The University Of Sheffield. | School Of Economics

Rethinking Job Quality: In the Context of Work-Related Wellbeing and Labour Productivity.

Joanne Lindleya and Steven McIntoshb

Sheffield Economic Research Paper Series

SERPS no. 2025013

ISSN 1749-8368

12 December 2025

Rethinking Job Quality: In the Context of Work-Related Wellbeing and Labour Productivity.

Joanne Lindley[a] and Steven McIntosh[b]

[a] King's Business School, King's College London, Bush House, Aldwych, London, WC2B 4B, UK. Email: joanne.lindley@kcl.ac.uk.

[b] School of Economics, University of Sheffield, Elmfield Building, Northumberland Road Sheffield, S10 2TU, UK. Email: s.mcintosh@sheffield.ac.uk

Abstract

This study investigates the relationship between worker-reported job quality characteristics and both work-related wellbeing and labour productivity, utilizing data from the European Working Conditions Surveys (EWCS) of 2005 and 2015, and the European Working Conditions Telephone Survey (EWCTS) of 2021. We construct composite Job Quality Scores (JQS) for wellbeing and productivity based on 24 key job quality characteristics, weighted by their correlation with each respective outcome. Our analysis reveals a divergence in trends between 2015 and 2021, with average JQS for work-related wellbeing significantly declining while the JQS for labour productivity increased. By decomposing the changes, we identify specific job quality characteristics, such as increased repetitive hand/arm movements, working at high speed, carrying heavy loads, and working to tight deadlines, as key drivers of this opposing trend. Conversely, increased computer use, reduced physically demanding postures, appropriate reward for effort, and reduced exposure to dangerous chemicals are identified as factors that could simultaneously enhance both productivity and wellbeing. Furthermore, we explore the role of occupational shifts in explaining these changes, finding that the observed increases in key job characteristics listed above are largely occurring within occupations rather than solely due to changes in occupational composition of the workforce. These findings offer valuable insights for managers seeking to balance economic performance with worker wellbeing, highlighting specific areas for intervention to foster a more harmonious and productive work environment.

Keywords: Job quality, wellbeing, productivity, occupations

JEL Codes: J20, J21, J24

Acknowledgments: The EWCTS and the EWCS datasets were made available by the UK Data Archive. The EU KLEMS datasets were provided by Groningen Growth and Development Centre (GGDC). We would like to thank Robert Elliott, Amairisa Kouki, Jesse Matheson and Mary O' Mahony for comments on earlier drafts, and acknowledge helpful comments received at the Work, Pensions and Employment Group (WPEG) 2024 annual conference. Any remaining errors are our responsibility alone.

1. Introduction

As we live through a period of profound changes in the labour market, where the nature of jobs and work is being fundamentally altered, a key question is the impact that this change is having on workers, in terms of the quality of their jobs. This paper sets out to answer this question, focussing on two aspects in particular; how the changing nature of jobs is affecting the quality of jobs in terms of worker wellbeing, and how it is affecting the quality of jobs in terms of worker productivity.

Using data reported by workers on the characteristics of their jobs from a series of surveys over time, we show that there have indeed been large changes in the nature of work, consistent with anecdotal evidence. Our analysis goes on to reveal the implication of these changes, for wellbeing and productivity. Most interestingly, when we consider changes in job characteristics in two separate periods (2005-2015) and (2015-2021), we find that the changing characteristics of jobs are associated with increased worker wellbeing and productivity in the earlier period, but in the latter period, the changes we observe are associated with higher productivity but at the expense of lower worker wellbeing. The changing job characteristics that are most related to this pattern of rising job quality with respect to productivity but falling job quality with respect to wellbeing are shown to involve increased intensity of work and greater physical demands of work.

In order to investigate this question and reach these answers, we need a measure of job quality that can be related to these two aspects of work; worker wellbeing and worker productivity. Measuring job quality has been a challenge in the literature, with researchers often using whichever indicators were available to them in the datasets they were using. Warhurst et al. (2025) undertake a review of 75 such studies, in order to identify some commonality and develop a standard measure of job quality. From the 75 studies, the authors extract the various indicators used, identify those most commonly used across the studies, and then assess these to determine whether they can be grouped together in clusters. The end result is six such groups, which together form their standard measure for job quality: pay, intrinsic characteristics of the work (for example, autonomy, usefulness of work, support from colleagues and management), term of employment (for example, contract status, training), health and safety, work-life balance and representation and voice.

Our measures of job quality, using cross-country data from the European Working Conditions Telephone Survey of 2021 and the European Working Conditions Surveys of 2015 and 2005[1], recognise the fact that these numerous aspects of job quality have been identified in the literature, and so incorporate information on 24 different characteristics of jobs, that together reflect the different aspects of job quality listed above.

Another challenge in the literature has been how to combine different job characteristics into single measures of job quality. Our approach involves generating total composite 'wellbeing related-' and 'productivity related-' Job Quality Scores (JQS) for each individual worker, obtaining weights for each of the 24 job characteristics derived from regression equations of those characteristics against a wellbeing measure and a productivity measure respectively. The key contribution is therefore that this gives us an objective, rather than subjective, weighting of the various job characteristics in the JQS, based on the extent to which each job quality characteristic is related to, respectively, wellbeing and productivity. We focus on three points in time, 2005, 2015 and 2021, and consider the changes in JQS between these dates. In doing so, we can therefore demonstrate the extent to which the nature of work has changed over time, and whether such changes have affected job quality positively or negatively with respect to productivity and wellbeing.

The relationship between work and wellbeing has been the subject of extensive research across various disciplines, including psychology, sociology, economics, and public health. A central theme in this research is the concept of job quality and its profound influence on individuals' overall wellbeing. Studies have tended to focus on the needs from work in terms of wages, prospects and job insecurity, intrinsic job quality, and the quality of work time (Felstead et al., 2015). Existing studies have therefore evaluated the relative importance of job quality characteristics by measuring their correlation and causal relationship with a variety of measures for worker wellbeing. These wellbeing measures have tended to include life satisfaction, general health measures, but also psychological or mental health measures, as summarised in Eurofound (2012, 2017).

Similarly, the relationship between job quality and labour productivity has become a central focus in organizational research and economics. For example, Forth et al. (2020) survey managers in UK firms, and find a deterioration in UK worker job quality, which they suggest

[1] Unfortunately, the 2010 version of EWCS included very few of these characteristics, and so was not considered here, to allow us to define the indices consistently across years.

occurred as a consequence of increased labour costs imposed on firms after the introduction of the UK National Living Wage in 2016. They also find some evidence of increases in labour productivity and of capital deepening. Of course, the job quality-wellbeing and job quality-productivity mechanisms are not mutually exclusive, since poor job quality can negatively impact physical and mental health, which in turn can reduce productivity through absenteeism, presenteeism (being at work but not fully functioning), and decreased cognitive function, while good job quality can promote health and wellbeing, leading to a more productive workforce. On the other hand, there is a possibility for the work to change in such a way that wellbeing and productivity move in opposite directions, for example if increased intensity of work leads to productivity improvements but at the expense of worker wellbeing.

Our paper also speaks to the literature that has looked at the effects of technological developments, with for example the proliferation of AI widening the variety of tasks that can be performed by technology, and so altering the expectations of what workers are expected or required to do. Significant research has been undertaken in labour economics that looks at such issues, for example the skill-biased technological change literature (see Katz and Murphy, 1992, for the original exposition of the idea, and Card and DiNardo, 2002, Mondolo, 2022 and Handel, 2025, for reviews) and the 'tasks' literature and routine-biased technological change (perhaps most associated with Autor et al., 2003, further developed in Acemoglu and Autor, 2011, and summarised in Autor, 2013). The focus of much of this work has been on explaining changes in observed labour market outcomes such as the distribution of wages, inequality, employment and the polarisation of the occupation structure, whereas our focus is on how the changing nature of work is related to changes in job quality.

Our study contributes to the academic literature in a number of ways. First, we provide new measures of job quality, that are (i) specific to productivity and wellbeing aspects of jobs, and (ii) use data to determine the optimal weighting to apply to various observed job characteristics, determined by their correlation with productivity and wellbeing, rather than applying arbitrary weights, or giving all observed job characteristics an equal weight in creating job quality indices, as has been previously done. Second, having obtained our new wellbeing- and productivity-related job quality scores (JQS), we use them to show how the changing nature of jobs has affected these scores differently in different periods, thus providing new evidence on the changing nature of work and the impact of this for job quality.

We then extend the work on job quality further, by using our new measures to answer additional questions, for example around the source of the underlying changes in job characteristics, examining whether they are due to the changing nature of work within existing jobs, or to changes in the occupational structure of the labour market to new jobs with different characteristics? We also question whether the changing job quality has been more noticeable in the public or private sector and whether the increased prevalence of working from home following the onset of the Covid-19 pandemic is related to our JQS.

We show that the changes in work characteristics have mostly occurred within existing jobs/occupations, rather than a changing occupational structure towards jobs with these characteristics. Indeed, if the level of these job characteristics within jobs had remained unchanged, then wellbeing-related job quality would have increased, since the change in occupational structure has been *towards* jobs that score well on these characteristics. However, these occupational changes have in fact been more than offset by the deterioration of wellbeing-related job quality happening *within* existing jobs.

Further investigation and disaggregation of results goes on to show that the more demanding physical nature and intensity of jobs that has been productivity-enhancing but wellbeing-detracting, has taken place to a greater extent in the public sector than in the private sector, and amongst those working in the workplace rather than working from home.

Our final, broader, contribution goes back to the individual characteristics that make up the JQS, to provide information to managers on which aspects of jobs are driving changes in job quality. Our study will be of particular interest to managers who are trying to balance their workers' wellbeing with the economic performance of their firm. We feel it would be insightful for managers to be able to use our research findings to enable them to simultaneously increase their productivity levels and improve the welfare of their workers. We hope therefore that our study provides an empirical methodology that managers can adapt to evaluate their own individual work practices, to improve firm performance and productivity whilst also creating a harmonious balance with worker wellbeing and welfare.

The paper proceeds by first describing in detail the method used to generate the JQS. Section 3 then begins the core results with a discussion of how the JQS have changed over time, while Section 4 looks at which job characteristics in particular are driving the changes in job quality. Sections 5 and 6 contain the additional results, examining the extent to which job characteristics are changing within or between occupations and how job quality is changing for public versus

private sector workers, and for those who work from home versus those who do not. A final section offers some final thoughts for policy.

2. Methodology for Generating Wellbeing and Productivity Job Quality Scores

Before we can begin to answer the research questions posed in the Introduction, the first aim of this paper is to generate job quality scores from the perspective of (1) work-related wellbeing and (2) labour productivity. Our choice of job quality characteristics is based on those used in Eurofound (2012, 2017, 2022). These consist of 24 dichotomous job quality characteristic variables that are consistently defined over the European Working Conditions Telephone Survey (EWCTS) 2021[2] and the European Working Conditions Survey (EWCS) 2015 and 2005. The variables indicate whether or not the respective workplace characteristic is commonly or usually experienced by the survey respondent, as opposed to ever being experienced, which could have been a one-off isolated incident. [3]

Table 1 summarises the job characteristic variables. They comprise five variables to capture workers' physical environment (for existing evidence on the relevance of this type of characteristic, see for example Chari et al., 2018), three variables for social environment (Clark, 2005), three for working time quality (Kahneman and Deaton, 2010; OECD, 2017), two for work intensity (Gallie and Zhou, 2013), four for skills use and discretion (Clark, 2005; Wiswall and Zafar, 2018), and four that capture prospects and job security (Clark, 2005). We also include three social capital job quality characteristic variables, given Magdelana et al. (2021) find that doing meaningful work is an important determinant of job quality from the perspective of wellbeing, and Graeber (2018) suggests that meaningful work is important for defining job quality from the perspective of firm productivity. The variables used therefore reflect a variety

[2] Not all questions in the 2021 EWCTS were asked to the full sample. Three sub-samples are used M1=1 (N=18,722), M1=2 (N=18,235) and M1=3 (N=18,535), with partially different questions asked to each group. We chose to use the sub-group that had the largest overlap with the list of job characteristics measured in 2005 and 2015, in order to produce a consistent series.

[3] Specifically, we created the dichotomous variables so that all characteristics are measured on a consistent basis. While some questions are asked on a yes/no basis (e.g. subject to bullying or harassment in the previous 12 months), most are asked on a frequency scale, which is sometimes a five-point scale (almost always, often, sometimes, rarely, almost never) and sometimes on a seven-point scale (all of the time, almost all of the time, about three-quarters of the time, around half of the time, around one-quarter of the time, almost never and never – used particularly for the exposure to physical conditions variables). For the five-point scale, the first two categories (almost always and often) were coded as 'yes', while for the seven-point scale, the first four categories (about half the time, or more frequently) were coded as 'yes'. Measurement details for each variable are included in Table 1. Results were not sensitive to cut-off points to create these dichotomous variables (results available from authors on request).

of characteristics, covering all aspects of the job, rather than a narrower focus on just workplace conditions.

Note that although the data were available to us, we chose not to include the value of the wage received amongst our list of job characteristics. From an economist's perspective, one could consider workers' wages to be a proxy for productivity. However, this rests on the assumption that workers are paid their marginal product, which may not be the case in any imperfectly competitive markets (Manning, 2003). In addition, existing empirical evidence summarised in Green et al. (2015), shows that wages are more likely to be capturing only one aspect of job quality. Moreover, self-reported worker wages may be unreliable as they may contain noise and measurement error problems. Rather than use worker wages anywhere in our study we use labour productivity directly as our measure of productivity and a variable that measures a `*feeling of being rewarded appropriately for effort*' as a job quality characteristic. The latter takes into consideration other forms of worker remuneration, and from an economist's perspective, is likely to be capturing efficiency wages, which, under the Gift Exchange model of efficiency wages (Akerlof, 1984) at least, could be viewed as a positive job characteristic

The 24 job quality characteristics are combined to form two new job quality scores (JQS), measuring the overall job quality in terms of these characteristics and how they relate to, respectively, wellbeing and productivity aspects of workers' jobs. Thus, the two new JQS reflect the various job quality characteristics, weighted to reflect the importance of that characteristic for each particular aspect of the job.

The JQS are calculated for employed individuals in the 2005 and 2015 EWCS, as well as in the 2021 EWCTS, by estimating Equation 1:

$$JQS_{jt} = X_t B_j \qquad (1)$$

where *j* refers to one of the two JQS i.e. wellbeing and labour productivity. Therefore, **JQS** for each job aspect, *j*, in year, t, is an (*i* x *1*) vector, where *i* refers to a worker. Each of these $\mathbf{JQS_{jt}}$ vectors comprises two elements. The first element is worker *i*'s individual survey responses to job quality characteristic *k,* where k=1…24 indexes the 24 job quality characteristics listed in Table 1. These are contained in the (*i* x *k*) matrix **X**, observed in each year t for t=2005, 2015 and 2021. The second element is the weight capturing how important each *k* variable is in predicting job aspect *j* (wellbeing or productivity). These are contained in the (*k* x 1) vector **B**. Given our 24 job characteristic variables in matrix **X** are dichotomous and take the value of

zero or one, and the weights in vector **B** sum to unity, the value of each individual worker's job quality score for each job aspect is bounded between zero and one.

Given that the focus of our study is to look at the changing nature of jobs with respect to the quality of work from the perspective of worker wellbeing and firm productivity (rather than the changing importance of ratings of different characteristics for job quality), we calculate the weights in vector **B** at fixed points in time, and then keep the weights fixed throughout the study. Therefore, any changes in **JQS** can only be a consequence of changes in job characteristics, which removes the influence of other endogenous effects on the relative importance attached to self-reported job characteristics and their relationship with wellbeing and labour productivity. This is especially important for the 2015-2021 changes, given the potential impact of the COVID-19 pandemic on job quality, wellbeing and productivity.[4] The focus is therefore on changes in the actual characteristics of workers' jobs, rather than changes in their views of what causes or influences wellbeing.

To calculate the weights, **B**, we adopt a similar approach to Holman and McClellan (2011), which involves estimating OLS regressions for wellbeing and for productivity. For wellbeing, we use 15077 workers from the 2005 EWCS microdata. The definitions of the work-related wellbeing variables are described in Table 2. For labour productivity, we aggregate worker-level 2015 and 2005 EWCS job characteristic microdata to 13 industries and 20 countries and use industry-country productivity data from the EU KLEMS data.[5] This involves matching industry-country-year level employment shares for our 24 job quality characteristic variables

[4] It is for this reason that we do not use the Oaxaca (1973) or the Juhn, Murphy and Pierce (1993) decomposition methodologies, since we want to hold the coefficients in our regressions fixed in time, to provide fixed weights.

[5] We use the July 2018 release of the EU KLEMS database, provided by Groningen Growth and Development Centre (GGDC) and accessed from https://dataverse.nl/dataset.xhtml?persistentId=doi:10.34894/6GDD7Q in January 2024. Real gross value added and real capital are in 2010 prices and in millions of the national currency. Employment is number of workers engaged in thousands. These are taken from the output accounts. Capital is derived capital based on output less labour compensation. Other measures of capital were explored but these involved too many missing values to be of practical use. To match to the EWCS data it was necessary to aggregate some NACE industries. These are: B, D and E into non-manufacturing; H, I and J into transport/storage, accommodation/food services and information/communication; K and L into financial/insurance and real estate; M and N into prof scientific/tech & admin/support. Croatia and Hungary are dropped from this analysis as a consequence of missing capital data. This provides consistently defined productivity data for 20 countries and 13 industries for 2005 and 2015. It was also necessary to use the EWCS 2010 microdata to concord the first revision of NACE into the second revision in the EWCS 2005. For this we used the EWCS 2010 dataset since it provides both revisions of the NACE two-digit codes although it does not contain many of our job quality characteristic variables and therefore it was not used in any other part of our analysis. Table A1 in the appendix shows the one-digit distribution for the predicted NACE second revision which is very similar to that for the actual NACE second revision in the 2010 EWCS. Consequently, we apply exactly the same prediction method for predicting the NACE second revision in the 2005 EWCS, and this is provided in Table A2. The STATA program files are available from the authors on request.

from the EWCS (the proportion exposed to loud noise, for example), to real value added per worker in the EU KLEMS data. We then run industry-country-year level OLS regressions of real value added per worker on job quality characteristic employment shares.[6] We condition on real capital per worker, and estimate our productivity equation in logs. We use data for 2005 and 2015 which provides 520 observations in total.

