find no evidence of compensating differentials, even within individuals as they switch occupations.

Occupation is one of the most important decisions that individuals make. Another is education. We first show that earnings alone under-estimate the full-earnings returns to education. Moreover, the ranking of occupations (in terms of their full earnings) is not identical by education. 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. Last, 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 can be replicated using two sources of US data in both cross-section and panel. Compared to the UK, US workers experience more dispersion in both earn-

ings and amenities. However, equivalent to our key findings in the UK, the dispersion of full earnings is one-third larger than the dispersion of earnings, and controlling for time-invariant unobserved characteristics does not alter our conclusions. Similarly, the full returns to education in the labour market are also larger than those in wages, while the differences between people with different educational attainment are starker in the US than in the UK. Finally, differences in earnings also underestimate the full racial gap in the US, 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 earnings alone would suggest.

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Appendix

A. Additional Tables and Figures

Table A1: Descriptive Statistics in the Annual Population Survey

	Mean	**SD**	**N**
Life Satisfaction (0-10)	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	
Earnings			
Real Log hourly pay	2.64	0.51	209,672

Source: Annual Population Survey.
Notes. The means and standard deviations are calculated from the sample of respondents aged 18 to 65 in full-time employment in five waves of APS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution.

Table A2: Descriptive Statistics in Understanding Society

	Mean	**SD**	**N**
Life Satisfaction (recoded 0-10)	7.03	2.21	100,948
Job Satisfaction (recoded 0-10)	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	
Earnings			100,948
Real Log hourly pay	2.63	0.51	

Source: Understanding Society.
Notes. For a more-straightforward comparison with the Annual Population Survey, 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 to 65 in full-time employment in nine waves of Understanding Society data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution.

Table A3: Important Standard Deviations in the APS and Understanding Society

	Life Satis APS Cross-section	**Life Satis** USoc. Cross-section	**Life Satis** USoc. Panel	**Job Satis** USoc. Cross-section	**Job Satis** USoc. Panel
Log earnings	0.51	0.51	0.51	0.51	0.51
α_3^j	0.10	0.15	0.17	0.26	0.35
α_3^j/α_2	0.38	0.32	0.70	0.88	1.17
Full earnings	0.68	0.66	0.90	1.07	1.36
Sample size	209,672	100,948	100,948	100,948	100,948

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

Table A4: The Value of Job Amenities by Education, Gender and Ethnicity 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

Source: Annual Population Survey.
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) and adjusted by the coefficient on log earnings. The sample covers respondents aged 18 to 65 in full-time employment in five waves of the APS, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-robust standard errors appear in parentheses. Data at the occupation level is collapsed using the *NPWT18* population weights in the Annual Population Survey, designed for performing analysis

on the sample completing wellbeing questions. The regression results are weighted based on the number of respondents in each occupation. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table A5: Decomposition of Full Earnings in the Annual Population Survey, as shown in Table 6, but without Controls for Education

	Log earnings	α_3^j/α_2	**Full earnings**
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

Source: Annual Population Survey.
Notes. These are OLS regressions. In column (1) "Log earnings" is the logarithm of hourly earnings. 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 earnings. In column (3) the dependent variable is our measure of full earnings. The sample covers respondents aged 18 to 65 in full-time employment in five waves of the APS, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-robust standard errors appear in parentheses. The sample is re-weighted using the *NPWT18* population weights in the Annual Population Survey, designed for performing analysis on the sample completing wellbeing questions. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Table A6: Important Standard Deviations with Statistically-Significant α_3^j

	Log earnings	α_3^j/α_2	Full earnings	Sample Size
SD	0.51	0.30	0.64	175,188

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

Table A7: Descriptive Statistics in the GSS and the PSID

	Mean (GSS)	**SD** (GSS)	**N** (GSS)	**Mean** (PSID)	**SD** (PSID)	**N** (PSID)
Happiness (recoded 0-10)	6.18	2.98	20,475			
Job Satisfaction (recoded 0-10)	7.71	2.56	20,226			
Life Satisfaction (recoded 0-10)				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
Earnings						
Log real yearly income	9.83	0.77	20,475			
Log real hourly earnings				3.01	0.67	20,217

Source: General Social Survey and Panel Survey of Income Dynamics.
Notes. The means and standard deviations are calculated from the sample of respondents aged 18 to 65 in full-time employment in 29 waves of GSS data and six waves of PSID, excluding those whose earnings are in the 1^{st} percentile of the earnings distribution.

