Labour Economics 81 (2023) 102331

Contents lists available at ScienceDirect

Labour Economics

journal homepage: www.elsevier.com/locate/labeco

Assessing data from summary questions about earnings and income

Thomas F. Crossley [a], Paul Fisher [b,*], Omar Hussein [b]

[a] European University Institute and Understanding Society, UK
[b] ISER, University of Essex and Understanding Society, Wivenhoe Park, Colchester, Essex, CO4 3SQ, UK

ARTICLE INFO

JEL classification:
C81
C83
I32

Keywords:
Validation
Measurement error
Data quality
COVID-19

ABSTRACT

In short surveys, or in surveys that prioritise other content domains, earnings and income are often elicited using small sets of summary questions. This contrasts with the detailed questions recommended for surveys that focus on earnings and income, that ask source by source. We evaluate earnings and income data collected with summary questions in a series of recent web-surveys: the *Understanding Society* COVID-19 Study. The fact that many COVID-19 Study respondents also contemporaneously answered the main annual *Understanding Society* survey provides individual- and household-level validation data. We find that measures of household earnings and income in the COVID-19 Study are noisier than those from the main annual *Understanding Society* survey, and that there is evidence of systematic under-reporting for household totals. However, for most measures and samples, we find that measurement errors in the COVID-19 Study are substantively uncorrelated with true values. We conclude that the COVID-19 Study collected valuable data on earnings and income, and more broadly, that summary questions on earnings or income can be a useful data collection tool.

1. Introduction

During times of crisis, the demand for timely data may rise, and social science surveys must be developed and fielded at speed. In particular, earnings and income can be tracked with brief summary questions in web surveys. Many such surveys were fielded during the COVID-19 pandemic and continue to be analysed by economists (see, for example, Adams-Prassl et al. (2020); Belot et al. (2020); Bundervoet et al. (2022); Crossley et al. (2021); Institute for Social and Economic Research (2020)). These rapid surveys are important because administrative data sources (such as tax returns) may be available only at annual frequency, and official household income surveys may also lack timeliness, or may have been disrupted (e.g., Ward and Edwards (2021)). Earnings and income data are also collected with a small number of summary questions in surveys that prioritise other content domains. Examples include the US General Social Survey, the Gallup Healthways Wellbeing Index, the European Social Survey, and the Health Survey for England. Data from these surveys are used extensively in economic research.

In contrast, the best practice approach to collecting earnings and income data in a household survey is with a detailed set of questions that ask each household member about each individual income source, and then, post fieldwork, to aggregate over sources and then over individuals in the household (United Nations, 2011). In the crisis context, or where a survey prioritises other content domains, practice necessarily deviates from this ideal. Demands on interview space push data collectors towards fewer summary questions that ask about earnings and income totals, rather than going source by source. Where field work periods are compressed, it may not be possible to interview all household members, and one individual may need to report household totals. Given the importance of earnings and income data to research and policymaking, it is imperative to understand the quality of the data collected in such cases.

In this paper, we study the quality of earnings and income data collected with summary questions in a series of surveys fielded during the COVID-19 pandemic - the *Understanding Society* COVID-19 Study. We link individuals who were interviewed twice in a short-time period - with a set of detailed earnings and income questions in the main annual *Understanding Society* survey, and in the COVID-19 Study. As the gap between interviews is very close, we can use the more detailed survey to learn about the error properties of the data from the shorter one. We exploit the individual-level linkage between the two surveys to describe the differences in reports at an individual level. We then interpret those differences through the lens of an estimated model of measurement error. That model does not impose that the validation source (here, the *Understanding Society* Main Study) is error free, but it does allow us to compare the quality of the two sources.

We have three main findings. First, the summary questions in the COVID-19 Study produce very reliable data on individual earn-

* Corresponding author.
E-mail addresses: thomas.crossley@EUI.eu (T.F. Crossley), pfishe@essex.ac.uk (P. Fisher), om20319@essex.ac.uk (O. Hussein).

https://doi.org/10.1016/j.labeco.2023.102331
Received 15 February 2022; Received in revised form 14 November 2022; Accepted 4 January 2023
Available online 09 January 2023

ings; second, household earnings and income is systematically underreported in summary questions; and third, measurement errors in the COVID-19 Study household income measure is largely uncorrelated with true values, but there is a mild correlation for household earnings. The latter means that, reassuringly, that an instrumental variables approach can correct for measurement error in a regression context.

A growing literature has looked at the misreporting of earnings and income in household surveys. Validation studies can be distinguished by whether two measurements – the measurement of interest and the validation measure – are available for a given individual or household unit (a "micro" study in the terminology of Bound et al. (2001)); or those measures are available on separate samples (a "macro" study in the terminology of Bound et al. (2001)) so that only differences between distributions can be studied. Validation studies can further be distinguished by the nature of the validation data (a high-quality survey, or administrative records), and whether it is a broad population sample or a more narrow set of records (such as the payroll records of a single firm). Finally, validation studies differ in what is assumed about the validation data (in particular, whether is assumed to be error free).

Micro validation studies of earnings and income data in surveys have typically linked survey responses to administrative records (payroll, social security, or tax records). Early micro vaidlidation studies often used narrow validation samples, and assumed the administrative data was error free (see, for example, Bound et al. (1994); Pischke (1995)). However, more recent papers have linked to more broadly representative data sets such as social security records (Gottschalk and Huynh, 2010; Meyer and Mittag, 2019) and allowed for errors in the validation source, or linkage error, or both (Abowd and Stinson, 2013; Bingley and Martinello, 2017; Jenkins and Rios-Avila, 2020; Kapteyn and Ypma, 2007; Wilhelm, 2018).

Whilst the validation literature has assessed data from income-focussed surveys with detailed earnings and income questions, there is little evidence on the performance of summary income and earnings questions. This is a surprising fact given their widespread use. Two rare exceptions are Micklewright and Schnepf (2010) and Han et al. (2020). Micklewright and Schnepf (2010) perform several macro validations, comparing responses to a single summmary income question in one survey to data derived from a more detailed set of questions in a benchmark survey. The authors conclude that distributions compare less well for household income than for individual income. Han et al. (2020) also find that poverty rates and income percentiles estimated on data from global questions of the monthly Current Population Survey (CPS) fall below those estimated on more detailed equivalents from the Annual Social and Economic Supplement of the CPS.

Our design is unusual in that we conduct a micro validation study that draws validation data from a high-quality survey. We are able to work with a large nationally representative sample, but we do not need to worry about linkage error because the COVID-19 Study was launched directly from our validation source (the *Understanding Society* Main Study). Like other recent studies, we do not assume our validation source – the more detailed survey – to be error free. Among studies of summary earnings and income questions, we differ from Micklewright and Schnepf (2010) and Han et al. (2020) in that we directly estimate measurement error models and are not limited to simple aggregate comparisons of distributions from different surveys. For example, we can quantify the bias of OLS and IV estimated on data from the summary questions.

The rest of the paper proceeds as follows. Section 2 describes our data sources and lays out our research design. Section 3 provides a descriptive comparison of our two data sources before presenting our estimated measurement error models. Section 4 concludes.

2. Data and methods

2.1. Understanding society *and the* understanding society *COVID-19 study*

We link the *Understanding Society*: the UK Household Longitudinal Study (henceforth Main Study) with the *Understanding Society* COVID-19 study (henceforth COVID-19 Study). The former is a long-standing general purpose panel survey from the UK, and it is our validation source for information on earnings and incomes. The latter is our source of earnings and income data collected with a short set of summary questions, and it is a series of short web surveys conducted during the pandemic and completed by the Main Study participants. It is a prime example of a survey collecting earnings and income data with a summary questions in the face of pressures on interview length.

Our analysis is based on waves two to six of the COVID-19 Study and the 2020 calendar year release of the Main Study.[1] The COVID-19 waves were fielded in the last weeks of April, May, June, July, September, and November 2020, and of January, March and September 2021. We work with the waves fielded from May-November 2020. The Main Study is a mixed-mode survey, collecting data from participants annually by face-to-face or web interview since 2009, but switched to web mode (with telephone follow-up) from the onset of the pandemic (Burton et al., 2020). It is one of the largest household panel studies in the world. We take the Main Study data from the 2020 calendar year release for which the fieldwork was conducted across 2020.[2] The COVID-19 Study employs shorter and more frequent web surveys to record the experiences and behaviour of Main Study participants during the COVID-19 pandemic. Each such web survey is designed to take about 20 minutes to complete, in contrast to the 45 minutes for the more detailed and extensive questions of the Main Study. Both studies contain a mix of repeating and rotating content. Income and earnings variables are collected at almost all waves.

