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The Income and Consumption Effects of Covid-19 and the Role of Public Policy

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The Income and Consumption Effects of Covid-19 and the Role of Public Policy

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Abstract

This paper provides empirical evidence on how the labour market impacts of the covid-19 pandemic vary across workers' incomes, assets, characteristics and household structures in the UK. Using data from the UK Household Longitudinal Study, we find that less educated and young workers are most likely to be laid-off. This is particularly the case for females. Moreover, less educated workers tend to have low income and low assets, limiting their ability to maintain consumption in the face of reduced income. This is compounded at the household level by assortative partnering between workers with similar education levels. We analyse the source of these inequalities by relating employment outcomes to factors related occupational and industrial characteristics. We then conduct a quantitative assessment of the likely impact of covid-19 on households' consumption and find that, because the adverse labour market impacts are concentrated on workers with low income and low assets, 70 percent of households in the bottom fifth of the income distribution cannot maintain their usual expenditure for even one week. Finally, we consider the effectiveness and distributional implications of two different policy interventions: the Coronavirus Job Retention Scheme in the UK and Economic Impact Payments in the US. Our findings suggest that both policies can alleviate the increase in consumption inequality that would have otherwise arisen during the pandemic. In the short term, the US-style one-off payment is most effective at providing affected households with the means to smooth consumption. However, the CJRS provides better insurance against prolonged disruption as the program provides continuous income support.

Keywords: Covid-19, Consumption, Income, and Mitigation Policy

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1 Introduction

The covid-19 pandemic has created new and urgent challenges for public policy. Measures introduced to curtail the spread of the virus, including restrictions on work, travel and other aspects of daily life, come at potentially substantial economic costs. Importantly, many of these costs—especially the effects of labour market restrictions—may be borne unequally across members of society. Workers with jobs which are less amenable to be performed remotely, or in industries suffering the most significant reductions in demand, may be at greatest risk of experiencing income losses. The disparity in these risks could be amplified at the household level if spouses have similar jobs. And the inequalities in labour market disruption could contribute to widening inequalities in consumption, especially if the most affected households have least resources to cushion negative income shocks. Governments around the world have adopted a range of policies to mitigate these negative and unequal consequences. Understanding the potentially heterogeneous impacts of the pandemic, and identifying groups which are most exposed to disruption, iscrucial for designing policy responses and assessing their effectiveness.

In this paper, we use nationally representative real-time survey data from the the UK Household Longitudinal Study (UKHLS) to provide empirical evidence on the inequalities in labour market outcomes during the pandemic, across workers in the UK with different incomes, assets, characteristics and household structures. We analyse the source of these inequalities by relating employment outcomes to three factors, associated with different types of occupations and industries, which are likely to determine the extent of labour market disruption. First, workers in certain occupations may be at higher risk of infection due to close *physical proximity* at the workplace. Second, workers whose jobs have less *location flexibility* may be less able to continue working. Third, some workers may have greater *industry exposure* to reduced demand during the pandemic and face higher risk of being laid off due to businesses closing or scaling back operations. We estimate the contributions of these factors to the probabilities of three potential labour market outcomes during the pandemic: workers retaining their job, being furloughed, or being laid-off. We analyse the implications of these risks for both income and consumption taking into account assortative partnering and differences in households' assets. We then consider the effectiveness and distributional implications of two different policy interventions, modelled after the headline economic support packages in the UK and the US, to draw conclusions on the features of effective mitigation policy.

Our analysis focuses on the UK, which has imposed strict lockdown measures since late March. To provide support for workers at risk of job loss, the government introduced the Coronavirus Job Retention Scheme (CJRS) which pays 80 percent of usual income (up to a monthly cap) for workers who remain employed but are unable to work due to the pandemic. The scheme has

had substantial uptake, with 8.7 million jobs (over 30 percent of the workforce) supported by the scheme by 31 May 2020 (HMRC, 2020). A key objective of CJRS was to allow employees to remain at their firms during the pandemic. However, despite this, the UK has also experienced a spike in unemployment claims in addition to the workers furloughed on CJRS (ONS, 2020b), and there is evidence of businesses closing (ONS, 2020a).

We combine data from UKHLS with a supplemental covid-19 module to investigate the impacts of the pandemic on income and consumption in the UK, and to assess the extent to which the CJRS has mitigated these impacts.[1] Our analysis incorporates explicitly the roles of disruption to both labour supply and labour demand. We adopt measures of physical proximity and location flexibility of different occupations from Lekfuangfu et al. (2020),[2] and derive a measure of industry exposure to reduced demand from the economic impact survey conducted by ONS (2020a). We quantify the relationship between these ordinal indices and observed labour market outcomes. We then compare the effects of the UK's CJRS to an alternative relief program similar to the Economic Impact Payments in the US.

We find substantial variation in labour market outcomes across incomes, assets, and demographic characteristics. Lower earning workers are much more likely to be laid-off or furloughed than higher earning workers. The probability of being laid-off or furloughed is also decreasing in households' assets, although the differences across the asset distribution are smaller than they are over the income distribution. Less educated workers are more likely to be laid-off or furloughed than higher educated workers. Males and females are equally likely to experience some disruption to their normal work—however, among those with labour market disruption, females are more likely to be laid-off (rather than furloughed) than males. In terms of age groups, we find polarizing effects with those under 25 years old and those above 65 years most likely to experience labour market disruption.

Finally, we document differences in labour market outcomes across races. Black people have the highest probability of retaining their jobs, with 75 percent continuing to work as usual (compared with 67 percent of white people). Asian and mixed raced people are more than twice as likely as black people to be laid-off. At the household level, about 40 percent of white and Asian laid-off workers have their partners working or furloughed i.e. they still have some source of household's labour income. On the other hand, this number is lower for black and mixed race people, 34 and 27 percent, respectively.

More generally, at the household level the relationship between labour market impacts and income is qualitatively similar to the individual level, with higher income households less likely to

[1] The covid-19 module collected data on outcomes for UKHLS sample members in the last week of April.

[2] The location flexibility measure over 900 detailed occupations is consistent with real-time surveys from Adams-Prassl et al. (2020b) who provide evidence on variations in the share of tasks workers able to perform at home within and between broad category of occupations.

face disruption. However, while 23 percent of singles in the bottom fifth of the income distribution are laid-off, only 4 percent of couples have both partners laid-off. Instead, for the majority of couples in the bottom fifth of the distribution, at least one partner continues working or is furloughed onto the CJRS. This highlights the importance of partial insurance at the household level: the probability of both spouses being laid-off is low.

To understand sources of inequalities in the impact of the pandemic, we provide evidence that the unequal employment outcomes of workers may be driven by their occupational and industrial characteristics. At the individual level, lower earning workers are most likely to be in industries exposed to negative demand shocks during the pandemic, and also have less flexibility to work remotely. Similarly, low educated workers are most exposed to both labour supply and demand disruption—this is also the case for the youngest and oldest workers. Female workers, regardless of their education level, are more likely to be in jobs requiring more physical proximity than their male counterparts. However, physical proximity varies only modestly over types of workers and across the distributions of earnings and assets.

At the household level, the average degree of work flexibility rises substantially in the top half of the income distribution and the average degree of industry exposure to demand shocks declines. These risks are also highly correlated between spouses, particularly among low income households—and so the lowest income households are least able to self-insure against the labour market impacts of the pandemic. The degree of work flexibility of the household head (defined as the highest earner) is substantially lower for households with least liquid wealth, while the degree of industry exposure is slightly higher. Households at the bottom of both the income and asset distributions are therefore most at risk from both supply and demand disruption to their work caused by covid-19.

We confirm the above arguments by estimating a probit model of employment outcomes (either working, furloughed or separated) on the physical proximity, location flexibility and industry exposure of a worker's job. We find that all three factors matter for the likelihood of a worker being laid-off, but only location flexibility and industry exposure are key predictors for continuing to work or being furloughed. While the effects of location flexibility and industry exposure on the probability of remaining employed are similar, the effect of industry exposure on the probability of being furloughed is twice as large as the effect of location flexibility. This suggests that the firm's decision about whether to temporarily furlough its workers depends crucially on the industry outlook.

We then conduct a quantitative analysis of the potential impacts of the covid-19 pandemic on the incomes and consumption in the UK, given the support provided by the CJRS policy. There are three main findings. First, lower income households experience a larger proportionate income reduction than those further up the income distribution. This reflects their higher exposure to labour

market risks: they are more likely to work in the industries most badly affected by the pandemic, and in occupations with less flexibility to work from home, than households with higher income.

Second, we show that, despite the support provided by CJRS, the reduction in labour income leads to a shortfall between income and required expenditure for lower income households. In addition to the larger income reduction for lower income households, this reflects that (1) lower income households have a smaller buffer between usual income and expenditure, and so are less able to absorb an income reduction, and (2) higher income households are likely to make greatest savings during the pandemic, as they usually spend more on categories most affected by lockdown policies (like restaurants, leisure activities and travel).

Third, we consider households' ability to maintain expenditure using liquid assets. We show that around 70 percent of households who experience a shortfall between income and expenditure have insufficient assets to maintain expenditure for even one week. This means that the widening income-expenditure gap resulting from the pandemic is likely to lead many affected households to reduce expenditure, while the unaffected (higher income) households can maintain their spending. Therefore the inequalities in the labour market effects of the pandemic are also likely to widen inequalities in consumption.

We finally compare the relative effectiveness of CJRS adopted in the UK to a very different mitigation measure, modelled after the headline policy response in the US. Compared with the CJRS, which supports the incomes of workers who cannot continue to work during the pandemic, US policy provides a one-off payment to all tax-filing households. We find that a similarly-sized payment in the UK would be better at helping households to maintain usual expenditure in the short term. This highlights the value of providing liquidity to the most affected households, particularly as these have disproportionately low income (with only a small buffer between usual income and expenditure) and low wealth. However, over longer periods of labour market disruption, the effectiveness of the UK's CJRS relative to the US-style payments increases. This is mainly driven by the fact that the CJRS provides continuous income support for workers (and so, over longer periods, is a more generous policy than the one-off payment). And this continuous income support also means fewer households need to make large consumption reductions under CJRS than under US-style payments (which eventually run out).

While we focus attention on the likely short-term effects of policy during the pandemic, we note that the UK and US-style policies may also differ in their longer-term distributional consequences. A key motivation behind the design of the UK's CJRS was to keep workers with their existing employer, both to allow workers to re-enter the labour market easily when the restrictions on working lifted and to prevent firms from losing workers with job-specific human capital. While it is not yet possible to assess the effectiveness of the CJRS in achieving this objective, supporting existing employment relationships is likely to generate important longer-term benefits.

This paper is closely related to work studying heterogeneity in labour market impacts of lockdown measures. Most existing work uses occupational characteristics from the Occupational Information Network (O*NET) to study the potential effects of covid-19 on labour supply and focuses on income losses. Hicks et al. (2020) studies degree of physical proximity and Dingel and Neiman (2020) analyse work location flexibility, while Lekfuangfu et al. (2020) and Mongey et al. (2020) consider the interaction between these two factors. del Rio-Chanona et al. (2020) provide a quantitative prediction of both supply and demand across wage levels.[3] However, the relationship between these ordinal indices of occupational characteristics and labour market disruption during the pandemic remains unstudied, making it difficult to understand the implications of differences in the indices for outcomes.

Using real-time and nationally representative survey data from the UKHLS, we contribute to the literature in three ways. First, we provide empirical evidence on heterogeneity in labour market disruption of workers during the pandemic. Our findings are consistent with Adams-Prassl et al. (2020a) who provide survey results that less educated workers and women are more affected.[4] However, in addition to gender and education, we also analyse impact differentials by incomes, assets, various demographics and household structures. Second, we introduce measure of changes in labour demand using survey data on the impact of covid-19 on businesses from ONS (2020a), and quantify the relationship between labour supply and demand related factors and labour market outcomes. Third, we analyse the implications of the pandemic on consumption in addition to income, as this may better reflect the true impact on household welfare and resources (Poterba, 1989; Cutler, 1992).