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

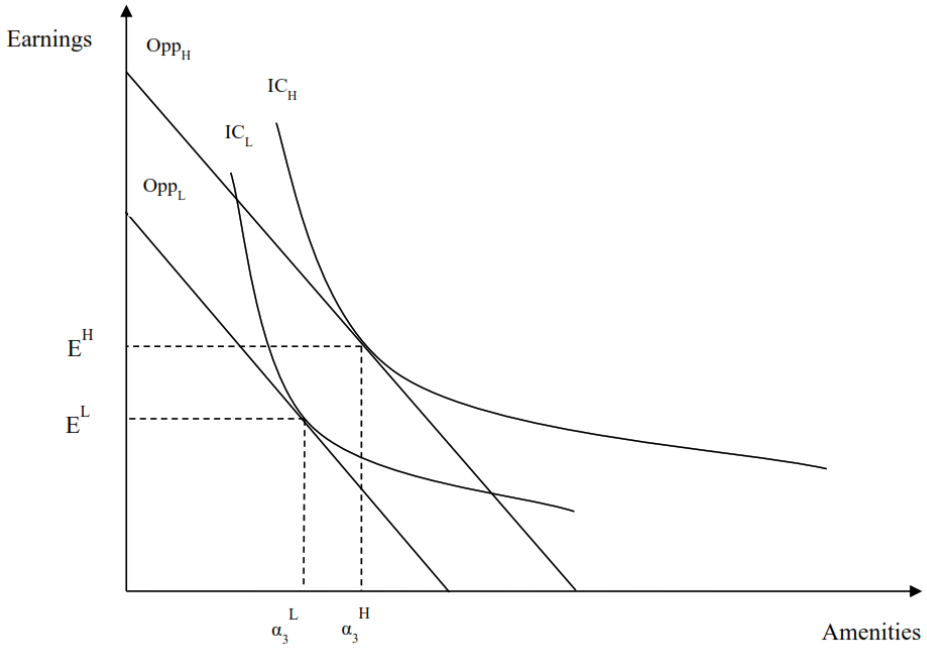