The two JQS scores are therefore based upon measures of job characteristics at different levels of aggregation – at the individual level for the wellbeing score and at the aggregated industry level for the productivity score. We view this as an advantage, given that unobserved characteristics of the individual workers reporting the job characteristics cannot influence both JQS to the same extent, and so removing the possibility of a spurious relationship between them.

Table 3 contains the regression coefficients from OLS regressions for work-related wellbeing and labour productivity, regressed on job characteristics. Given these are OLS estimates, the coefficient estimates are not causal and therefore capture correlations, showing the relative size of the associations between the job characteristics and the respective wellbeing and productivity aspects of the job. Table 3 also provides dominance statistics and dominance ranks for each of our 24 job quality characteristic variables. The dominance statistics indicate the relative importance of each job quality characteristic based on its contribution to the overall R^2 in each regression. These are the standardised relative weights or epsilon, as described by Johnson (2000). The dominance rank shows how each job quality characteristic ranks in terms of its dominance, for that particular job aspect. So for example, for the wellbeing regression, 'being in a posture related painful/tiring position' contributes the most to the R^2 as it has a rank of 1, whilst 'feeling supported by colleagues' contributes the least as it has a rank of 24.

The first set of columns of Table 3 contain the regression coefficients, dominance statistics and ranks for the work-related wellbeing regression.[7] On the whole, these correlations appear sensible. Only 'feeling of doing work well done', 'feeling rewarded appropriately for effort', 'having managerial support', 'having a good work/life balance (working hours that fit in with

[6] Estimation of a Cobb-Douglas production function provides coefficients (standard errors) of 0.5255 (0.0152) for the log of real capital and 0.4815 (0.0197) for the log of employment. These are sensible and suggest constant returns to scale.

[7] Table A2 in the Appendix reports the same statistics for the separate measures of physical and psychological wellbeing, as well as repeating those for overall wellbeing, to show that results are very similar whether we look at the overall wellbeing measure, or its constituent components. We therefore focus on the former in what follows.

family)', 'using a computer', 'having promotion prospects' and 'having a fixed term contract' (relative to having another type of non-permanent contract) are positively correlated with wellbeing. The remaining job characteristics are negatively correlated with work-related wellbeing and these include, 'exposure to noise', 'being in a posture related painful/tiring position', 'carrying/moving heavy loads', 'repetitive hand/arm movements', 'handling/contact with chemicals/infectious materials', 'being subjected to bullying/harassment', 'working long hours (over 48 per week)', 'working at night', 'working at high speed', 'working to tight deadlines' and a 'feeling that might lose job in the next six months'. We would expect all of these covariates to be negatively correlated with wellbeing.

Other job characteristics negatively correlated with wellbeing that are less intuitive are 'feeling of doing useful work', 'feeling supported by colleagues', 'having received firm-financed training', 'received on-the-job training', 'having the ability to choose methods of work' and 'being on a permanent contract (relative to having another type of non-permanent contract)'. These negative correlations are less easy to explain. However, the dominance rank for each of these characteristics shows that they are of very little importance in their correlation with worker wellbeing, with dominance ranks of 23, 24, 16, 17, 22 and 19 respectively.

In terms of dominance, 'having a posture related painful/tiring position' and 'exposure to noise' have the largest associations with work-related wellbeing. 'Having a good work/life balance' and 'feeling rewarded appropriately for effort' are next most important for work-related wellbeing, and with a positive sign, whilst 'being subjected to bullying/harassment' completes the 'top 5' most important for work-related wellbeing, with a negative coefficient.

Table 3 also presents the regression coefficients, standardised dominance statistics and ranks from the OLS labour productivity regressions, with and without the 'real capital per worker' and 'year'[8] controls. It is worth noting that the coefficient on the year variable is not statistically significant and ranks 23rd in terms of its dominance. This suggests that labour productivity did not change much between 2005 and 2015, outside that which can be explained by these covariates. After real capital per worker, the 'share of workers using a computer' ranks the highest in terms of its association with labour productivity. Perhaps this is unsurprising since this variable is likely capturing industry level ICT. Having the 'ability to choose methods used' ranks very highly in terms of its contribution to labour productivity, in second place. This

[8] The 'year' variable is used to control for other factors that have changed between 2005 and 2015 (the two years used in the productivity equation) and which might affect productivity.

worker-autonomy variable negatively correlated with work-related wellbeing, but was very low in the rankings in terms of its importance and ranked at 22nd. Moreover, the 'feeling of being rewarded appropriately for effort' is the third most important job quality characteristic for labour productivity and the 4th for work-related wellbeing. This suggests that paying workers an efficiency wage has a significant and important association with both wellbeing and productivity.

Most of the job quality characteristic variables that correlate positively with wellbeing, also positively correlate with labour productivity when job quality characteristics are measured as industry level employment shares. The two exceptions are 'promotion prospects', and 'proportion with a fixed term contract' which have a negative correlation with labour productivity. These latter correlations are less intuitive and may need further reflection. Given the productivity estimation is at the sectoral level, one might conjecture that firms with fewer promotion prospects and with relatively fewer workers on fixed-term contracts (more workers on flexible/zero hours contracts) may be associated with higher levels of labour productivity as a consequence of workers facing greater competition for higher level and/or permanent jobs. At the same time this would be detrimental to wellbeing.

On the other hand, it is also clear from Table 3 that there are a number of further characteristics that correlate, intuitively, positively with labour productivity, but negatively with wellbeing, such as 'feeling of doing useful work', 'exposure to noise', 'carrying/moving heavy loads', 'repetitive hand/arm movements', 'working at night', 'working at high speed', 'working to tight deadlines', 'received training', 'received on the job training', 'ability to choose methods of work' and 'might lose job'.

Given that the standardised dominance statistics determine the relative importance of each job quality characteristic in the OLS regressions presented in Table 3, we use these as weights in vector **B** of Equation (1) when we calculate worker-level JQS. For the job quality characteristics that correlate negatively with work-related wellbeing and labour productivity in Table 3 we reversed the values on the dichotomous variables included in matrix **X**, so that they contribute negatively to the job quality score.

These resulting JQS therefore provide indicators of the quality of an individual's job, in terms of the extent to which the observed job characteristics of that individual's job are ones that are associated higher or lower (i) wellbeing and (ii) productivity. The analysis maintains these fixed weights on the job characteristics over time, so that any changes observed in the average

JQS can be said to be due to the changing nature of jobs, rather than changes in the weights. For the wellbeing JQS, however, based as it is on the 2005 values for the job characteristics, this was an arbitrary choice of which of the three years available to choose. Table A3 in the appendix shows that the dominance and rankings for the various job characteristics are quite similar whichever year was chosen. In particular, the top six ranked job characteristics, with the largest weights, are the same in each year. The results that follow therefore do not depend upon which year's data was chosen to calculate the weights.

Figure A1 in the appendix shows the average JQS in 2021 by age group and gender, for both wellbeing and productivity. The graphs reveal there is little variation across either age group or gender for both measures, with the exception of some evidence of higher wellbeing-related JQS for the oldest age group. Graphs for 2005 and 2015 show similar patterns and are not reported here. We therefore do not focus on variation in JQS by individual worker characteristics, for the remainer of the paper.

3. Changes in Average Job Quality Scores Over Time

Having created our new indices for job quality, objectively related to wellbeing and productivity, we now begin our analysis using them, in order to answer the research questions posed in the Introduction. The first question relates to how these job quality measures have changed over time.

Panel A of Table 4 summarises the descriptive statistics for our job quality scores when these are constructed, using the results from Equation (1), for 15270 employees in the 2005 EWCS and 19138 employees in the 2015 EWCS.[9] In terms of changes between 2005 and 2015, Panel A clearly shows that both the wellbeing and the productivity JQS significantly increased, on average across all workers. The largest increase was for the productivity JQS which increased by 0.028 points, compared to an increase of 0.017 points for the wellbeing JQS. Given that the weights in vector **B** are fixed over time, this suggests that job quality from the perspective of both work-related wellbeing and productivity must have increased as a consequence of positive changes in the job quality characteristics experienced by workers.

[9] These are calculated from a full sample of 34,408 workers from 22 countries: Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the UK.

In order to look at more recent changes in JQS, we also construct JQS using the results from Equation (1) and data from the 2021 EWCTS.[10] Given this survey was undertaken by telephone and followed a different sampling approach to that used in the EWCS as a consequence of the COVID-19 pandemic, not all of our 24 job quality characteristic questions were asked to all workers in the survey, as described in Eurofound (2022). Consequently, we focus on a sub-sample in the data that consists of 18,535 workers who were asked the relevant questions. Table A4 in the appendix provides sample means for key socio-economic characteristics across the three sample years 2005, 2015 and 2021.[11] These appear sensible and not out of line with those that one might expect to find in nationally representative datasets.

Panel B in Table 4 shows that, between 2015 and 2021, job quality from the perspective of work-related wellbeing fell by around 0.050 points, whereas job quality from the perspective of labour productivity increased by 0.095 points. Again, given that the weights in vector **B** of Equation (1) are fixed and do not change over time, these changes are only a consequence of changes in the quality characteristics of jobs. Unlike the changes between 2005 and 2015, those between 2015 and 2021 have been detrimental to job quality with respect to work-related wellbeing and favourable to job quality with respect to labour productivity.

Figure A2 in the appendix shows the change in the mean wellbeing- and productivity-related JQS between 2015 and 2021 separately by country. The graphs reveal that wellbeing-related JQS fell in every country except for Romania, while productivity-related JQS rose in every country except for Denmark. The observed overall pattern has therefore been experienced consistently by the wide range of OECD countries under analysis.

We also calculated the mean change in JQS by 2-digit occupation. Figure A3 in the appendix shows the top and bottom quartiles of occupations in terms of these changes for (a) wellbeing and (b) productivity. We can see that the smallest falls in wellbeing-related job quality have typically been in manufacturing, whereas the three occupations with the largest falls have been armed forces, health professionals and teaching professionals, three public sector occupations. We will return to consider public versus private sector in Section 6.

The long changes between 2005 and 2021 are provided in panel C of Table 4. These show that the positive changes for JQS with respect to wellbeing between 2005 and 2015 were not large

[10] These are calculated for 37673 workers from the same 22 countries as defined in footnote 4.

[11] For occupations, we have focussed on the ISCO-08 which is provided in 2015 EWCS and 2021 EWCTS and not on ISCO-88 which is only provided in the 2005 EWCS.

enough to compensate for the negative changes that followed. For productivity, the second period increase was much larger than that for the first period with a long change of 0.123 points overall.

4. The Main Drivers of the Changes in Job Quality Scores

In this section we turn our attention to identifying the main drivers of the changes in the JQS that we observed in Table 4, which we have shown were detrimental to job quality with respect to work-related wellbeing between 2015 and 2021, whilst at the same time being favourable to job quality with respect to labour productivity.

Tables 5a and 5b show changes over time in the sample means of our 24 job quality characteristics. Table 5a shows that these have all significantly changed between 2005 and 2015, except for four: 'painful/tiring work', 'carrying/moving heavy loads', 'repetitive tasks' and 'working at night'. Similarly in Table 5b, all job quality characteristics changed at the mean between 2015 and 2021, except for 'work/life balance'.

The contribution of these changes in job quality characteristics to the changes in JQS will be determined by (i) the extent of the change in the relevant job characteristic over time, and (ii) their relative importance to the wellbeing and productivity JQS, as captured by the dominance statistics in Table 3 which serve as our fixed weights in Equation (1).

Tables A5 and A6 in the appendix show these two components for each job quality characteristic. Table A5 refers to changes between 2005 and 2015 and Table A6 to changes between 2015 and 2021. The tables also tell us how each job characteristic ranks in terms of its importance for explaining changes in overall JQS, based on the combination of these two components. Again, this is ranked in descending order, with '1' indicating the top-ranked characteristic.

While all the information needed for identifying the two mechanisms behind the changes in JQS seen in Table 4 is available in Tables A5 and A6, the key messages are difficult to spot. We therefore provide a summary table, Table 6, to help see the overall picture, focussing specifically on the 2015 to 2021 period, given this is the more interesting period when the average JQS related to wellbeing has fallen, in contrast to the average JQS related to productivity, which continued to rise. The aim is therefore to identify the changing job characteristics that have been most responsible for this pattern.

Panel A in Table 6 refers to work-related wellbeing and panel B refers to labour productivity. We focus on the job quality characteristics that have made the largest contributions to the changes in these two JQS scores between 2015 and 2021, i.e. the 12 largest contributors to each JQS, listed in order of their contribution. So for example, the first row shows that 'having a posture related painful/tiring position' ranks 1st and is the largest driver in terms of its contribution to the 2015-2021 change in JQS for wellbeing, whilst 'received on the job training' ranks 12th.

The third and fourth columns in Table 6 show the rank and sign of the characteristic's mean changes from Table 5b. The signs are all positive for the 12 variables shown in Panel A. The dominance rank and correlation with wellbeing are the next two columns, taken from Table 3. Given that the average JQS score with respect to wellbeing has fallen between 2015 and 2021 (from Table 4), it is not surprising that most of the variables in Panel A correlate negatively with wellbeing. These two factors (the size and sign of the change in characteristic and size and sign of the correlation with wellbeing) together determine the importance of the overall contribution of that characteristic to the change in the JQS. So we can see, for example, that the job characteristic most strongly associated with wellbeing, 'having a posture related painful/tiring position', also has the 7th largest change in the value of the characteristic itself, so that overall it makes the largest contribution to the observed fall in wellbeing between 2015 and 2021. The job characteristic that shows the largest change, 'using a computer/laptop's is however only the 15th highest ranked in terms of its relationship with wellbeing, and furthermore is positively associated with wellbeing. It is therefore not a key characteristic for explaining the fall in wellbeing after 2015.

Similarly, Panel B in Table 6 shows that `working with a computer or laptop' ranks first in terms of its contribution to the change in the average JQS with respect to labour productivity. The mean of this job quality characteristic has the largest positive increase between 2015 and 2021 (from Table 5b). It also ranks first in terms of its dominance, and correlates positively, with labour productivity in the OLS regressions (from Table 3). It is therefore clearly the most important characteristic for explaining the increase in productivity after 2015. Given that the average JQS score with respect to productivity has increased between 2015 and 2021 (in Table 4), it is not surprising that most of the variables in Panel B correlate positively with productivity.

The final two columns in Table 6 show how each job quality characteristic variable ranks in terms of its dominance and correlation with the other JQS. For example, in the first row of panel A, `having a posture related to painful/tiring position' ranks first in terms of explaining the change in wellbeing and is negatively correlated with wellbeing, whilst the final two columns show it ranks 4th in terms of its dominance with labour productivity and correlates negatively. Similarly in Panel B, `working with a computer or laptop' ranks first in terms of explaining productivity changes and is positively correlated with productivity. The final two columns show it ranks 15th in terms of its dominance with wellbeing and also correlates positively. Both of these job quality characteristics correlate in the same way with wellbeing as they do with productivity, and so are not candidates for explaining the overall observed pattern of declining wellbeing and increasing productivity between 2015 and 2021. In order to see more clearly which characteristics *are* candidates, we colour code the rows in Table 6 as blue for job quality characteristics that correlate in the same way for wellbeing as they do for productivity and pink for those that correlate in opposite ways. We can clearly see that most of these job quality characteristics correlate in opposite directions.

The job quality characteristics that correlate with wellbeing in the opposite direction to productivity and appear in both Panels A and B are 'having promotion prospects', 'repetitive hand/arm movements', 'working at high speed', 'carrying/moving heavy loads' and 'working to tight deadlines'. However, the first of these was working in the 'wrong' direction (wellbeing-enhancing and productivity-detracting). Hence it is likely that the increase in the average productivity JQS that has occurred at the expense of wellbeing JQS was driven by:

1. An increase in the requirement to perform repetitive hand/arm movements
2. An increase in the expectation to work at high speed
3. An increase in the requirement to carry and/or move heavy loads
4. An increase in the expectation to work to tight deadlines

These are ranked in descending order of how they have adversely affected wellbeing (i.e. their rank from the first column of Panel A). These relate to physical characteristics and demands of jobs. Moving forward, we refer to this group of job quality characteristics as Group 1.

Of course, managers will also be interested in the main drivers of JQS that correlate in the same way for wellbeing and productivity. These can increase productivity and wellbeing simultaneously. The suggestion from Table 6 is that managers should:

1. Increase computer use

2. Reduce the requirement to work in posture related painful and tiring positions
3. Pay more workers appropriately for their effort
4. Reduce the requirement to handle or have contact with dangerous chemicals.

These are ranked in descending order of how they affected the JQS for productivity (i.e. their rank from the first column in Panel B). We refer to this group of job quality characteristics as Group 2. On balance we feel these results are intuitive.

Thus far, we have identified job characteristics that changed significantly between 2015-2021 in terms of the proportion of workers affected by them, and which also correlated strongly with wellbeing and productivity. At this stage, one might wonder whether the rising employment shares of these job characteristics can be attributed to changes in the job requirements of existing roles, or whether they are driven by changes in the number of jobs that tend to demonstrate more of these job quality characteristics. For example, we might think that some occupations (e.g. clerical workers, managers, and technical/associate professionals) use computers more than workers in other occupations. So it might be the case that JQS for wellbeing and productivity have simultaneously improved as a consequence of an increase in computer use purely because there has been an increase in the share of workers employed in these occupations, rather than more workers using computers within existing jobs, especially given that Table A4 shows an increase in the proportion of mangers, professionals and technical/associate professionals in the EWCTS 2021. Consequently, we now turn our attention to investigating this further.

5. The Role of Occupations in Explaining Changes in Job Quality Scores

In this section we explore whether occupational changes can explain the increases in the four key job quality characteristics (Group 1) that we have identified as driving the simultaneous increase in the JQS for productivity and fall in the JQS for wellbeing, from the previous section. We also look for similar occupational composition explanations for the four key job quality characteristics that we have found to be both productivity and wellbeing enhancing (Group 2).