Our framework is also related to the literature on household risk sharing and consumption (e.g. Attanasio et al., 2002; Heathcote et al., 2014; Blundell et al., 2008). These papers point to the role of family labour supply as partial insurance for consumption against income shocks. While assortative sorting between partners could widen the inequality in labour market risks induced by covid-19 across households, we show that couples are less affected by the pandemic than singles. This is because correlation in the income shocks between spouses is imperfect, providing for some partial insurance against the income reductions within the household. However, the correlation between spouses' labour market risks is highest for lower income households, meaning that these lower income households are least able to insure themselves against labour market disruption from the pandemic.

Overall, this paper highlights the importance of differences in households' ability to cushion negative income shocks. The framework sheds light on features of effective pandemic-mitigation

[3] Their measure of work flexibility is derived similarly to Dingel and Neiman (2020), and the measure of demand shocks is based on pre-covid-19 estimates of an influenza pandemic.

[4] Additionally, Adams-Prassl et al. (2020a) document that workers in occupations which are less amendable to be done from home are more likely to experience reduction in earnings or lost their jobs.

policy design. Our results suggest that, to effectively reduce the negative and uneven consequences of covid-19 on household welfare, it is important to both provide short-term liquidity (as the most affected households also have the lowest means to smooth consumption) and, in the longer term provide a combination of income and employment support. This is particularly the case as laid-off workers tend to be low educated and female, both groups with relatively low labour force attachment even before the crisis.

The rest of the paper is organised as follows: Section 2 presents an overview of the data. Section 3 analyses the three measures of labour market risk across income and assets at the individual and household levels. Section 4 considers the implications of these factors on households' income and consumption. Section 5 compares the likely effect of different mitigating policies and section 6 concludes.

2 Data Overview

We combine information from two sources for our analysis. Our main data are drawn from the UK Household Longitudinal Study (UKHLS), a nationally representative annual longitudinal survey of individuals in the UK. We focus on the most recent wave of the survey (wave 9), which contains data collected in 2017 and 2018, merge in detailed data on liquid assets from a specialist survey module administered during in 2016 and 2017 (in wave 8). We use additional information on labour market outcomes during the pandemic (as measured in the last week of April) from the UKHLS supplemental covid-19 module. This supplemental module contains information on various outcomes such as employment, earnings, health status and time allocations.

Throughout the analysis, we focus on individuals who are employed or self-employed over the age of 16 at the time of their wave 9 interview. We define occupations using the three-digit Standard Occupation Classification (SOC) codes of their current main job, and similarly define industries using top-level Standard Industrial Classification (SIC) codes.[5] We construct two measures of income. First, we define earnings as labour income in the month before the individual was interviewed in wave 9, net of taxes and national insurance contributions.[6] Second, we define total income which adds to earnings any benefit payments or income from investments, pensions, or other sources (such as from a family member). Additionally, we construct a measure of liquid assets, defined as the sum of savings and the value of any funds held in investment accounts. This is intended to reflect assets the individual can access at short notice, and without incurring substantial cost, to smooth consumption.[7]

[5] Specifically, we use the SOC 2010 and the SIC 2007 classification systems.

[6] This includes usual pay from their main job, pay from any second jobs, and profits (or losses) from self-employment.

[7] We also considered a measure of non-volatile liquid assets, which excludes assets held in investment accounts.

Our main sample from the UKHLS also includes measures of household expenditure on a small set of essential items.[8] However, to provide a more complete picture of household spending, we impute measures of total household expenditure into UKHLS using highly detailed data on household spending drawn from the 2017-18 Living Costs and Food Survey (LCFS).[9] We follow a similar imputation procedure as in Blundell et al. (2008). In all of our analysis, we apply weights to ensure the sample is representative of the UK population.

Finally, we drop individuals who are out of work, did not provide data on assets in wave 8, or missing information about industry exposure. Our sample contains 13,225 residents in 9,639 households. We provide more details on UKHLS, definitions of variables, descriptive statistics as well as details on expenditure imputation using LCFS in Online Appendix A.

3 Labour Market Impacts of Covid-19

The pandemic has disrupted labour markets along multiple dimensions. First, workers in certain occupations are at higher risk of infection and transmission due to close physical proximity to other people at workplace. Second, workers whose jobs are not adaptable to work from home may be forced to reduce labour supply and consequently face a higher risk of income losses. Third, workers in industries experiencing a bigger decrease in demand during the lockdown, such as accommodation and food services, may be more likely to be laid off due to businesses closing or scaling back operations. Given worker heterogeneity across occupations and industries, the impacts are likely to be uneven. In section 3.1, we first examine the distribution of labour market outcomes at the individual level by incomes, assets and demographics. Given the role of assortative partnering and risk sharing between spouses, we then extend our analysis to households.

In section 3.2, we analyse the source of different labour market outcomes. We relate observed outcomes to three potential labour market risks.[10] The first two risks pertain to occupational characteristics that may lead to labour supply disruption during the pandemic. These include the physical proximity and location flexibility factors which have been extensively used as predictors of expected labour market impacts of covid-19 in a number of papers.[11] The third risk is associated

None of our main findings is substantially affected by the choice of measure.

[8] These include spending on food, alcohol and tobacco, utility bills and rent or mortgage payments.

[9] LCFS is the UK equivalent of the Consumer Expenditure Survey in the US. It is used by the UK Office for National Statistics to compile national statistics on household final consumption expenditure, as well as to provide item-level weights for national price indices.

[10] The labour market risks considered in this paper are most relevant for currently employed workers. Beyond the scope of this paper, there are other risks such as job finding risk for unemployed workers as a result of firms reducing vacancy positing during the lockdown (Costa Dias et al., 2020) or fewer new firms entering the market (Sedlacek and Sterk, 2020), and risks of income reductions for the economically inactive e.g. pensioners (Crawford and Sturrock, 2020).

[11] For example, Dingel and Neiman (2020) for the location flexibility factor and Hicks et al. (2020) for the physical

with reduced labour demand due to businesses closing or downsizing. We estimate the effects of these three factors on observed labour market outcomes using a discrete choice model.

3.1 Labour Market Outcomes

We use data from the UKHLS covid-19 module to study the labour market impacts of the pandemic. In addition to labour market status in April 2020, sample respondents were asked to provide a recent 'baseline' employment status—specifically, their status in February 2020. We focus on three types of labour market transitions between the baseline and April 2020. The first consists of those who were working both at the baseline and in April. The second consists of those who were working in the baseline but were furloughed on the CJRS in April. This second group of workers are entitled to receive 80 percent of their usual income (up to a monthly cap). The third groups together all those who were working at the baseline but are not in April. This may include both those who leave their job voluntarily alongside those who are laid off. However, since quits and layoffs have the same implications for labour income, we do not distinguish between them in our analysis.[12]

Figure 1 shows the fractions of these three outcomes across different workers' time-invariant characteristics. Figure 1.a displays the three outcomes by race in the left panel and by gender and education level in the right panel.[13] The left panel shows that black people are most likely to have kept their jobs (75 percent) and least likely to have been laid off (8.1 percent). This may be because a high proportion of black people are essential workers (Platt and Warwick, 2020). On average, around 20 percent of workers in each race are furloughed except for Asian people who are only half as likely to be furloughed. However, Asian and mixed race people are almost three times more likely than black people to be laid off. In the right panel, we show that low educated workers are more adversely affected than high educated workers regardless of their gender.

Figure 1.b plots the three outcomes by individuals' time-variant characteristics, specifically their location (left panel) and age group (right panel). The left panel shows little variation in outcomes across locations except for London which has the highest fraction of workers remaining in their jobs. The right panel reveals polarizing impacts across age groups. The youngest (under 25 years old) and the oldest (over 65 years old) are much more likely than other age groups to experience labour market disruption. Additionally, we find that immigrants (defined as those born outside the UK) are more likely to be laid off or furloughed than natives, and workers in rural areas

proximity factor.

[12]The covid-19 supplementary sample provides variables indicating whether the worker was laid-off. However, due to a number of missing responses to these variables, we decide to simply group all transitions out of work together.

[13]We treat education as being time invariant for the purposes of this study. Of course, over longer time horizons, workers may obtain more education.

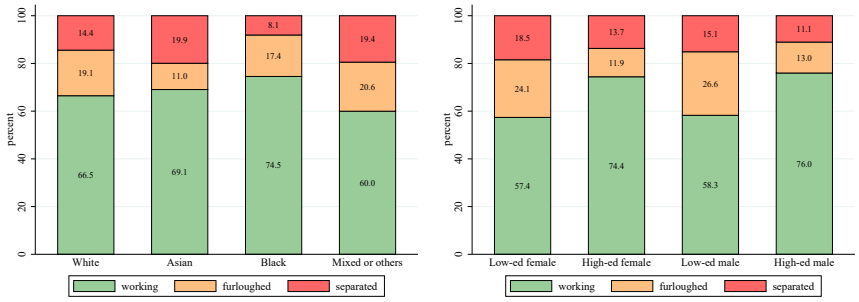
are, on average, slightly more affected than those in urban areas (see the top panel of Figure A.1 in the appendix).

Figure 1.c examines how these outcomes vary by individuals' incomes (left panel) and assets (right panel). The left panel shows that lower-income workers are much more affected than those with higher incomes. And workers with lower assets are also more likely to be furloughed or laid-off (although the variation over the asset distribution is less pronounced than over incomes). Finally, Figure 1.d shows the distribution of impacts at the household level by the income quintile of household heads. The left panel shows the distribution of labour market impacts for singles and the right panel shows the same distribution for couples. The relationship between labour market risk and income is qualitatively similar at the household level as it is at the individual level. While 23 percent of singles in the bottom fifth of the income distribution are laid-off, only 4 percent of couples have both partners laid-off. Instead, for the majority of couples in the bottom fifth of the distribution, at least one partner continues working or is furloughed onto the CJRS. Additionally, the bottom panel of Figure A.1 in the appendix shows variation in household impact across races. We find that 40 percent of white and Asian laid-off workers still have their partners working or furloughed, while this number is lower for black and mixed race people, 34 and 27 percent, respectively. This highlights the importance of partial insurance at the household level: the probability of both spouses being laid-off is low.

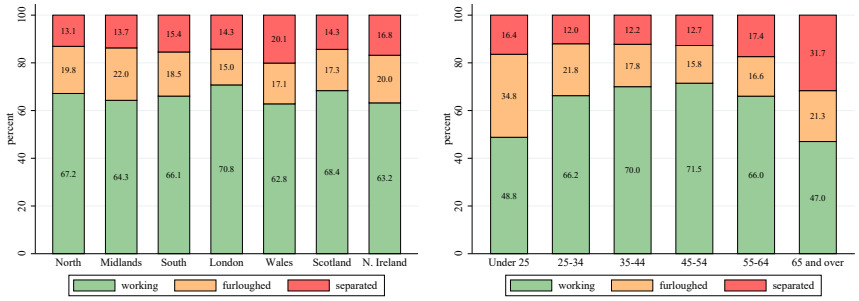
Overall, these plots provide compelling evidence that workers at the bottom of both the earnings and asset distributions are more affected from disruption to their work caused by covid-19, particularly for singles who have no risk sharing within the household. This is likely to have important implications for their ability to smooth consumption in the face of any reduction in labour income. We return to this point explicitly in section 4 and quantify its likely implications for consumption.