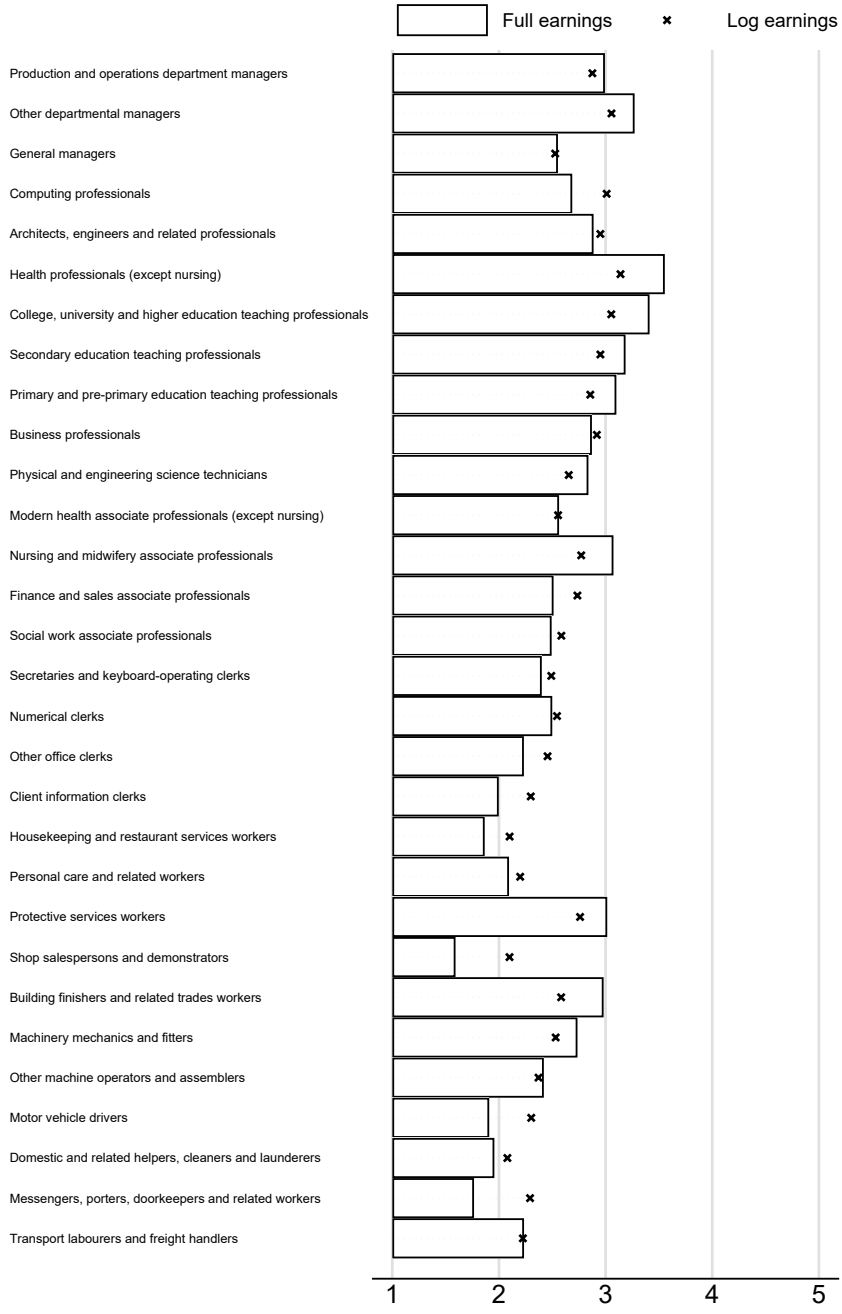
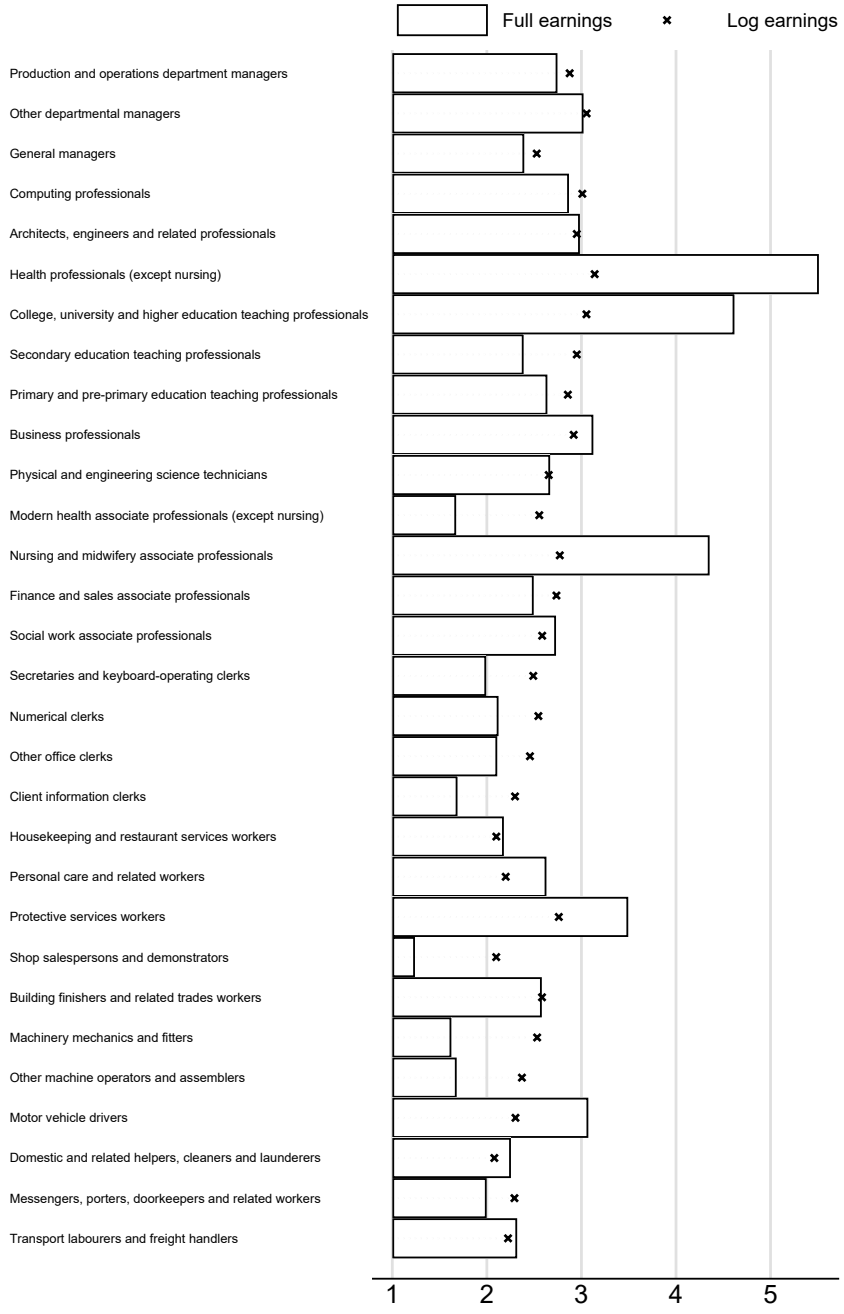