All individual members of the Main Study who were aged sixteen or over in April 2020, and who belonged to active households, were invited to participate in the COVID-19 Study.[3] In mid-April, potential respondents were sent a pre-notification letter introducing the study and offering a small incentive for each web survey they completed. The fieldwork period for each web survey lasted seven days, whereas in the Main Study the fieldwork extends for up to nearly six months. Additional information on the *Understanding Society* COVID-19 Study can be found in Institute for Social and Economic Research (2020) and Institute for Social and Economic Research (2021b), and for the Main Study in Institute for Social and Economic Research (2021a).

The detailed earnings and income questions of the Main Study follow international best practice (United Nations, 2011). Main Study income data have been shown to be of high quality. Earnings and income distributions from the Main Study match closely those from other high-quality sources (e.g., Fisher et al. (2019), Fisher (2019)), and Main Study income data are the source for official UK statistics on poverty dynamics. While the earnings and income questions of the COVID-19 Study have been extensively used in academic research, they have yet to be validated against external sources as no benchmark for the pandemic period yet exists. Further relevant details of the earnings and income questions asked in each survey are discussed below.

[1] We do not include wave one of the COVID-19 Study because the income questions were only asked from wave two. However, we provide some analysis of the wave one earnings data in Supplemental Appendix sections A3 and A4.

[2] The calendar release draws observations from the overlapping 11th and 12th waves of the Main Study, but note that each individual is interviewed just once in a calendar year.

[3] An active household is one that participated in at least one of the last two waves of the Main Study.

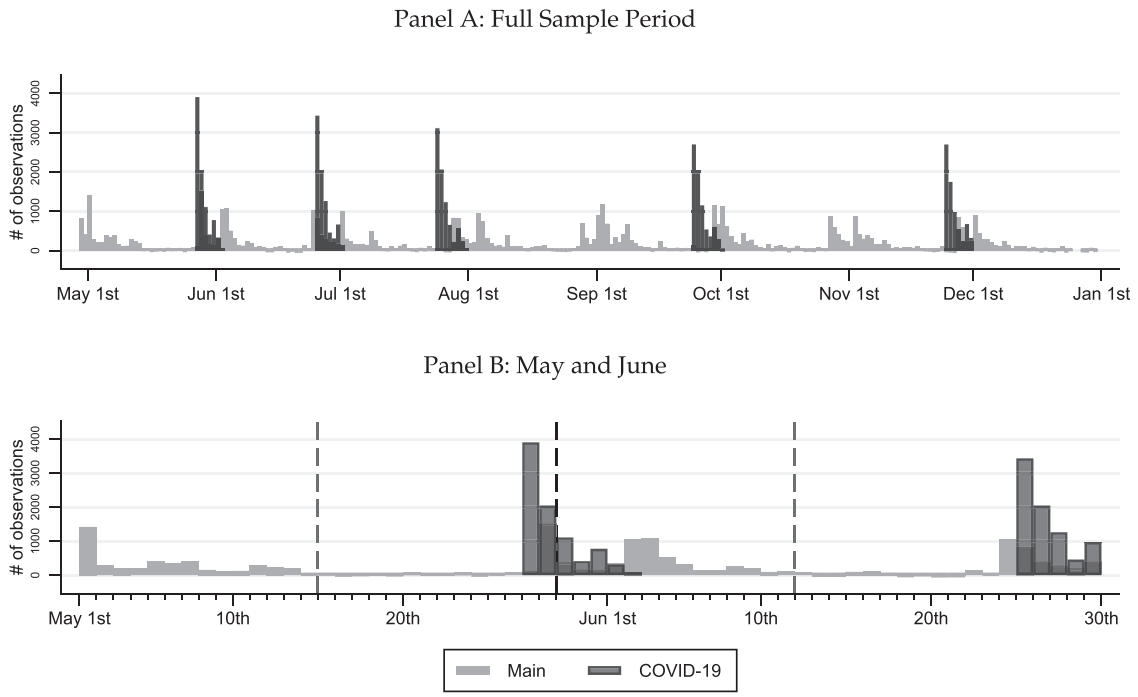

Fig. 1. Interview dates: COVID-19 and main study. *Notes*: Time is recorded on the horizontal axis and number of interviews completed on the vertical axis. The top panel covers the full sample period and the bottom panel focuses on the months May and June.

2.2. Research design

Our research design is based on the fact that the *Understanding Society* Main Study continued to run throughout the pandemic (though with a reduced set of survey modes). Study participants are issued to the field for annual Main Studys interview throughout the year, with batches issued at the beginning of each month. This means for each COVID-19 Study wave, approximately one twelfth of the sample will have been invited to a Main Study interview within a few weeks of the invitation to the COVID-19 Study interview. The resulting pattern of interviews is shown in Fig. 1. Time is recorded on the horizontal axis and number of observations (or interviews), by day, are record on the vertical axis. The number of COVID-19 Study interviews is plotted in dark grey, while the number of Main Study interviews is plotted in light grey. The top panel of Fig. 1 shows the period from late May 2020 through to the end of the calendar year used in our analysis. This captures five COVID-19 Study Waves (Waves two through six). Because each COVID-19 Study wave occurred in the last week of the month, and each monthly batch of Main Study invitations are released in the first week of the month, there are repeated Main Study interview peaks shortly after each COVID-19 Study interview peak.

The utility of this for our research questions is that, when a study participant completes a COVID-19 Study interview and Main Study interview in quick succession, they respond to (for a similar period) both the summary set of summary earnings and income questions in the COVID-19 Study, and the detailed earnings and income questions in the Main Study (these are described in detail in the next subsection). We construct our sample by looking for Main Study interviews by the same participant in a window of plus or minus fourteen days around their COVID-19 Study interview. In the rare cases where two Covid-19 interviews fall within 14 days of a Main Study interview, we keep the nearest match, so that individuals appear only once in our sample (though we do not rule out the inclusion of multiple individuals from the same household).

This is further illustrated in the second panel of Fig. 1 (which is a blow-up of one section of the first panel, corresponding to the May COVID-19 Study). We construct our sample by matching COVID-19 Study interviews to Main Study interviews in this window, indicated in the figure by the vertical dashed lines. Each match gives us two sets of earnings and income measures to compare. As the Main Study is annual, each participant will provide at most one match in our data period, but we pool across COVID-19 Studies to get a substantial sample of 4325 individuals. Because of the timing of fieldwork for COVID-19 and Main Studies, most matches will involve a Main Study interview shortly *after* the COVID-19 Study interview. This is useful, as one concern might be that completing the longer set of Main Study questions first would improve the responses that are given in the COVID-19 Study. To further guard against this possibility, below we report a robustness check in which we construct a sample from matches found only in the three weeks *after* the COVID-19 Study interview.

The Main Study data are our validation data. It will of course contain measurement error due to misreporting. However, we note that recent validation studies (e.g., Abowd and Stinson (2013); Bingley and Martinello (2017); Wilhelm (2018)) have documented measurement error in administrative income data, and we deal with measurement error in the validation sample using a similar econometric approach. An advantage of our design is that there is no linkage error. Kapteyn and Ypma (2007) and Jenkins and Rios-Avila (2020) have shown that linkage error can be an important issue in validation studies involving linkage to external records.

We begin with a descriptive comparison of the two measures. We first examine the distributions of individual earnings, household earnings and household income in the two data sources. For many questions, such as whether the summary and detailed measures give similar impressions of poverty or inequality, these “macro” comparisons of distributions are sufficient.

We then examine the distribution of *differences* across those two data sources for each measure (rather the difference in distributions). These differences will comprise measurement error from both sources, and so cannot be interpreted directly as measurement error in the COVID-19 Study measures. Nevertheless, the magnitudes of differences are a useful starting point. To go further, we examine the data through the lens of a standard measurement error model. The model closely follows Bingley and Martinello (2017).

Let y be the variable of interest (individual earnings, household earnings, or household income), with mean μ_y and variance σ_y^2 (these are the unobserved true values). Denote the measure in the COVID-19 Study by y_c, and the measure in the Main Study by y_m. We assume that y_c is linearly related to the true value y.

$$y_c = \mu_y + k_c + (1+\rho_c)(y-\mu_y) + \epsilon_c \tag{1}$$

The parameter k_c captures under- or over-reporting at the mean ($y = \mu_y$), while ρ_c allows the error in y_c to be systematically related to the true value, y. A negative ρ_c implies mean reversion (for example, low earners over-reporting, and higher earners doing the opposite). The error term ϵ_c has mean zero, variance σ_c^2, and is independent of y. Note that if $\rho_c = k_c = 0$, the measurement error in y_c is classical. Consider estimating a bivariate regression with $x = \beta y + u$, where the usual regression assumptions hold, but the independent variable y is replaced by measure y_c. With this measurement error model, it is well known that (Bound et al., 2001):

$$\text{plim}\,\hat{\beta}^{OLS} = \beta \frac{(1+\rho_c)\sigma_y^2}{(1+\rho_c)^2\sigma_y^2 + \sigma_{\epsilon_c}^2} \tag{2}$$

and if an instrument z is available that is correlated with y but uncorrelated with ϵ_c

$$\text{plim}\,\hat{\beta}^{IV} = \beta \frac{1}{(1+\rho_c)} \tag{3}$$

Finally, if the regression of interest is instead $y = x\alpha + v$, with y as the dependent variable, and measured by y_c:

$$\text{plim}\,\hat{\alpha}^{OlS} = \alpha(1+\rho_c) \tag{4}$$

Thus, we can summarise the quality of y_c by the parameters ρ_c, k_c and σ_c^2. The attenuation factors in Eqs. (2) through (4) suggest that an earnings or income measure is more useful the closer it's measurement error is to classical (and in particular, the closer ρ_c is to zero), and the smaller the variance of the classical measurement error component (σ_c^2).