Figure 1: Heterogeneity in labour market outcomes

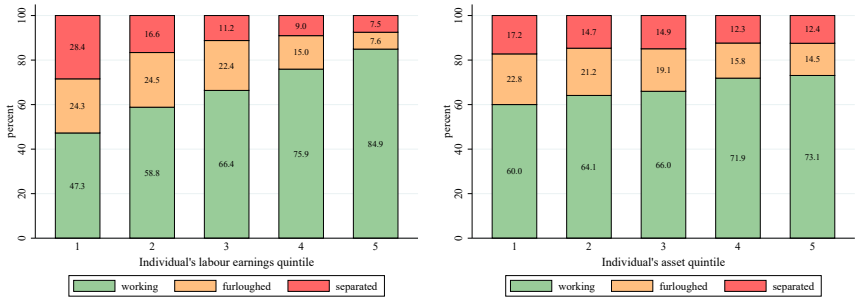
(a) Race (left) and gender-education (right)



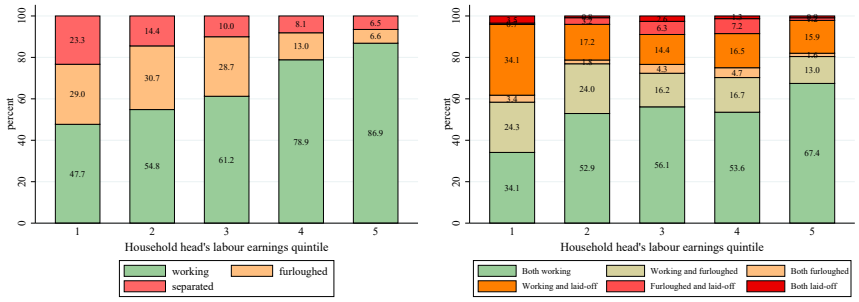
(b) Location (left) and age group (right)



(c) Earnings (left) and assets (right)



(d) Singles (left) and couples (right)



Notes: High education is defined as having a university degree or higher. Subfigures a-c include employed workers in the baseline period of the covid-19 supplementary sample. The right panel of subfigure d includes households with partners living together. Household head defined as the highest earning partner, and household head's labour earnings quantile is calculated from the unconditional individual earnings distribution, comparable to the individual-level labour income quantiles in subfigure c.

3.2 Sources of Outcome Differential

To analyse factors driving differences in labour market outcomes shown in the previous section, we focus on three sources of labour market risk. For the first two risks, we adopt the physical proximity and location flexibility factors from Lekfuangfu et al. (2020) who construct these pandemic-related indices from the Occupational Information Network (O*NET) using factor analysis (see Lekfuangfu et al. (2020) and Online Appendix B for more details). The indices provide continuous measures of the location flexibility and physical proximity for each of 900 detailed occupation classifications, allowing for the possibility that these features are unlikely to be binary as in Dingel and Neiman (2020). For our third measure of labour market risk, we construct an index for industry exposure based on the economic impact survey of ONS (2020a). We use the percentage of businesses reporting to have temporarily closed in each industry, defined by its top-level SIC code, as an indicator of negative demand shock exposure (see Table A.4 in Appendix 6).[14] The measures of all three factors are standardised to have mean zero and standard deviation one.[15] We show the distribution of occupation-industry pairs in our data across two of these factors—industry exposure and location flexibility—in Figure 2.[16]

We first present some descriptive to motivate our focus on these three factors. As seen in Figure 1, the labour market impacts vary considerably across age groups, incomes and assets. Unconditional on income, youngest and oldest groups are the most vulnerable, while low-income and low-assets workers in general appear to be more affected.

The top panel of Figure 3 shows how each of the three risks varies across age groups, conditional on gender and education level. While there is not much variation in physical proximity factor by age, the degree of location flexibility and industry exposure exhibit a U-shape and inverse U-shape, respectively. This implies that youngest and oldest workers may be more adversely affected by the pandemic due to the inflexibility of their jobs and demand disruption within their industries. And these undesirable characteristics of occupations and industries are also more prevalent among low educated workers across all age groups.

The middle panel of Figure 3 shows similar measures across earnings deciles at the individual level. In these figures, the marker size reflects the number of workers of that gender and education group in each decile. First, Figure 3.a displays the degree of physical proximity across earnings. Female workers, regardless of their education level, tend to be in jobs that require more physical

[14] Due to some industries having an insufficient number of firms responding to the ONS survey, this measure is available for only 12 of 21 top-level SIC codes, representing 82 percent of the UK workforce. We have dropped individuals whose industry is missing from the ONS survey from our analysis.

[15] Specifically, the measures have mean zero and standard deviation one across unweighed occupations and industries. The measures may not have mean zero and standard deviation one at the level of the UK population, owing to different employment shares across industries and occupations.

[16] We choose these two factors for the purposes of Figure 2 as they are the ones we find to have the strongest association with labour market outcomes in our multinomial probit model below.

proximity at the workplace than their male counterparts. And workers in the top earnings decile are in occupations that require slightly less physical proximity than those with lower earnings, especially for females. But, overall, physical proximity varies only modestly across the earnings distribution and over types of workers.

On the other hand, the degree of location flexibility and industry exposure vary substantially across the earnings distribution. Figure 3.b shows that lower earning workers are most likely to be in industries that are exposed to negative demand shocks during the pandemic. Male workers with low education are particularly exposed to industrial demand shocks across the earnings distribution. In terms of location flexibility, Figure 3.c shows that jobs held by lower income workers in the UK are least easily done from home. This is consistent with with patterns observed in other countries.[17] Across the earnings distribution, male workers with low education appear to have least flexibility to work remotely. Conditional on education, there is little difference in either the degree of work flexibility or industry exposure between men and women in the bottom one-third of the earnings distribution.

Additionally, the bottom panel of Figure 3 shows similar measures along the distribution of liquid assets. It is noticeable from Figure 3.e that low educated workers are most exposed to negative demand shocks induced by the pandemic, and also have relatively low liquid assets (as indicated by the size of markers). Overall, Figure 3 shows that both men and women with low education are more adversely affected by both labour supply and demand disruption than those with more education. Assortative partnering between people with similar education levels could amplify the unequal distribution of income risk at the household level. And, because these workers have relatively low income and assets, their ability to smooth consumption following a reduction in income could be limited.

To understand how assortative partnering may amplify the inequality in these risks, Figure 4 shows the within-couple correlations of each factor (on the left vertical axis), and the average score of household head for a given factor (the right vertical axis).[18] The marker size in this figure represents the number of household heads in each decile of the individual earnings distribution. The top panel shows spousal correlations by the household head's earnings, and the bottom panel shows similar statistics along the distribution of household liquid assets.

While there is little difference in the average degree of physical proximity across the household head's earnings distribution, the average degree of work flexibility rises substantially in the top half of the distribution and the average degree of industry exposure declines gradually in income. That is, low earnings households are more likely to experience unfavourable shocks to labour supply and demand. Further, these risks are positively correlated between spouses because they tend to work

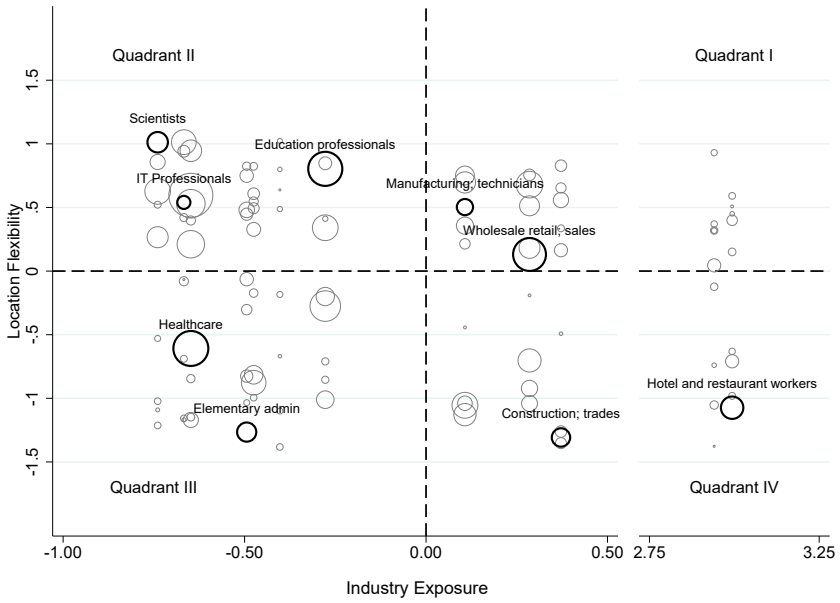
[17] See Mongey et al. (2020) for the US, Saltiel (2020) and Lekfuangfu et al. (2020) for developing countries.

[18] We designate the highest earning member of a cohabiting couple as the household head.

in similar occupations and industries, particularly at the bottom end of the income distribution.

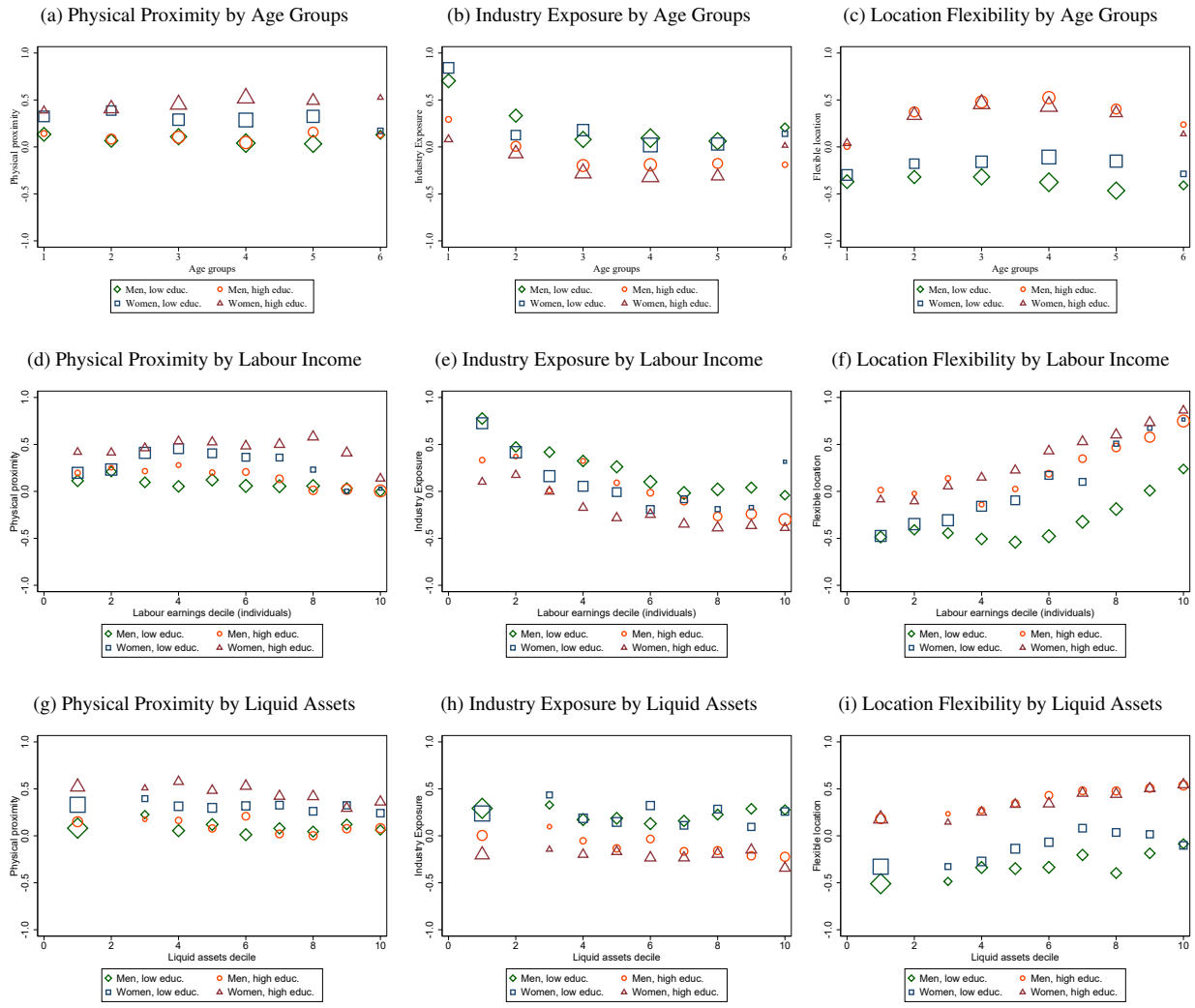
Additionally, the bottom panel in Figure 4 shows that the average degree of the household head's physical proximity does not vary much by the household's liquid assets. However, the degree of industry exposure is slightly declining in the household's assets, with a higher positive correlation among spouses in wealthy families. The degree of work flexibility of household head is substantially lower at the bottom end of the asset distribution and it is more correlated between spouses than the other measures. Overall, these plots provide compelling evidence that households at the bottom of both the earnings and asset distributions are more at risk from disruption to their work caused by covid-19, and that differences in these factors may explain the substantial differences in labour market outcomes across workers in the previous section.