Figure A2: Earnings and Full Earnings in Different Occupations: Cross-Section.



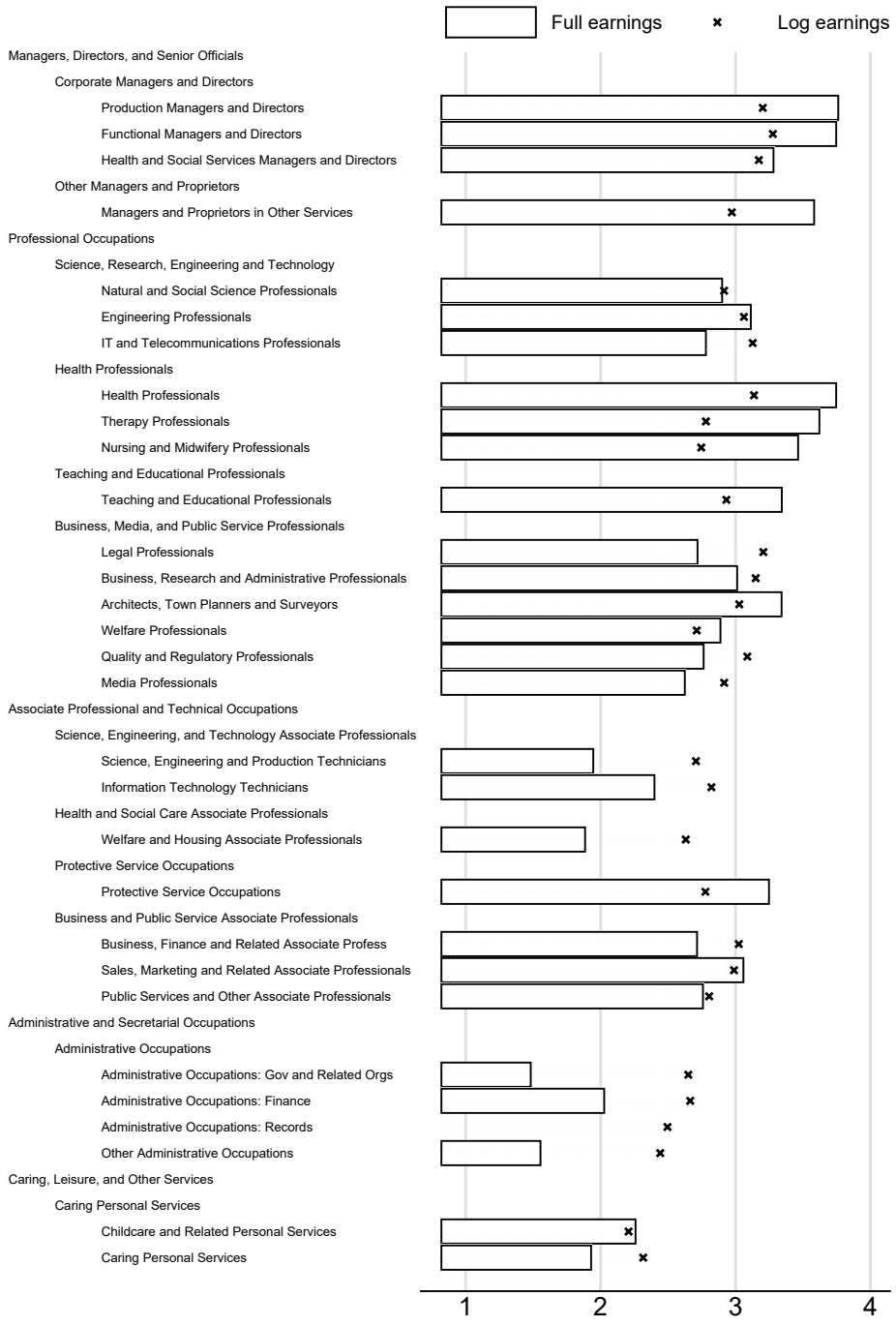
Source: Understanding Society.
Notes. The bars depict full earnings in each occupation, and the black 'x's the logarithm of earnings. Occupations are listed in order of the ISCO88 classification. To avoid outliers, we do not plot occupations under the 1^{st} percentile in terms of share of the population employed. Full earnings in each occupation are expressed in terms of deviations from the sample mean. The figure is based on respondents aged 18 to 65 in full-time employment in nine waves of Understanding Society data.

Figure A3: Earnings and Full Earnings in Different Occupations: Panel.