Figure 1 presents the mean values for each of the four job quality characteristics (Group 1) by one-digit occupation in 2015 and 2021. These show that the mean for all four job quality characteristics increased for all occupation groups. For example, Figure 1a shows that regular repetitive hand or arm movements were reported more so by plant and machine operators and

elementary workers in 2015. In 2021, this job characteristic is still most commonly observed in similarly manually intensive jobs (elementary workers, skilled agricultural workers, craft and related workers) with managers and professionals remaining least likely to experience this characteristic. However, the requirement for repetitive hand or arm movements increased within all one-digit occupations, including managers and professionals. This pattern holds for all Group 1 job characteristics.

Figure 2 shows that the same pattern holds for the job quality characteristics that we have identified as both productivity and wellbeing enhancing (Group 2). All four of these job quality characteristics have increased at the mean within all one-digit occupations. Figure 2a for example, shows that computer use has increased for all occupational groups, and the gap has closed somewhat between the top and bottom occupations. Moreover, it is difficult to attribute these results to changes in the sectoral structure of our sample, given that Table A4 shows the industry distribution to be fairly consistent over time.

To explore this further, we decompose average changes in our job quality scores (JQS) for wellbeing and productivity, and our key job quality characteristics, into those that have occurred within and 'between' 43 two-digit ISCO-08 occupations. This involves calculating

$$\Delta J = \sum_i \Delta J_i \overline{N}_\iota + \sum_i \overline{J_\iota} \Delta N_i \qquad (2)$$

where ΔJ is the change in the average JQS or in one of our key average job quality characteristics from Groups 1 and 2, ΔJ_i is the change in the same JQS or job quality characteristic in the two-digit occupation, i, and ΔN_i is the change in the proportion employed in each occupation i, between 2015 and 2021. Given that $\overline{N}_\iota$ is the average proportion employed, and $\overline{J_\iota}$ the average value of the particular job characteristic, over the full period for each occupation, then the first term provides the within-occupational change, and the second term provides the between-occupational change.

Panel A of Table 7 presents the within and between occupational changes in our two job quality scores (JQS) for wellbeing and productivity. The first column shows that the average overall JQS fell by 0.049 points for wellbeing and increased by 0.092 points for productivity between 2015 and 2021.[12] The second and third columns show that these changes occurred mainly within two-digit occupations. The JQS for wellbeing actually increased between occupations

[12] In Table 4 these changes are -0.0489 and 0.0948 respectively. The changes differ slightly here as a consequence of missing two-digit occupation data for 54 respondents in the EWCS 2015.

by 63 percent which suggests that occupations with job characteristics favourable to relatively higher wellbeing grew relative to those with job characteristics associated with lower wellbeing. However, all the occupations in our sample experienced a decline in their job quality wellbeing scores, and it is these changes within occupations due to the changing nature of the work and the job characteristics discussed above that cause the overall fall in wellbeing job quality. For productivity, 62 percent of the increase in the JQS occurred within occupations, whilst 38 percent occurred between occupations. This suggests that occupations with job characteristics favourable to relatively higher productivity grew relative to those with job characteristics associated with lower productivity, although this only explains just over a third of the total change, with the remainder due to the changing nature of existing jobs.

Panel B refers to our key 'Group 1' and 'Group 2' job quality characteristics identified from Table 6. The first column shows that all these increased in terms of proportions of workers experiencing them between 2015 and 2021.[13] The second column shows that most of these changes occurred within two-digit occupations. In many cases, and especially for the more physical-based job quality characteristics, the between-occupational changes were actually negative. This suggests that occupations intensive in these physical characteristics are declining relative to those that report lower levels. However, this is more than offset by the rising observance of these characteristics within jobs. Thus on balance, Table 7 clearly demonstrates that the job quality changes we have identified as important for wellbeing and productivity in this research have occurred within two-digit occupations, and this supports the idea that these can be attributed to changes in individual worker's job requirements.

6. Exploring Other Structural Differences in Job Quality Shifts.

Given our focus is on changes in job quality that occurred between 2015 and 2021, and especially given Table A4 shows a substantial increase in the proportion of managerial and professional workers, it is of interest to see whether these changes in job quality have been occurring more in the private than in the public sector, with such workers often working in the latter sector. Panel A in Table 8 shows that wellbeing JQS fell for both public and private sector workers, although the fall was larger in the public sector, while the productivity JQS increases were similar in both sectors and only slightly larger in the private sector. So there is evidence

[13] Again, some of these numbers differ slightly to those in Table 5b as a consequence of missing occupational data for 54 respondents in the EWCS 2015.

that the productivity-wellbeing trade-off that we have seen occurring between 2015 and 2021 is universal across both sectors, but has been felt most keenly in the public sector.

Panel B investigates this further and shows that for all of the Group 1 characteristics (that increased productivity at the expense of wellbeing), the changes were larger in the public sector than in the private sector. Thus, the demands of work in terms of physical demands and the intensity of work have increased by more in the public sector than in the private sector during this period, contributing to the larger fall in wellbeing job quality in the former sector (while also raising productivity). Of the Group 2 characteristics (that correlated with productivity and wellbeing in the same way), it was only those that correlated negatively with wellbeing and productivity that increased more in the public sector. These were the physical characteristics; 'working in posture related/tiring positions' and 'handling/contact with dangerous chemicals'. The non-physical characteristics that correlated positively with wellbeing and productivity ('paid appropriately for my effort') increased more in the private sector, while both sectors saw similar changes in 'work with computer/laptop'. Thus, as far as the potential for simultaneous increases in both wellbeing-related and productivity-related job quality is concerned, in terms of the job characteristics that are simultaneously related positively with wellbeing and productivity, the public sector lags behind the private sector in terms of paying workers what they feel they deserve, while also leading in job characteristics detrimental to both wellbeing and productivity.

Finally, it would be irresponsible of us not to acknowledge the impact of the COVID-19 pandemic on home working and therefore ignore how this may have affected changes in job quality between 2015 and 2021 (Bartik et al., 2020). Fortunately, the EWCS and EWCTS ask respondents to report whether their job includes a significant work from home element, allowing us to divide the sample between those who do and do not have this option. Panel A in Table 9 shows that wellbeing JQS fell only for those who were not working at home in 2021, whilst productivity JQS increased for this group, but not to the same extent as it did for those who were working at home. Therefore, our results suggest that for those working from home, wellbeing and productivity improved over this period. It was only workers who were working in the workplace who felt the negative impact on their wellbeing, and this was also related with a smaller increase in average productivity.

Panel B in Table 9 presents the changes in our Group 1 and Group 2 job quality characteristics between 2015 and 2021, for those working at home and those working in the workplace. These

clearly show that the physical job quality characteristics that correlate negatively with wellbeing and positively with productivity (Group 1) increased more for those who were not working at home. In fact, for those who were working at home in 2021, the proportion reporting 'carrying heavy loads' fell. There was however an increase in work intensity ('working at high speed' and 'working to tight deadlines') for those working at home, more so than for those not working at home. This suggests that home working may have played a part in increasing productivity at the expense of wellbeing along these particular dimensions of increased work intensity. The effects of these productivity-enhancing but welfare-reducing characteristics on the wellbeing of home-workers seems to have been offset, however, by the other wellbeing-enhancing characteristics of working from home, around physical requirements of the work, given that, overall, the wellbeing JQS went up for home workers.

Of the job quality characteristics that simultaneously increased productivity and wellbeing (Group 2), the largest change was observed amongst those working from home and using a computer, which became essential for remaining connected to the workplace during the pandemic. This, together with feeling appropriately rewarded for effort, which also increased more so for those working from home, and the smaller increase in the 'bad' physical working conditions in Group 2, helps explain the larger overall increase in productivity JQS for those working from home, relative to those in the workplace.

To summarise, the fall in wellbeing JQS in 2021 was only experienced by workers who remained in their workplace, and not by those who worked at home. Moreover, the main increases in labour productivity JQS occurred for those workers who were working at home, and this largely came from increases in 'working at high speed' and 'working to tight deadlines', as well as increased computer usage.

7. Concluding Comments

In this paper we have brought together individual worker-level data and industry level national accounts data to compare the relationship between job quality characteristics and worker wellbeing to that between job quality characteristics and labour productivity. We have identified which job characteristics correlate differently with wellbeing and productivity, and which correlate in the same way. Holding the aforementioned correlations constant over time and looking at the changes in the averages of these job quality characteristics has enabled us to

compare which of these job quality characteristics can explain more, and which can explain less, of observed changes in wellbeing and productivity over time.

Overall, our results suggest that changes in job quality that occurred during the period that included the COVID-19 pandemic (between 2015 and 2021) were labour productivity enhancing whilst at the same time being detrimental to worker wellbeing. This was not the case for changes that occurred between 2005 and 2015, when job quality associated with both worker wellbeing and labour productivity increased, on average. The changing job characteristics that have been most responsible for this pattern of results in the later period are an increased work intensity, and greater physical requirements of work.

There are, however, job characteristics that have been associated with both rising wellbeing and rising productivity, which suggests ways in which managers might simultaneously improve productivity and wellbeing in the future. These include allowing greater use of technology and computers, paying workers appropriately for their effort, and improving physical conditions of work.

The changes in job quality that we observed have mostly occurred within two-digit industries, rather than between, suggesting that average job characteristics are changing within existing jobs, rather than due to the different jobs created through occupational changes. The changes have been observed across both the public and private sector, with public sector workers feeling slightly more of a reduction in wellbeing, on average. Finally, the rise in working from home may have contributed in some part to the fall in wellbeing and increase in labour productivity between 2015 and 2021, with home workers reporting larger changes in the necessity to work at high speed and to tighter deadlines, but also more positive wellbeing results due to other characteristics of their work-from-home jobs.

Table 1: Subjective Job Quality Characteristic Variables in the European Working Conditions Survey.

Job Characteristic	Measurement of variable
Meaningful Work	
Feeling of doing useful work	Often & Always =1, otherwise 0
Feeling of doing work well done	
Paid appropriately for my effort	Agree & strongly agree = 1, otherwise 0
Physical Environment	
Exposure to loud noise (raise voice to talk)	All the time, about almost all of the time, about ¾ of the time, about ½ of the time =1, otherwise 0
Posture related painful/tiring positions	"
Carrying or moving heavy loads	"
Repetitive hand or arm movements	"
Handling/contact with chemicals/infectious	"
Social Environment	
Subj to bullying/harassment last 12 months	Yes=1, No=0
Your colleagues help and support you	Often & Always =1, otherwise 0
Your manager helps and supports you	Often & Always =1, otherwise 0
Working Time Quality	
Long working hours	(>=48h/week)
Nights (any, including shifts)	Coded never=0, otherwise 1
How do working hours fit with your family?	Very well & well=1, otherwise 0
Work Intensity	
Does your job involve working at high speed	All the time, about almost all of the time, about ¾ of the time, about ½ of the time =1, otherwise 0
Does your job involve tight deadlines	All the time, about almost all of the time, about ¾ of the time, about ½ of the time =1, otherwise 0
Skills and Discretion	
How often work with computer, laptop etc	Often & Always =1, otherwise 0
Training (paid for by firm) in past 12 months	Yes=1, No=0
Training on the job in last 12 months	Yes=1, No=0
Ability to choose methods of work	Yes=1, No=0
Prospects/Security	
Prospects for career advancement	Agree & strongly agree = 1, otherwise 0
I might lose my job in 6 months	
Contract type: Permanent	Relative to 'other' contract type (apprentice or zero hours)
Contract type: Fixed term	

Table 2: Subjective Wellbeing Variables in the 2005 European Working Conditions Survey.

Wellbeing Measure	Measurement of Variable
Physical Wellbeing	If have reported no effects from work with respect to hearing, vision, skin problems and no backache, headaches, stomach ache, muscular pain, respiratory difficulties, heart disease, injuries, allergies and other.
Psychological Wellbeing	If have reported no effects from work with respect to: stress, overall fatigue, sleeping problems, anxiety or irritability.
Overall Wellbeing	If have reported that job does not affect health.

Table 3: Correlations for Job Quality Characteristics with Wellbeing (EWCS 2005) and Labour Productivity (KLEMS and EWCS for 2005 & 2015).

	Wellbeing			Productivity			Excl. K & Year	
	Reg Coeff	Dom[a]	Rank	Reg Coeff	Dom[a]	Rank	Dom[a]	Rank
Log of Real Capital				0.487	0.6147	1		
Useful Work	-0.048	0.0021	23	0.252	0.0055	18	0.0142	17
Work Well Done	0.033	0.0108	18	0.851	0.0114	14	0.0298	13
Effort Rewarded	0.092	0.0799	4	0.137	0.0267	4	0.0696	3
Noise	-0.141	0.1297	2	0.192	0.0034	21	0.0091	20
Painful/Tiring	-0.173	0.2033	1	-0.315	0.0255	5	0.0663	4
Carrying	-0.041	0.0543	6	0.305	0.0098	15	0.0256	14
Repetitive Tasks	-0.040	0.0415	7	0.179	0.0056	17	0.0146	16
Using Chemicals etc	-0.076	0.037	11	-0.377	0.0141	12	0.0366	11
Bullying	-0.152	0.0557	5	-0.086	0.0007	26	0.0019	24
Colleagues Support	-0.023	0.0012	24	-0.450	0.0013	24	0.0032	22
Manager Support	0.024	0.0075	20	0.000	0.0011	25	0.0029	23
Work Long Hours	-0.092	0.0412	8	-0.470	0.0136	13	0.0356	12
Working at Night	-0.056	0.0347	12	0.219	0.0026	22	0.0068	21
Work/Life Balance	0.121	0.0991	3	0.317	0.0047	20	0.0123	19
Work at High Speed	-0.038	0.0375	10	0.775	0.0219	7	0.0570	6
Work Tight Deadlines	-0.030	0.0297	14	0.443	0.0178	11	0.0466	10
Use Computer	0.030	0.0192	15	0.186	0.0679	2	0.1770	1
Received Training	-0.059	0.0134	16	0.150	0.019	10	0.0495	9
Rec Training on Job	-0.042	0.0108	17	0.023	0.0213	8	0.0553	7
Autonomy: Method	-0.043	0.0025	22	1.754	0.0569	3	0.1482	2
Promotion Prospects	0.071	0.0407	9	-0.008	0.0193	9	0.0502	8
Might Lose Job	-0.078	0.0327	13	0.013	0.0054	19	0.0142	18
Permanent Contract	-0.060	0.0101	19	-0.436	0.0227	6	0.0589	5
Fixed Term Contract	0.021	0.0056	21	-0.652	0.0056	16	0.0146	15
Year=2015				-0.002	0.0016	23		
Constant	0.727			-1.713				
N (R Squared)	15077 (0.186)			520 (0.805)				

Notes: **a** are standardised dominance statistics.

Table 4: Means and Standard Deviations for Job Quality Scores by Year, and Changes for 2005-2015 and 2015-2021.

	Wellbeing		Productivity (Gary)	
Panel A: First Period	**Mean**	**SD**	**Mean**	**SD**
EWCS 2005 (N = 15,270)	0.6919	0.1904	0.4976	0.1520
EWCS 2015 (N = 19,138)	0.7084	0.1877	0.5257	0.1533
	Difference	**SE**	**Difference**	**SE**
Change 2005 to 2015	0.0165*	0.0021	0.0281*	0.0016
Panel B: Second Period	**Mean**	**SD**	**Mean**	**SD**
EWCS 2015 (N = 19,138)	0.7084	0.1877	0.5257	0.1533
EWCTS 2021 (N = 18,535)	0.6595	0.2033	0.6205	0.1451
	Difference	**SE**	**Difference**	**SE**
Change 2015 to 2021	-0.0489*	0.0020	0.0948*	0.0015
Panel C: Full Period	**Mean**	**SD**	**Mean**	**SD**
EWCS 2005 (N = 15,270)	0.6919	0.1904	0.4976	0.1520
EWCTS 2021 (N = 18,535)	0.6595	0.2033	0.6205	0.1451
	Difference	**SE**	**Difference**	**SE**
Change 2005 to 2021	-0.0324*	0.0022	0.1229*	0.0016

Notes: Job Quality Scores are constructed using the variables defined in Table 1 and the weights defined by `Dom' in Table 3. Negative correlations (coefficients) use reversed job quality characteristic variables in the construction of the scores. EG for a painful or tiring response, a measure capturing not painful or tiring is used. For 2005, a sample of 15077 individuals are used in the wellbeing regressions shown in Table 3 but wellbeing job quality scores are generated for 15270 respondents, and therefore 193 of these have missing wellbeing data. * denotes statistically significant at the 5 percent level.

Table 5a: Sample Means, Standard Deviations and Changes between 2005 and 2015 for Job Quality Characteristics.

JQ Characteristic	2005		2015		2005 to 2015	
	Mean	SD	Mean	SD	Diff	SE
Useful Work	0.8255	0.3795	0.8497	0.3574	0.0241*	0.0040
Work Well Done	0.7948	0.4039	0.8054	0.3959	0.0106*	0.0043
Effort Rewarded	0.3866	0.4870	0.5045	0.5000	0.1179*	0.0054
Noise	0.2044	0.4033	0.1892	0.3917	-0.0152*	0.0043
Painful/Tiring	0.3050	0.4604	0.3007	0.4586	-0.0043	0.0050
Carrying	0.1845	0.3879	0.1862	0.3893	0.0017	0.0042
Repetitive Tasks	0.5327	0.4989	0.5270	0.4993	-0.0057	0.0054
Using Chemicals etc	0.0870	0.2819	0.0990	0.2987	0.0120*	0.0032
Bullying	0.0722	0.2588	0.0564	0.2307	-0.0158*	0.0026
Colleagues Support	0.7709	0.4203	0.7589	0.4278	-0.0119*	0.0046
Manager Support	0.6640	0.4724	0.6328	0.4821	-0.0312*	0.0052
Work Long Hours	0.1255	0.3313	0.1122	0.3156	-0.0134*	0.0035
Working at Night	0.1893	0.3917	0.1963	0.3972	0.0070	0.0043
Work/Life Balance	0.8079	0.3939	0.8308	0.3750	0.0228*	0.0042
Work at High Speed	0.3385	0.4732	0.3595	0.4799	0.0210*	0.0052
Work to Tight D/lines	0.3520	0.4776	0.3745	0.4840	0.0225*	0.0052
Use Computer	0.3237	0.4679	0.4058	0.4911	0.0821*	0.0052
Received Training	0.3299	0.4702	0.4173	0.4931	0.0874*	0.0052
On the Job Training	0.3399	0.4737	0.4002	0.4900	0.0603*	0.0052
Autonomy: Method	0.6597	0.4738	0.6476	0.4777	-0.0121*	0.0052
Promotion Prospects	0.2906	0.4540	0.3792	0.4852	0.0887*	0.0051
Might Lose Job	0.1655	0.3716	0.1802	0.3843	0.0147*	0.0041
Permanent Contract	0.7943	0.4042	0.8174	0.3863	0.0231*	0.0043
Fixed Term Contract	0.1298	0.3361	0.1376	0.3445	0.0078*	0.0037
N	15270		19138			

Notes: * denotes statistically significant at the 5 percent level.

