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UKHLS Input Data For UKMOD (2010-2019)

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UK HOUSEHOLD LONGITUDINAL STUDY (UKHLS) - UNDERSTANDING SOCIETY INPUT DATA FOR UKMOD (2010-2019)

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UKMOD version B1.03

UKMOD is a tax-benefit model for the UK and its constituent nations. It uses the EUROMOD platform. For more information on UKMOD visit https://www.microsimulation.ac.uk/ukmod and on EUROMOD, see: http://www.iser.essex.ac.uk/research/euromod. UKMOD enables researchers and policy analysts to calculate the effects of taxes and benefits on household incomes and work incentives for the UK as a whole or for the population of the each of its nations. This is done in a comparable manner with other models using the EUROMOD platform.

UKMOD is updated bi-annually to recent policy systems using data from the Family Resources Survey (FRS) as input databases. This report documents the work done to introduce the UK Household Longitudinal Study (UKHLS) as the UKMOD input database. This work was carried out by the UKMOD developer team, based ISER at the University of Essex.

The results presented in this report are derived using UKMOD version B1.03. UKMOD is continually being improved and the results presented here may not match those that would be obtained with later versions of UKMOD.

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UKMOD is currently receiving support under a fixed term grant from the abrdn Financial Fairness Trust. abrdn Financial Fairness Trust funds research, policy work and campaigning activities to tackle financial problems and improve living standards for people on low-to-middle incomes in the UK.

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1. BASIC INFORMATION ABOUT THE PROJECT

UKMOD is a tax-benefit microsimulation model (MSM) for the UK and its constituent nations (England, Wales, Scotland, Northern Ireland) that originated from EUROMOD[1] and since 2020 has replaced, as a stand-alone model, the UK component of EUROMOD (see Richiardi et al., 2021). UKMOD is freely accessible, released open-source, and thoroughly documented and validated using external data.

Tax-benefit MSMs such as UKMOD are aimed at understanding how (changes in) taxes and benefits affect the disposable income of individuals and households (i.e. income after taxes have been paid and all benefits have been received). This is done by comparing a baseline policy scenario (normally, the current legislation) with a counterfactual scenario. The simplest counterfactual scenario is a scenario with no taxes and benefits, so that the distribution of disposable income coincides with that of market income. This allows to estimate the impact of the tax-benefit system as a whole. Other counterfactuals might involve switching off some specific policies, modifying some policy parameters, introducing entirely new policies, or a combination of the above. The method enables a researcher to make a detailed analysis of the revenue and distributional effects of an individual policy or a whole tax-benefit system. The resulting taxes, benefits and income measures obtained at the level of individual agents can be aggregated at the level of population subgroups (e.g. to define the losers and winners in the reform) or at the macro-level (e.g. to define the cost of the reform for the state budget).

The main use of tax-benefit MSMs such as UKMOD is ex-ante policy impact assessments, or predictions of the likely impact of a change in policy, prior to its implementation. Microsimulation of taxes and benefits allows the researcher to conduct a controlled experiment by changing the parameters of interest in the tax-benefit system while holding everything else constant and avoiding endogeneity problems in identifying the direct effects of the analysed policy change. Most existing tax-benefit MSMs (such as EUROMOD family of models) are based on cross-sectional survey data and are referred to as arithmetic or static models, meaning that they only provide point-in-time estimates and do not take into account how individuals or their households might respond to changes in fiscal incentives between the baseline and the counterfactual. In other words, they can be thought of as looking at the "morning after" effects of policy changes, before behavioural changes set in. For example, when modelling a reduction in income tax rates, a static model calculates household incomes on the assumption that individuals continue to work the same number of hours as they did before.

To accurately simulate fiscal liabilities and benefit entitlements, tax-benefit MSMs require comprehensive information at the micro-level about the individual and household characteristics driving these entitlements and liabilities. Based on this information and on legislative rules, MSM can then simulate the amount of fiscal liabilities and benefit entitlements at the tax-benefit unit level. In practical terms, a tax-benefit MSM is a computer code that calculates disposable income for each micro-unit (individual, family or household) in a representative sample of the population, under a specific policy scenario. The calculation combines elements of income taken from the micro-data directly (e.g. employee earnings) with elements simulated by the model (tax liabilities and benefit entitlements).