Figure 2: Occupation-Industry Pairs by Location Flexibility and Industry Exposure



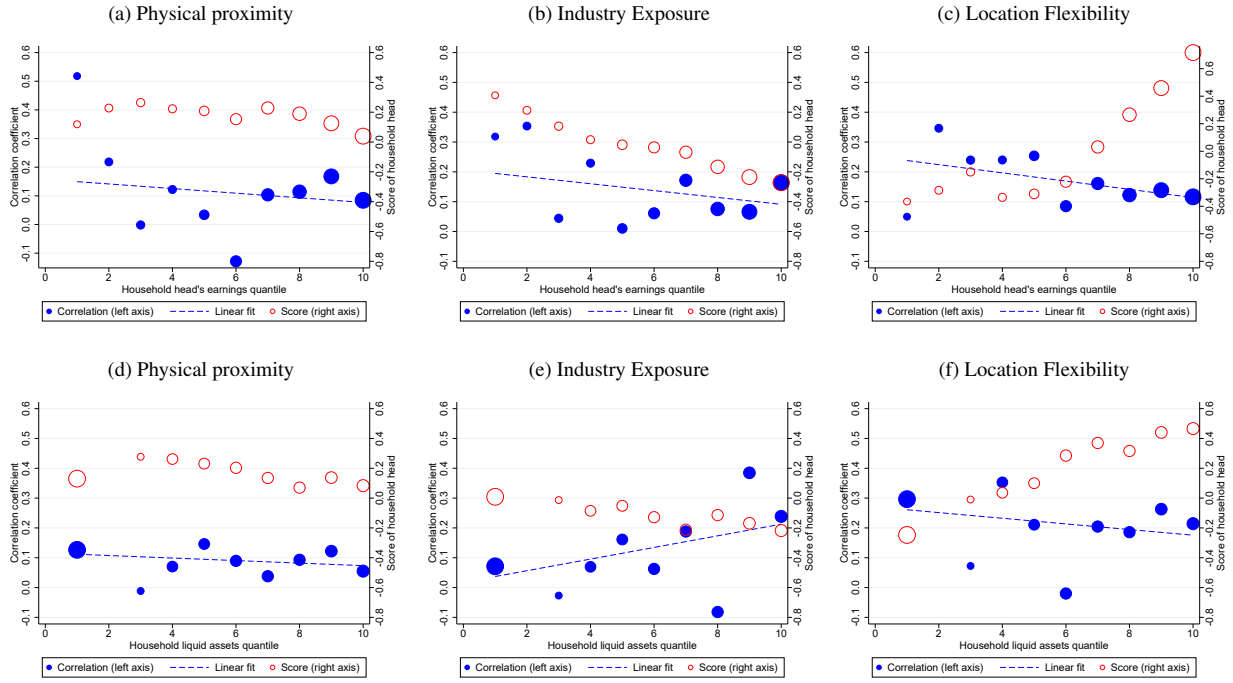
Notes: Figure shows location flexibility against industry exposure for each occupation-industry pair observed in the data. Occupations are defined by 3-digit SOC 2010 codes, and industries by the top-level SIC 2007 classification. Markers are weighted by the number of employees.

Figure 3: Work Characteristics by Sex and Education



Notes: High education is defined as having a university degree or higher (48% of the weighted sample). Marker size reflects employment counts relative to the unconditional individual earnings distribution (meaning that sizes are comparable across subfigures). Sample includes all employed workers in the main UKHLS sample.

Figure 4: Within-household correlation between exposure measures



Notes: Correlation between partners' values of each exposure measure (left axis) and score of the exposure measure for the household head (right axis). Household head defined as the highest earning partner. Marker size reflects number of household heads in each decile of the unconditional individual earnings distribution (including singles and partners of heads). Sample includes all employed spouses in the main UKHLS sample.

To quantify the effects of these risks, we estimate the probability of these three labour market outcomes—working as usual, being furloughed, or being laid off—as a function of the three factors using a multinomial probit model.[19] For each of the three labour market outcomes $j = \{\text{working}, \text{furloughed}, \text{separated}\}$, we write

$$y_{ij} = \alpha_j \mathbf{f}_i + \beta \mathbf{x}_i + \xi_{ij} \tag{1}$$

where y_{ij} is the latent labour market outcome variable of worker i, $\mathbf{f}_i$ is a vector containing the three factors and their interactions based on the individual's occupation and industry in the pre-pandemic period, $\mathbf{x}_i$ contains individual's characteristics such as age, and $\xi_{ij} \overset{iid}{\sim} \mathrm{N}(0,1)$ is an idiosyncratic shock.

Table 1 reports the marginal effects of each factor, holding other variables at their means. The last two rows present AIC and BIC of each model using different controls. The marginal effects are robust across model specifications. On average, a one unit increase in physical proximity increases the probability of being laid-off by around four percentage points. The marginal effect of a one unit increase in location flexibility on the probability of being laid-off is slightly higher, around five percentage points, and a one unit increase in industry exposure increases the lay-off probability by around two percentage points. In terms of furlough, a one unit increase in location flexibility factors decreases the probability of being furloughed by four to six percentage points, while a one unit increase in industry exposure factor increases the furlough probability by seven to eight percentage points. Finally, both location flexibility and industry exposure factors have roughly equal marginal effects on the probability of remaining employed, 0.9-one percentage points. We plot the distribution of these marginal effects in Figure 5.

These estimates suggest that all three factors matter for the likelihood of being laid-off. On the other hand, only location flexibility and industry exposure are key determinants of working or being furloughed. While the effects of location flexibility and industry exposure on the probability of remaining employed are roughly the same, exposure to negative industrial demand shocks is a more crucial factor affecting furlough probability. Since the CJRS allows employers to temporarily keep their workers at no cost, consumer demand and market performance at the industry level are a crucial determinant whether employers would put their employees on furlough or permanently cease the employment relationship.

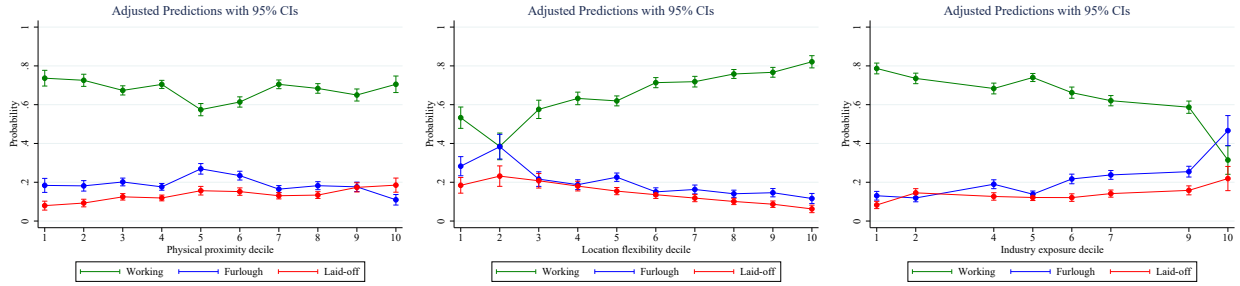
[19] While there is an ordering of the outcomes for incomes of workers, the decision whether to keep each employment match is likely to be made by firms (or possibly jointly by firms and workers) in which case the cost and benefits of these outcomes may not have global ordering. Therefore, we consider a multinomial probit to be more appropriate than an ordered discrete choice model.

Table 1: Marginal Effects

	Model				
Marginal Effects	1	2	3	4	5
Physical Proximity					
Working	-0.0253	-0.0285	-0.0251	-0.0255	-0.0248
	(-1.47)	(-1.62)	(-1.42)	(-1.45)	(-1.40)
Furlough	-0.0200	-0.0128	-0.0131	-0.0140	-0.0156
	(-1.42)	(-0.89)	(-0.91)	(-0.98)	(-1.07)
Laid-off	0.0452***	0.0413***	0.0382**	0.0395**	0.0404***
	(3.92)	(3.45)	(3.20)	(3.25)	(3.35)
Industry Exposure					
Working	-0.0987***	-0.0930***	-0.0900***	-0.0894***	-0.0907***
	(-7.83)	(-7.36)	(-7.16)	(-7.20)	(-7.31)
Furlough	0.0775***	0.0722***	0.0704***	0.0707***	0.0702***
	(7.75)	(7.23)	(7.09)	(7.18)	(7.09)
Laid-off	0.0211*	0.0208*	0.0195*	0.0187*	0.0205*
	(2.48)	(2.42)	(2.33)	(2.19)	(2.51)
Flexibility Location					
Working	0.111***	0.0882***	0.0848***	0.0843***	0.0783***
	(7.15)	(5.40)	(5.18)	(5.16)	(4.77)
Furlough	-0.0565***	-0.0327*	-0.0309*	-0.0314*	-0.0273*
	(-4.34)	(-2.37)	(-2.25)	(-2.28)	(-1.97)
Laid-off	-0.0542***	-0.0555***	-0.0538***	-0.0529***	-0.0510***
	(-5.05)	(-4.95)	(-4.78)	(-4.72)	(-4.53)
Controls:					
Male		✓	✓	✓	✓
High Education		✓	✓	✓	✓
Age and age squared			✓	✓	✓
Regional dummy				✓	✓
Race					✓
Sample size	3258	3258	3258	3258	3229
AIC	4894.7	4852.6	4827.4	4839.6	4770.4
BIC	4992.1	4974.3	4973.5	5131.8	5098.7

Notes: Marginal effects at means. Z-scores in parenthesis. ***, ** and * signify p-value <0.01, p-value<0.05 and p-value <0.1, respectively. Sample includes employed workers in the baseline period of UKHLS covid-19 module.

Figure 5: Predictive margins by risk factor



Notes: Predictive margins based on model 3 in Table 1. Probabilities calculated using all employed workers in UKHLS wave 9.

4 Effects on Income and Spending

We now consider the consequences of the labour market risks for the income and consumption of households. To quantify these effects, we first calculate the expected income of each individual in a household during the pandemic, based on the estimated probabilities that they continue working as usual, are furloughed, or separate from their job from model 3 of Table 1. Specifically, for each individual in our sample, we calculate expected labour income during the pandemic y_{covid} as

$$y_{\text{covid}} = \big(\Pr(\text{working}) \times y_{\text{pre}}\big) + \big(\Pr(\text{furloughed}) \times y_{\text{f}}\big) + \big(\Pr(\text{separated}) \times y_{\text{s}}\big),$$

where y_{pre} is monthly labour income in the pre-pandemic period; y_f is labour income if furloughed; and y_s is labour income if separated. We define each of these three income measures in section 4.1, and examine the effects of the pandemic on household income across the income distribution. Then, in section 4.2, we consider the extent to which reduced income affects households' ability to meet their expenditure requirements and in section 4.3 we discuss the extent to which households may be able to maintain expenditure in the face of reduced income using assets. We summarise the main results in section 4.4.

4.1 Income

In our quantitative exercise, we assume that the labour earnings of individuals who continue working y_{pre} are unchanged compared to the pre-crisis period, as measured during wave 9 of UKHLS

during 2017 or 2018.[20] We assume that labour earnings of separated workers y_s fall to zero. The labour earnings of furloughed workers y_f are supported by the Coronavirus Job Retention scheme, under which the government pays workers 80 percent of their usual labour earnings up to a cap of £2,500 a month before taxes (around £2,000 net).[21] We then define an individual's total income as their labour earnings plus any income from other sources where, in all cases, we assume that workers' income from other sources is unchanged compared to the pre-crisis period.[22] For couples, total household income is the sum of each individual's total income.[23]

We show the impact of our scenario on net household income for couples in Figure 6.a, and for singles in 6.b. The green bars show median household income per person before the pandemic across quintiles of the income distribution, and the red bars show household income per person under our scenario.[24] For both couples and singles, the *absolute* reduction in per person household income is larger for higher-earning households. However, the *proportionate* reduction in income is highest for low-income households. For example, median per person household income falls by 17 percent for couples in the bottom earnings quintile compared with 13 percent for couples in the top; similarly, the income reduction is 22 percent for singles in the bottom quintile and 14 percent for those in the top.