Table 5b: Sample Means, Standard Deviations and Changes between 2015 and 2021 for Job Quality Characteristics.

JQ Characteristic	2015		2021		2015 to 2021	
	Mean	SD	Mean	SD	Diff	SE
Useful Work	0.8497	0.3574	0.8783	0.3269	0.0287*	0.0035
Work Well Done	0.8054	0.3959	0.8470	0.3600	0.0416*	0.0039
Effort Rewarded	0.5045	0.5000	0.6036	0.4892	0.0991*	0.0051
Noise	0.1892	0.3917	0.3112	0.4630	0.1220*	0.0044
Painful/Tiring	0.3007	0.4586	0.4260	0.4945	0.1252*	0.0049
Carrying	0.1862	0.3893	0.2626	0.4401	0.0764*	0.0043
Repetitive Tasks	0.5270	0.4993	0.6730	0.4691	0.1460*	0.0050
Using Chemicals etc	0.0990	0.2987	0.1962	0.3971	0.0972*	0.0036
Bullying	0.0564	0.2307	0.0654	0.2473	0.0091*	0.0025
Colleagues Support	0.7589	0.4278	0.8282	0.3772	0.0693*	0.0042
Manager Support	0.6328	0.4821	0.7439	0.4365	0.1112*	0.0047
Work Long Hours	0.1122	0.3156	0.1476	0.3547	0.0354*	0.0035
Working at Night	0.1963	0.3972	0.3572	0.4792	0.1609*	0.0045
Work/Life Balance	0.8308	0.3750	0.8336	0.3724	0.0029	0.0039
Work at High Speed	0.3595	0.4799	0.4937	0.5000	0.1341*	0.0050
Work to Tight D/lines	0.3745	0.4840	0.4912	0.4999	0.1167*	0.0051
Use Computer	0.4058	0.4911	0.7764	0.4167	0.3706*	0.0047
Received Training	0.4173	0.4931	0.4996	0.5000	0.0824*	0.0051
On the Job Training	0.4002	0.4900	0.5510	0.4974	0.1508*	0.0051
Autonomy: Method	0.6476	0.4777	0.7122	0.4527	0.0646*	0.0048
Promotion Prospects	0.3792	0.4852	0.5587	0.4966	0.1794*	0.0051
Might Lose Job	0.1802	0.3843	0.1370	0.3438	-0.0432*	0.0038
Permanent Contract	0.8174	0.3863	0.8249	0.3800	0.0075**	0.0039
Fixed Term Contract	0.1376	0.3445	0.1443	0.3514	0.0067**	0.0036
N	19138		18535			

Notes: * denotes statistically significant at the 5 percent level. ** denotes statistically significant at the 10 percent level.

Table 6: Summary of Results for the Top 12 (of 24) Drivers of Changes in Job Quality Scores (JQS), 2015 to 2021.

Panel A: Wellbeing						Productivity	
Contribution to Δ JQS 2015-2021[a]		**Δ Char [b]**		**Dominance [c]**		**Dominance [c]**	
Rank		Rank	Change sign	Rank	Corr	Rank	Corr
1	Posture related painful/tiring positions	7	+	1	-	4	-
2	Exposure to loud noise (raise voice to talk)	8	+	2	-	20	+
3	Paid appropriately for my effort	11	+	4	+	3	+
4	Prospects for career advancement	2	+	9	+	8	-
5	How often work with computer/laptop etc	1	+	15	+	1	+
6	Repetitive hand or arm movements	5	+	7	-	16	+
7	Working nights (any, including shifts)	3	+	12	-	21	+
8	Job involves working at high speed	6	+	10	-	6	+
9	Carrying or moving heavy loads	14	+	6	-	14	+
10	Handling/contact with chemicals etc	12	+	11	-	11	-
11	Job involves working to tight deadlines	9	+	14	-	10	+
12	Training on the job in last 12 months	4	+	17	-	7	+
Panel B: Productivity						**Wellbeing**	
Contribution to Δ JQS 2015-2021 [a]		**Δ Char [b]**		**Dominance [c]**		**Dominance [c]**	
Rank		Rank	Change sign	Rank	Corr	Rank	Corr
1	How often work with computer/laptop etc	1	+	1	+	15	+
2	Ability to choose methods of work	16	+	2	+	22	-
3	Prospects for career advancement	2	+	8	-	9	+
4	Training on the job in last 12 months	4	+	7	+	17	-
5	Posture related painful/tiring positions	7	+	4	-	1	-
6	Job involves working at high speed	6	+	6	+	10	-
7	Paid appropriately for my effort	11	+	3	+	4	+
8	Job involves working to tight deadlines	9	+	10	+	14	-
9	Training (firm paid) in past 12 months	13	+	7	+	16	-
10	Handling/contact with chemicals etc	12	+	11	-	11	-
11	Repetitive hand or arm movements	5	+	16	+	7	-
12	Carrying or moving heavy loads	14	+	14	+	6	-

Notes: **a** are ranks taken from Table A5 and Table A6 in the appendix.

b are changes in the characteristic means taken from Table 5b.

c are changes in the dominance rank and correlations, from the coefficients taken from Table 3.

Table 7: Changes Within and Between Two-Digit Occupations for Key Variables, 2015 to 2021.

	Total Change	Within Occupation	Between Occupation
Panel A: Job Quality Scores			
Wellbeing	-0.0490	-0.0799 (163%)	0.0309 (-63%)
Productivity	0.0923	0.0569 (62%)	0.0353 (38%)
Panel B: Key Job Quality Characteristics			
Group One:			
Repetitive hand or arm movements	0.1462	0.1785 (122%)	-0.0323 (-22%)
Working at high speed	0.1341	0.1429 (107%)	-0.0088 (-7%)
Carrying or moving heavy loads	0.0767	0.1486 (194%)	-0.0719 (-94%)
Working to tight deadlines	0.1168	0.0963 (82%)	0.0205 (18%)
Group Two:			
Work with computer/laptop etc	0.3707	0.2430 (66%)	0.1277 (34%)
Posture related painful/tiring positions	0.1255	0.1846 (147%)	-0.0591 (-47%)
Paid appropriately for my effort	0.0993	0.0699 (70%)	0.0294 (30%)
Handling/contact chemicals etc	0.0975	0.1370 (141%)	-0.0395 (-41%)
N	37,619		

Notes: Based on a sample of 19,084 respondents from the EWCS 2015 and 18,535 respondents from the EWCTS 2021 datasets, since 54 workers in the EWCS 2015 had missing two-digit ISCO-08 occupational codes.

Table 8: Changes for Key Variables in the Public and Private Sector, 2015 to 2021.

	Total		Public Sector		Private/Other	
	Change	**SE**	**Change**	**SE**	**Change**	**SE**
Panel A: Job Quality Scores						
Wellbeing	-0.0489	0.0020	-0.0877	0.0036	-0.0327	0.0024
Productivity	0.0923	0.0015	0.0792	0.0027	0.0974	0.0018
Panel B: Key Job Quality Characteristics						
Group One:						
Repetitive hand or arm movements	0.1460	0.0050	0.2069	0.0092	0.1215	0.0059
Working at high speed	0.1341	0.0050	0.1821	0.0090	0.1155	0.0061
Carrying or moving heavy loads	0.0764	0.0043	0.1211	0.0073	0.0588	0.0052
Working to tight deadlines	0.1170	0.0051	0.1473	0.0091	0.1055	0.0061
Group Two:						
Work with computer/laptop etc	0.3706	0.0047	0.3721	0.0084	0.3685	0.0056
Posture related painful/tiring positions	0.1252	0.0049	0.1989	0.0089	0.0944	0.0059
Paid appropriately for my effort	0.0991	0.0051	0.0634	0.0094	0.1152	0.0060
Handling/contact chemicals etc	0.0971	0.0036	0.1282	0.0068	0.0837	0.0042
N	37,673		11,161		26,512	

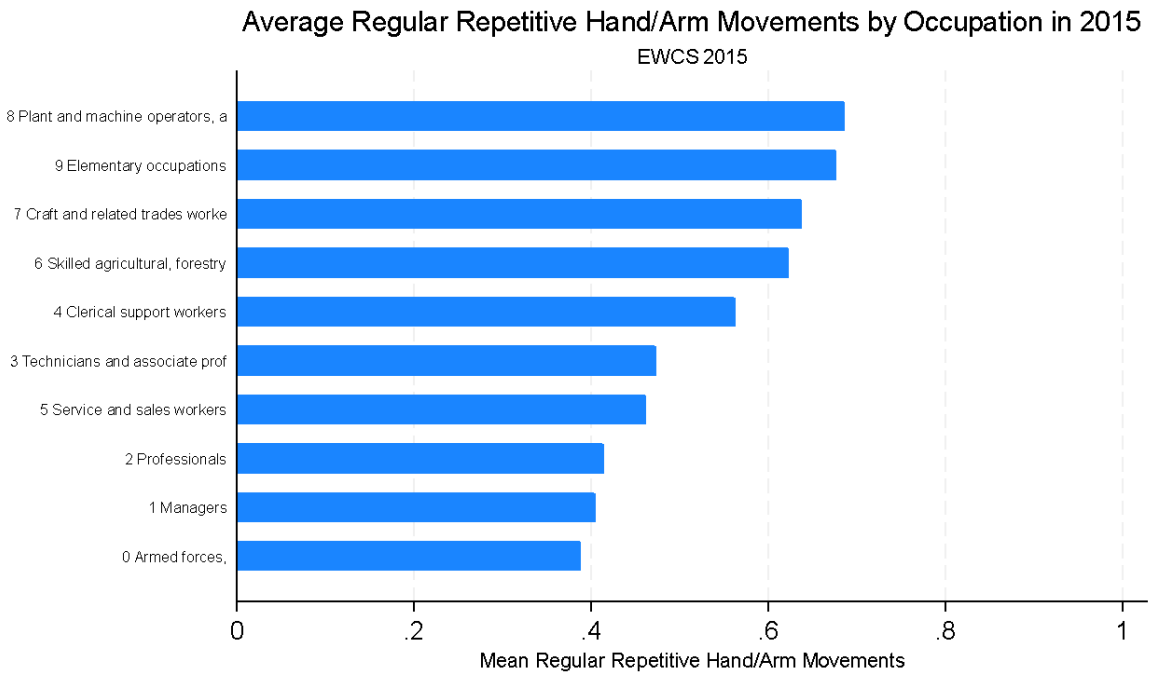
Notes: Using a self-reported measure of public and private sector employment. Other contains Not-for-Profit Organisations and those split between the Public and Private sector. All changes that appear in this table are statistically significant at the 5 percent level.

Table 9: Changes for Key Variables for those Working From Home in 2021 and those Not Working From Home in 2021, 2015 to 2021.

	Total		Home Working In 2021		Not Home Working in 2021	
	Change	**SE**	**Change**	**SE**	**Change**	**SE**
Panel A: Job Quality Scores						
Wellbeing	-0.0489	0.0020	0.0146	0.0027	-0.0794	0.0023
Productivity	0.0923	0.0015	0.1511	0.0021	0.0640	0.0017
Panel B: Key Job Quality Characteristics						
Group One:						
Repetitive hand or arm movements	0.1460	0.0050	0.0874	0.0073	0.1742	0.0055
Working at high speed	0.1341	0.0050	0.1444	0.0072	0.1291	0.0056
Carrying or moving heavy loads	0.0764	0.0043	-0.0921	0.0054	0.1575	0.0049
Working to tight deadlines	0.1170	0.0051	0.1786	0.0071	0.0869	0.0056
Group Two:						
Work with computer/laptop etc	0.3706	0.0047	0.5551	0.0065	0.2818	0.0055
Posture related painful/tiring positions	0.1252	0.0049	0.0099[a]	0.0068	0.1807	0.0055
Paid appropriately for my effort	0.0991	0.0051	0.1504	0.0073	0.0743	0.0057
Handling/contact chemicals etc	0.0971	0.0036	-0.0223	0.0043	0.1546	0.0041
N	37,673		25,160		31,651	

Notes: a denotes not statistically significant at the 5 percent level, all other changes in this table are statistically significant. Estimates use a self-reported measure of working from home. The samples consist of 19,138 respondents in 2015, and these are compared to 6,022 who were working from home in 2021 and 12,513 who were not working from home in 2021.

Fig 1 (a) Regular Repetitive Hand or Arm Movements, by Occupation and Year.



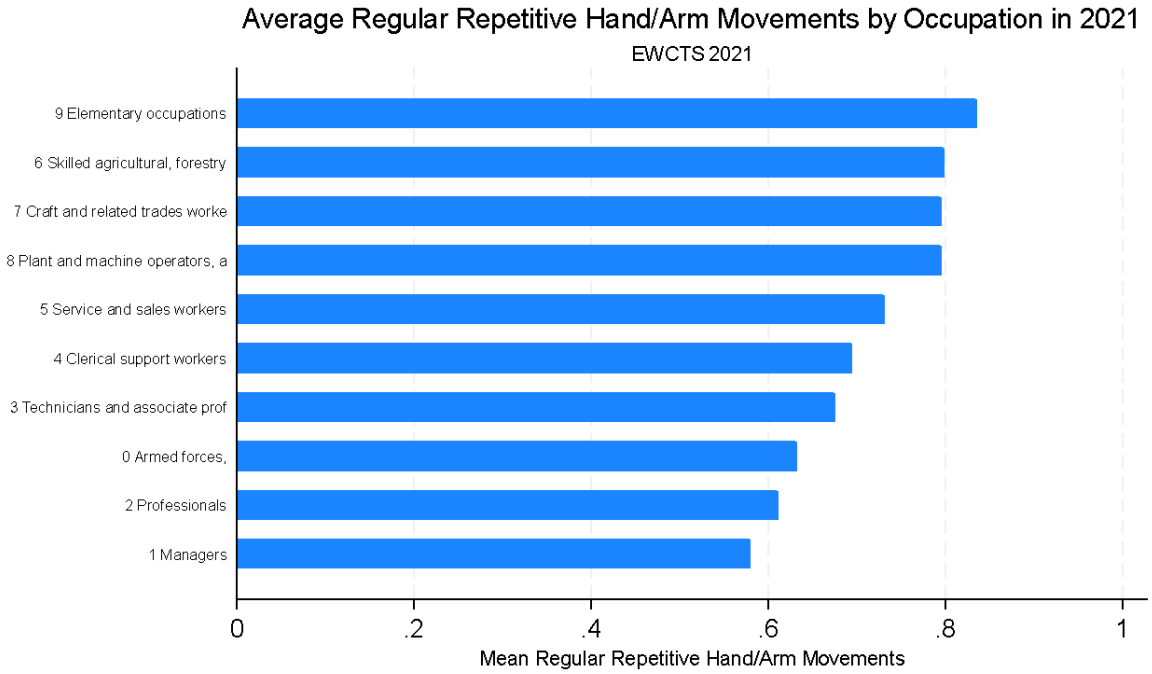
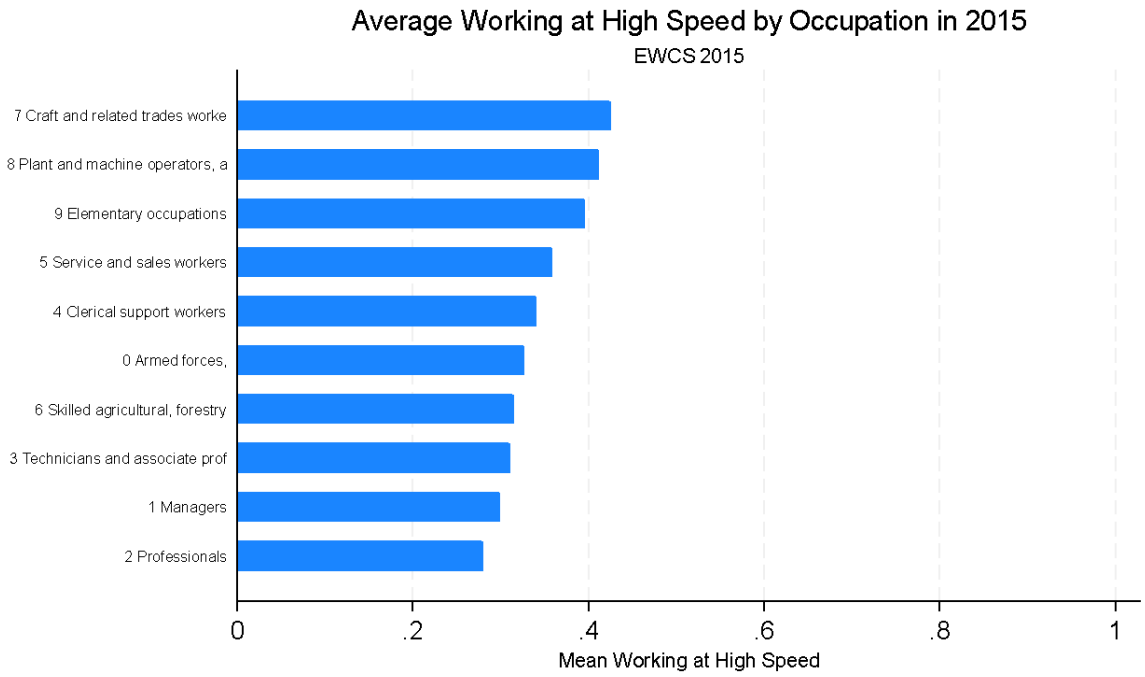


Fig 1 (b) Regularly Working at High Speed, by Occupation and Year.