To recover these parameters, we require two things. First, we assume that measurement error in the Main Study measures is classical:

$$y_m = y + \epsilon_m \tag{5}$$

where ϵ_m has mean zero, variance σ_m^2, and is independent of y. While this is an assumption, two lines of evidence support this approach. First, as described in Section 2.1, income and earnings data from the Main Study has been extensively validated against other high-quality sources. Second, more recent validation studies of survey earnings and income measures have failed to reject that the measurement error in those measures is classical. For example, Bingley and Martinello (2017) cannot reject that measurement error in earnings data from the Survey of Health Ageing and Retirement in Europe (SHARE) is classical. SHARE collects earnings and income with a detailed approach similar to that taken by the *Understanding Society* Main Study. The second requirement is that we have an instrumental variable that is correlated with y but uncorrelated with the measurement errors ϵ_c and ϵ_m. Then μ_y is identified by the mean of y_m, and given μ_y, k_c is identified by the mean of y_c. We can combine 1 and 5 to give:

$$y_c = \mu_y + k_c + (1+\rho_c)(y_m - \mu_y) + \epsilon_c - (1+\rho_c)\epsilon_m \tag{6}$$

where $(1+\rho_c)$ can be estimated by IV. Given $(1+\rho_c)$, the 2nd moments of y_m and y_c identify σ_y^2, σ_m^2 and σ_c^2. Following Bingley and Martinello (2017), we estimate $(\mu_y, k_c, \rho_c, \sigma_y^2, \sigma_m^2, \sigma_c^2)$ by Generalized Method of Moments (GMM).

In our results below, we report estimates of these parameters as well as the OLS and IV attenuation factors in Eqs. (2) and (3). A comparison of the attenuation factors reveals how the bias would differ if one did have instrumental variables or did not (and hence used OLS). A researcher using similar summary earnings or income questions who does not have access to appropriate instrumental variables can use our estimates of the OLS attenuation factor to assess their likely bias.

We make use of well-measured Main Study variables as instruments. Instruments need to predict earnings or income, and they need to be uncorrelated with the measurement errors in the Main study and Covid-19 study. Our three household-level instruments are the number of cars the household owns or has access too; the number of rooms in the home; and council tax liability. Council tax is a local tax and is assigned by allocating each residential property to one of eight bands based on the property value. While the first two variables are reported by a single respondent for the whole household, the latter is linked (by the data producers) to official council tax information, where the household postcode is the linking variable. As documented below, these "asset" variables predict household income and earnings well, they are thought to be well measured, and they have been used previously in the literature (see, for example, Bingley and Martinello (2017)). A potential concern with validity is that larger households with multiple adults may have more assets, and individuals in such households may have more difficulty in reporting household earnings or income totals. In part to address this concern, we conduct subsample analysis on single and multiple adult households separately.

For individual earnings, we use two alternative instrument sets. The first is an average of 2 lags of individual earnings. The second is a small set of common wage predicators; age, gender, and the highest educational qualification achieved. Both sets are good predictors of earnings. The validity of the lagged earnings measure rests on measurement error being uncorrelated over time for an individual. The validity of human capital variables requires that measurement error is not correlated with those variables. It cannot be, for example, that lower education respondents under-report, while higher education respondents do not.

2.3. Earnings and income measures

The Main Study questionnaire has been optimised around earnings and income data collection where the different components of income are collected in distinct survey modules (employees; self-employment; second jobs; unearned income and state benefits; and household finances) with the aim of maximising response and data quality. In contrast, the short length of the COVID-19 Study interviews necessitates a compromise, and so the questions sit within a general 'employment module' that asks about various aspects of employment, earnings, and income in one place.

Other features of the Main Study would suggest it produces data of higher quality than the COVID-19 study. First, in-interview respondent help notes were much more limited in the COVID-19 Study interviews, as the latter were optimised for completion by smartphone or similar device. While 67% of interviews were by smartphone in the COVID-19 study, only 33% of interviews were on a similar device in the Main Study. Second, to improve recall, respondents are encouraged to check relevant documents like payslips, in the Main Study. Third, the Main Study uses in-interview tools to improve reporting. Dependent interviewing reminds survey respondents of their reports at the previous interview, with the aim of reducing spurious change between waves. Non-response is reduced with follow-ups that prompt for reports where a respondent initially refused to answer a question. Fourth, while respondents are familiar with the reoccurring structure and questions of the Main Study, having participated in previous interviews, the COVID-19 Study is new.[4]

We construct three earnings and income variables for each study: individual earnings in main job, total household earnings, and total household income. For the Main Study, we work with the publicly available derived household earnings and income variables from the data producers. For the COVID-19 Study, we use the amounts reported on the summary set of earnings and income questions. While for the Main Study,

[4] Both surveys make use of in-interview soft-checks that, for example, notify a respondent if they have reported a gross amount less than a net amount.

household totals are arrived at by summing over an individual's own income sources and then across individuals, in the COVID-19 study, each individual reports on household totals directly. We always work with the variables that are asked net of relevant taxes.[5] The reference periods for each study broadly align. The Main Study asks about income around the time of the interview, with some exceptions described below, the COVID-19 study always asks 'now'. The respondent chooses the exact period code to report on in both surveys (week, two week, month or year in the COVID-19 Study with a slightly larger set of options in the Main Study). The majority of respondents choose a monthly period code. For example, in the COVID-19 Study, this option was chosen by 80% of respondents for individual earnings; 74% for household earnings and 67% for household income. We always report amounts converted to monthly equivalents.

Our definition of individual earnings is employee pay in the main job. Both surveys record this amount with a similar question. We exclude self-employees from our definition, as the reference periods do not match across the surveys.[6]

Our definition of household earnings includes employee pay from all jobs, including self-employment profit and earnings from any second jobs. For the Main Study, this is calculated as the sum of reported main job, profits and second job earnings across all household members. For the COVID-19 study, we take this amount from the question asking about total earnings of the household, i.e., including second jobs and self-employee profit.[7]

Our definition of household income covers all sources of individual incomes including household earnings as above, plus social security benefits, state and private pensions, private transfers and investment income. While the global household income figure is collected directly in the COVID-19 study, the Main Study asks separately about each of 41 sources of benefits and unearned income, where the reference period is the 'last payment received'. Investment income is asked about for the 'last 12 months'. The exact wording of the earnings and income questions for both studies are provided below.

We never work with imputed earnings or income data in our analysis, even though they are supplied by the data providers. Instead, observations with item-missing data on a source are removed for that source. Our overall distributional comparisons apply survey weights to correct for item non-response, survey non-response, and survey design. Weights match each sample to 2020 Main Study totals defined by gender, age and education.

3. Results

3.1. Item missingness

A possible benefit of summary questions is that they may suffer less from item-missingness when compared to a detailed set of questions that go source by source and household member by household member. This is because non-response cumulates over items and over individuals - essentially a mechanical effect. On the other hand, if respondents find summary questions harder to answer, then overall item non-response could be higher with summary questions.

Table 1 shows item-missingness is less prevalent in the COVID-19 Study (summary questions), relative to the Main Study (detailed question sets). The difference is largest for earnings at the household, rather than the individual level, and for multiple, rather than single adult households. Overall missing rates for individual earnings, household earnings and household income, respectively, are 12%, 34%, and 43% in the Main Study and 11%, 14% and 23% in the COVID-19 Study. We count an observation as item missing where an individual declines to answer the corresponding survey question or a question it is routed on; or where an individual resides in a household where at least one member declines an interview (we refer to such cases as 'incomplete households').

The right half of Table 1 shows that the difference in missingness holds when we consider individuals from complete households as defined in the Main Study.[8] The differences are smaller for this subsample, as should be mechanically true (Main Study: 11%, 19%, and 33%; COVID-19 Study: 11%, 14%, 22%). On a point of detail, the sample sizes for individual earnings marginally differ across the studies (Main or COVID-19) as they include only those reporting paid work in the corresponding study. Also, the sample sizes for household earnings are smaller than those for household income, as we restrict the former to individuals of working age. The missing data numbers we report are of comparable magnitude to those seen in similar UK household surveys.