The pattern of income reductions reflects the combination of two offsetting effects. First, as shown in Figure 1.c, the probability of continuing to work as usual during the pandemic is increasing in income, meaning that lower income households are most exposed to labour market risk. However, the cap on monthly payments in the CJRS means that higher income individuals (whose monthly CJRS payment is capped at around £2000 net a month) experience a higher proportionate

[20] Our analysis uses individual's employment status and earnings at the time of their wave 9 UKHLS interview in 2017 or 2018 as the baseline (rather than incomes measured in the supplementary covid sample in January or February 2020), and we calculate expected changes to income relative to this baseline. This allows us to include the full sample of UKHLS participants from wave 9 in our analysis, not just the subset who responded to the supplementary covid sample.

[21] Individuals who are self-employed are entited to the Self Employment Income Support Scheme (SEISS) instead of CJRS. The features are very similar: individuals entitled to SEISS receive 80 percent of average monthly trading profits, up to a cap of £2500 (gross) a month. One key difference, which we include in our calculation of incomes for furloughed self-employed workers, is that only individuals with annual trading profits of less than £50,000 are eligible. We assume that self-employed individuals with average monthly self-employment earnings above £4167 (i.e. £50,000 / 12) receive no government support if they are furloughed. For couples, this affects 17 out of 76 self-employed heads and 1 out of 118 self-employed partners in the unweighted sample. For singles, it affects 9 out of 112 self-employed individuals.

[22] Separated workers may be entitled to claim additional support from other parts of the UK welfare, such as Universal Credit. Our assumption that unearned income remains constant may overstate therefore their long-term net income reduction. However, new claimants to Universal Credit must wait for a minimum of five weeks before receiving their first payment: by holding unearned income fixed, we are therefore capturing the short-term effects of being laid off (before any increases in unearned income start) on a worker's net income.

[23] In this analysis, we drop from our sample any households containing people other than a single individual or couple and any of their children. We also exclude any earnings of children from our definition of household income.

[24] In Figure 6, the income quintiles correspond to the household's position in the overall per person household income distribution (pooling together couples and singles).

reduction in labour income if they are furloughed than those with lower income. However, the higher exposure of lower income households to labour income risk is the largest of these effects meaning that the overall impact of the pandemic on income is greatest for low-income households.

4.2 Expenditure

We now consider the effect of these income reductions on households' ability to finance expenditure.[25] We examine the effects of expected changes in income during the pandemic on the gap between household-level income and expenditure: households for which this income-expenditure gap is positive are able to finance their spending out of income with a surplus left over, while households for which it is negative are unable to meet their expenditure from income.

We present our estimates of the income-expenditure gap in Figure 6.c for couples and 6.d for singles. In these figures, the green bars show the median gap between household net income and total expenditure in the period before the pandemic, expressed per person within a household. For both couples and singles, this pre-crisis gap is increasing in the income quintile of the household. This suggests that higher income households are better able to absorb a reduction in income without needing to either reduce expenditure, run down savings or rely on outside support.[26]

The red bars in Figures 6.c and 6.d show the income-expenditure gaps in our pandemic scenario. Specifically these bars show, for each quintile of the income distribution, the median difference between household income in the pandemic scenario and total expenditure in the period before the crisis, divided by the total number of household members. For couples, the reduction in income increases the pre-existing income-expenditure shortfall for households in the bottom 20 percent, and reduces the income-expenditure surplus over the rest of the distribution (although the gaps remain positive). For singles, the pre-existing income-expenditure deficits increase for those in the bottom 40 percent. Single households in the third quintile experience a substantial reduction in their income-expenditure surplus to almost zero. Therefore, despite the support for furloughed workers from the Coronavirus Job Retention Scheme, the labour market impacts of the pandemic jeopardise the ability of the lowest-income households to afford usual spending. And the effects are particularly severe for singles, with those in the bottom 40 percent of the income distribution facing potential difficulty in meeting usual expenditure from income.

However, as a result of increased restrictions, household spending may have fallen during the covid-19 pandemic. If this is the case, comparing income to pre-crisis expenditure will overstate

[25] Expenditure includes all types of spending, reflecting that a households may have financial commitments (such as rent payments and utility bills) in addition to spending on consumption items.

[26] We also note that the pre-pandemic income-consumption gap is negative for lower-income households. The observation that median household income exceeds expenditure for the lowest income households is consistent with other studies e.g. Brewer et al. (2006) for the Britain, Pew Charitable Trusts (2016) for the U.S, and Shraberman (2018) for Israel.

the effect of the pandemic on the income-consumption gap. To account for this, we construct a second measure of total expenditure which reduces (or removes entirely) spending on categories that are likely to have fallen as a direct result of policies designed to slow the spread of covid-19.[27] This measure represents a likely lower bound on households' spending during the pandemic, as it simply removes spending on certain items without allowing households to substitute this consumption into other categories.

We show the gap between household income in our pandemic scenario and this reduced measure of expenditure in the blue bars of Figures 6.c and 6.d. With this lower measure of expenditure, the income-expenditure gap returns to around the pre-pandemic level for couples and singles in the bottom 20 percent of the income distribution. But for all other groups, the income-expenditure gap remains lower than in the pre-crisis period for both couples and singles and across the income distribution. This means that even substantial reductions in expenditure would not offset the fall in household income during the pandemic.

We note also that households further up the earnings distribution are likely to have made larger savings on usual expenditure during the pandemic. Comparing the red and blue bars in Figures 6.c and 6.d, couples in the top earnings quintile save £104 a month (per person) by eliminating some types of expenditure during the lockdown (such as leisure activities and restaurants). But couples in the bottom earnings quintile eliminate only £52. Similarly, for singles, households in the top quintile save £182 a month per person, compared with only £65 in the bottom quintile.

Overall, this section highlights substantial inequalities in the likely effects of the pandemic on households' ability to meet their expenditure requirements. These are in addition to the inequalities in the effects on income discussed in the previous section. Higher earning households had a larger buffer between income and usual expenditure before the pandemic, putting them in a better position to absorb any reduction in labour income. By contrast, households at the bottom of the income distribution are at risk of income falling below required expenditure during the pandemic. And the inequality in these effects is amplified because expenditure is likely to fall most in higher income households as a direct result of lockdown policies.[28]

4.3 Using Assets to Maintain Expenditure

In the previous subsection, we showed that households towards the bottom of the income distribution are particularly at risk of income falling below usual expenditure. However, whether or not

[27] In particular, we exclude any spending on restaurants, hotels, leisure classes, or miscellaneous activities such as visiting a museum, club or cinema. We also reduce spending on transport by 80 percent reflecting that, across modes, transport use fell by between 70 percent (for car travel) 95 percent (for rail travel) (Cabinet Office, 2020).

[28] Additionally, some goods prices have risen substantially during the lockdown period which may have disproportionately affect low-income households, particularly as these households tend to bulk buy to reduce their shopping costs (Blundell et al., 2020; Griffith et al., 2009).

households will need to cut expenditure depends on their ability to smooth consumption using savings: individuals with liquid assets may be able to maintain expenditure at pre-crisis levels, even if this exceeds income, at least in the short-term.[29] In this section, we analyse the extent to which the households whose income-consumption gap becomes negative (or more negative) as a result of the pandemic have sufficient savings to maintain spending.[30]

We consider the three groups whose median income-expenditure gap becomes more negative as a result of the pandemic: couples in the bottom quintile of the earnings distribution, and singles in the first two quintiles. These are the households who are particularly at risk of being unable to afford expenditure out of income, and so potentially need to cut spending as a result of the pandemic. For each household in these groups, we calculate the number of weeks it could finance the increase in the median income-consumption gap for their group out of liquid assets.[31]

We focus attention on the number of households able to finance the median income-expenditure gap from liquid assets for (i) less than one week, representing those with the most serious constraints and likely inability to absorb the income reduction, (ii) less than five weeks, (iii) less than 12 weeks and (iv) more than 12 weeks. Households in categories (i) and (ii) are of particular policy interest, as these highly constrained households may not be able to sustain spending for the five week minimum wait between claiming benefits and receiving the first payment in the UK welfare system. We show the proportions of households in each of these categories in Figure 6.e.

Across all three groups, a substantial fraction of households have insufficient liquid assets to finance the median income-consumption gap for even one week. For couples in the bottom quintile of the income distribution, around 79 percent would be unable to maintain expenditure for the five weeks before receiving any increased benefit payments they may become entitled to. The equivalent figures are 58 percent and 65 percent for singles in the first and second quintiles. This underlines that a substantial fraction of the households whose income falls below required expenditure are likely to need to reduce spending as a result. Therefore the labour market disruption resulting from the pandemic is likely to lead households to need to reduce spending—and this is

[29] In this analysis, we define liquid assets as the sum of savings and investment in stocks and bonds. Our findings are similar when we restrict the definition of assets to non-volatile liquid assets, defined as the sum of savings only. We summarise the distribution of liquid assets across income quintiles, separately for couples and singles, in Appendix Figure A.2.

[30] Brewer et al. (2017) attribute under-reporting of income as a likely explanation for the negative income-expenditure gap among low-income households in Britain. Since we focus on analysing households' ability to finance additional gaps, induced by the pandemic, our results are less affected by the issue of baseline under-reporting of income.

[31] We use the income-expenditure gaps based on pre-pandemic expenditure (i.e. the red bars in panels (c) and (d)). We note that the median income-expenditure deficit falls relative to pre-pandemic levels for the bottom quintile of singles and couples when we use the consumption measure which allows for reduced spending as a direct result of the pandemic (i.e. the blue bars). However, we reiterate that these reduced expenditure measures are likely to understate households' actual expenditure needs, and so focus attention on ability to finance the difference between income and pre-pandemic spending for the median household.

particularly the case for households at the bottom of the income distribution. This means that the pandemic is likely to widen inequality in consumption.

4.4 Summary of Results

This section presents quantitative analysis of the potential impacts of the covid-19 pandemic on the income and consumption of households across the income distribution. First, we show that lower income households experience a larger proportionate income reduction than those further up the income distribution. This reflects that lower income households are disproportionately exposed to labour market risks: they are more likely to work in the industries most badly affected by the pandemic, and in occupations with less flexibility to work from home and greater requirements for physical proximity, than households with higher income.

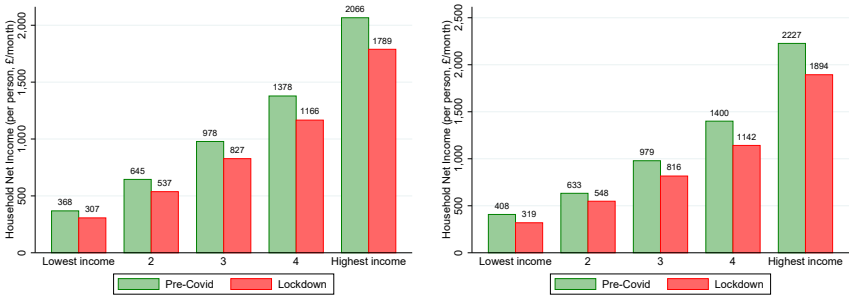
Next, we show that the reduction in labour income leads to an increased shortfall between income and required expenditure for lower income households, but not for higher income households. In addition to the larger income reduction for lower income households, this reflects that (1) lower income households had a smaller buffer between income and expenditure in the period before the pandemic, and so are less able to absorb an income reduction, than higher income households and (2) the spending of higher income households may fall by more during the pandemic than for lower income households, as they usually spend more on categories which are likely to have been most reduced like restaurants, leisure activities and travel.

Finally, we consider households' ability to maintain expenditure using liquid assets. For all groups who experience a shortfall between income and expenditure, we find a substantial proportion of households without sufficient assets to maintain expenditure for even one week. This means that the widening income-expenditure gap resulting from the pandemic is likely to lead many affected households to reduce expenditure, while the unaffected (higher income) households can maintain their spending. Therefore the inequalities in the labour market effects of the pandemic are also likely to widen inequalities in consumption.