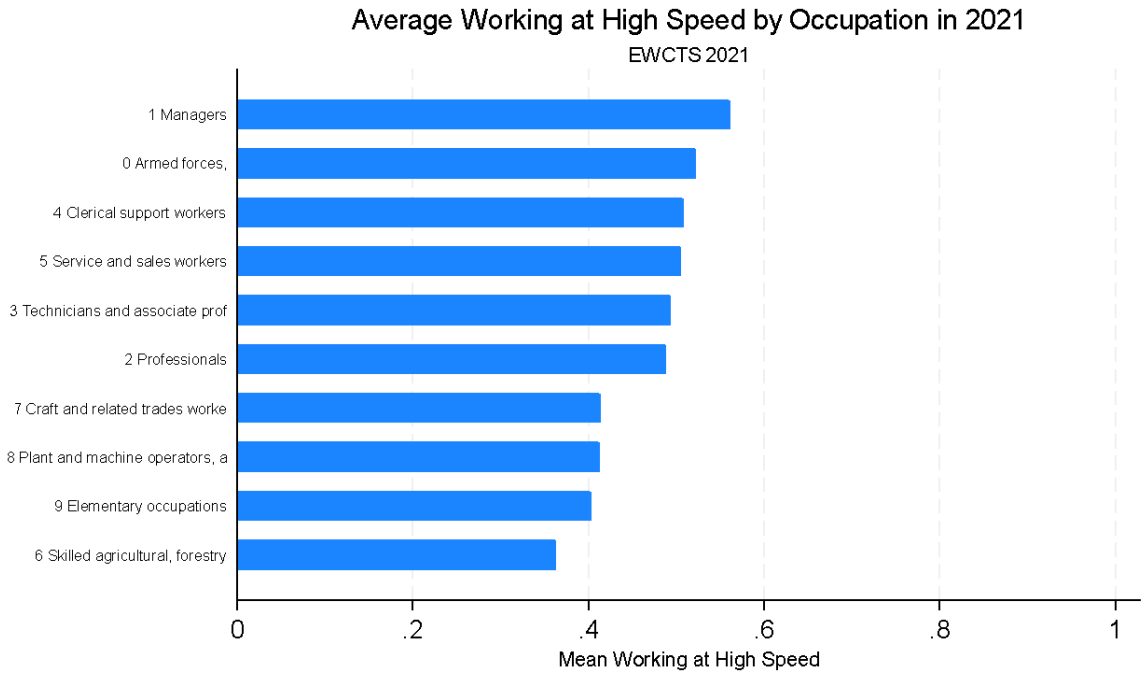
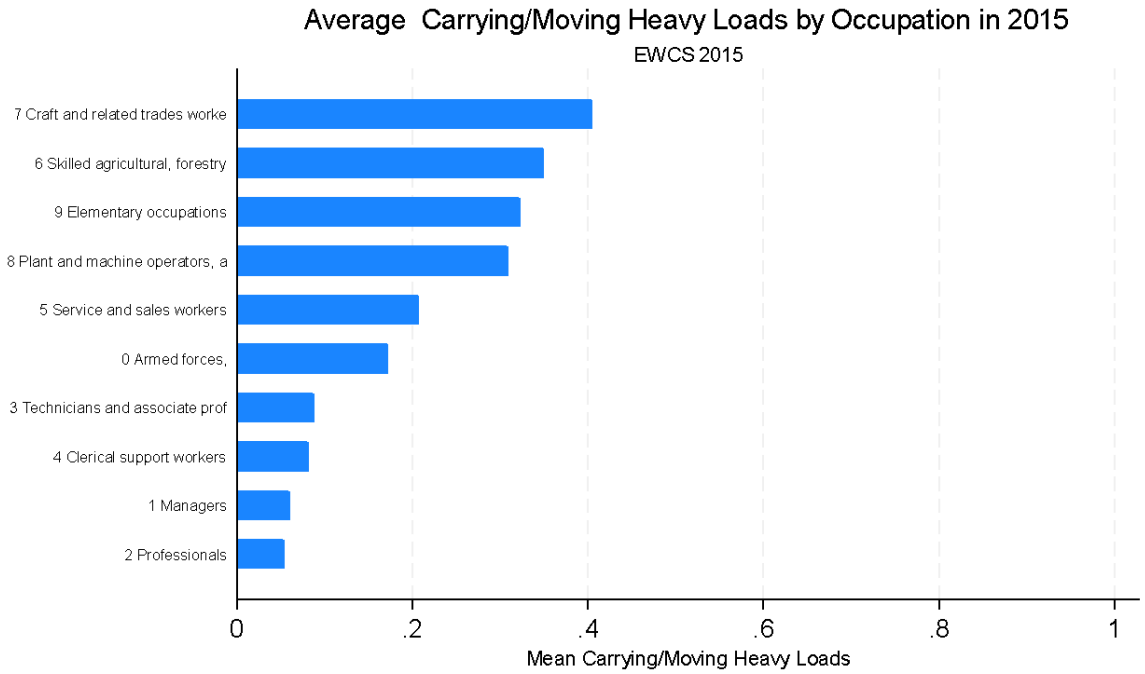


Fig 1 (c) Regularly Carrying or Moving Heavy Loads, by Occupation and Year.



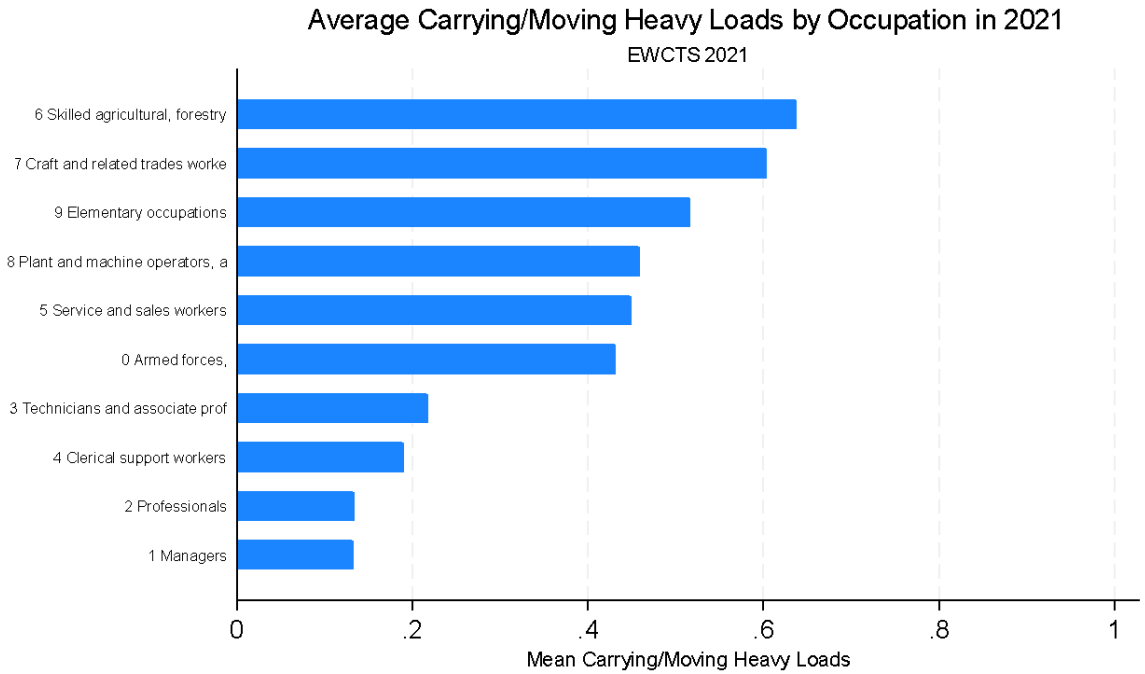
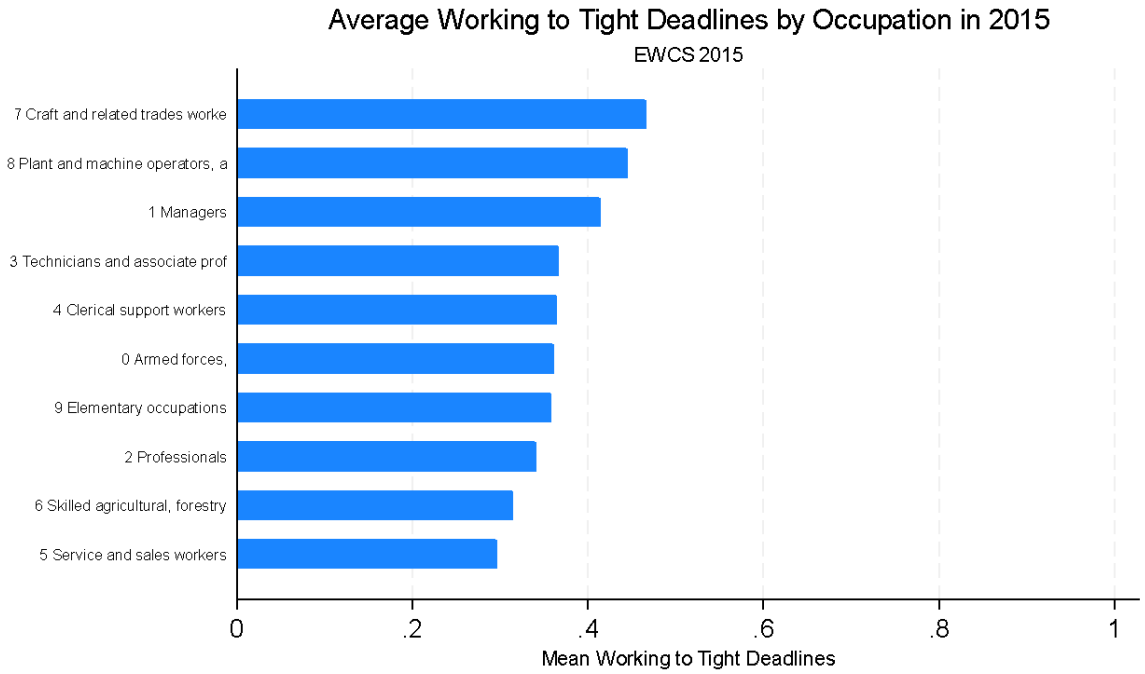


Fig 1 (d) Regularly Working to Tight Deadlines, by Occupation and Year.



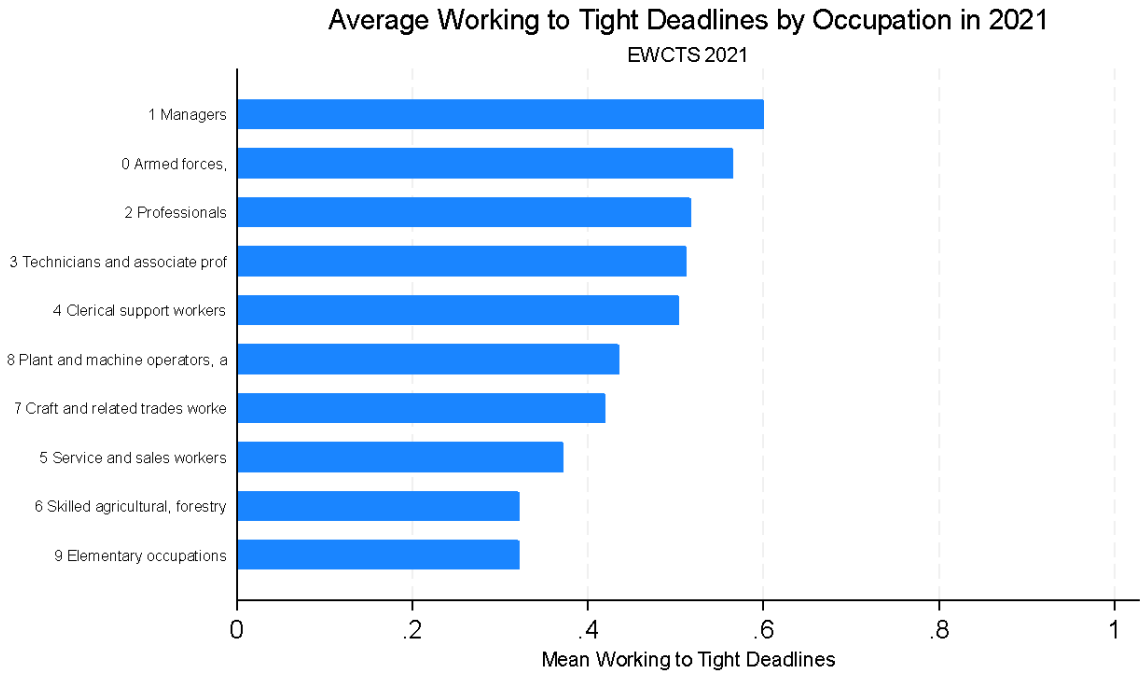
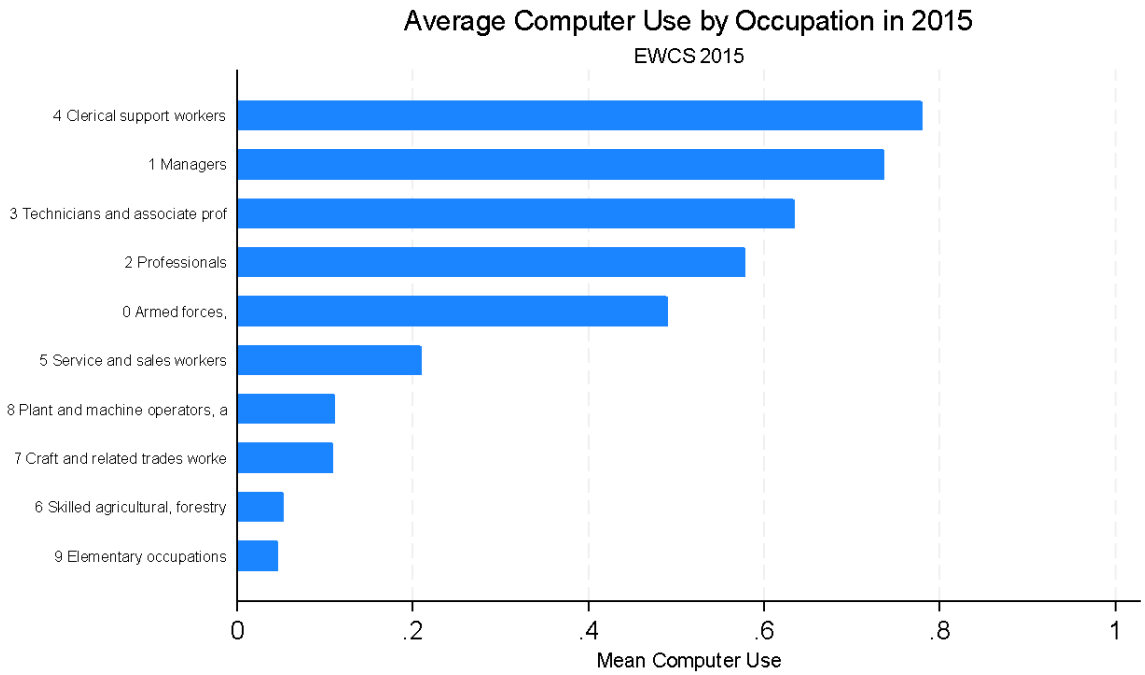


Fig 2 (a) Computer Use, by Occupation and Year.



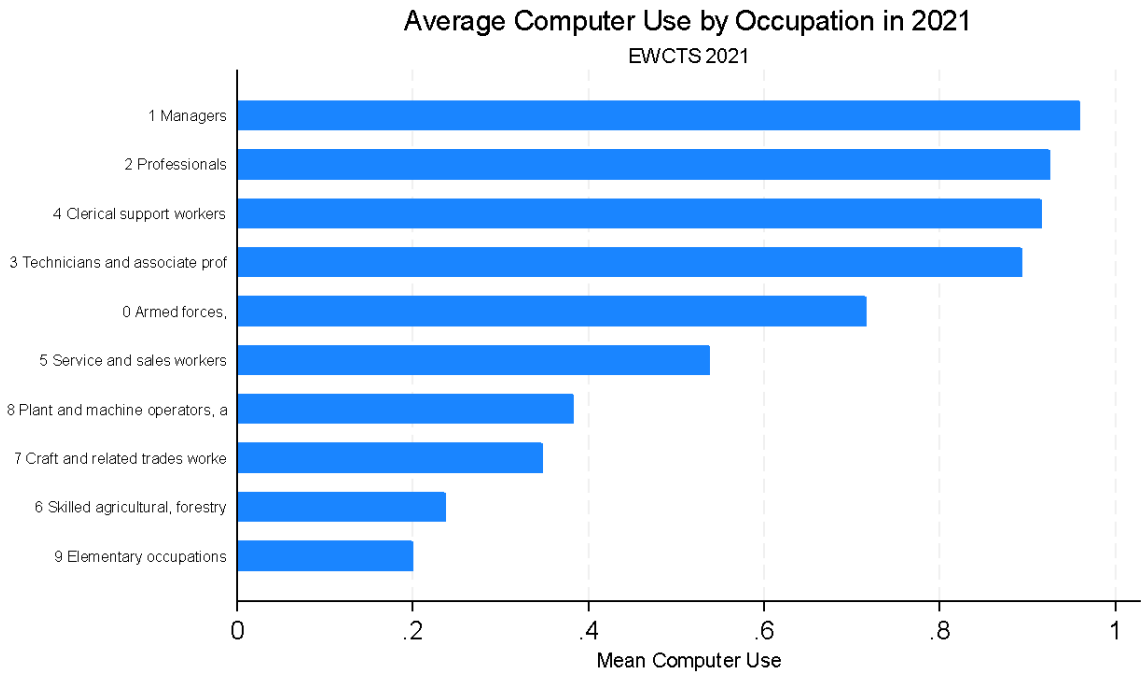
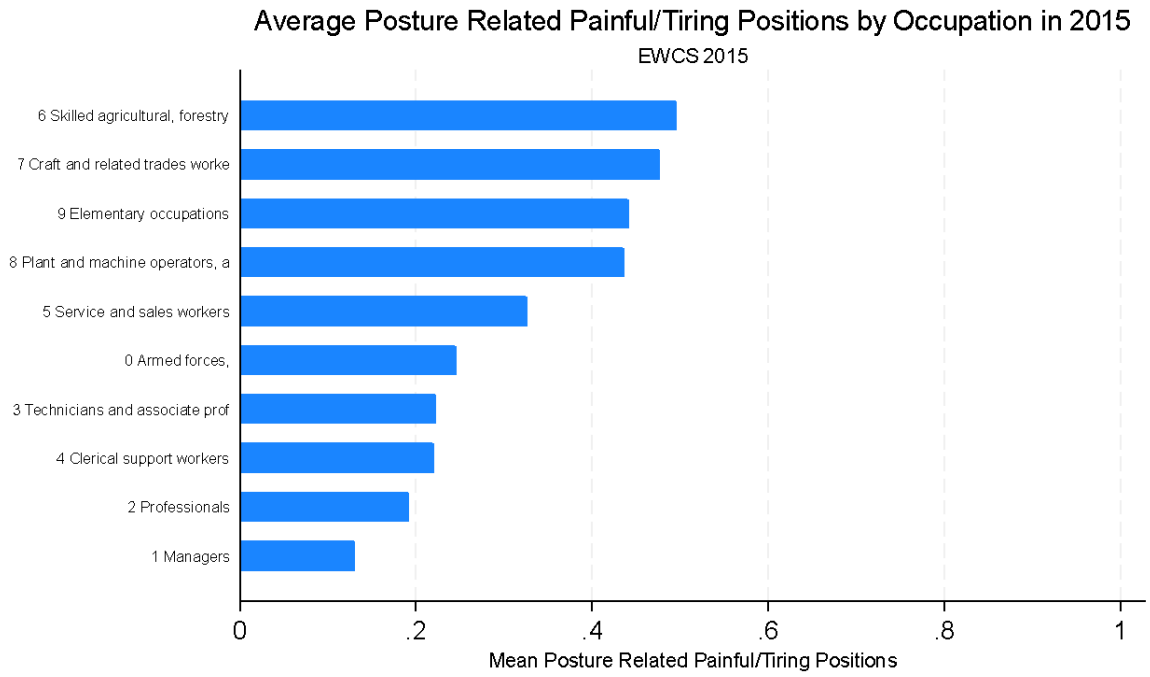


Fig 2 (b) Regularly in Posture Related Painful/Tiring Positions, by Occupation and Year.