Table 1 also shows that the difference in item missing rates are larger for multiple adult households than for singles, and the missingness gap is largest for the household concepts and particularly large for household income. This reflects the fact that household income consists of more subcomponents than household earnings, and so there is a greater chance that at least one subcomponent is missing. For example, the missing rate in household income for individuals in multiple adult households is 35% in the Main Study, compared to only 23% for the COVID-19 Study (complete households).

3.2. Descriptive comparison

We now compare the earnings and income distributions across the two surveys. Fig. 2 shows the cumulative distributions (CDF) for individual earnings, household earnings and household income, while Table 2 shows selected percentiles as well as the Gini coefficient. The table reports test results for whether the ratio of the percentile estimates for each survey are statistically different from one (i.e., whether the percentage difference between each survey is zero) and similarly for the Gini coefficients. We drop from the analysis samples cases which suffer item-missing for a given concept, and then apply calibration weighting to adjust for selection into the analysis samples. Weights are constructed to match each survey-specific earnings and income concepts to 2020 Main Study totals defined by gender, age and education.[9] All sources are expressed in levels.

Looking at the distributions, the most striking feature is a high degree of agreement for all concepts. Individual earnings are most similar, as the CDFs for the two surveys overlap, and there is very little difference in the selected percentiles or Gini in Table 2. Indeed, the ratio of the percentiles are always close to one. The comparison differs for household earnings and household income, where the surveys disagree somewhat. Here, the COVID-19 Study estimates are consistently lower than the equivalents from the Main Study - and statistically so - and more notably so for household income. For example, the estimated medians are 84% of the Main Study figures for both household earnings and household income. Also, the COVID-19 Study gives a slightly higher estimate of the Gini for household earnings (43.6 to 42.9) and household income (33.4 to 31.2).

The similarity in individual earnings measures, and apparent difference of household earnings and income, is not completely surprising.

[5] Some minor conversion from gross to net does take place in the Main Study, i.e., second jobs is reported gross, but the data producers translate the amount to a net equivalent by tax simulation.

[6] In the Main Study, self-employees receive a distinct set of questions about profits on last year's accounts, whereas in the COVID-19 study they receive the same pay question as employees asking about pay 'now'.

[7] This does mean that our household earnings comparisons will suffer from the definitional difference for the self-employed stated above. However, the self-employed correspond to only 6.8% of our sample (COVID-19 Study).

[8] Summary statistics for this sample are included in the supplementary appendix Table.

[9] In robustness checks, we also performed an unweighted analysis and the main conclusions of the paper all hold.

Table 1
Prevalence of item-missing data (percent) .

	All respondents				Respondents in complete hhs.			
	(1) Main %	(2) N	(3) COVID-19 %	(4) N	(5) Main %	(6) N	(7) COVID-19 %	(8) N
All individuals								
Ind. earnings	12	(2034)	11	(2118)	11	(1674)	11	(1752)
HH. earnings	34	(3112)	14	(3112)	19	(2568)	14	(2568)
HH. income	43	(4325)	23	(4325)	33	(3669)	22	(3669)
Single adult hhs.								
Ind. earnings	8	(275)	8	(281)	8	(275)	8	(281)
HH. earnings	8	(434)	6	(434)	8	(434)	6	(434)
HH. income	25	(715)	19	(715)	25	(715)	19	(715)
Multiple adult hhs.								
Ind. earnings	12	(1759)	12	(1837)	12	(1399)	12	(1471)
HH. earnings	38	(2678)	16	(2678)	22	(2134)	15	(2134)
HH. income	46	(3610)	24	(3610)	35	(2954)	23	(2954)

Notes: Sample of individuals completing a COVID-19 Study interview within 14 days of their Main Study interview. In the case of multiple matches the nearest match is kept. A 'complete household' is one in which all adult members complete a Main Study individual interview and households not meeting this condition are recorded as 'incomplete households'. 'Single adult households' refers to individuals living in households with no other adults age 16 or over as reported in the Main Study; and 'Multiple adult households' refer to individuals in households with more than one adult aged 16 or over. Individual earnings are conditional on reporting paid employment as an employee in the relevant study (COVID-19 or Main). Individual and household earnings are reported for the sample of working age (age<66).

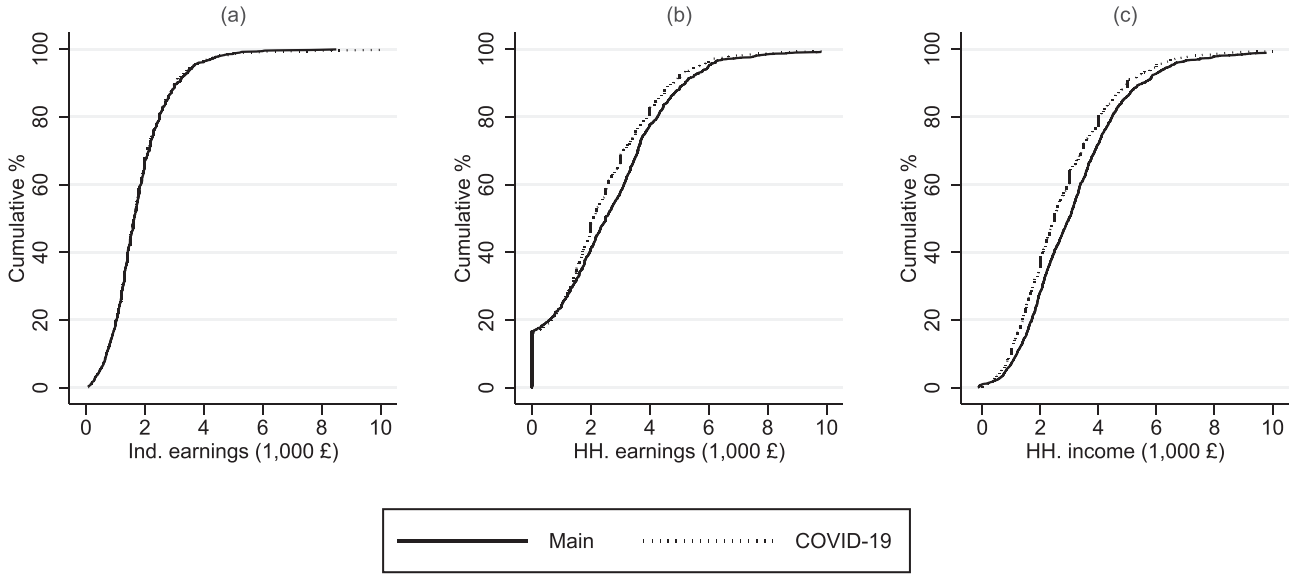

Fig. 2. Income and earnings CDFs. *Notes*: Sample of individuals completing a COVID-19 Study interview within 14 days of their Main Study interview where all adults in the household completed a Main Study individual interview ('complete households'). All income sources are net of tax and national insurance contributions. Individual earnings are conditional on reporting paid employment as an employee in the relevant study (COVID-19 or Main). Individual and household earnings are reported for the sample of working age (age<66). Observations with item-missing data on an income source are removed for that source. Weights correct for item non-response, survey non-response and survey design. Weights match each (income source and survey specific) sample to 2020 Main Study totals defined by gender, age and education. Sample sizes as in panel A of Table 2.

First, both surveys ask similar individual earnings questions and second, individual earnings can be arrived at without respondents needing to aggregate sources or have knowledge of other household members finances. A different interpretation is that the lower item-non response rate of the COVID-19 study leads to differing compositions across the surveys, and consequently distributional estimates differ. The bottom panel of Table 2 presents evidence against the latter interpretation by focussing on the sample of individuals that report a given source in both surveys.

Fig. 3 presents a related analysis by plotting the rank in one survey against the rank in the other, for each of our earnings and income measures. Income ranks are used in various empirical literatures such as intergenerational mobility (e.g. Chetty et al. (2014)), and are unaffected by monotonic transformation (such as from levels to logarithms), motivating the comparison. While most points in the rank-rank plots are close to the 45 ° line - indicating a high degree of agreement between the surveys - there are noticeable deviations, which are strongest for the household measures. Spearman's rank correlation is high for individual earnings (0.94); and lower for household earnings (0.85) and household income (0.83).

Fig. 4 examines the distribution of the *differences* between the surveys (COVID-19 minus Main). To focus on percentage differences, we take the natural logarithm of each income source before differencing. We present CDFs for the differences and also the absolute differences.

Table 2
Income and earnings distributions .