The cross-sectional version of UKMOD uses the Family Resources Survey (FRS) as its input dataset and covers all policy years starting from 2005. The FRS is an annual cross-sectional survey of the living standards and circumstances of people living in the UK, with a sample of approximately 40,000 households. The survey contains detailed information on income and benefits, employment, personal and household characteristics. The data is used by government bodies such as the Department for Work and Pensions (DWP) for official income statistics.

[1] EUROMOD is a tax-benefit microsimulation model for the EU-27. EUROMOD was initially developed at the University of Essex and is now being developed by the Joint Research Centre of the European Commission. (see: https://euromod-web.jrc.ec.europa.eu/).

This report introduces a new version of UKMOD that uses the UK Household Longitudinal Study (UKHLS) data as its input dataset. UKHLS is a large panel survey with a sample of approximately 40,000 households in its first wave. UKHLS contains detailed income data and a wide range of demographic and labour market information. As such it is the primary survey of interest in the UK for those interested in longitudinal analysis. The longitudinal version of UKMOD that runs on UKHLS data covers the period 2010-2019 (waves 1-11).

While building the UKMOD input data using the UKHLS dataset, the main aim was to re-create as closely as possible UKMOD input data variables that are based on FRS. When running policy simulations, users have an option of running UKMOD either with the FRS dataset (default option) or with UKHLS dataset. The UKMOD version based on UKHLS data maintains all the flexibility of UKMOD: policy scenarios can be created by implementing not only parametric changes, but also more structural reforms, and benefits from all existing UKMOD tools and add-ons that facilitate scenario analysis.

This report is structured as follows. Chapter 2 discusses the advantages and potential applications of combining UKMOD with the UKHLS data. Chapter 3 sheds light on various aspects of the process of building a UKMOD input dataset using UKHLS data. It provides a general description of UKHLS, discusses the adjustments made to the UKHLS data and the assumptions used while making these adjustments, and summarizes the key differences between the FRS and UKHLS input data variables. Chapter 4 provides a validation of the UKMOD estimates based on UKHLS against external data, including validation of non-simulated and simulated income components (market incomes, taxes and benefits) and validation of income distribution characteristics based on UKHLS data. Chapter 5 provides a comparison of the UKMOD-UKHLS estimates against the FRS data which is the primary source of input data for UKMOD. The final section provides a summary of "health warnings" for users of the UKMOD-UKHLS.

2. VALUE ADDED OF THE UKHLS INPUT DATA FOR UKMOD

The quality of a tax-benefit MSM is largely dependent on its input data. To be suitable for tax-benefit modelling a dataset should fulfil a number of conditions outlined below (Figari, Levy et al. 2007):

- It must be a recent, representative sample of households, large enough to support the analysis of small groups and with weights to apply to population level and correct for non-response.
- It must contain information on primary gross incomes by source, with the reference period being relevant to the assessment periods for taxes and benefits. If certain benefits cannot be simulated (e.g. due to data limitations), information on the amount these benefits, gross of taxes, is required for each recipient.
- It must contain information about individual characteristics affecting tax liabilities or benefit entitlements (e.g. age, education, weekly hours of work, disability status, civil servant status, etc.) for each household member, as well as information about within-household family relationships.
- It must contain information on housing costs and other expenditures that may affect tax liabilities or benefit entitlements.

It should be noted that all these criteria are rarely met in one data source and typically a significant amount of work must be done to transform available data into the required database.

Coherently with the cross-sectional data used by other European EUROMOD models (European Union Statistics on Income and Living Conditions - EU-SILC), UKMOD uses the Family Resources Survey (FRS) as its primary source of input data. The FRS is the source of official income and poverty statistics

for the UK, hence it produces aggregate estimates of taxes and benefits that match the official figures quite well. The FRS-based UKMOD input data go back to 2005. UKMOD is however flexible in terms of the input data used, and it can be run in conjunction with any input dataset, subject to initial harmonisation of input data variables. UKHLS fully satisfies the UKMOD input data criteria and has an additional advantage of being a panel survey, i.e. it follows the same individuals over time. This allows users to carry out many analyses that are not accessible with the cross-sectional input data.