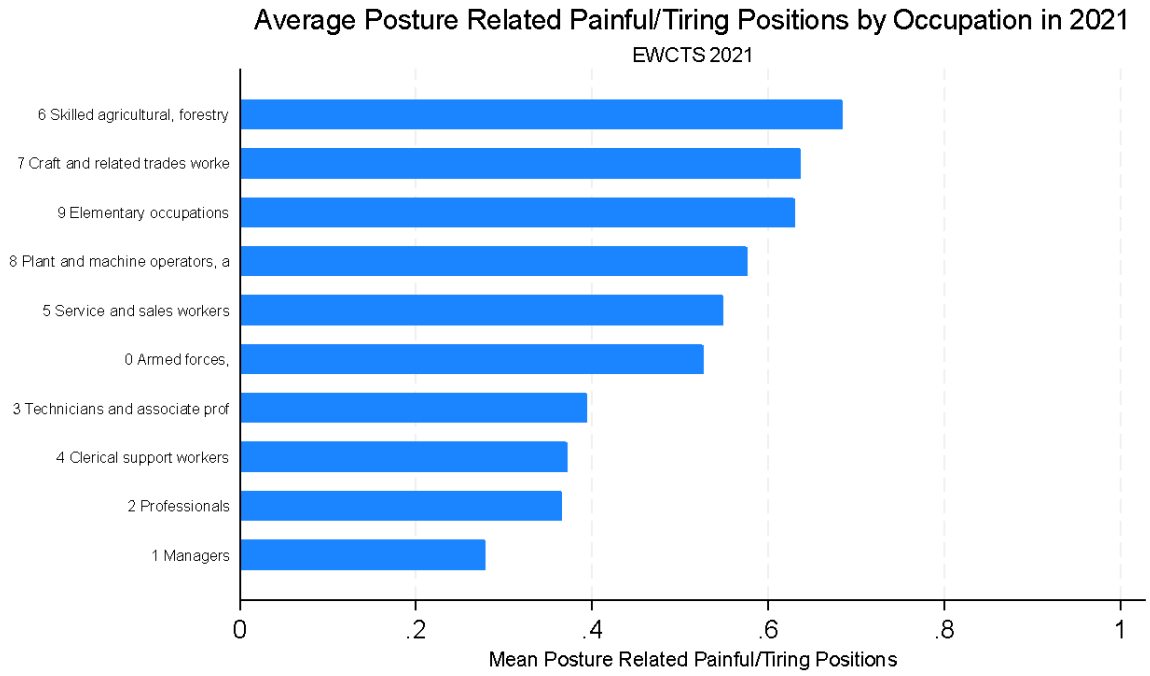
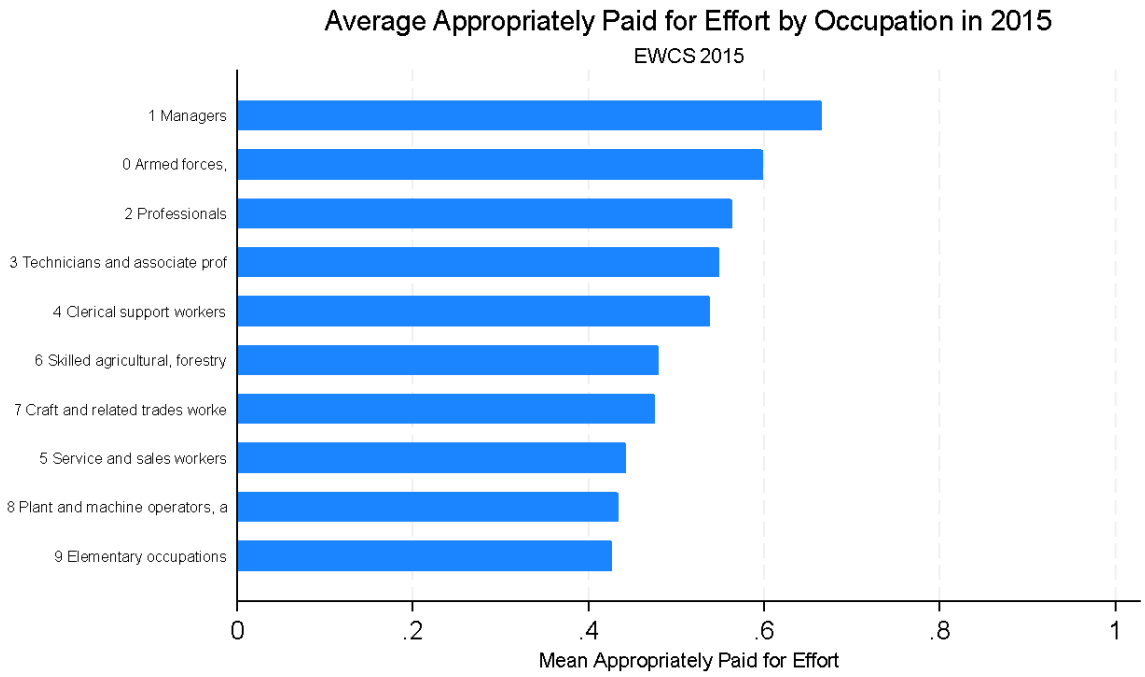


Fig 2 (c) Feel Appropriately Paid for Effort, by Occupation and Year.



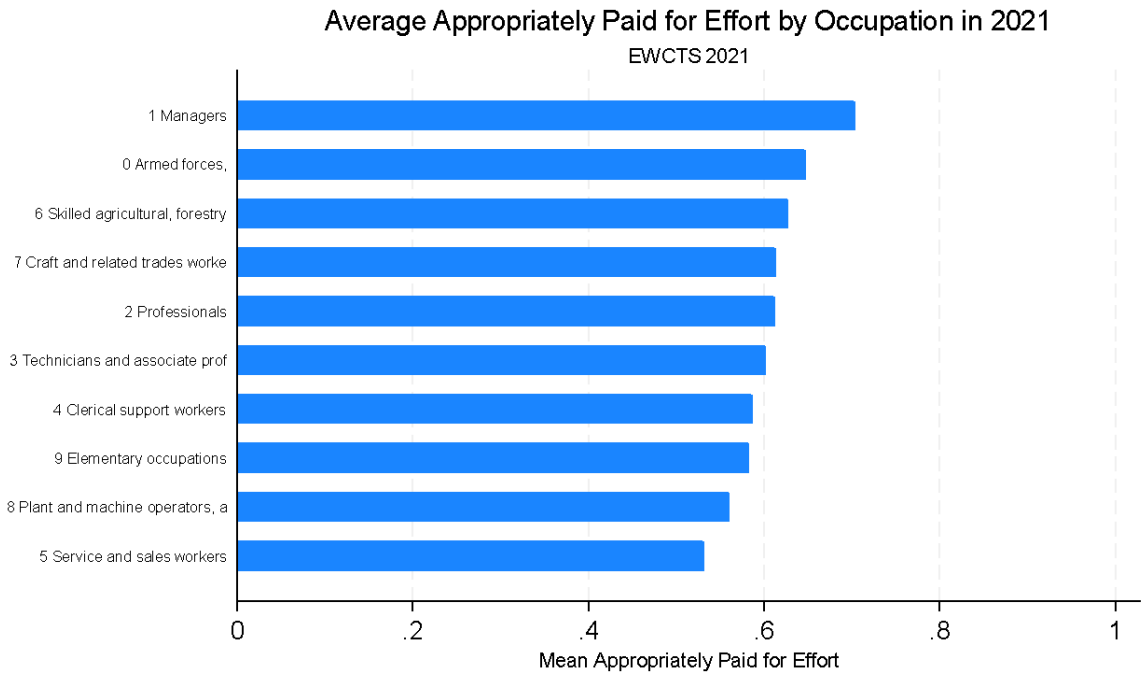
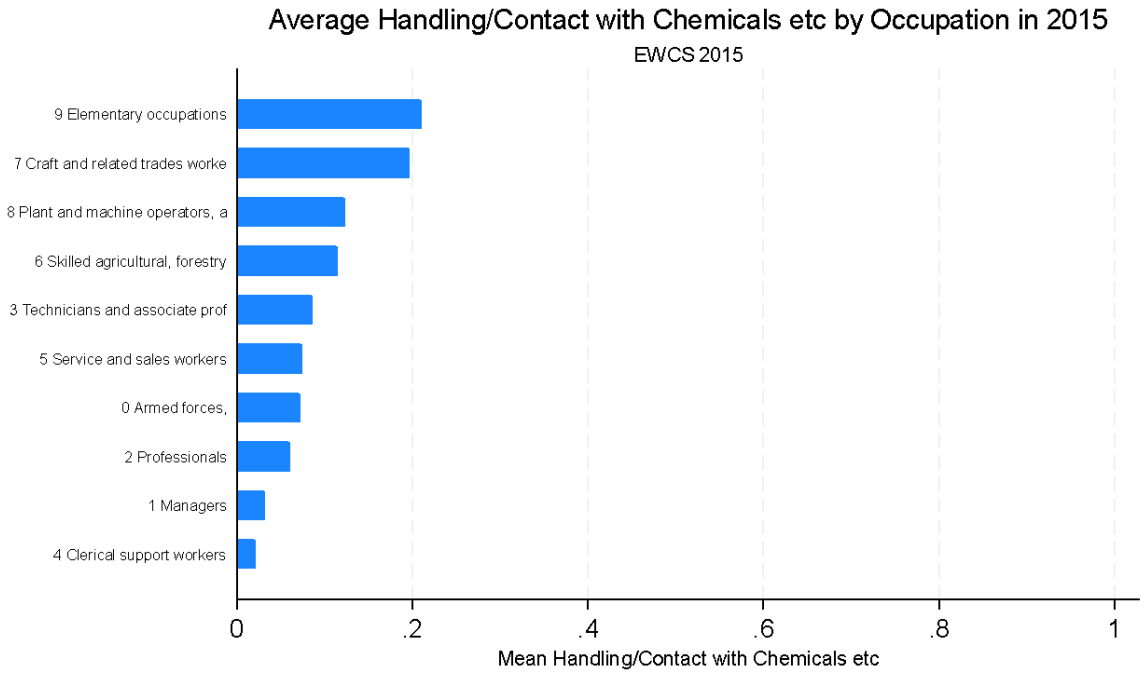
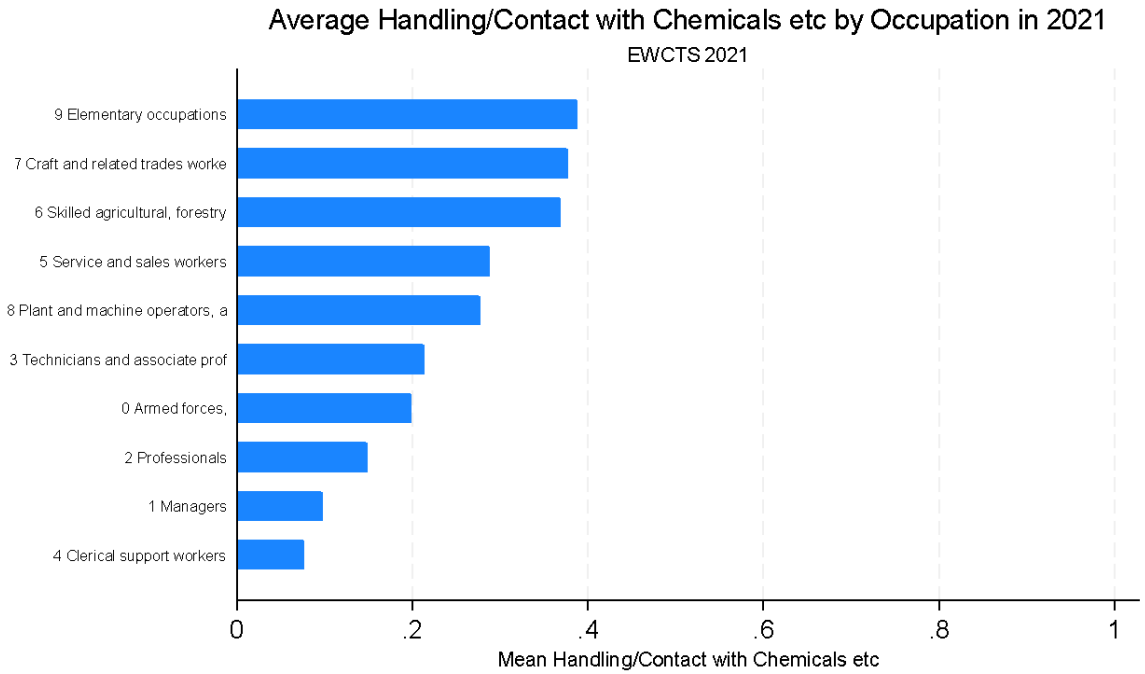


Fig 2 (d) Regularly Handling/Contact with Chemicals/hazardous substances etc, by Occupation and Year.





Appendix

Table A1: Actual and predicted workers by one digit NACE (second revision), EWCS 2010.

	Actual		Predicted	
	Mean	**SD**	**Mean**	**SD**
KLEMS 1, NACE A	0.06	0.231	0.06	0.231
KLEMS 2, NACE B, D & E	0.02	0.148	0.02	0.141
KLEMS 3, NACE C	0.14	0.348	0.14	0.345
KLEMS 4, NACE F	0.07	0.255	0.07	0.256
KLEMS 5, NACE G	0.16	0.369	0.16	0.368
KLEMS 6, NACE H, I & J	0.13	0.331	0.13	0.336
KLEMS 7, NACE K & L	0.04	0.190	0.04	0.188
KLEMS 8, NACE M & N	0.07	0.256	0.06	0.241
KLEMS 9, NACE S	0.04	0.191	0.05	0.211
KLEMS 10, NACE O	0.07	0.254	0.07	0.253
KLEMS 11, NACE P	0.09	0.286	0.09	0.285
KLEMS 12, NACE Q	0.10	0.298	0.10	0.301
KLEMS 13, NACE R	0.02	0.135	0.02	0.141
N	42603		42603	

Note: `Predicted' contains the distribution of workers predicted into one digit NACE (second revision) using two-digit NACE (first revision).

Table A2: Correlations for Job Quality Characteristics with Different Measures of Wellbeing

(EWCS 2005)

	Physical Wellbeing			Psychological Wellbeing			Wellbeing		
	Reg Coeff	Dom[a]	Rank	Reg Coeff	Dom[a]	Rank	Reg Coeff	Dom[a]	Rank
Useful Work	-0.037	0.0013	23	-0.056	0.0031	23	-0.048	0.0021	23
Work Well Done	0.022	0.0081	18	0.048	0.0167	15	0.033	0.0108	18
Effort Rewarded	0.089	0.0740	4	0.091	0.0828	4	0.092	0.0799	4
Noise	-0.149	0.1383	2	-0.127	0.1127	3	-0.141	0.1297	2
Painful/Tiring	-0.189	0.2272	1	-0.161	0.1857	1	-0.173	0.2033	1
Carrying	-0.052	0.0645	5	-0.016	0.0346	11	-0.041	0.0543	6
Repetitive Tasks	-0.051	0.0526	7	-0.019	0.0249	13	-0.040	0.0415	7
Using Chemicals etc	-0.082	0.0403	9	-0.047	0.0231	14	-0.076	0.037	11
Bullying	-0.152	0.0526	6	-0.181	0.0816	5	-0.152	0.0557	5
Colleagues Support	-0.015	0.0009	24	-0.021	0.0014	24	-0.023	0.0012	24
Manager Support	0.022	0.0075	19	0.033	0.0112	18	0.024	0.0075	20
Work Long Hours	-0.076	0.0300	12	-0.099	0.051	6	-0.092	0.0412	8
Working at Night	-0.053	0.0296	13	-0.063	0.0432	7	-0.056	0.0347	12
Work/Life Balance	0.110	0.0825	3	0.134	0.1255	2	0.121	0.0991	3
Work at High Speed	-0.038	0.0370	10	-0.042	0.043	8	-0.038	0.0375	10
Work Tight Deadlines	-0.027	0.0276	14	-0.036	0.0373	9	-0.030	0.0297	14
Use Computer	0.032	0.0211	15	0.007	0.0078	19	0.030	0.0192	15
Received Training	-0.052	0.0087	17	-0.055	0.0161	17	-0.059	0.0134	16
Rec Training on Job	-0.038	0.0075	20	-0.048	0.0163	16	-0.042	0.0108	17
Autonomy: Method	-0.038	0.0018	22	-0.047	0.004	22	-0.043	0.0025	22
Promotion Prospects	0.074	0.0424	8	0.056	0.0305	12	0.071	0.0407	9
Might Lose Job	-0.076	0.0309	11	-0.078	0.0349	10	-0.078	0.0327	13
Permanent Contract	-0.062	0.0090	16	-0.038	0.0069	20	-0.060	0.0101	19
Fixed Term Contract	0.015	0.0046	21	0.035	0.0056	21	0.021	0.0056	21
Constant	0.766			0.751			0.727		
N (R Squared)	15077 (0.200)			15077 (0.178)			15077 (0.186)		

Note: Figures in black represent positive correlations with wellbeing, while figures in red represent negative correlations.