Figure 6: Effects on Income and Consumption

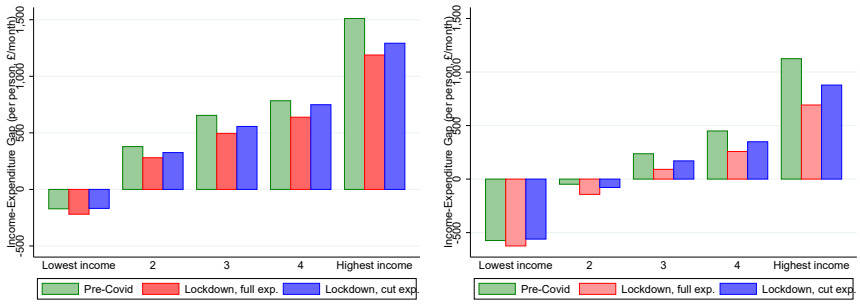
(a) Income (Couples)

(b) Income (Singles)



(c) Income-Expenditure Gap (Couples)

(d) Income-Expenditure Gap (Singles)



(e) Weeks Expenditure Sustainable using Liquid Assets

Notes: Panels (a) shows median per person net household total income for couples in each quintile of the (per person) household income distribution. Panel (c) shows the median gap between income and expenditure (per person) for couples, both in the pre-covid period and under the two scenarios described in the text. Panels (b) and (d) show the same statistics for singles. Panel (e) shows, for households in income quintiles with a negative median income-expenditure gap in our scenario, the lengths of time households could afford to maintain pre-crisis expenditure by using liquid assets. Specifically, it shows the distribution of household's liquid assets divided by the median income-expenditure gap for their income quintile and status as a couple or single, defined using the pre-pandemic expenditure measure (i.e. the red bars in panels (c) and (d)). For groups with a negative median income-expenditure gap before the pandemic, we instead divide liquid assets by the increase in the income-expenditure gap (i.e. the difference between the red and green bars in panels (c) and (d)).

5 Alternative Policy Response

5.1 US-style Economic Impact Payments

In the previous section we showed that, despite the 80 percent income subsidy for furloughed workers under the UK's Coronavirus Job Retention Scheme, the labour market disruption caused by the pandemic are likely to jeopardise the ability of low-income households to afford usual expenditure. It is therefore likely to increase in inequalities in both income and consumption.

In this section we consider the likely effects of an alternative scheme, based on the Economic Impact Payments (EIP) made to households in the US. The EIPs provide a one-off payment to all households who file a tax return, up to a maximum of $1,200 for each adult household member and $500 for every child. At higher incomes, the payments are reduced at a rate of $5 for every $100 of income above a threshold which depends on household structure: $75,000 for singles, $112,500 for household heads and $150,000 for married couples filing jointly.

This policy has a number of important differences from the CJRS in the UK. First, the payments are a one-off transfer rather than a recurring income replacement. The level of support provided by the EIPs therefore depends crucially on the length of time a household's labour market activity is disrupted. Second, the EIPs are available to all households who file a tax return, not just those who are unable to work due to the impacts of covid-19. Finally, because there is no link between the size of the payment and usual labour income (below a threshold), the lowest income households are entitled to the maximum EIP, even if this is higher than usual income. By contrast, the link between payments and usual income means that payments under the UK's CJRS are increasing in usual labour income (up to a monthly cap).

We study the likely effects of an EIP-style payment in the UK. Under the policy, every household receives a one-off payment, with the amount depending on the household size and structure as well as household gross labour income. Specifically, we set the maximum payment to £593 per adult and £247 per child within a household. These amounts are equal to 1.0 and 0.4 times average weekly household expenditure in the UK, the same level as the EIPs relative to average household spending in the US (BLS, 2019). We then reduce a household's payment at a rate of 5 pence for every pound of gross household labour income earned above a threshold of £4,031 a month for couples and £1,916 a month for singles. These are the 60th percentile of the household income distributions for couples and singles in our sample, corresponding to the approximate location of the EIPs thresholds in the US income distribution.

Unlike the CJRS in the UK, EIPs are not contingent on the recipient remaining employed. The policy therefore does not provide firms with an incentive to retain workers – there is no national furlough scheme.[32] In the absence of a national scheme for furloughing workers, it is likely that

[32]There is a small Employee Retention Credit available in the US, providing a credit of 50 percent of wages up to

some workers who were furloughed in the UK would have lost their jobs (or experienced a large temporary income reduction), while others may have continued working. Given the uncertainty around the counterfactual labour market outcomes for furloughed workers in the absence of such a scheme, we consider three scenarios intended to capture the full range of potential outcomes. Specifically, we assume that either (1) all workers who were furloughed on the CJRS would have instead experienced a job separation, (2) workers who were furloughed would have either separated and continued to work with equal probability, or (3) all furloughed workers would have instead continued to work. These therefore represent worst-, mid- and best-case scenarios for the counterfactual outcomes of furloughed workers in the absence of CJRS.

We show the effects of these scenarios on the income of couples and singles in panels (a) and (b) of Figure 7. In panels (c) and (d) we show the income-expenditure gaps for each of the scenarios.[33] The income-expenditure gaps are mechanically more negative (or less positive) for both the worst- and mid-case scenarios than the equivalent gaps under the UK policy in Figure 6, because the expected income loss from experiencing a separation with probability of either 1 or 0.5 is higher than the loss from being furloughed.

However, the EIP-style payments are a significant multiple of the median monthly income-expenditure gaps. In panels (e) and (f) we show the average payments received by households under this alternative scheme. The green bars show the total amounts a household is entitled to claim, as determined by household size and composition, as well as household gross labour income. The blue bars show these totals expressed per household member, and so are comparable with panels (a) to (d). For couples, even in the worst case scenario, the income-expenditure gap increases by only £52 a month per household member for those in the bottom income quintile, while this group receives a payment of £412 per person. This means that even a household with no initial savings would be able to finance the median worst-case income expenditure gap for nearly eight months. This finding is consistent across the income distribution for couples.

The EIP-style payments are also significant for low income singles. The average payment in the bottom quintile is £491, which is almost 80 percent of the worst case monthly income-expenditure shortfall of -£673. But this income-expenditure gap is only £86 a month larger than the pre-pandemic shortfall—and so the average payment would sustain the *additional* gap for this group nearly six months. As with couples, the one-off payments allow even singles with no initial savings to sustain even worst case income-expenditure deficits for well over the five weeks required to receive benefit payments in the UK.

$10,000 from March to December 2020. This scheme is substantially less generous than the UK's CJRS. In particular, unlike the UK scheme, the Employee Retention Credit can only be claimed on 50 percent of wages an employer actually pays; by contrast, there is currently no requirement for UK employers to contribute anything towards their furloughed employees' pay.

[33] In these panels, we show the gap between income and pre-pandemic expenditure.

Figure 7: Effects US-Style Policy on Income and Consumption

Notes: Panels (a) shows median per person net household total income for couples in each quintile of the (per person) household income distribution. Panel (c) shows the median gap between income and expenditure (per person) for couples, defined as pre-pandemic total expenditure. Panels (b) and (d) show the same statistics for singles. In Panels (a) to (d), the worst- mid- and best-case scenarios correspond to the three scenarios described in the text. Panels (e) and (f) show the average size of the one-off payment to households in our scenario, expressed by as a total and per person within the household.

5.2 Comparison Between US and UK-style Support

We now compare the effectiveness of the UK's CJRS and the US EIP as a means of supporting workers during the pandemic. In particular, in Table 2, we consider the impacts of the CJRS and the EIP in our scenarios on households' ability to maintain expenditure. We also compare these two schemes to a 'No Policy' scenario, in which the labour market impacts are identical to those in the worst-case scenario in the EIP analysis, but workers receive no support from the government.

In Panel A, we show the fraction of workers who can sustain expenditure for different lengths of time under each of the policies.[34] With no policy intervention, around 61 percent of households would retain income above required expenditure and so not need to cut spending, regardless of their level of assets. However, 18 percent of households would need to cut back on expenditure within the first week of labour market disruption, and around 22 percent would be unable to sustain consumption for five weeks.

The UK's CJRS is reasonably effective at mitigating the adverse effects of the no intervention scenario. Under the scheme, the fraction of households able to sustain expenditure indefinitely out of their income increases to around 66 percent. And the fraction needing to cut spending within the first one or five weeks of the labour market disruption falls to around 17 percent.

Compared with the CJRS, the EIP-style scheme is substantially more effective at enabling households to sustain expenditure in the short term, although this could be less effective if labour market disruption is prolonged.[35] Notably, the EIP-style payment reduces the fraction of households unable to sustain expenditure for one week to zero (or almost zero) across all three scenarios. This highlights the severity of tightly binding liquidity constraints for the households most affected by the pandemic, which the EIP payment is effective at relaxing. The UK's CJRS could be more effective at allowing workers to sustain consumption over longer periods, as it provides continuous support (rather than just a single payment). However, the size of the EIP relative to the income-consumption deficits that have emerged during the pandemic means that it is more effective than CJRS at reducing the number of households needing to reduce consumption within at least 12 weeks.

In Panel B, we consider the effects of the policies on the level expenditure as measured 5 and 12 weeks after the labour market disruption. Our measure of expenditure is again the households' total

[34] Specifically, we consider the number of weeks households could sustain any gap between their income and our measure of total pre-pandemic expenditure using liquid assets.

[35] We note that the final row of Panel A, which shows the fraction of households with no expenditure gap, is entirely unaffected by the EIP. This is because, unlike the CJRS, the EIP is a one-time payment which does not affect households' monthly income—and so has no effect on a household's ability to maintain expenditure out of income. Differences in the proportion of households with no expenditure gap across columns (3) to (5) therefore reflect only differences in the severity of the labour market disruption in these scenarios. By contrast, the CJRS increases monthly income for households who would have otherwise been laid off, and so *does* have a direct effect on the proportion of households with no income-expenditure gap.

expenditure in the pre-pandemic period. We assume that households reduce expenditure if (i) their income falls below the pre-pandemic expenditure levels (or any pre-existing income-expenditure deficit widens as a result of the pandemic) and (ii) their assets are insufficient to finance the shortfall for either 5 or 12 weeks. For reference, we also show each of the statistics calculated pre-pandemic for 2017-18.

Compared with the pre-pandemic period, average expenditure falls regardless of the policy response. Therefore none of the policies is able to fully mitigate the adverse consequences of the pandemic for household consumption. However, both the CJRS and EIP prevent average consumption from falling as much as it would in the absence of a policy response. After five weeks, average consumption falls only moderately compared to the pre-pandemic period under either policy response. And, while some households must cut expenditure further by 12 weeks, the reductions in expenditure are again far smaller under either policy than would have been the case with no policy response.

However, of the two polices we consider, the EIP response is better at providing households with the means to sustain expenditure, at least in the short term. Even in the worst case scenario, in which we assume that all workers who were furloughed under the CJRS would have separated from their employers under an EIP system, average expenditure falls by slightly less under the EIP than under CJRS. In the best case scenario, expenditure is hardly affected relative to the pre-covid period. This highlights the potentially substantial short-term benefits of providing constrained households with liquidity in response to the covid-19 disruption. However, over longer time horizons, the continued support provided by the UK's CJRS becomes increasingly beneficial: by 12 weeks, the consumption reduction under CJRS is similar to the mid-case EIP.[36]

Finally, in Panel C, we consider the cost per household of the CJRS and EIP payments. As the CJRS is a recurring payment, its total cost will depend on the length of time households claim it. We therefore show total costs of the policies after five and 12 weeks. We note that the cost of CJRS per household is less than the EIP even by 12 weeks. This is partly because the CJRS is only paid to workers who are furloughed, while the EIP is a payment to all households. This higher generosity of the EIP over five weeks is part of the reason for smaller consumption reductions after 5 weeks than CJRS. After 12 weeks, the costs of the schemes are similar and lead to similar average expenditure reductions.

[36]We note that, compared to the EIP, this similar average expenditure reduction arises from more households making smaller average spending reductions under CJRS. Panel A shows that, by 12 weeks, 18.9 percent of households would need to cut some expenditure under CJRS, compared to 9.2 percent in the mid-case EIP. However, the CJRS provides more support to labour income than under the mid-case EIP, and so the resulting income-expenditure gaps are smaller on average.