2.1 Using microsimulation of taxes and benefits as an enhancement to UKHLS data

Using UKMOD in conjunction with UKHLS data can improve the accuracy of income information in UKHLS. For instance:

- Several studies have shown that means-tested benefits tend to be under-reported in surveys, at least in developed countries (Meyer and Sullivan 2003, Brewer, Etheridge et al. 2017). By simulating means-tested benefit entitlements, UKMOD can improve the accuracy of income measures at the bottom of the distribution.
- UKMOD can also be used to simulate benefit entitlements and tax liabilities at the individual/assessment unit level whenever information is only collected at the household level in the survey (for a recent application, see Avram and Popova (2022)).
- UKMOD can be used to construct measures of fiscal/tax advantages that are not directly observable in UKHLS, such as tax allowances or tax credits.
- UKMOD allows producing harmonised outputs based on the FRS and UKHLS data, hence the UKHLS estimates of income distribution can be cross-validated using the FRS data, and otherwise.

2.2 Using UKHLS as an enhancement to microsimulation of taxes and benefits.

The longitudinal (panel) dimension of the UKHLS data allows us to increase the precision of simulations of some benefits.[2] For instance:

- One of the limitations of tax-benefit models based on cross-sectional data is that they are restricted in terms of modelling benefits that require information about previous work history of individuals, such as, for instance, unemployment benefits or pensions. In the cross-sectional data the only information we have about whether someone is entitled to these benefits is whether they say they claim it or not. Therefore, these benefits either have to be taken directly from the data or simulated using some simplified assumptions (e.g. modelled on a reported take-up basis: only those who say that they claim are modelled as entitled). The effect of this is that we may understate the impact of reforms of these benefits on actual entitlements and/or on their actual receipt.
- A second example is potential improvements in simulations of disability benefits. Whether someone is entitled to a disability benefit depends on specifics about their health. Information on health is much more limited in the FRS data compared to UKHLS.

2.3 Enlarging the scope of analyses that could be done using UKMOD.

- UKHLS is a rich dataset that contains information on many life course domains not available in the FRS, e.g. employment history, partnership history, private transfers, health and well-being. In addition, UKMOD output data based on UKHLS can be linked to the original UKHLS

[2] The current version of UKMOD running on UKHLS data does not make use of this longitudinal information.

dataset, hence permitting analyses of the effects of taxes and benefits on many additional outcomes.

— UKHLS has boost samples to ensure it is representative of immigrant and ethnic minority groups thus enabling the researchers to study how these are treated by the tax-benefit system and various policy reforms.

— Moreover, having time series of UKMOD-derived outcomes at the individual/household level expands research possibilities over many directions, such as studies of longitudinal inequality, persistent poverty, inter-generational redistribution, income dynamics and social mobility.

3. CONSTRUCTION OF THE UKHLS INPUT DATA

3.1 General description

UKHLS, also known as Understanding Society, is a panel survey of UK households with yearly interviews, which began in 2009–2010. It comprises multiple sample components: the General Population Sample (GPS), the Ethnic Minority Boost Sample (EMBS), the Immigrant and Ethnic Minority Boost Sample (IEMBS), and the British Household Panel Survey sample (BHPS). BHPS is the legacy sample of approximately 8,000 households, going back to 1991. The central component of the sample, the GPS, is a clustered and stratified probability sample of approximately 24,000 households living in Great Britain in 2009 – 2010 and a simple random sample of approximately 2,000 households living in Northern Ireland in 2009. The sample is designed to be representative of the total UK household population. Booster samples include 4,000 households selected from areas of high ethnic minority concentration in 2009 – 2010 where at least one member was from an ethnic minority group, for the EMBS, and 2,900 households selected from areas of high ethnic minority concentration in 2015, where at least one member was born outside the UK, or from an ethnic minority group, for the IEMBS (Lynn 2009) provides a detailed description of the sample design for each subcomponent of Understanding Society. IEMB sample is not used to construct the input data for UKMOD.