Table A3: Dominance and Rank Statistics with Wellbeing for Job Characteristics in Different Years

	Domin. (2005)	Rank (2005)	Domin. (2015)	Rank (2015)	Domin. (2021)	Rank (2021)
Useful Work	0.0021	23	0.0034	21	0.0036	20
Work Well Done	0.0108	18	0.0169	15	0.0137	17
Effort Rewarded	0.0799	4	0.0702	5	0.0667	7
Noise	0.1297	2	0.0812	3	0.1126	2
Painful/Tiring	0.2033	1	0.1934	1	0.1780	1
Carrying	0.0543	6	0.0563	6	0.0926	5
Repetitive Tasks	0.0415	7	0.0390	13	0.0265	12
Using Chemicals etc	0.0370	11	0.0449	8	0.0996	3
Bullying	0.0557	5	0.0799	4	0.0901	6
Colleagues Support	0.0012	24	0.0122	16	0.0086	19
Manager Support	0.0075	20	0.0437	10	0.0379	8
Work Long Hours	0.0412	8	0.0101	17	0.0146	15
Working at Night	0.0347	12	0.0479	7	0.0368	9
Work/Life Balance	0.0991	3	0.1298	2	0.0941	4
Work at High Speed	0.0375	10	0.0416	11	0.0271	11
Work Tight Deadlines	0.0297	14	0.0405	12	0.0164	14
Use Computer	0.0192	15	0.0060	20	0.0318	10
Received Training	0.0134	16	0.0068	19	0.0007	22
Rec Training on Job	0.0108	17	0.0017	24	0.0010	21
Autonomy: Method	0.0025	22	0.0019	23	0.0141	16
Promotion Prospects	0.0407	9	0.0448	9	0.0194	13
Might Lose Job	0.0327	13	0.0186	14	0.0132	18
Permanent Contract	0.0101	19	0.0069	18	0.0004	23
Fixed Term Contract	0.0056	21	0.0025	22	0.0004	24

Note: Figures in black represent positive correlations with wellbeing, while figures in red represent negative correlations.

Table A4: Sample Means of Socio-Economic Characteristics over time

	2005		2015		2021	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Female	0.54	0.498	0.52	0.500	0.49	0.500
Age 15-25	0.12	0.324	0.08	0.275	0.11	0.308
Age 26-35	0.25	0.432	0.22	0.414	0.25	0.433
Age 36-40	0.29	0.452	0.27	0.443	0.27	0.445
Age 46-55	0.24	0.428	0.28	0.447	0.23	0.424
Age 56-65	0.09	0.291	0.14	0.345	0.12	0.329
Age over 65	0.01	0.107	0.02	0.123	0.01	0.117
Graduate	0.28	0.451	0.36	0.479	0.58	0.493
KLEMS 1, NACE A	0.02	0.147	0.02	0.126	0.01	0.094
KLEMS 2, NACE B, D & E	0.02	0.151	0.02	0.138	0.03	0.165
KLEMS 3, NACE C	0.17	0.374	0.16	0.364	0.14	0.343
KLEMS 4, NACE F	0.06	0.232	0.06	0.234	0.06	0.229
KLEMS 5, NACE G	0.14	0.343	0.14	0.352	0.12	0.322
KLEMS 6, NACE H, I & J	0.11	0.307	0.14	0.346	0.15	0.358
KLEMS 7, NACE K & L	0.04	0.194	0.04	0.187	0.06	0.234
KLEMS 8, NACE M & N	0.06	0.239	0.09	0.289	0.11	0.307
KLEMS 9, NACE S	0.05	0.221	0.03	0.164	0.02	0.138
KLEMS 10, NACE O	0.09	0.282	0.07	0.251	0.08	0.273
KLEMS 11, NACE P	0.12	0.320	0.10	0.303	0.11	0.312
KLEMS 12, NACE Q	0.12	0.320	0.12	0.329	0.11	0.313
KLEMS 13, NACE R	0.02	0.132	0.02	0.123	0.02	0.142
ISCO 0, Armed Forces			0.00	0.062	0.01	0.073
ISCO 1, Managers			0.05	0.210	0.11	0.312
ISCO 2, Professionals			0.20	0.400	0.32	0.467
ISCO 3, Tech & Assoc Prof			0.14	0.343	0.17	0.373
ISCO 4, Clerical & Supp			0.11	0.314	0.11	0.309
ISCO 5, Service & Sales			0.21	0.406	0.12	0.322
ISCO 6, Skilled Ag, F&F			0.01	0.096	0.01	0.071
ISCO 7, Craft & Trades			0.11	0.319	0.07	0.257
ISCO 8, Plant & Machine			0.07	0.262	0.05	0.215
ISCO 9, Elementary			0.09	0.293	0.05	0.209
ISCO Missing			0.00	0.035	0.00	0.000
N	15,270		19,138		18,535	

Table A5: Contribution of Job Quality Characteristics and Weights to Changes in Job Quality Scores (Wellbeing & Productivity) for 2005 to 2015

	Job Quality (Wellbeing)				Job Quality (Productivity)			
	ΔChar[a]	Dom[b]	Total JQS Change[d]	Rank	ΔChar[a]	Dom[c]	Total JQS Change[e]	Rank
Useful Work	-0.0241	0.0021	-5.0674E-05	21	0.0241	0.0142	3.4361E-04	12
Work Well Done	0.0106	0.0108	1.1448E-04	19	0.0106	0.0298	3.1560E-04	13
Effort Rewarded	0.1179	0.0799	9.4217E-03	1	0.1179	0.0696	8.2047E-03	2
Noise	0.0152	0.1297	1.9692E-03	4	-0.0152	0.0091	-1.3758E-04	17
Painful/Tiring	0.0043	0.2033	8.6738E-04	8	0.0043	0.0663	2.8305E-04	14
Carrying	-0.0017	0.0543	-9.1305E-05	20	0.0017	0.0256	4.2990E-05	22
Rep Tasks	0.0057	0.0415	2.3506E-04	16	-0.0057	0.0146	-8.2487E-05	20
Using Chems	-0.0120	0.037	-4.4342E-04	14	-0.0120	0.0366	-4.3826E-04	11
Bullying	0.0158	0.0557	8.7937E-04	7	0.0158	0.0019	3.0656E-05	24
Colleagues Sup	0.0119	0.0012	1.4339E-05	24	0.0119	0.0032	3.8670E-05	23
Manager Support	-0.0312	0.0075	-2.3407E-04	17	-0.0312	0.0029	-9.0901E-05	19
Long Hours	0.0134	0.0412	5.5023E-04	12	0.0134	0.0356	4.7542E-04	10
Night Work	-0.0070	0.0347	-2.4286E-04	15	0.0070	0.0068	4.7565E-05	21
Work/Life Bal	0.0228	0.0991	2.2626E-03	3	0.0228	0.0123	2.8078E-04	15
High Speed	-0.0210	0.0375	-7.8899E-04	9	0.0210	0.0570	1.1984E-03	8
Tight D/lines	-0.0225	0.0297	-6.6960E-04	10	0.0225	0.0466	1.0507E-03	9
Use Computer	0.0821	0.0192	1.5770E-03	5	0.0821	0.1770	1.4540E-02	1
Rec Training	-0.0874	0.0134	-1.1706E-03	6	0.0874	0.0495	4.3254E-03	4
On-Job Training	-0.0603	0.0108	-6.5142E-04	11	0.0603	0.0553	3.3379E-03	5
Auton: Method	0.0121	0.0025	3.0282E-05	23	-0.0121	0.1482	-1.7954E-03	6
Prospects	0.0887	0.0407	3.6091E-03	2	-0.0887	0.0502	-4.4481E-03	3
Might Lose Job	-0.0147	0.0327	-4.7994E-04	13	0.0147	0.0142	2.0900E-04	16
Perm Contract	-0.0231	0.0101	-2.3360E-04	18	-0.0231	0.0589	-1.3623E-03	7
Fixed Contract	0.0078	0.0056	4.3583E-05	22	-0.0078	0.0146	-1.1334E-04	18
Total			0.0165				0.0281	

Notes: **a** are taken from the penultimate column of Table 5a. In the case where the job quality characteristic is negatively correlated with wellbeing and productivity, as shown in Table 3, the sign of the job characteristic change is reversed, to ensure a correctly signed contribution to the overall change in JQS. **b** these are the weights taken from the third column of Table 3. **c** these are the weights taken from the eighth column of Table 3. **d** is column 1 multiplied by column 2. **e** is column 5 multiplied by column 6.

Table A6: Contribution of Job Quality Characteristics and Weights to Changes in Job Quality Scores (Wellbeing & Productivity) for 2015 to 2021

	Job Quality (Wellbeing)				Job Quality (Productivity)			
	ΔChar[a]	Dom[b]	Total JQS Change[d]	Rank	ΔChar[a]	Dom[c]	Total JQS Change[e]	Rank
Useful Work	-0.0287	0.0021	-6.0202E-05	23	0.0287	0.0142	4.0821E-04	19
Work Well Done	0.0416	0.0108	4.4962E-04	18	0.0416	0.0298	1.2395E-03	14
Effort Rewarded	0.0991	0.0799	7.9155E-03	3	0.0991	0.0696	6.8930E-03	7
Noise	-0.1220	0.1297	-1.5822E-02	2	0.1220	0.0091	1.1054E-03	15
Painful/Tiring	-0.1252	0.2033	-2.5461E-02	1	-0.1252	0.0663	-8.3088E-03	5
Carrying	-0.0764	0.0543	-4.1492E-03	9	0.0764	0.0256	1.9536E-03	12
Rep Tasks	-0.1460	0.0415	-6.0583E-03	6	0.1460	0.0146	2.1260E-03	11
Using Chems	-0.0972	0.037	-3.5946E-03	10	-0.0972	0.0366	-3.5528E-03	10
Bullying	-0.0091	0.0557	-5.0485E-04	17	-0.0091	0.0019	-1.7600E-05	24
Colleagues Sup	-0.0693	0.0012	-8.3169E-05	21	-0.0693	0.0032	-2.2430E-04	21
Manager Support	0.1112	0.0075	8.3379E-04	16	0.1112	0.0029	3.2380E-04	20
Long Hours	-0.0354	0.0412	-1.4574E-03	13	-0.0354	0.0356	-1.2593E-03	13
Night Work	-0.1609	0.0347	-5.5833E-03	7	0.1609	0.0068	1.0935E-03	16
Work/Life Bal	0.0029	0.0991	2.8308E-04	19	0.0029	0.0123	3.5128E-05	23
High Speed	-0.1341	0.0375	-5.0293E-03	8	0.1341	0.0570	7.6389E-03	6
Tight D/lines	-0.1167	0.0297	-3.4657E-03	11	0.1167	0.0466	5.4380E-03	8
Use Computer	0.3706	0.0192	7.1152E-03	5	0.3706	0.1770	6.5601E-02	1
Rec Training	-0.0824	0.0134	-1.1037E-03	15	0.0824	0.0495	4.0782E-03	9
On-Job Training	-0.1508	0.0108	-1.6288E-03	12	0.1508	0.0553	8.3460E-03	4
Auton: Method	-0.0646	0.0025	-1.6152E-04	20	0.0646	0.1482	9.5762E-03	2
Prospects	0.1794	0.0407	7.3027E-03	4	-0.1794	0.0502	-9.0004E-03	3
Might Lose Job	0.0432	0.0327	1.4120E-03	14	-0.0432	0.0142	-6.1488E-04	17
Perm Contract	-0.0075	0.0101	-7.5694E-05	22	-0.0075	0.0589	-4.4142E-04	18
Fixed Contract	0.0067	0.0056	3.7452E-05	24	-0.0067	0.0146	-9.7397E-05	22
Total			-0.0489				0.0948	

Notes: **a** are taken from the penultimate column of Table 5b. In the case where the job quality characteristic is negatively correlated with wellbeing and productivity, as shown in Table 3, the sign of the job characteristic change is reversed, to ensure a correctly signed contribution to the overall change in JQS. **b** these are the weights taken from the third column of Table 3. **c** these are the weights taken from the eighth column of Table 3. **d** is column 1 multiplied by column 2. **e** is column 5 multiplied by column 6.

Figure A1: Average Job Quality Scores by Gender and Age Group in 2021

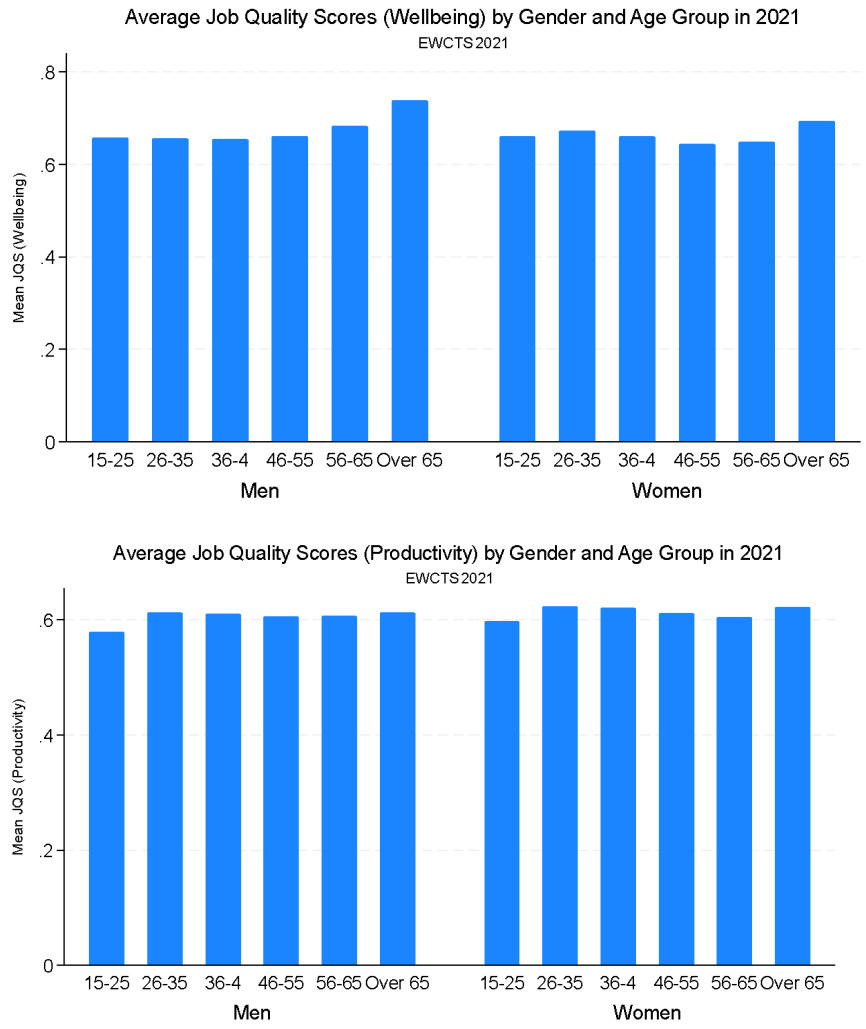
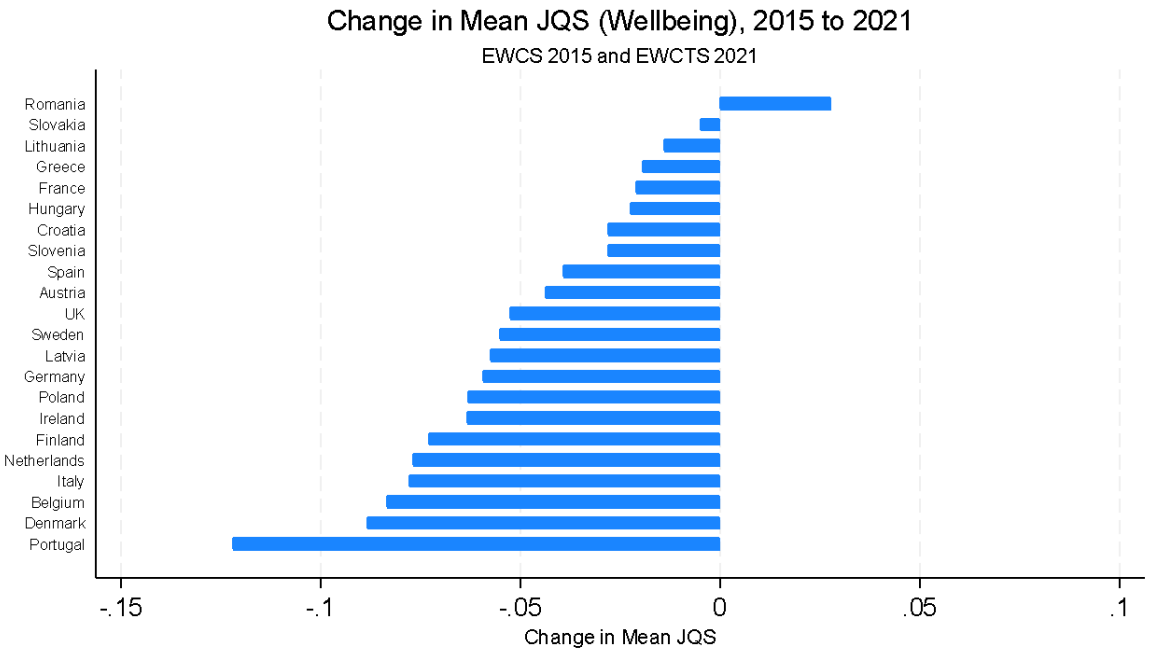
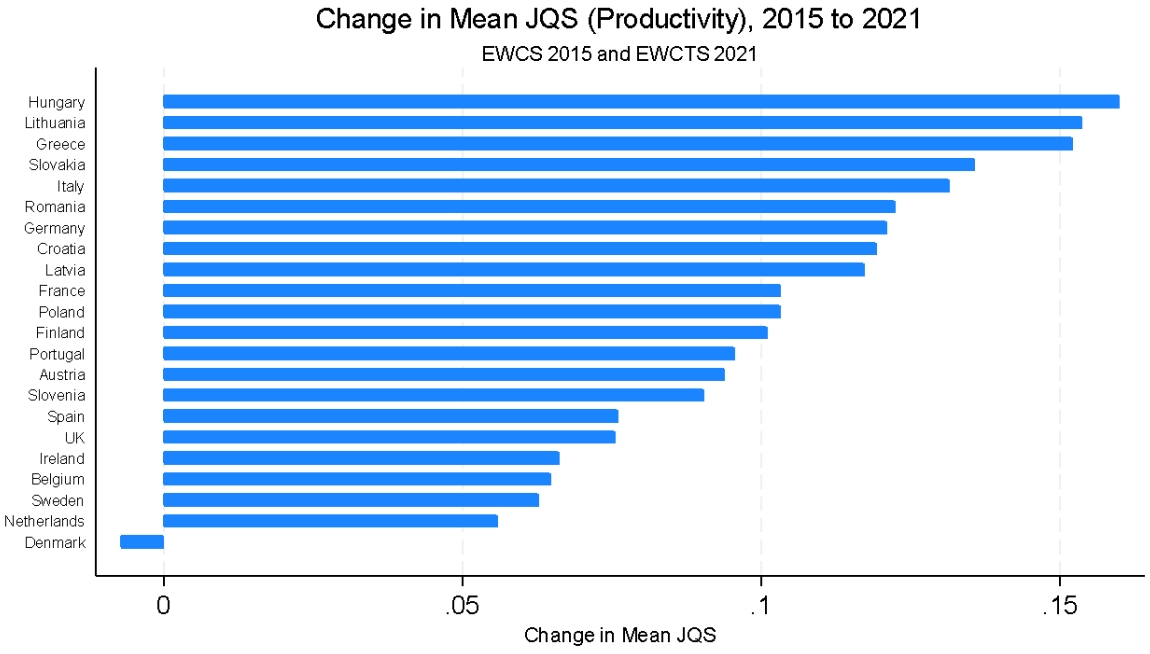