Table 2: Effects on Expenditure

	No Policy (1)	UK CJRS (2)	US EIP Best case (3)	US EIP Mid case (4)	US EIP Worst case (5)	Pre-Covid (6)
Panel A: Maintain exp. with liquid assets						
< 1 week	18.3%	15.5%	0.0%	0.0%	0.1%	-
1-5 weeks	3.2%	1.0%	0.2%	1.3%	3.8%	-
5-12 weeks	3.1%	2.4%	3.4%	7.9%	10.0%	-
> 12 weeks	14.2%	14.6%	28.2%	26.5%	24.9%	-
No exp. Gap	61.2%	66.4%	68.3%	64.3%	61.2%	-
Panel B: Average total expenditure						
After 5 weeks	1533	1573	1603	1595	1575	1604
After 12 weeks	1519	1566	1593	1568	1536	1604
Panel C: Cost per household						
After 5 weeks	0	357	913	913	913	-
After 12 weeks	0	857	913	913	913	-

Notes: Table compares the effects of various policy options on households' ability to maintain expenditure, and resulting consumption inequality, during the covid-19 pandemic. In each column, we consider a scenario in which the labour market disruption a worker faces depends on their estimated probabilities of continuing to work, being furloughed, or separating from their employer. See the text for details of the labour market impacts in columns (1) to (5). In column (6) we present measures of pre-pandemic consumption inequality, using LCFS data from 2017/18.

5.3 Discussion

The US and UK adopted substantially different policies to support workers through the labour market disruption. Compared with the UK's CJRS, which supports the incomes of workers who cannot continue to work during the pandemic, a US-style one-off payment is substantially better at allowing liquidity constrained households to meet their usual expenditure requirements, at least in the short term. This highlights the value of providing liquidity to the most affected households, particularly as these households are disproportionately low income (with only a small buffer between usual income and expenditure) and low wealth. While the income support provided by the UK's CJRS does improve the ability of affected households to maintain spending (compared to a case with no policy intervention), nearly 16 percent will still need to cut spending within the first five weeks of the labour market disruption. However, over longer periods of time, the effectiveness of the UK's CJRS relative to the US-style EIPs increases. This is mainly driven by the fact that the CJRS provides continuous income support for workers (and so, over longer periods, is a more generous policy), whereas the EIP is just a one-off payment.

Our analysis has focused on the likely effects of the policies on outcomes during the covid-19 pandemic. However, it is worth noting that the two types of policies may have important longer-term distributional consequences. A key motivation behind the design of the UK's CJRS was to keep workers with their existing employer, both to allow workers to re-enter the labour market easily when the restrictions on working lifted and to prevent firms from losing workers with job-specific human capital. Differences in the effectiveness of CJRS and EIPs in allowing workers to return to their existing firms could have important implications for the long-term effects, both for the time labour markets remain disrupted and in the aftermath of the pandemic. We do not assess these longer-term effects in our present analysis, but they are a potentially important channel by which CJRS may mitigate longer-term increases to inequality which may have otherwise arisen from the pandemic. Therefore, while a one-off payment may be more effective at providing liquidity for the most affected households in the short term, additional intervention to help workers retain their existing job is likely to be important. Assessing these longer-term consequences of different policy choices would be a useful exercise for future work.

6 Conclusion

This paper assesses the implications of the labour market disruption caused by covid-19 on households in the UK. At the individual level, workers who have relatively low labour force attachment compared to their counterparts, such as those with lower education and and females, are more likely to be adversely affected. The negative impacts are also more concentrated on households at

the bottom of the income and asset distributions. We provide evidence that occupational and industrial characteristics are the likely sources of inequalities in income risk. More specifically, these characteristics include the ability to continue supplying labour during the pandemic (as measured by their flexibility to work from home) and exposure to industrial demand shocks.

We then consider the potential quantitative effects of this differential exposure on incomes and consumption. Lower income households experience a larger proportionate income reduction than those further up the income distribution. This, along with a smaller buffer between income and usual expenditure, and smaller savings on usual expenditure during the pandemic, contributes to a shortfall between income and required expenditure for lower income households, but not for higher income households. Moreover, inequality in holdings of liquid assets further exacerbates inequality in the likely transmission of the income shocks to consumption for all groups who experience a shortfall between income and expenditure, but especially the lowest income groups. We find that more then two thirds of households in the bottom fifth of the income distribution have insufficient assets to maintain expenditure for even one week.

Finally, we compare the relative effectiveness of CJRS policy adopted in the UK to a different mitigation measure, modelled after the headline policy response in the US. Compared with the CJRS, which supports the incomes of workers who cannot continue to work during the pandemic, US policy provides a one-off payment to all tax-filing households. We find that a similarly-sized payment would be substantially better at helping households in the UK to maintain usual expenditure, at least in the short term. This highlights the value of providing liquidity to the most affected households, particularly as these have disproportionately low income (with only a small buffer between usual income and expenditure) and low wealth. However, over the longer term, a policy such as the UK's CJRS which aims to preserve existing employment relationships may have important benefits, as workers may be able to return to work more promptly and retain any job-specific human capital. Future work could usefully assess these longer-term consequences of the two policy regimes.

Overall, this paper highlights the importance of differences in household's abilities to cushion negative income shocks. Our framework shows that to effectively reduce the negative and uneven consequences of covid-19 on household welfare, it is crucial to both provide short-term liquidity (as the most affected households also have the lowest means to smooth consumption) and, in the longer term, provide a combination of income and employment support. This is particularly the case as laid-off workers tend to be young—disruption during early career means that these workers lose the opportunity to accumulate human and social capitals at work, the effect of which could have long term consequences on their lifetime earnings.

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Online Appendix

A. Data

A.1 UKHLS: Employment and Income

The UKHLS is the largest nationally representative household panel survey in the UK, containing individual-level data on employment, income, assets and family characteristics for a panel of individuals. We focus on the wave 9 of the survey (the most recent), which contains data collected in 2017 and 2018. We merge in detailed data on liquid assets from a specialist survey module administered during wave 8 (in 2016 and 2017).

We focus on individuals who are employed or self-employed over the age of 16 at the time of their wave 9 interview. We define occupations using the three-digit Standard Occupation Classification (SOC) codes of their current main job, and similarly define industries using top-level Standard Industrial Classification (SIC) codes.[37]

We combine information on the labour market impacts of covid-19 from the supplementary module. In addition to labour market status in April 2020, sample respondents were asked to provide a recent 'baseline' employment status—specifically, their status in February 2020. We define 'remaining employed'workers as those who were receiving positive earnings both in the baseline and in April, and 'separated' if they were receiving positive earnings only in the baseline. We classify workers as furloughed if they were receiving positive earnings in the baseline and reported as furloughed on the CJRS in April.

We construct two measures of income. First, we define earnings as labour income in the month before the individual was interviewed in wave 9, net of taxes and national insurance contributions. This includes usual pay from their main job, pay from any second jobs, and profits (or losses) from self-employment. Second, we define total income which adds to earnings any benefit payments or income from investments, pensions, or other sources (such as from a family member).

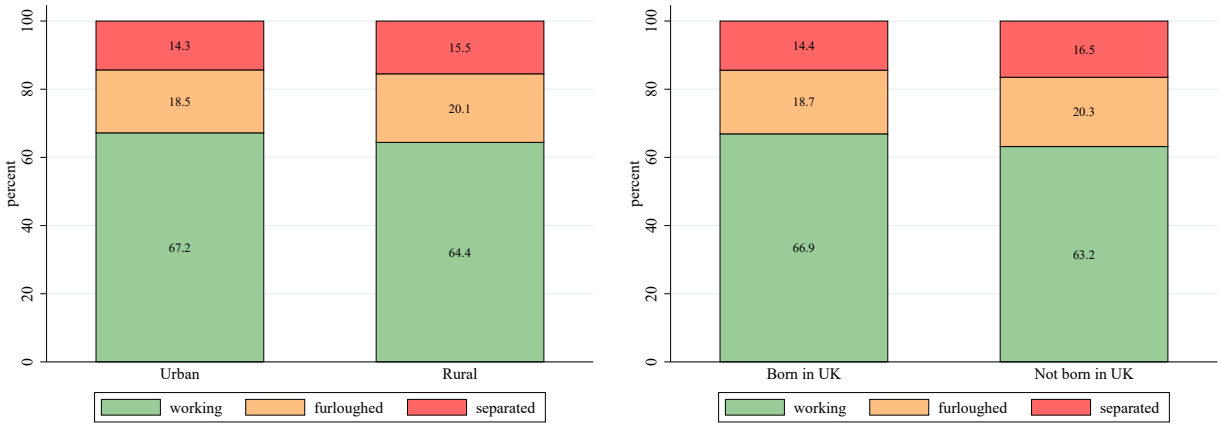
Of the 36,055 individuals (from 20,510 households) in UKHLS wave 9, we drop 15,489 individuals who are not employed and a further 4,328 who did not provide data on assets in wave 8

[37] Specifically, we use the SOC 2010 and the SIC 2007 classification systems.

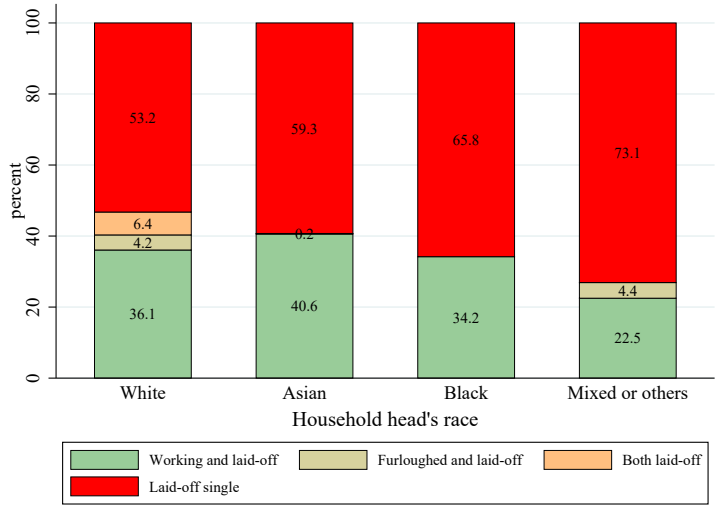
(either because they missed their wave 8 interview or refused to respond to the assets questions). We also drop 3,013 individuals with missing information on industry exposure. Our final sample therefore contains 13,225 residents in 9,639 households.

Figure A.1: Labour market outcomes

(a) Urban (left) and Immigration (right)



(b) Households of laid-off workers by race



Notes: The top panel includes all employed workers in the baseline period of the covid-19 supplementary sample. The top left subfigure shows work status by location and top right shows status by nativity. The bottom panel focuses on laid-off workers where household head defined as the highest earning partner.

A.2 UKHLS:Assets

We use detailed data on individuals' assets collected as part of a specialist question module in wave 8 of UKHLS (in 2016 and 2017). Individuals were asked whether they held savings or investments, either in their sole name or jointly with others, in any of (1) a savings or deposit account, (2) national savings account, (3) ISA (cash only) account, (4) ISA (investment: stocks and funds) account, (5) premium bonds or (6) other type of account. For each of these six types of account an individual reported holding, they were asked how much they held in total across all accounts of that type.

We construct two measures of assets from these data. Our measure of liquid assets (LA) is the sum of assets held across all six account types, while our measure of non-volatile liquid assets (NVLA) is the sum of amounts held in categories (1), (2), (3) and (6) only. The NVLA reflects assets the individual can access at short notice and costlessly smooth consumption. In particular, given the volatility in stock prices since the pandemic has begun, liquidating investments in funds and stocks may involve significant costs for some people; hence we make a distinction between NVLA and LA in our analysis. Further, neither measure includes non-liquid wealth held in housing or cars, available credit on credit cards, or any debts which may offset the gross asset holdings. This is because our main focus is on assets people could access at short notice and at relatively small transaction costs to smooth consumption in response to an unanticipated reduction in earnings.

In the benchmark analysis, we present results using LA. Our results are similar when we restrict the definition of assets to NVLA. We plot the distributions of LA separately for couples and singles in each income quintile, in Figure A.2.