	Ind. Earnings			HH. Earnings			HH. Income		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Percentile	Main	COVID-19	Ratio (2)/(1) x100	Main	COVID-19	Ratio (5)/(4) x100	Main	COVID-19	Ratio (8)/(7) x100
Panel A: All individuals									
5	465	455	98	0	0	.	820	650	79***
10	700	700	100	0	0	.	1195	1000	84***
25	1166	1170	100	1048	1000	95	1894	1560	82***
50	1642	1609	98	2500	2100	84***	2990	2500	84***
75	2300	2260	98	3839	3500	91***	4150	3750	90***
90	3100	3000	97*	5200	4800	92***	5539	5000	90***
95	3667	3611	98	6010	5700	95**	6494	6000	92***
Gini	30.10	30.70	102	42.90	43.60	102	31.20	33.40	107***
Weighted	Yes	Yes	-	Yes	Yes	-	Yes	Yes	-
N	1484	1560		2068	2214		2450	2845	
Panel B: No item-missing data in both surveys (source specific)									
5	495	459	93	0	0	.	897	717	80***
10	700	730	104	0	0	.	1256	1000	80***
25	1150	1170	102	1024	997	97	1925	1610	84***
50	1625	1600	98	2493	2083	84***	3028	2587	85***
75	2262	2225	98	3800	3500	92***	4135	3900	94***
90	3048	3000	98	5178	4800	93***	5633	5000	89***
95	3639	3600	99	5977	5500	92***	6517	6000	92***
Gini	29.90	30.20	101	43.10	44.20	103*	30.40	32.20	106***
Weighted	Yes	Yes	-	Yes	Yes	-	Yes	Yes	-
N	1418	1418		1927	1927		2124	2124	

Notes: Sample of individuals completing a COVID-19 Study interview within 14 days of their Main Study interview, where all adults in the household completed a Main Study individual interview ('complete households'). In the case of multiple matches, the nearest match is kept. All income sources are net of tax and national insurance contributions. Individual earnings are conditional on reporting paid employment as an employee in the relevant survey (COVID-19 or Main). Household earnings refers to working-age individuals (age<66). Observations with item-missing data on an income source are removed for that source. Panel B further restricts the sample to individuals with non-missing data on a source in both surveys. Weights correct for item non-response, survey non-response and survey design. Weights match each (income source and survey specific) sample to 2020 Main Study totals defined by gender, age and education. Stars indicate a ratio that is statistically different from one, where the standard errors are bootstrapped: * p<0.1, ** p<0.05, *** p<0.01.

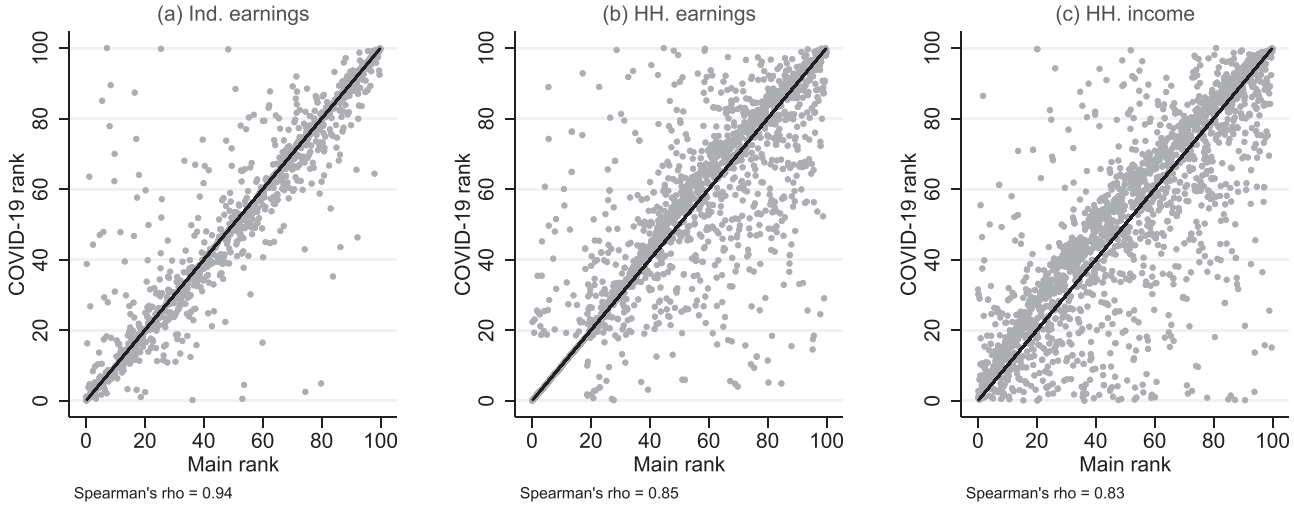

Fig. 3. COVID-19 study rank vs. main study rank. *Notes*: Sample of individuals completing a COVID-19 Study interview within 14 days of their Main Study interview where all adults in the household completed a Main Study individual interview ('complete households'). In the case of multiple matches the nearest match is kept. All income sources are net of tax and national insurance contributions. Individual earnings are conditional on reporting paid employment as an employee in both surveys. Observations with item-missing data on an income source are removed for that source. Individual and household earnings are reported for the sample of working age (age<66). Ranks are the percentile rank of each source in the correpsonding survey. Sample sizes are 1418 (individual earnings), 1927 (household earnings) and 2124 (household income).

Several features are notable. First, there is a large mass of zeros for all three measures. Second, many of the differences fall both above and below zero, but more fall below than above for the household measures (pointing to possible under-reporting in the COVID-19 Study). Individual earnings has the smallest mass below zero at 35 percent, but the same figure for the household measures is around 55 percent. For each of our measures, around 35% of differences are greater than zero. Third, the absolute differences show fewer and small differences for individual earnings compared to the household measures.

A summary of this section is that both surveys produce similar data, although the summary questions of the COVID-19 Study give lower estimates of household earnings and income, and marginally higher estimates of inequality as measured by the Gini coefficient. We also see that the same individuals tend to report lower income in the COVID-19 Study

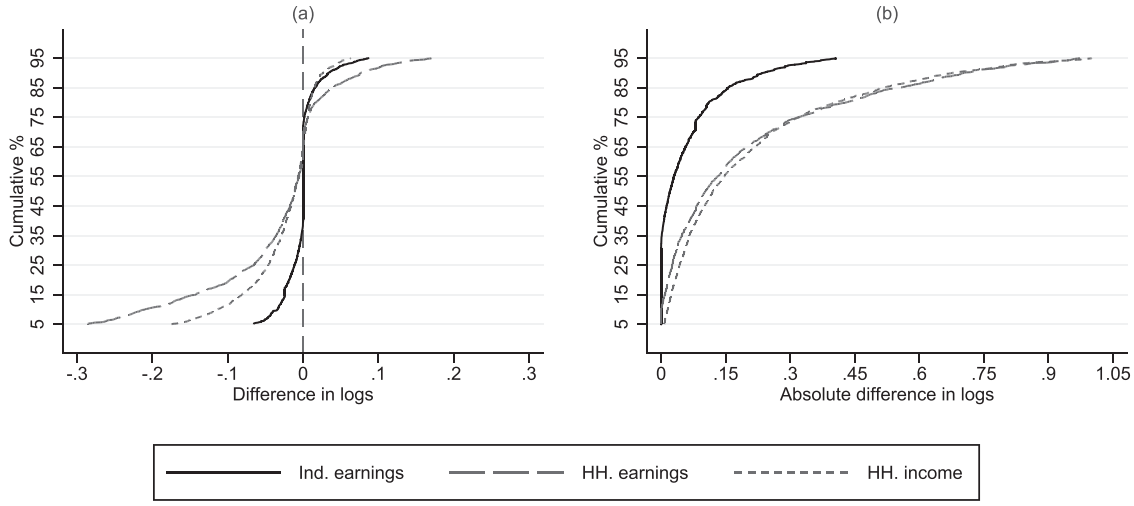

Fig. 4. CDFs of differences in reported earnings and income (COVID-19 - Main). *Notes*: Sample of individuals in multiple adult households completing a COVID-19 Study interview within 14 days of their Main Study interview where all adults in the household completed a Main Study individual interview ('complete households'). In the case of multiple matches the nearest match is kept. All income sources are net of tax and national insurance contributions. Individual earnings are conditional on reporting paid employment as an employee in both surveys. Individual and household earnings are reported for the sample of working age (age<66). Observations with item-missing data on an income source are removed for that source. Differences are constructed as: log(COVID-19 Study amount) - log(Main Study amount). Sample sizes are 1418 (individual earnings), 1524 (household earnings) and 2124 (household income).

than in the Main Study, although again only for the household measures. A possible interpretation of the findings is that the summary question sets of the COVID-19 Study tend to under-record household earnings and income, as the Main Study data is collected with gold standard interviewing methods. In the next section, we allow for the possibility of errors in both surveys and estimate directly their measurement error properties.

3.3. GMM estimates of a measurement error model

We now turn to estimates of the measurement error model outlined in Section 2.2. For individual log earnings, we compare two sets of instruments. The first is an average of lagged earnings (from previous waves of the Main Study). The second is a set of human capital variables: gender, age, education. The results are presented in Table 3. Both sets of instruments are strongly correlated with reported earnings in the Main Study, as indicated by the First Stage F-statistic. Results are very similar for both instrument sets.