Figure A2: Changes in Job Quality Scores by Country, 2015-2021

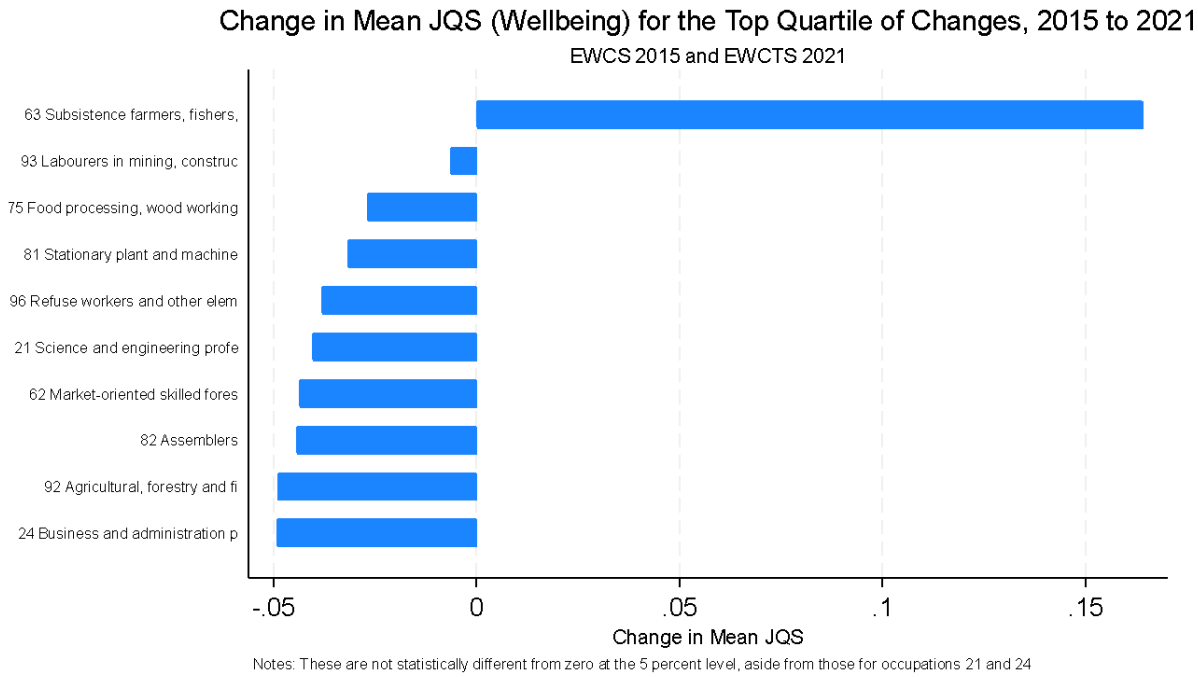


Notes: These are all statistically significant at the 5 percent level, aside from those for Greece, Hungary, Lithuania and Slovakia



Notes: These are all statistically significant at the 5 percent level, aside from that for Denmark

Figure A3 (a) Detailed Occupations for Top and Bottom Quartile of Changes in JSQ (Wellbeing)



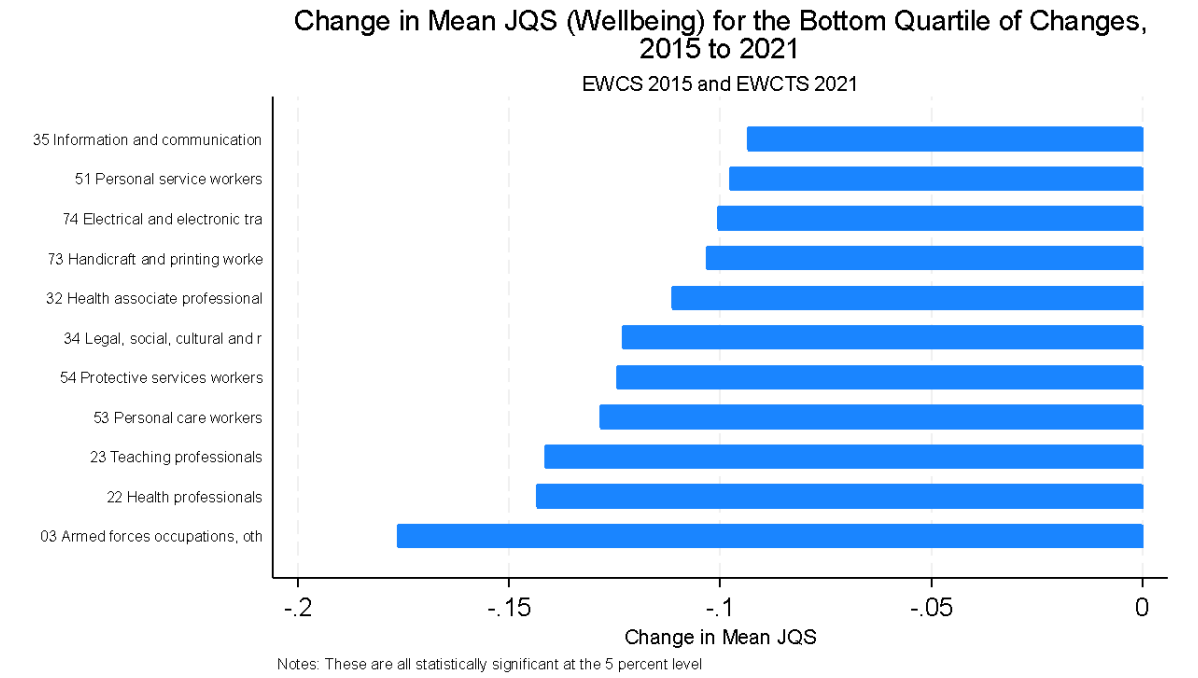
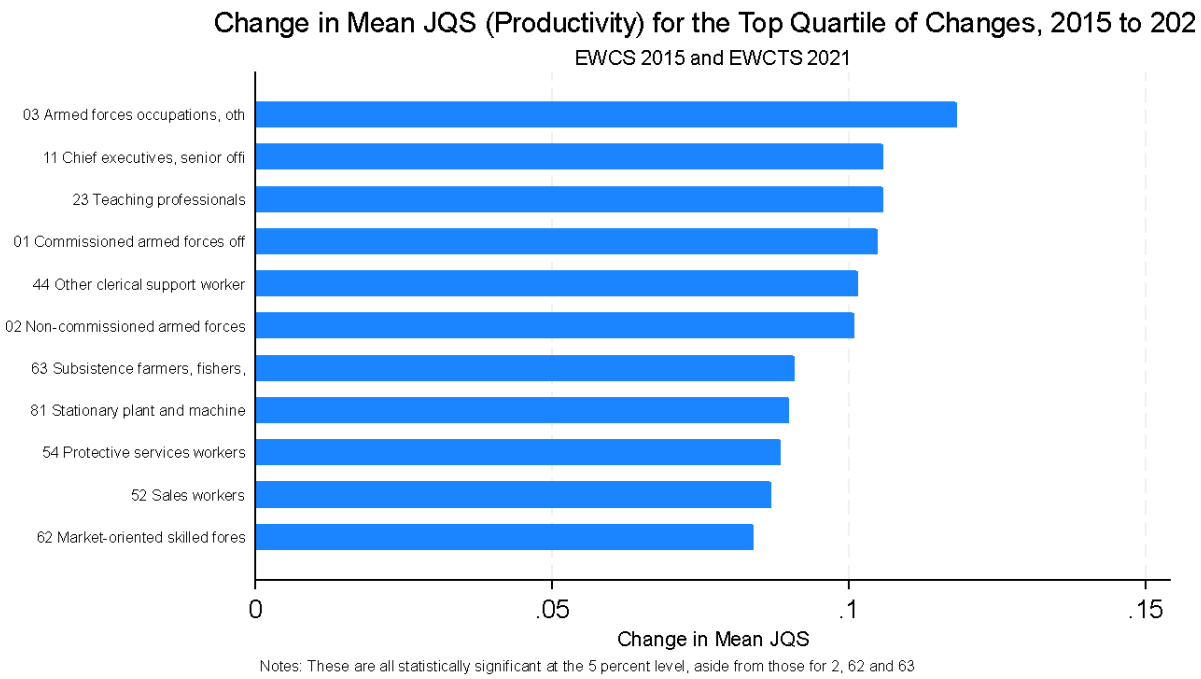
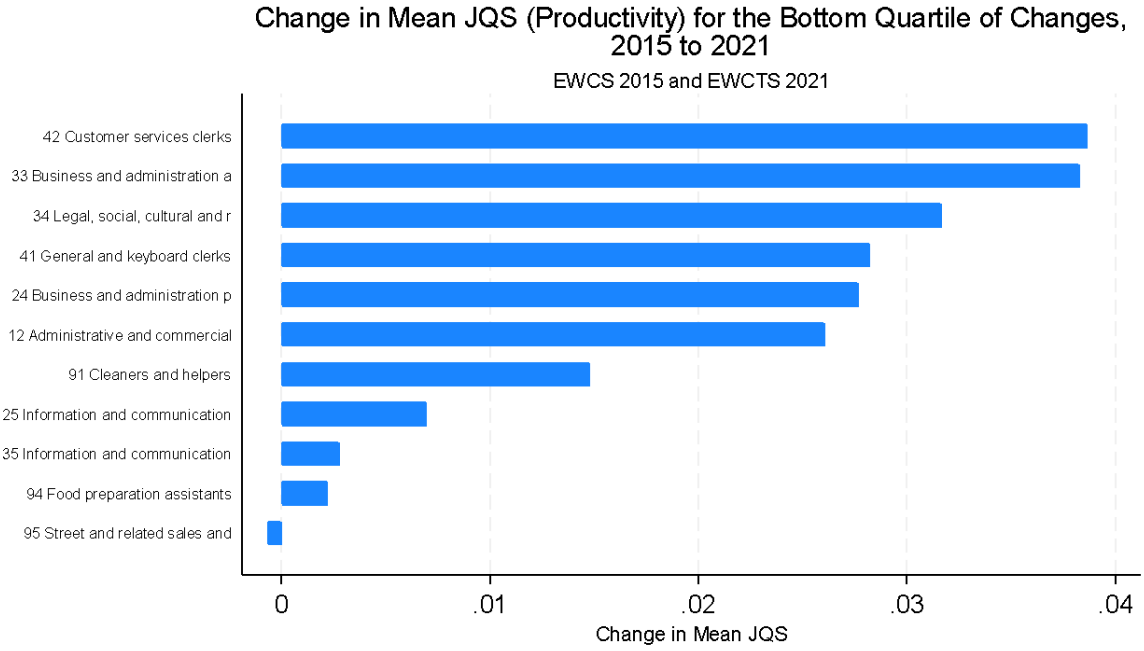


Figure A3 (b) Detailed Occupations for Top and Bottom Quartile of Changes in JSQ (Productivity)



Notes: These are all statistically significant at the 5 percent level, aside from those for 2, 62 and 63



Notes: These are all statistically significant at the 5 percent level, aside from those for 25, 35, 91, 94 and 95

References

Acemoglu, D. and Autor, D., 2011. Skills, tasks and technologies: Implications for employment and earnings. In *Handbook of Labor Economics* (Vol. 4, pp. 1043-1171). Elsevier.

Akerlof, G. (1984). Gift Exchange and Efficiency-Wage Theory: Four Views. *The American Economic Review*, *74*(2), 79-83.

Autor, D.H. (2013). The "Task Approach" to Labor Markets: An Overview. *Journal for Labour Market Research*, *46*(3), pp.185-199.

Autor, D.H., Levy, F. and Murnane, R.J. (2003). The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics*, *118*(4), pp.1279-1333.

Bartik, A. W., Cullen, Z. B., Glaeser, E. L., Luca, M., and Stanton, C. (2020). What Jobs Are Being Done at Home During the COVID-19 Pandemic? Working Paper 27422. National Bureau of Economic Research.

Card, D. and DiNardo, J.E. (2002). Skill-biased technological change and rising wage inequality: Some problems and puzzles. *Journal of Labor Economics*, *20*(4), pp.733-783.

Chari, R., Chang, C.C., Sauter, S.L., Sayers, E.L.P., Cerully, J.L., Schulte, P., Schill, A.L. and Uscher-Pines, L., (2018). Expanding the Paradigm of Occupational Safety and Health: a New Framework for Worker Well-being. *Journal of Occupational and Environmental Medicine*, *60*(7), pp.589-593.

Clark, A. (2005). What Makes a Good Job? Evidence from OECD Countries. In S. Brazen, C. Lucifora and W. Salverda (eds.) *Job Quality and Employer Behaviour* (pp. 11-30). London: Palgrave Macmillan UK.

Eurofound (2012), Trends in Job Quality in Europe, Publications Office of the European Union, Luxembourg.

Eurofound (2017), Sixth European Working Conditions Survey – Overview report (2017 update), Publications Office of the European Union, Luxembourg.

Eurofound (2022), Working Conditions in the Time of COVID-19: Implications for the Future, European Working Conditions Telephone Survey 2021 series, Publications Office of the European Union, Luxembourg.

Felstead. A., Gallie, D. and Green, F. (2015) *Unequal Britain at Work*. Oxford University Press, Oxford, UK

Forth, J., Paczos, M., Davies, G. and Riley, R. (2020) The Impact of the National Living Wage on Businesses: Evidence from New Survey and Linked Datasets, Report to the low pay commission.

Gallie, D. and Zhou, Y., (2013). Job Control, Work Intensity, and Work Stress. In D. Gallie (ed.) *Economic Crisis, Quality of Work and Social Integration: The European experience*, pp.115-141. Oxford: Oxford Academic.

Graeber, D. (2018). *Bullshit Jobs: A Theory*. London: Penguin Random House.

Green, F., Felstead, A and Gallie, D. (2015). The Inequality of Job Quality. In A. Felstead., D. Gallie and F. Green (eds.) *Unequal Britain at Work*. Oxford: Oxford University Press.

Handel, M.J. (2025). Skill-biased technological change: a critical assessment. In *Handbook on Education and the Labour Market* (pp. 108-140). Edward Elgar Publishing.

Holman, D. and McClelland, C. R. (2011). Job Quality in Growing and Declining Economic Sectors of the EU, WALQING working paper 2011.3, Manchester University Press, Manchester.

Johnson, J. W. (2000). A Heuristic Method for Estimating the Relative Weight of Predictor Variables in Multiple Regression. *Multivariate Behavioral Research*, 35(1), 1-19.

Juhn, C., K. M. Murphy and B. Pierce (1993), "Wage Inequality and the Rise in Returns to Skill." *Journal of Political Economy*, 101(3), 410-442.

Kahneman, D. and Deaton, A., (2010). High Income Improves Evaluation of Life but not Emotional Well-being. *Proceedings of the National Academy of Sciences*, *107*(38), pp.16489-16493.

Katz, L.F. and Murphy, K.M. (1992). Changes in relative wages, 1963–1987: supply and demand factors. *The Quarterly Journal of Economics*, *107*(1), pp.35-78.

Magdelana, S., Wood, A. and Burchell, B. (2021) `Alienation Is Not 'Bullshit': An Empirical Critique of Graeber's Theory of BS Jobs.' *Work Employment and Society*, 36 (5), 816-840.

Manning, A. (2003). *Monopsony in Motion: Imperfect Competition in Labor Markets*. Princeton: Princeton University Press

Mondolo, J., (2022). The Composite Link Between Technological Change and Employment: A Survey of the Literature. *Journal of Economic Surveys*, *36*(4), pp.1027-1068.

Oaxaca, R. (1973). Male-Female Wage Differentials in Urban Labor Markets. *International Economic Review*. 14 (3): 693–709.

OECD (2017). *OECD Employment Outlook 2017*. Paris: Organisation for Economic Co-operation and Development.

Warhurst, C., Knox, A. and Wright, S., (2025). Developing a Standard Measure of Job Quality. *Work, Employment and Society*, Vol. 39(4), pp. 927–948.

Wiswall, M., & Zafar, B. (2018). Preferences for the Workplace, Investment in Humam Capital and Gender. *Quarterly Journal of Economics*, 133(1), 457-507.