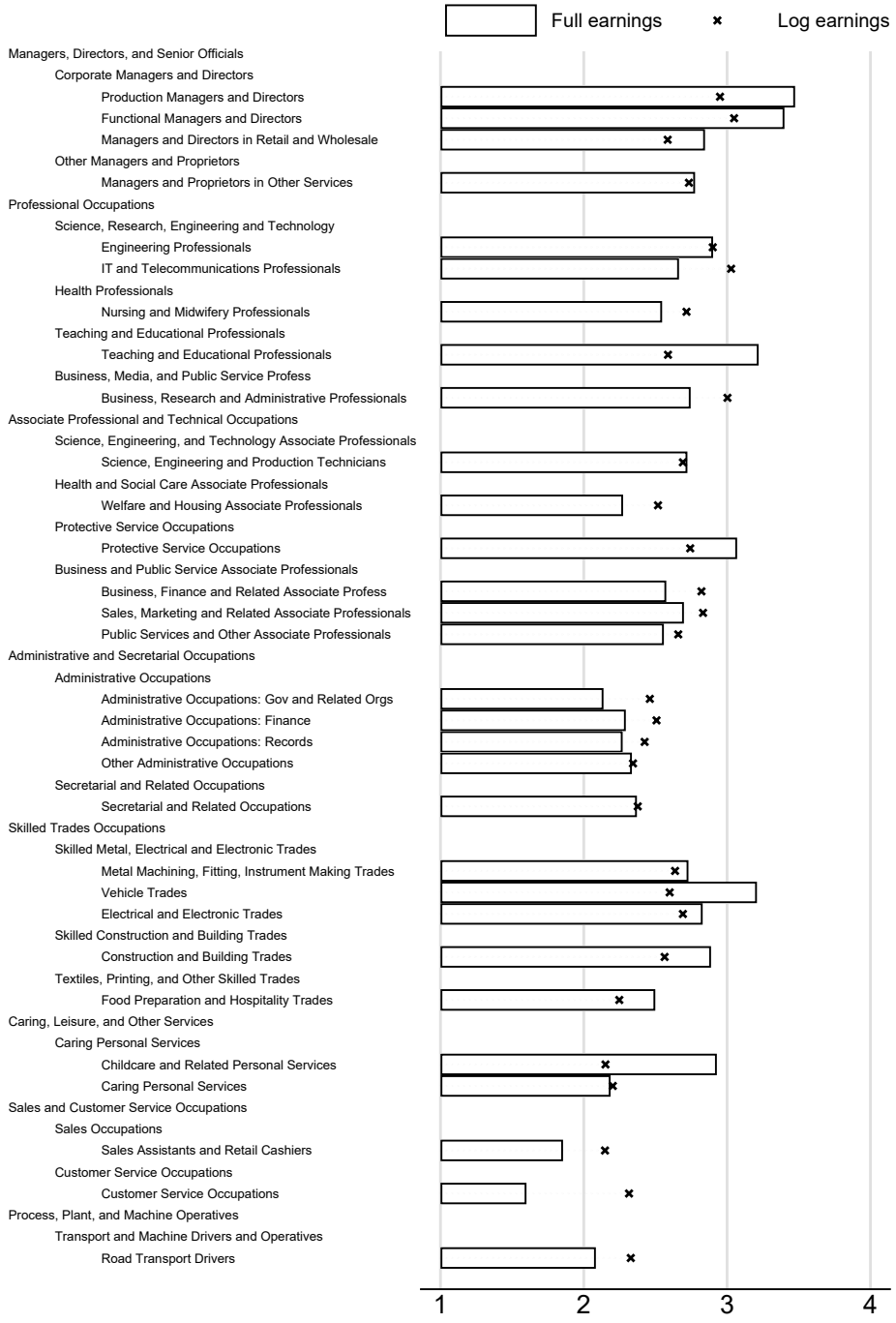
Source: Understanding Society.
Notes. The bars depict full earnings in each occupation, and the black 'x's the logarithm of earnings. Occupations are listed in order of the ISCO88 classification. To avoid outliers, we do not plot occupations under the 1^{st} percentile in terms of share of the population employed. Full earnings in each occupation are expressed in terms of deviations from the sample mean. The figure is based on respondents aged 18 to 65 in full-time employment in nine waves of Understanding Society data.

Figure A4: Earnings and Full Earnings across Occupations: Respondents with a Degree.



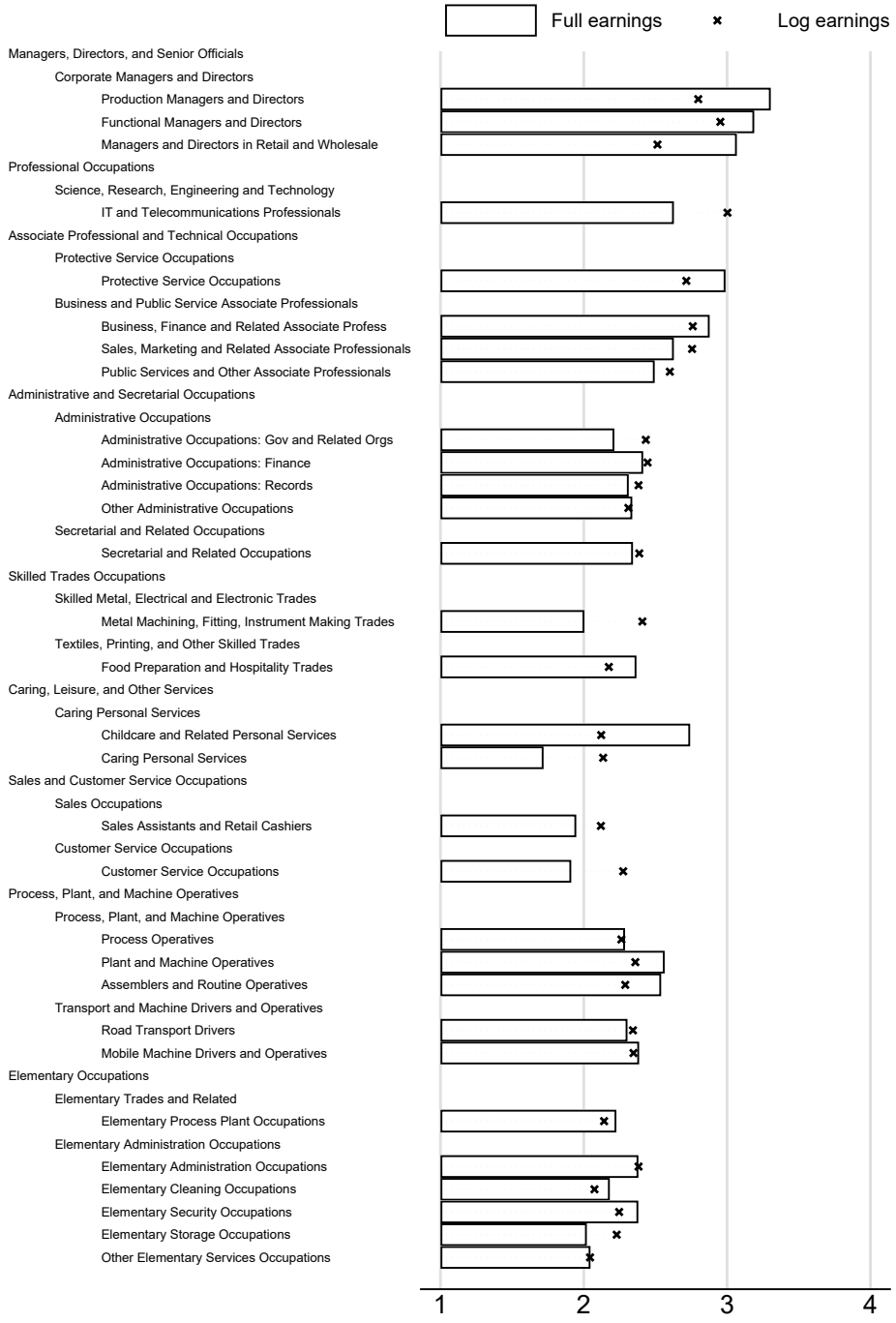
Source: Understanding Society.
Notes. Occupations are listed in order of the ISCO88 classification. To avoid focusing on outliers, we only plot the 30 most popular occupations. Full earnings in each occupation are expressed in terms of deviations from the sample mean. The figure comes from respondents aged 18 to 65 in full-time employment in five waves of the APS.