The GPS is based on proportionately stratified, equal probability (clustered) sample of residential addresses. In Northern Ireland the sample is not clustered. In England, Scotland, and Wales the sampling follows two stages. First, a sample of postal sectors serving as the Primary Sampling Units is selected. In the second stage, a sample of postal addresses within each postal sector is selected (for details see Lynn (2009)). At each address selected for the GPS, a final stage of sampling was carried out by the interviewers in the field and consisted of selecting all persons resident at the sample address, at the time when wave 1 interviewer collected the household grid information, as sample members. All persons identified at wave 1 as sample members remain in the sample indefinitely, regardless of changes to their location or household circumstances. When sample members move, an attempt is made to interview all members of each household containing at least one sample member. However, the UKHLS is a sample of individual persons and non-sample members co-resident with a sample member do not themselves become sample members when they are interviewed, which means they will not be followed separately from the sample member. This procedure results in 2,640 primary sampling units in England, Wales, and Scotland, which were then allocated to 24 monthly samples. The allocation was done by listing sectors in order of selection from the stratified sampling frame and then allocating to month by a repeated balanced pattern.

Each monthly sample is representative random sample of the total population. However, because this sampling design is based on a 2-year sampling window for each wave of UKHLS, to create UKMOD input data the sample is divided into fiscal years, from the beginning of April of Year 1 to the end of March of Year 2. For example, 2019 input data contains interviews conducted from April 2019 to March 2020.

3.1.1 Non-response

Table 3.1 shows household response rates for UKHLS Wave 11 (2019-2020). 65.6% of households responded fully, which means that all eligible adults in the household have been interviewed. Only complete (fully responding) households were used to create input database for UKMOD.

Table 3.1 Household response rates for UKHLS Wave 11 (2019-2020)

Wave 11

Table 36: Household response rates, Wave 11

	UKHLS GPS		EMBS	IEMBS	Former-BHPS				Total
	UKHLS – GB	UKHLS – NI			Living in Britain	Living in Scotland	Living in Wales	NIHPS	
Fully responding	9,172 67.7%	439 66.3%	873 50.3%	714 45.8%	2,041 71.8%	441 70.0%	487 69.3%	528 70.9%	14,695 65.6%
Partially responding	2,195 16.2%	109 16.5%	429 24.7%	310 19.9%	434 15.3%	98 15.6%	117 16.6%	119 16.0%	3,811 17.0%
All responding	11,367 83.9%	548 82.8%	1,302 75.0%	1,024 65.7%	2,475 87.1%	539 85.6%	604 85.9%	647 86.9%	18,506 82.6%
Non-contact	634 4.7%	22 3.3%	150 8.6%	224 14.4%	100 3.5%	30 4.8%	30 4.3%	14 1.9%	1,204 5.4%
Untraced mover	251 1.9%	11 1.7%	43 2.5%	43 2.8%	57 2.0%	7 1.1%	10 1.4%	16 2.2%	438 2.0%
Refusal	944 7.0%	61 9.2%	175 10.1%	193 12.4%	148 5.2%	37 5.9%	41 5.8%	57 7.7%	1,656 7.4%
Other non-interview	346 2.6%	20 3.0%	66 3.8%	74 4.8%	61 2.2%	17 2.7%	18 2.6%	11 1.5%	613 2.7%
Total*	13,542	662	1,736	1,558	2,841	630	703	745	22,417

* Base is all households issued to the field for Wave 10 excluding the dormant sample, minus any found to have become ineligible.

3.1.2 Weights

Understanding Society is a survey with a complex design and uses weights to adjust for unequal selection probabilities, differential nonresponse, and potential sampling error. Weights in Understanding Society are constructed by combining design weights which adjust for unequal selection or sampling fraction, and non-response weights which adjust for differential non-response and attrition at various stages.

Table 3.2 Summary statistics for weight variable (dwt) in 2019 UKMOD-UKHLS input data

	dwt variable
Number	21,177 (27,414 with zero values)
Mean	3,108.8
SD	2,089.7
Maximum	32,950
Minimum	101
Max/Min	326.3

Cross-sectional household weights from UKHLS are used as the basis to create the weight variable 'dwt' in the UKMOD input data. These weights are adjusted to account for the use of only complete households in the UKMOD input data. The adjustment is performed by multiplying the original weight of complete households included in the sample by the inverse of the predicted probability of a household being a complete household, estimated on the whole sample using a probit regression model conditional on presence of individuals with different combinations of levels of education, age groups, gender, marital status categories, region, household size and housing tenure. Such constructed weights are then scaled to match population totals provided by FRS and rounded to the nearest integer. Note that while

observations with 0 weights are kept in the dataset, Table 3.2 shows summary statistics for positive values of dwt.