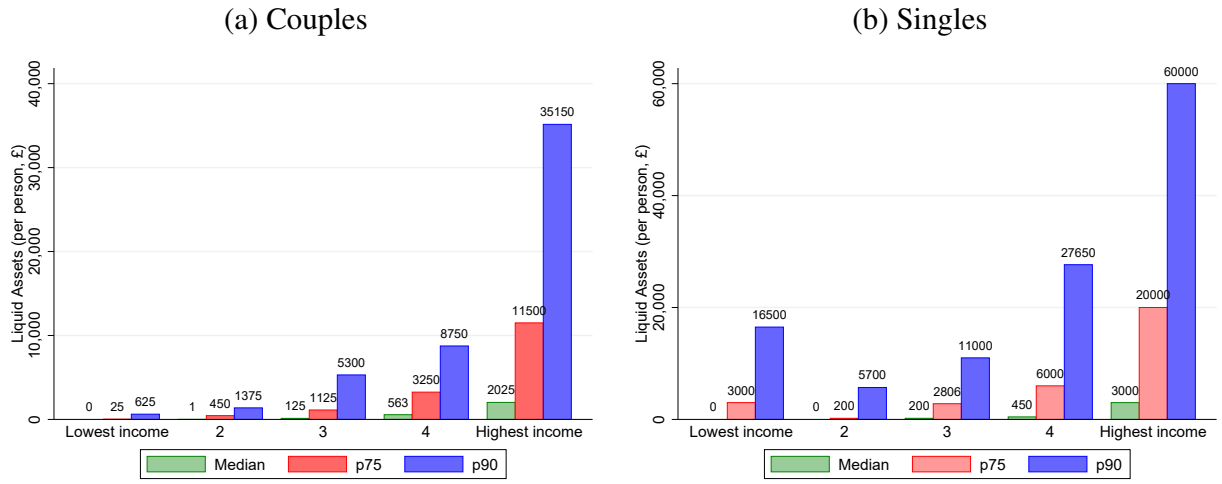
A.3 LCFS: Expenditure Imputation

We use the 2017/18 release of LCFS to correspond with the timing of our UKHLS sample. Our imputation is similar to Blundell et al. (2008) and proceeds as follows. First, we estimate the demand for food (a consumption item available in both UKHLS and LCFS) as a function of total expenditure and household characteristics:

$$\ln f_{it} = \beta_0 \ln c_{it} + D'_{it}\beta_1 \ln c_{it} + X'_{it}\mu + \ln p'_t\theta + \varepsilon_{it}, \tag{2}$$

where $\ln f_{it}$ is the logarithm of food expenditure for individual i in year t, $\ln c_{it}$ is a measure of total expenditure, and $\ln p_{it}$ is the logarithm of food prices. X_{it} are household characteristics including household size, number of children, government office region, the age and birth cohort of the household head, and binary indicators for whether the household contains a couple and

Figure A.2: Liquid Assets



Notes: Figure shows the median, 75th and 90th percentiles total liquid assets per household member, separately for couples in panel (a) and singles in panel (b).

whether the household head has an undergraduate degree. Finally, D_{it} are household characteristics which we allow to affect the share of food expenditure in total consumption, including the number of children, whether the household head has an undergraduate degree and whether the household contains a couple. All measures are available in both UKHLS and LCFS except for total expenditure c_{it} which is available only in LCFS.

We consider two measures of expenditure c_{it}. The first is total household expenditure across all categories. However, as a result of reduced travel and increased restrictions, household spending may have fallen during the covid-19 pandemic. Our second measure attempts to reflect this by excluding or reducing spending on certain items, such as travel or eating in a restaurant.[38] These two measures are intended to place bounds on households' expenditure since the start of the pandemic: the first provides an upper bound as it does not account for spending reductions, while the second provides a lower bound as it does not allow for households to substitute their reduced spending with increases in other categories.

We estimate demand equation (2) for the measure of total expenditure c_{it} by OLS, then invert the equation to express c_{it} as a function of f_{it}, X_{it}, D_{it} and p_t. We then use this inverted equation to impute each measure of total expenditure for each household in UKHLS. We report the estimated coefficients for demand equation (2) in Table A.1. Additionally, we perform a validation exercise in which we estimate equation (2) on a randomly selected 90 percent subset of the LCFS sample and compare the actual and imputed total consumption measures for the remaining 10 percent.

[38] In particular, it excludes entirely any spending on restaurants, hotels, leisure classes, and other miscellaneous activities such as visiting a museum, club or cinema, and reduces spending on transport by 80 percent

Overall, the imputed consumption measure is close to (but slightly lower than) the actual measures in LCFS, as shown in Table A.2.

We impute our measure of reduced expenditure into UKHLS following a two-step procedure. First, we construct the ratio r_{it} of reduced expenditure to total expenditure for each individual in LCFS and estimate the logistic transformation of this ratio as a function of food expenditure and other characteristics in LCFS:

$$\ln(\frac{r_{it}}{1-r_{it}}) = \delta_0 \ln f_{it} + D'_{it}\delta_1 \ln f_{it} + X'_{it}\gamma + \ln p'_t \phi + \nu_{it}. \tag{3}$$

We show the estimated coefficients from this equation in Table A.3. We then impute the expenditure ratio into UKHLS, and compute for each individual $\tilde{c}_{it}^{\text{reduced}} = \tilde{r}_{it} \times \tilde{c}_{it}$, where the c_{it} is the measure of total expenditure and tildes denote that the variables are imputed measures in UKHLS. We show the distribution of the imputed ratio across households in the UKHLS sample in

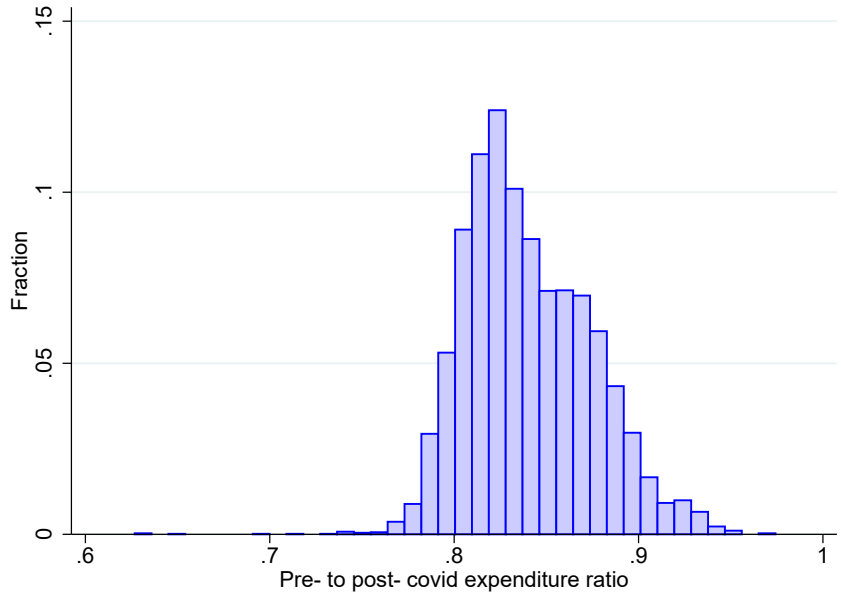
B. Occupational Factors

The location flexibility and physical proximity factors are taken from Lekfuangfu et al. (2020). These factors are constructed from occupational variables from the O*NET data for each of 900 detailed six-digit occupations using factor analysis (see Lekfuangfu et al. (2020) for more details). The O*NET measures are associated to occupations using US SOC codes. Unfortunately, there is no one-to-one mapping between the US SOC codes and the UK SOC codes provided in UKHLS. Therefore we manually assigned each 3-digit UK SOC code present in our data to one or more detailed US SOC codes, based on a close reading of the job requirements of each occupation. In cases where we assigned more than one US SOC code to a UK code (either because the lower detail of the UK codes in our data mean that they nest multiple more-detailed US codes, or because there is an imperfect equivalent between the two systems), we assign the average of the factors across US SOC occupations to the UK occupation.

C. Industry Exposure

We take the percentage of businesses reporting to have temporarily closed in each industry, defined by its top-level SIC code, from the economic impact survey of ONS (2020a) on 7 May 2020. We interpret this as an indicator of negative demand shock and construct an index for industry exposure by standardising these fractions of bushinesses closing to have mean zero and standard deviation one, as shown in Table A.4.

Figure A.3: Distribution of Imputed Ratio of Pre- to Post-covid Expenditure



Notes: Figure shows shows the distribution of the imputed ratio of pre- to post-covid expenditure, $\tilde{r}_{it}$, across households in UKHLS. See text in Appendix A.3 for details.

Table A.1: Consumption Function Coefficients

	Total Expenditure
	(1)
$\ln c$	0.352***
	(0.0333)
Education	
University degree	-0.0958
	(0.218)
$\ln c \times$ university	0.0190
	(0.0337)
Family structure	
One child	0.0981
	(0.278)
Two children	-0.203
	(0.295)
Three children	-0.914
	(0.515)
$\ln c \times$ one child	-0.00906
	(0.0430)
$\ln c \times$ two children	0.0308
	(0.0445)
$\ln c \times$ three children+	0.135
	(0.0787)
Married	0.536*
	(0.235)
$\ln c \times$ married	-0.0625
	(0.0380)
HH size	0.178***
	(0.0172)
Characteristics of HH head	
Age	0.0119
	(0.0236)
Age^2/1000	-0.000235
	(0.247)
Region dummies	\checkmark
Cohort dummies	\checkmark
Ethnicity dummies	\checkmark
Other controls	
$\ln c \times$ year dummies	\checkmark
$\ln p_{food}$	-5.806
	(10.40)
Constant	27.35
	(47.92)
R^2	0.403
N	2920

Notes: Table shows coefficients of equation (2), estimated using LCFS data for 2017/18, for total household expenditure. Standard errors in parentheses. See the text in Appendix A.3 for further details.

Table A.2: Imputation Validation

	Total Expenditure Model	
	Mean	S.D.
True $\ln(c)$	6.19	0.73
Imputed $\ln(c)$	6.26	1.55
True c	626.6	487.9
Imputed c	539.7	1056.9
$N = 438$		

Notes: Table shows the results of a validation exercise for our imputation procedure. We randomly selected an approximate 90 percent subsample of the LCFS data and re-estimated (2). The table compares actual and imputed consumption for both our total and reduced expenditure measures in 10 percent subsample excluded from estimation.

Table A.3: Consumption Ratio Coefficients

	Expenditure Ratio
	(1)
$\ln f$	0.121*
	(0.0617)
Education	
University degree	-0.437
	(0.237)
$\ln f \times$ university	0.0769
	(0.0571)
Family structure	
One child	0.511
	(0.326)
Two children	0.404
	(0.372)
Three children	1.818**
	(0.667)
$\ln f \times$ one child	-0.0683
	(0.0780)
$\ln f \times$ two children	-0.0370
	(0.0847)
$\ln f \times$ three children +	-0.281
	(0.149)
Married	-0.0984
	(0.271)
$\ln f \times$ married	-0.0519
	(0.0692)
HH size	-0.123***
	(0.0319)
Characteristics of HH head	
Age	-0.00976
	(0.0432)
Age^2/1000	0.242
	(0.247)
Region dummies	✓
Cohort dummies	✓
Ethnicity dummies	✓
Other controls	
$\ln f \times$ year dummies	✓
$\ln p_{food}$	17.04
	(12.25)
Constant	-78.30
	(56.42)
R^2	0.081
N	2887

Notes: Table shows coefficients of equation (2), estimated using LCFS data for 2017/18, for total household expenditure. Standard errors in parentheses. See the text in Appendix A.3 for further details.

Table A.4: Industry Exposure Index

Industry	Percent temporarily closed	Index
Accommodation and food service	80.6	2.99
Arts and recreation	79.5	2.94
Construction	26.1	0.37
Wholesale and retail trade	24.3	0.29
Manufacturing	20.6	0.11
Education	12.6	-0.28
Utilities and waste management	10.0	-0.40
Administrative and support	8.1	-0.49
Transportation and storage	8.5	-0.47
Human health and social work	4.9	-0.65
Information And Communication	4.5	-0.67
Professional Scientific And Technical Activities	3.0	-0.74

Notes: Table shows percentage of businesses reporting to have temporarily closed in each industry from the economic impact survey of ONS (2020a), and corresponding standardised index.