Figure A5: Earnings and Full Earnings across Occupations: Respondents with A-levels.



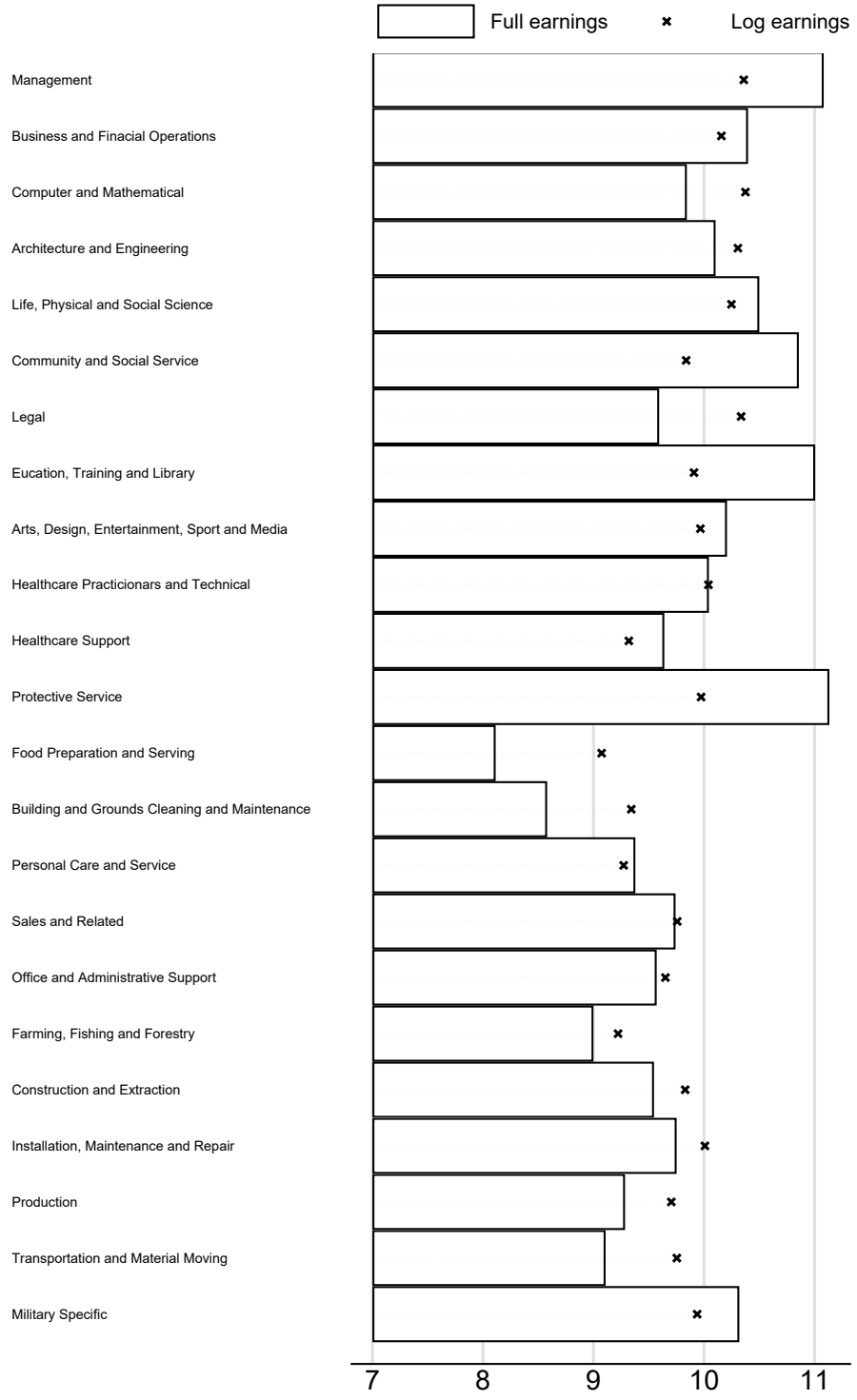
Source: Annual Population Survey.
Notes. Occupations are listed in order of the SOC2010 classification: the left-most entries show the 1-digit classification, the first indent the 2-digit classification, and the right-most entries that at the 3-digit level. It is for these latter that log earnings and full earnings are depicted. To avoid focusing on outliers, we only plot the 30 most popular occupations. Full earnings in each occupation are expressed in terms of deviations from the sample mean. The figure comes from respondents aged 18 to 65 in full-time employment in five waves of the APS.