3.2 Imputations and assumptions

The Understanding Society data are obtained from the UK Data Archive at the University of Essex. Variables corresponding to the FRS-based version of the UKMOD input data are then created on the basis of the UKHLS data, which requires some adjustments.

Each wave of Understanding Society contains information from 24 monthly interviews. For the purpose of creating UKMOD input data, the sample is divided according to the fiscal year, from the beginning of April of Year 1 to the end of March of Year 2. Information on earnings refers to the usual pay or the last pay period, depending on the availability of information. Earnings from employment are the usual earnings; earnings from second job or self-employment refer to the last pay period. Information about pensions and benefits refers to the last receipt before the interview. Investment income is based on the last 12-month receipt. As monetary values are typically provided in context of a specific pay-period (e.g., weekly, 4-weekly, monthly, etc.) all monetary amounts are converted into monthly terms for the UKMOD database. In the UKMOD calculations it is implicitly assumed that income is received at the same rate throughout the year. However, it should be remembered that this may not be the case and in particular that Income Tax (based on annual income) simulations do not take account of changes that may happen during the year. On the other hand, it is generally the case that personal and household characteristics are consistent with the current incomes that are observed, since they apply to the same or very similar reference periods.

The resulting input data files are called as uk_Year_c1, where "Year" refers to the year of the dataset (e.g. uk_2019_c1 refers to 2019), "c" – signifies that the input data files are derived from UKHLS data and "1" is the version of the input data release. For more information about the characteristics of the derived input data and adjustment of UKHLS variables into the UKMOD database variables see the UKMOD Data Requirements Document (DRD).

3.3 Key differences between FRS and UKHLS

Table 3.3 summarizes the key differences in the way the UKMOD input data variables were derived using FRS and UKHLS data. Overall, the aim was to construct the variables in the UKHLS data in the same way as they are constructed in the FRS data. This, however, was not always possible, due to differences between the two datasets.

Table 3.3 Summary of key difference between the derivation of UKMOD input data variables using the FRS and UKHLS

variable name	Description	FRS-UKMOD	UKHLS-UKMOD
dag	Age	Top coded at 80 in the FRS data.	No top coding.
dcz	Citizenship	Assumes all individuals are citizen as this information is unavailable in the FRS.	Distinguishes between citizens (born in the UK), and non-citizens (born outside of the UK).

variable name	Description	FRS-UKMOD	UKHLS-UKMOD
yem	Employment income	Uses employment income from the last pay period.	Uses usual employment income and self-employment / second job income from the last pay period.
yiy	Capital income	Constructed as the sum of tax-exempt income and taxable income, reported in the FRS data.	Obtained directly from the survey data. Tax exempt and taxable investment income constructed from this variable on the basis of imputed non-taxable income share obtained from Wealth modules of the UKHLS conducted at Waves 4 and 8.
yls	Lump sum income (redundancy payment)		Information not collected in the UKHLS, variable set to 0.
bdimb	Disability living allowance (mobility)		Information not collected in the UKHLS, variable set to 0.
bhlwk	Statutory sick pay		Information not collected in the UKHLS, variable set to 0.
buntr	Training allowance		Information not collected in the UKHLS, variable set to 0.
bedsl	Student loan		Information not collected in the UKHLS, variable set to 0.
bmaer	Statutory Maternity Benefit (Work related, paid by employer)		Information not collected in the UKHLS, variable set to 0.
boactcm	Secondary State Pension		Not recorded separately because Secondary State Pension is included in the state pension variable boact00.
tmu01	Council Tax amount based on average values	Tax - Council tax (based on average amount by region, band and household type)	Based on reported values and imputed on the basis of region, council tax band, and household type if missing. Equal to tmu02.
boaht	Winter Fuel Allowance		Information not collected in the UKHLS, variable set to 0.
bhoro	Number of bedrooms for Housing Benefit	The variable is derived taking into account the number, age and sex (if applicable) of the	The variable is based on UKHLS variable hsbeds: number of bedrooms.