The estimates of ρ_c and k_c are very close to zero, indicating that measurement error in the COVID-19 earnings measure is not related to the true value, and that it does not suffer from systematic under-reporting. Note that the estimates do reject the null of no measurement error variance in the Main Study, so we focus on the full model that allows for classical measurement error in validation data (columns (2) and (4)). Comparing the estimates of measurement error variance (σ_c^2 and σ_m^2), there is a suggestion that the variance of the measurement error in the COVID-19 earnings measure is larger than in the main study, although the variance estimates are similar when using the human capital instrument. However, estimates of classical measurement error variances for both studies are an order of magnitude smaller than the estimates of the true variance of earnings (σ_y^2). This means that the implied OLS attenuation factors (Eq. (2)) are above 0.85 for both measures. Thus, by this summary statistic, the two measures of individual earnings are of very similar quality.

Table 4 presents estimates of the same model, but for *household* earnings and income. Here there is greater scope for quality differences because the Main Study measure aggregates over the reports of multiple household members, and, in the case of household income, over responses to questions about different categories of income. Here we use a single instrument set containing a number of well-measured "asset" variables: council tax amount, the number of cars owned by the household, and the number of rooms in the home.

For household earnings and income, again, the estimates do reject the null of no measurement error variance in the Main Study measures, so we focus on estimates of the full model that allows for classical measurement error in validation data (columns (2) and (4)). For house-

Table 3
GMM estimates for individual earnings .

	Lagged earnings		Human capital	
	(1)	(2)	(3)	(4)
ρ_c	–0.079***	–0.007	–0.101***	0.003
	(0.021)	(0.018)	(0.021)	(0.020)
σ_y^2	0.317***	0.294***	0.386***	0.350***
	(0.017)	(0.017)	(0.021)	(0.020)
σ_c^2	0.066***	0.045***	0.070***	0.029**
	(0.014)	(0.012)	(0.012)	(0.011)
σ_m^2		0.023***		0.036***
		(0.007)		(0.008)
μ_y	7.444***	7.444***	7.380***	7.379***
	(0.017)	(0.017)	(0.017)	(0.017)
k_c	0.003	0.003	0.009	0.004
	(0.008)	(0.008)	(0.007)	(0.006)
Observations	1150	1150	1412	1412
First stage F-stat		1504.002		55.752
OLS attenuation factors:				
COVID-19	0.871	0.871	0.909	0.921
Main		0.927		0.908
IV attenuation factors:				
COVID-19	1.086	1.007	1.112	0.997

Notes: Sample of individuals completing a COVID-19 Study interview within 14 days of their Main Study interview where all adults in the household completed a Main Study individual interview ('complete households'). In the case of multiple matches, the nearest match is kept. All income sources are net of tax and national insurance contributions. Individual earnings are conditional on reporting paid employment as an employee in both surveys. Individual earnings are reported for the sample of working age (age<66). Attenuation factors are calculated from estimates according to Eqs. (2) and (3). Instruments: the average of lagged earnings in (1)-(2) and education, gender, and age in (3)-(4).

Table 4
GMM estimates for household earnings and income .

	HH. earnings		HH. income	
	(1)	(2)	(3)	(4)
ρ_c	–0.246***	–0.127***	–0.210***	0.016
	(0.028)	(0.037)	(0.037)	(0.037)
σ_y^2	0.494***	0.423***	0.412***	0.331***
	(0.028)	(0.028)	(0.023)	(0.019)
σ_c^2	0.249***	0.210***	0.385***	0.310***
	(0.050)	(0.050)	(0.077)	(0.075)
σ_m^2		0.067***		0.093***
		(0.020)		(0.020)
μ_y	7.905***	7.906***	7.944***	7.926***
	(0.019)	(0.019)	(0.014)	(0.016)
k_c	–0.105***	–0.107***	–0.165***	–0.159***
	(0.014)	(0.014)	(0.014)	(0.014)
Observations	1431	1431	1999	1999
First stage F-stat		105.960		191.362
OLS attenuation factors:				
COVID-19	0.702	0.693	0.507	0.516
Main		0.862		0.780
IV attenuation factors:				
COVID-19	1.326	1.145	1.266	0.984

Notes: Sample of individuals completing a COVID-19 Study interview within 14 days of their Main Study interview where all adults in the household completed a Main Study individual interview ('complete households'). In the case of multiple matches, the nearest match is kept. All income sources are net of tax and national insurance contributions. Household earnings are reported for the sample of working age (age<66). Attenuation factors are calculated from estimates according to Eqs. (2) and (3). Instruments: Log(council tax amount), number of cars in the household, and number of rooms in the house.

Table 5
GMM estimates, alternative sample .

	HH. earnings		HH. income	
	(1)	(2)	(3)	(4)
ρ_c	–0.269***	–0.138***	–0.233***	0.006
	(0.029)	(0.036)	(0.041)	(0.049)
σ_y^2	0.503***	0.425***	0.409***	0.318***
	(0.032)	(0.030)	(0.025)	(0.020)
σ_c^2	0.257***	0.217***	0.382***	0.317***
	(0.058)	(0.057)	(0.084)	(0.085)
σ_m^2		0.076***		0.093***
		(0.021)		(0.024)
μ_y	7.909***	7.910***	7.942***	7.942***
	(0.020)	(0.021)	(0.015)	(0.015)
k_c	–0.111***	–0.113***	–0.161***	–0.157***
	(0.016)	(0.015)	(0.015)	(0.015)
Observations	1219	1219	1725	1725
First stage F-stat		92.508		157.303
OLS attenuation factors:				
COVID-19	0.699	0.688	0.504	0.501
Main		0.848		0.774
IV attenuation factors:				
COVID-19	1.369	1.160	1.304	0.994

Notes: Sample of individuals completing a COVID-19 Study interview within 21 days before their Main Study interview where all adults in the household completed a Main Study individual interview ('complete households'). In the case of multiple matches the nearest match is kept. All income sources are net of tax and national insurance contributions. Household earnings are reported for the sample of working age (age<66). Attenuation factors are calculated from estimates according to Eqs. (2) and (3). Instruments: log(council tax amount), number of cars in the household, and number of rooms in the house.

hold earnings, estimates of ρ_c are statistically significant (and negative) indicating that measurement error in the COVID-19 measures is related to the true value, although not of a strong magnitude. However, in the case of household income the estimates are small and statistically insignificant indicating no such correlation. Estimates of k_c capture the significant under-reporting of 10–16%. While this clearly matters for means, totals or the measurement of poverty, as noted in Section 2.2 it does not affect regression coefficients.

Comparing the estimates of measurement error variance (σ_c^2 and σ_m^2) suggests that the variance of the measurement error in the COVID-19 household earnings and income measures are each over three times larger than in the Main Study. For both household earnings and income, the measures are noisier (in the sense that the ratio of the true variance to the measurement error variance is smaller) than for individual earnings. The consequence is that implied attenuation factors are substantially below one for both the Main Study and the COVID-19 study, and the measurement error in the COVID-19 Study implies substantially more attenuation than the Main Study. For household earnings, the attenuation factor (Eq. (2) of the COVID-19 Study is 0.69, as opposed to 0.86 for the Main Study. The corresponding numbers are 0.52 and 0.78 for household income.

To explore differences in misreporting by subgroup, we have repeated the above analysis for subsamples defined by gender, age (working age vs. pensioner), household size (single adult vs. multiple adult) and education (no degree vs. degree) - in the interest of space, we include these results in the supplementary appendix (Section A.1). The main findings are as follows: The degree to which under-reporting is correlated with true values does not vary much across the subsamples. Mean reversion is seen for household earnings, with the exception of multiple adult households, but never for household income. Differently, we observe a large degree of under-reporting for individuals in multiple adult households, relative to single adult households, in both household earnings and income. We also observe more under-reporting of both household earnings and income by female respondents than males. Our results for gender line up with the macro validations of Micklewright and Schnepf (2010) where women are found to be more likely to under-state household income than men.

A possible concern with our research design is that completing the Main Study interview *before* the COVID-19 Study interview might improve responses to the shorter COVID-19 question set. This would make our findings unrepresentative of what might be expected of summary question sets in general. As noted in Section 2.2, for the majority of the observations in our analysis sample, the Main Study interview followed the COVID-19 Study interview. Fig. 5 plots the difference between Main Study and the COVID-19 Study measurements (y-axis) against the difference in timing (Main Study date - COVID-19 Study date, x-axis). When the Main Study interview followed the COVID-19 Study, this difference is positive, so such observations are to the right of the dashed vertical line at 0. We do this for individual earnings (Panel (a)), household earnings (Panel (b)) and household income (Panel (c)). In all three figures, large differences in the two measures are less frequent to the left of the dashed vertical line at 0. This suggests that completing the more detailed Main Study interview before the COVID-19 Study may have affected responses to the shorter COVID-19 question set.