Figure A6: Earnings and Full Earnings across Occupations: Respondents with GCSE or less.



Source: Annual Population Survey.
Notes. Occupations are listed in order of the SOC2010 classification: the left-most entries show the 1-digit classification, the first indent the 2-digit classification, and the right-most entries that at the 3-digit level. It is for these latter that log earnings and full earnings are depicted. To avoid focusing on outliers, we only plot the 30 most popular occupations. Full earnings in each occupation are expressed in terms of deviations from the sample mean. The figure comes from respondents aged 18 to 65 in full-time employment in five waves of the APS.

Figure A7: Earnings and Full Earnings in Different Occupations in the General Social Survey.



Source: General Social Survey.
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 to 65 in full-time employment in 29 waves of GSS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution.

Appendix B. UK education classifications

The Annual Population Survey classifies educational attainment into six different categories: "Degree", "Other higher", "A-levels", "GCSEs", "Other qualifications", and "No qualifications". Respondents with a "Degree" are those who completed some form of tertiary education. This includes at the very minimum an undergraduate Degree, commonly obtained 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 the Degree level, such as foundational Degrees and post-secondary professional education. "A-levels" or 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 the age of 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 which were 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". Last, 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 with a 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 broadly correspond 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 earnings 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

Source: Annual Population Survey.
Notes. The means and standard deviations are calculated from the sample of respondents aged 18 to 65 in full-time employment in five waves of APS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution.

Appendix C. SOC2010 Classification by Major Groups (1-digit) and sub-component (2-digit)

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

Jobholders 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

We evaluate how different job attributes feed into both the monetary and non-monetary components of full earnings. We first appeal to the Annual Population Survey 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 Annual Population Survey at the 3-digit occupation level.

We proceed by re-estimating Equations (4) to (6), adding to each a vector of job characteristics Z_i. From the APS data, the Z_i will control for ever working 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. We here consider the occupation proportions of apprenticeship and unionization, the average time traveled to work (in minutes; split by the proportion in each quartile), and work times (during the day, the evening, or the night). This information is calculated from the sample of workers aged 18 to 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 occupation-wave level to each of our five APS waves.

We have additional occupation-level job characteristic information from 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. WERS is comprised of the Survey of Managers (MQ), the Survey of Employee Representatives (WEQ), the Survey of Employees (SEQ), and the Financial Performance Questionnaire (FPQ). 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, randomly selected 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 provides 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 flexi-time 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 relationship with the management. As for the LFS data, the job-characteristic information in 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 WERS are listed in Table D1.

Table D1: Descriptive Statistics for Job Attributes in APS, LFS, and WERS

	Mean	**SD**
At the individual level (APS)		
Ever overtime (binary)	0.48	0.50
Training last 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
Flexi-time 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

Source: Annual Population Survey, Labour Force Survey, and WERS.
Notes. The means and standard deviations are calculated from the sample of respondents aged 18 to 65 in full-time employment, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution.

To reduce the high dimensionality of the data in WERS, we create three factors which 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 flexi-time, and having paid leave. The autonomy factor includes the questions on influence over your own task, the pace of work, and the hours worked. Last, 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 separately control for job security.

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

Table D2: The Decomposition of Full Earnings by Job Amenities at the Individual (APS) and Occupation (LFS and WERS) Levels

	Earnings	α_3^j/α_2	**Full Earnings**
Individual-level attributes (APS)			
Ever overtime	0.060***	0.019***	0.079***
	(0.011)	(0.006)	(0.013)
Training last 13 wks	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)
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	296.13	9.96	59.93
N	197,055	197,055	197,055
SD dependent	0.51	0.38	0.68

Source: Annual Population Survey, Labour Force Survey, and WERS.
Notes. These are OLS regressions. In column (1) "Log earnings" is the logarithm of hourly earnings. 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 earnings. In column (3) the dependent variable is our measure of full earnings. The APS job attributes are at the individual level. "Ever overtime", "Training last 13 wks", "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 first 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 mostly measured on Likert scales: the questions appear in Appendix Table D1. The sample covers respondents aged 18 to 65 in full-time employment, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-robust standard errors appear in parentheses. The APS sample is re-weighted using the *NPWT18* population weights, designed for performing analysis on the sample completing wellbeing questions. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

Looking at the APS controls, working overtime, employer-provided training, and managerial responsibilities are all associated with higher earnings, while temporary jobs are associated with lower earnings. Column 2 considers job amenities: these job characteristics exhibit sizable 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 full earnings is naturally higher than that of earnings.