variable name	Description	FRS-UKMOD	UKHLS-UKMOD
	and Universal Credit	dependent children and number of adults in the household.	
bdimbwa	Mobility Part of the Personal Independence Payment		Always set to zero because the mobility part of the Personal Independence Payment is not recorded separately from the daily living part in UKHLS.
bdiscwa	Daily Living Part of the Personal Independence Payment		Includes both the Mobility Part and the Daily Living Part of the Personal Independence Payment.
afc	Value of financial capital	Value of financial capital is available in the FRS data.	Value of financial capital is imputed on the basis of wealth information from Waves 4 and 8 of the UKHLS. Assigned to 1 adult in benefit unit.
xhcot	Water and sewerage charges		Information not collected in the UKHLS, variable set to 0.
xhcsc	Compulsory service charges		Information not collected in the UKHLS, variable set to 0.
xhc01	Structural Insurance Premiums		Information not collected in the UKHLS, variable set to 0.

4. VALIDATION USING AGGREGATE DATA

4.1 Aggregate Validation

UKMOD results are validated against external benchmarks. Detailed comparisons of the number of people receiving a given income component and total yearly amounts are shown in Annex 2: Validation Tables. Both market incomes and non-simulated taxes and benefits in the input dataset as well as simulated taxes and benefits are validated against external official data. The main discrepancies between UKMOD results and external benchmarks are discussed in the following subsections. Factors that may explain the observed differences are also discussed.

4.1.1 Validation of incomes inputted into the simulation

- ***Earnings***

While many sources of original income are difficult to validate because of lack of independent and comparable sources of information, this does not apply to earnings from employment. Table 4.1 compares aggregate earnings in UKMOD-UKHLS and UKMOD-FRS with estimates from the Annual Survey of Hours and Earnings (ASHE) in 2019. ASHE is based on a 1% sample of employees on the Inland Revenue PAYE register for February and April in the relevant year, supplemented by data from the Inter Departmental Business Register for businesses registered for VAT but not registered for PAYE, to cover businesses which do not have employees above the PAYE threshold. Table 4.1 shows that average earnings across all employees in the UKMOD-UKHLS 2018-19 database are underestimated by 9% compared to the corresponding average value from ASHE 2019, across all employees whose pay is not affected by absence. In UKMOD-FRS 2018/19, average earnings are overestimated by 4% compared to ASHE 2019. Thus, both estimates from UKMOD are quite close to those reported in ASHE.

Table 4.1 Average gross monthly earnings from employment in 2019, comparing ASHE and the UKMOD (UK) input database

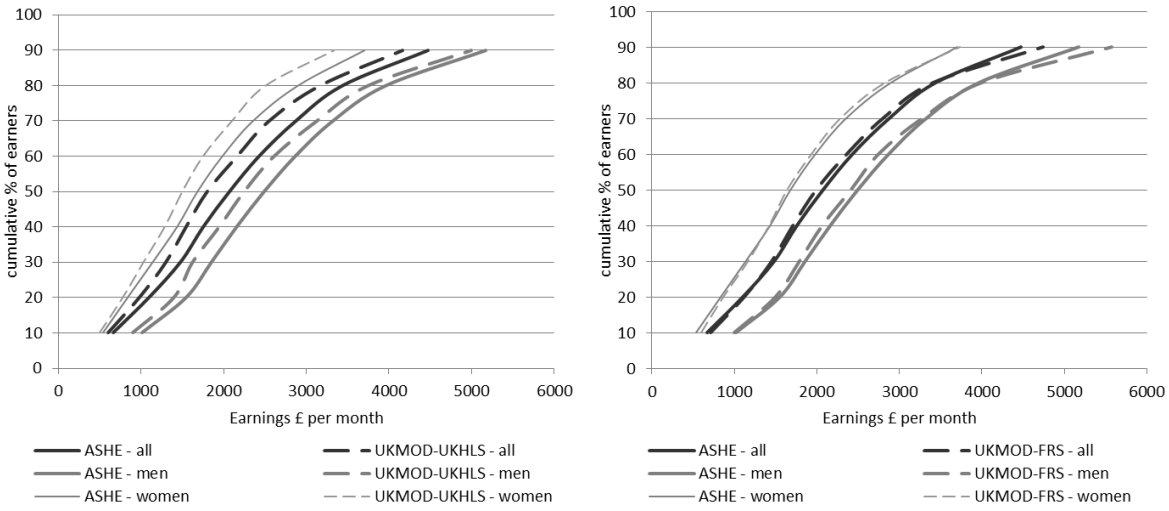
	2019		
	UKMOD-UKHLS	ASHE	Ratio
All	2,251	2,475	0.91
Male	2,730	2,960	0.92
Female	,827	1,992	0.92