Therefore, as a robustness check, we created a second analysis sample, comprising *only* cases where the Main Study interview followed the COVID-19 Study survey, within a 21-day window. We then re-estimated our measurement error models for household earnings and household income. The results are presented in Table 5. Comparing Table 5 and Table 4, the substantive results are very similar.

We now explore whether some household members report more reliably than do others. We take the sample of unique households and reestimate our GMM models using the reports of different household members. We assign household earnings (income) as either the report of a randomly chosen member of the household or of the head of household (defined by the highest earner). Results are presented in Table 6.

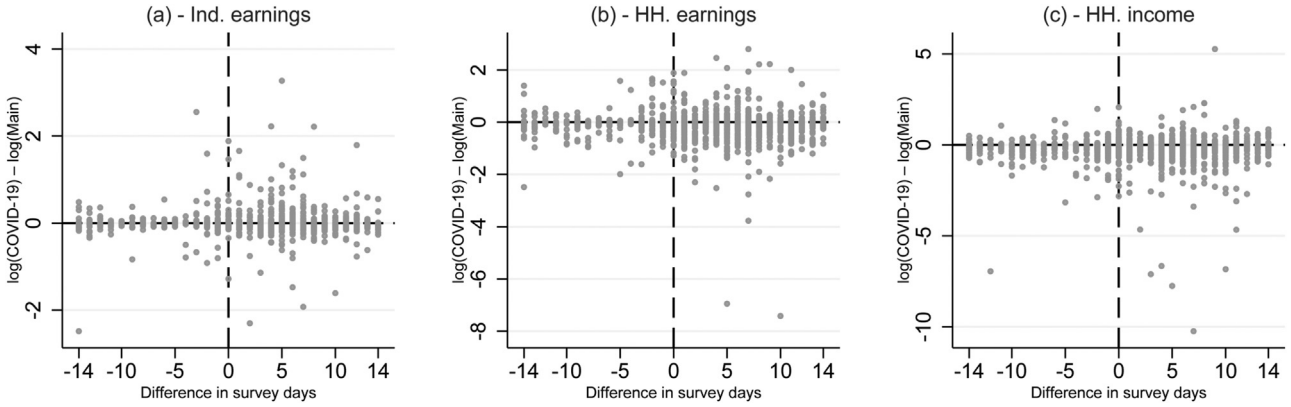

Fig. 5. Differences in income reports and days between interviews. *Notes*: Sample of individuals completing a COVID-19 Study interview within 14 days of their Main Study interview where all adults in the household completed a Main Study individual interview ('complete households'). In the case of multiple matches the nearest match is kept. All income sources are net of tax and national insurance contributions. Individual earnings are conditional on reporting paid employment as an employee in both surveys. Individual and household earnings are reported for the sample of working age (age<66). Differences are constructed as: log(COVID-19 Study amount) - log(Main Study amount). The x-axis shows the number of days between the Main Study interview and COVID-19 interview where a positive value indicates the Main Study interview took place after the COVID-19 Study interview. Each dot represents one observation. Sample sizes are 1418 (individual earnings), 1524 (household earnings) and 2124 (household income).

Table 6
GMM estimates, household Head vs. random household member.

	HH. earnings		HH. income	
	(1)	(2)	(3)	(4)
	Random member	Head of household	Random member	Head of household
ρ_c	–0.040	–0.098	–0.078	–0.037
	(0.122)	(0.102)	(0.081)	(0.070)
σ_y^2	0.363***	0.388***	0.270***	0.263***
	(0.054)	(0.057)	(0.030)	(0.027)
σ_c^2	0.106***	0.113***	0.352***	0.215***
	(0.037)	(0.036)	(0.122)	(0.060)
σ_m^2	0.093**	0.083**	0.094**	0.105***
	(0.042)	(0.041)	(0.038)	(0.036)
μ_y	7.994***	7.985***	8.062***	8.058***
	(0.024)	(0.027)	(0.020)	(0.021)
k_c	–0.113***	–0.094***	–0.170***	–0.144***
	(0.017)	(0.017)	(0.021)	(0.017)
Observations	803	803	1029	1029
First stage F-stat	31.767	31.767	39.242	39.242
OLS attenuation factors:				
COVID-19	0.790	0.817	0.428	0.552
Main	0.797	0.823	0.742	0.715
IV attenuation factors:				
COVID-19	1.041	1.109	1.084	1.039

Notes: Sample of households with at least one member completing a COVID-19 Study interview within 14 days of their Main Study interview where all adults in the household completed a Main Study individual interview (complete households). In the case of multiple matches the nearest match is kept. The reported household totals are taken from a random household member (columns headed 'Random member') or the 'Household Head' where the latter is the individual with highest income or where missing, the highest age. Where an outcome is reported missing it is filled with reports of another household member. All income sources are net of tax and national insurance contributions. Household earnings are reported for the sample of working age (age<66). Attenuation factors are calculated from estimates according to Eqs. (2) and (3). Instruments are council tax liability (logged), number of cars owned by the household, and number of rooms in the house.

We do not observe large differences in our parameter estimates whoever reports the household earnings or income.[10]

[10] In the supplementary appendices, we also report on the degree to which there are disagreements in reports of different household members. Fig. A.5 shows the percent of individuals whose report deviates from the mean of all reports in their household by different percentages. For household earnings, more than half of the sample deviate less than 10% from their household mean, whereas the figure for household income is less than 75%.

4. Conclusion

Many social science surveys were fielded during the COVID-19 pandemic that collected earnings and income data with a single question, or small set of summary questions, at odds with best practice methods for income data collection. We have presented evidence on the reliability of data collected with such questions, using the *Understanding Society* COVID-19 Study as a test case. Our evidence derives from a quirk of data collection: a large subset of respondents separately answered the

detailed questions considered best practice in their annual *Understanding Society* interview around the same time that they participated in the COVID-19 Study. The data collected in the annual interview can therefore act as a validation data source.

We find that the summary questions produce data on individual earnings that is of comparable quality to the detailed questions in the Main Study annual interview. In contrast, for household earnings and income, the detailed set of questions produces measures that are less noisy, and the COVID-19 Study measures suffer from systematic under-reporting. This should be born in mind when, say, estimating poverty rates. While we find a modest correlation between measurement error in the Covid-19 household earnings data and true values, we do not find a relationship for household income. This suggests that in a regression analysis of household income, an instrumental variables approach will be effective. A researcher using similar summary earnings or income questions can use our estimates of the OLS and IV attenuation factors to assess their likely bias. We conclude that summary question sets on earnings and income are useful content for short surveys or for longer surveys that prioritise content in other domains.

US poverty rates and income percentiles from the Current Population Survey have been shown to be lower when estimated on summary questions than those using detailed questions (Han et al., 2020). Similarly, the comparisons of Micklewright and Schnepf (2010) indicate the respondents report less income on questions about household totals, compared to detailed question sets. The results from our estimated measurement error models are consistent with these earlier findings in the literature. Our finding that women and individuals in multiple adult households more strongly under-report income on summary income questions than do men and singles also aligns with Micklewright and Schnepf (2010).

Our estimated measurement error models offer a fuller description of the measurement error process than earlier macro validations. Of course, our estimated measurement error models do not come assumption free and require, first, that the reporting errors on the detailed questions sets are uncorrelated with true values of income, and second, that the instruments we use to estimate these models are valid.

A further departure from the previous literature is that the summary questions of the present paper ask respondents for continuous earnings income amounts, rather than banded responses. We find no evidence that this lessened data quality, as our distributional comparisons are comparable to those in the literature. Banded responses necessitate assumptions about the distribution of incomes within bands and so summary income questions that ask for continuous amounts avoid that need, without necessarily lessening data quality.

Lower respondent burden and lower cost are significant advantages of collecting earnings and income data with small sets of summary questions. In the present paper, summary questions were found to suffer less from item non-response than do longer and more detailed question sets, although Micklewright and Schnepf (2010) find that item non-response rates for summary questions vary greatly across countries. Where summary questions have lower missingness, it may be useful to field such questions even in conjunction with longer question sets, and how such combinations might be best designed and analysed is a question for future research.

Survey Questions

I) Covid-19 Study

Ia) Individual Earnings

Q1: Thinking about your situation now. Even if you did not do any paid work last week, are you currently employed or self-employed?

- Yes, employed only
- Yes, self-employed only
- Both employed and self-employed
- No

Q2: What is your usual take-home pay/earnings now? Take-home pay is after tax, National Insurance and pension contributions have been deducted. Please include all jobs and self-employment activities.

Q3: Current earnings period: Per

- Week
- Two weeks
- Month
- Year

Ib) Household Earnings

Q4: Thinking about the other people living with you at the moment, are any of them employed or self-employed (even if they did not do any paid work last week)?