A number of the job characteristics from the LFS are significantly correlated with both earnings and amenities. Apprenticeships are not correlated with earnings but are associated with much better amenities. Travelling longer to work is related to a higher earnings but, as expected, not to better amenities such that the overall correlation with full earnings is broadly zero. Union membership increases both earnings and amenities, with a particularly large effect through the latter. Finally, those working during the day have higher full earnings, most of which reflects 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 WERS. Job security is not statistically significant, but the coefficient is in the expected direction. Elements of "job design" increase earnings, but not amenities. Autonomy factors increase full earnings 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 below estimates column (2) in Table D2 at the occupation level.

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 last 13 wks (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	4.24
N	90
SD dependent	0.38

Source: Annual Population Survey, Labour Force Survey, and WERS.
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 earnings. The sample covers respondents aged 18 to 65 in full-time employment, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-robust standard errors appear in parentheses. APS data at the occupation level is collapsed using the NPWT18 population weights, 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. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

E. Robustness Checks on Estimation Issues: Life Satisfaction and Earnings

E1: Ordered Probit and Ordinal Generalized Linear Model Results

	Life Satisfaction (0-10) (ordered probit)	**Life Satisfaction** (0-10) (OGLM)
Log Earnings	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

Source: Annual Population Survey.
Notes. These are ordered Probit and OGLM regressions. Life satisfaction is measured on an 11-point scale, where 0 corresponds to "not at all satisfied" and 10 to "completely satisfied". "Log earnings" is the logarithm of hourly earnings. The regression controls for 90 different occupations at the 3-digit level using the SOC2010 classification. The sample is respondents aged 18 to 65 in full-time employment in five waves of APS data (2014-2018), excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. Heteroskedasticity-adjusted robust standard errors appear in parentheses. The sample is weighted using the *NPWT18* population weights in the Annual Population Survey, designed for performing analysis on the sample completing wellbeing questions. Significance levels: *** $p<.01$, ** $p<.05$, * $p<.1$.

The estimated occupation coefficients are not displayed, but in the ordered probit and OGLM regressions they are of similar sign 92% and 87% of the time respectively. For those few occupations in which the estimated coefficient changes sign under the alternative estimation method, the coefficients are either very small or estimated with a great degree of noise. In Table E2 below we show that our main findings regarding standard deviations are robust when we estimate the regressions via OLS (while dropping these occupations that change sign), Ordered Probit, or OGLM.

Table E2: Important Standard Deviations - Alternative Estimations

	Log earnings	α_3^j/α_2	Full earnings	Sample size
Standard Deviations				
OLS (restricted sample)	0.51	0.42	0.72	167,332
Ordered Probit	0.51	0.34	0.61	209,672
OGLM	0.51	0.44	0.67	209,672

Source: Annual Population Survey.
Notes. These figures are calculated for respondents aged 18 to 65 in full-time employment in five waves of APS data, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. "Log earnings" is the logarithm of hourly earnings. α_3^j/α_2 are the non-pecuniary work rewards estimated in Equation (1) divided by the coefficient on log earnings. Our measure of full earnings is described in Equation (3).

Table E3: Important Standard Deviations in the BHPS (Full sample and only those who show pay slip)

	Life Satis Full Sample Cross-section	**Life Satis** Full Sample Panel	**Life Satis** Only Payslip Cross-section	**Life Satis** Only Payslip Panel
Log earnings	0.50	0.50	0.49	0.49
α_3^j	0.14	0.12	0.18	0.21
α_3^j/α_2	0.51	0.75	1.02	1.21
Full earnings	0.76	0.95	1.21	1.33
Sample size	47,123	47,123	12,826	12,826

Source: British Household Panel Survey.
Notes. These standard deviations are restricted to respondents aged 18 to 65 in full-time employment in all twelve waves of BHPS in which life satisfaction is recorded, excluding those whose hourly earnings are in the 1^{st} percentile of the earnings distribution. "Log earnings" is the logarithm of hourly earnings. α_3^j/α_2 are the non-pecuniary work aspects estimated in Equation (1) and adjusted by the coefficient on log earnings. Our measure of full earnings is described in Equation (3). As the BHPS sample is considerably smaller than that in either APS or Understanding Society, and only a fraction of people provide a payslip to the interviewer, we carry out the analysis in this table only for those occupations where the corresponding estimated coefficients are statistically significant. This produces a figure of 79 estimated occupation coefficients in the first two columns and 78 in the final two.