- Yes
- No

Q5: Thinking about everyone living with you at the moment, what is the total take-home pay/earnings of your household now? Please only include earnings from paid work or self-employment. If you are not sure, please tell us an approximate amount.

Q6: Current household earnings period: Per

- Week
- Two weeks
- Month
- Year

Ic) Household Income

Q7: Many people have additional sources of income beyond earnings from paid work and self-employment. Thinking about everyone living with you at the moment, what is the total take-home/after tax income of your household now? Please include all sources of income, such as benefits, pensions and earnings from investments, as well as earnings from paid work or self-employment. If you are not sure, please tell us an approximate amount.

Q8: Current household income period: Per

- Week
- Two weeks
- Month
- Year

II) Main Study (individual income)

Q9: Can I just check, did you do any paid work last week - that is in the seven days ending last Sunday - either as an employee or self-employed?

- Yes
- No

Q10: Even though you weren't working did you have a job that you were away from last week?

- Yes
- No
- Waiting to take up job

Q11: Are you an employee or self-employed?

- Employee
- Self-employed only

Q12: The last time you were paid, what was your total (gross) pay before any deductions? This is before any deductions for tax, National Insurance or pension contributions, student loan repayments, union dues and so on. Please include any overtime, bonuses, commission, tips or tax refunds.

Q13: And what was your take home pay last time, that is after any deductions were made for tax, National Insurance, pensions, student loan repayments, union dues etc?

Q14: How long a period did that cover?

- One week
- Four weeks
- Calendar month
- One year/12 months/52 weeks
- Per hour
- Two weeks
- Three weeks
- Two calendar months
- Eight times a year
- Nine times a year
- Ten times a year
- Three months/13 weeks
- Six months/26 weeks
- Less than once a week
- One off/lump sum
- None of these None of these

Q15: Before tax and other deductions, how much do you earn from your second and all other occasional jobs in a usual month?

Q16: In the past 12 months how much have you personally received in the way of dividends or interest from any savings and investments you may have?

Q17: How much was the last payment of *[X]* - i.e., benefit source - you received (to nearest £)?

Benefit sources: (1) NI Retirement/State Retirement (Old Age) Pension (2) A Pension from a previous employer (3) A Pension from a spouse's previous employer (4) A Private Pension/Annuity (5) A Widow's or War Widow's Pension (6) A Widowed Mother's Allowance/ Widowed Parent's Allowance/ Bereavement Allowance (7) Pension Credit (includes Guarantee Credit & Saving Credit) (8) Severe Disablement Allowance (9) Industrial Injury Disablement Allowance (10) Disability Living Allowance (11) Attendance Allowance (12) Carer's Allowance (formerly Invalid Care Allowance) (13) War Disablement Pension (14) Incapacity Benefit (15) Income Support (16) Job Seeker's Allowance (17) Child Benefit (including Lone-Parent Child Benefit payments) (18) Child Tax Credit (19) Working Tax Credit (includes Disabled Person's Tax Credit) (20) Maternity Allowance (21) Housing Benefit (22) Council Tax Benefit (23) Educational Grant (not Student Loan or Tuition Fee Loan (24) Trade Union/ Friendly Society Payment (25) Maintenance or Alimony (26) Payments from a family member not living here (27) Rent from Boarders or Lodgers (not family members) living here with you (28) Rent from any other property (29) Foster Allowance / Guardian Allowance (30) Rent Rebate (31) Rate Rebate (32) Employment and Support Allowance (33) Return to Work Credit (34) Sickness and Accident Insurance (35) In-Work Credit for Lone Parents (36) Other Disability Related Benefit or Payment (37) Any other regular payment (38) Any other state benefit (39) Universal Credit (40) Personal Independence Payments.

Declaration of Competing Interest

None.

Data Availability

The authors do not have permission to share the data.

Acknowledgements

Author order is alphabetical. *Understanding Society* COVID-19 Study is funded by the Economic and Social Research Council (ES/K005146/1) and the Health Foundation (2076161). Fieldwork for the survey is carried out by Ipsos MORI and Kantar. *Understanding Society* is an initiative funded by the Economic and Social Research Council and various Government Departments, with scientific leadership by the Institute for Social and Economic Research, University of Essex. The research data are distributed by the UK Data Service. The authors thank Hamish Low for useful comments.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at 10.1016/j.labeco.2023.102331

References

Abowd, J.M., Stinson, M.H., 2013. Estimating measurement error in annual job earnings: a comparison of survey and administrative data. Review of Economics and Statistics 95 (5), 1451–1467.

Adams-Prassl, A., Boneva, T., Golin, M., Rauh, C., 2020. Inequality in the impact of the coronavirus shock: evidence from real time surveys. J Public Econ 189, 104245. doi:10.1016/j.jpubeco.2020.104245.

Belot, M., Choi, S., Jamison, J. C., Papageorge, N. W., Tripodi, E., van den Broek-Altenburg, E., 2020. Six-country survey on covid-19. Mimeo, available at https://www.egontripodi.com/papers/covidintro.pdf.

Bingley, P., Martinello, A., 2017. Measurement error in income and schooling and the bias of linear estimators. J Labor Econ 35 (4), 1117–1148.

Bound, J., Brown, C., Duncan, G.J., Rodgers, W.L., 1994. Evidence on the validity of cross–sectional and longitudinal labor market data. J Labor Econ 12 (3), 345–368.

Bound, J., Brown, C., Mathiowetz, N., 2001. Measurement error in survey data. In: Handbook of econometrics, Vol. 5. Elsevier, pp. 3705–3843.

Bundervoet, T., Dávalos, M.E., Garcia, N., 2022. The short-term impacts of COVID-19 on households in developing countries: an overview based on a harmonized dataset of high-frequency surveys. World Dev 105844. doi:10.1016/j.worlddev.2022.105844.

Burton, J., Lynn, P., Benzeval, M., 2020. How understanding society: the UK household longitudinal study adapted to the Covid-19 pandemic. In: Survey Research Methods, Vol. 14, pp. 235–239.

Chetty, R., Hendren, N., Kline, P., Saez, E., 2014. Where is the land of opportunity? the geography of intergenerational mobility in the united states. Q J Econ 129 (4), 1553–1623.

Crossley, T.F., Fisher, P., Low, H., 2021. The heterogeneous and regressive consequences of COVID-19: evidence from high quality panel data. J Public Econ 193 (C). doi:10.1016/j.jpubeco.2020.10.

Fisher, P., 2019. Does repeated measurement improve income data quality? Oxf Bull Econ Stat 81 (5), 989–1011.

Fisher, P., Fumagalli, L., Buck, N., Avram, S., 2019. Understanding Society and its Income Data(2019-08).

Gottschalk, P., Huynh, M., 2010. Are earnings inequality and mobility overstated? the impact of nonclassical measurement error. Rev Econ Stat 92 (2), 302–315.

Han, J., Meyer, B.D., Sullivan, J.X., 2020. Income and poverty in the covid-19 pandemic. Brookings Pap Econ Act 2020 (2), 85–118.

Institute for Social and Economic Research, 2020. Understanding society COVID-19 study, 2020. [data collection]. 1st edition. UK Data Service. SN: 8644, 10.5255/UK-DA-SN-8644-1.

Institute for Social and Economic Research, 2021. Understanding society COVID-19 user guide. version 1.0. University of Essex, Colchester.

Institute for Social and Economic Research, 2021. Understanding Society: Waves 1–11, 2009–2020 and Harmonised BHPS: Waves 1–18, 1991–2009, UserGuide. University of Essex, Colchester.

Jenkins, S.P., Rios-Avila, F., 2020. Modelling errors in survey and administrative data on employment earnings: sensitivity to the fraction assumed to have error-free earnings. Econ Lett 192, 109253.

Kapteyn, A., Ypma, J.Y., 2007. Measurement error and misclassification: a comparison of survey and administrative data. J Labor Econ 25 (3), 513–551.

Meyer, B.D., Mittag, N., 2019. Using linked survey and administrative data to better measure income: implications for poverty, program effectiveness, and holes in the safety net. American Economic Journal: Applied Economics 11 (2), 176–204.

Micklewright, J., Schnepf, S.V., 2010. How reliable are income data collected with a single question? Journal of the Royal Statistical Society: Series A (Statistics in Society) 173 (2), 409–429.

Pischke, J.-S., 1995. Measurement error and earnings dynamics: some estimates from the PSID validation study. Journal of Business & Economic Statistics 13 (3), 305–314.

United Nations, 2011. Canberra Group Handbook on Household Income Statistics, second edition United Nations, New York and Geneva.

Ward, J.M., Edwards, K.A., 2021. CPS nonresponse during the Covid-19 pandemic: explanations, extent, and effects. Labour Econ 72, 102060.

Wilhelm, D., 2018. Testing for the presence of measurement error. Technical Report. cemmap working paper.