	2019		
	UKMOD-FRS	ASHE	Ratio
All	2,585	2,475	1.04
Male	3,075	2,960	1.04
Female	2,071	1,992	1.04

Sources: Source: Annual Survey of Hours and Earnings 2019 and earlier years, Office for National Statistics. Table 1.1a, weekly gross pay including overtime for adults whose gross pay was not affected by absence, multiplied by 4.333 to produce the monthly figures. Latest version available via :
https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/allemployeesashetable1

Figure 4.1 compares the cumulative earnings distribution from ASHE and the UKMOD input data based on UKHLS and FRS for 2019 for all employees and for men and women (plotting decile points cumulatively). In the UKMOD-FRS data average earnings and males earnings are slightly overestimated at the top of the earnings distribution compared to ASHE data, and underestimated in the middle. Earnings based on UKMOD-UKHLS are slightly underestimated across all the distribution.

Figure 4.1 Cumulative earnings distributions in 2019: UKMOD and ASHE



- ***Benefits and taxes***

Table 1 and Table 2 (Annex 2: Validation Tables) compare statistics on benefits and taxes that are not simulated by UKMOD with external sources. This provides an assessment of the quality of the input database and hence the estimates are referred to as "UKHLS estimates" although in a few cases some imputation was applied in order to provide UKMOD with the necessary information for simulation. The tables also provide some useful background information for the validation of simulated components of income which may depend on, or are associated with, the non-simulated components.

Table 1 (Annex 2: Validation Tables) shows the ratio of the UKHLS estimates of the number of benefit recipients or taxpayers to that provided in administrative statistics. Table 2 (Annex 2: Validation Tables) shows ratios of UKMOD estimates of total expenditure on each benefit (or revenue from Council Tax) and administrative totals. Generally, the closeness of expenditure/revenue estimates to external statistics follows the same pattern as for the number of recipients/payers suggesting that average amounts per recipient/payer are approximately right.

According to official sources, the combined number of Incapacity Benefit (IB) and contributory Employment and Support Allowance (c-ESA) recipients is over-reported in UKHLS. The ratios range from 1.14 times in 2010 to 1.43 times in 2019. This is mainly the result of over-reporting of IB, while c-ESA is under-reported in all policy years. Over time the number of recipients of IB decreases, while the number of c-ESA recipients goes up. Based on initial forecasts, the transition from IB to ESA should have been finalized by 2014, however the UKHLS data reveals that in reality the transition has been slower than expected and some people report being on IB up to 2019, which may also be related to inability of the respondents to distinguish between the two benefits. Consequently, the annual spending on IB is over-estimated, while spending on contributory-ESA is under-estimated.

The numbers in receipt of the basic State Pension are well reported in UKHLS (the external statistics are adjusted to remove recipients living outside the UK) up to 2016. In 2017-2019 the number of recipients is over-reported compared to the external numbers by 14-29%. The receipt of the Second State Pension is not recorded separately in UKHLS data, the two sources of State Pension being reported in a single variable. Total annual spending on pensions is well aligned with external data amounts with a higher discrepancy being recorded starting from 2017 due to over-estimation of the number of recipients in UKHLS.

Widows/Bereavement benefit recipient numbers are strongly over-reported in the UKMOD-UKHLS data, with the discrepancy ranging from 1.8 times to 2.8 times in some years. Consequently, spending on Widows/Bereavement benefit are over-reported in the data.

Two benefits with small numbers of recipients, such as War Pension and Industrial Injuries Disablement Allowance, are under-reported in the survey data by 28 and 35% in 2010, but the match with the external numbers improves in the latest waves of UKHLS. While statistics on total spending on War Pension is not available, spending on Industrial Injuries Disablement Allowance are under-estimated by 40-50% in various years.

The receipt of Maternity Allowance is under-reported in 2010-2013, while starting from 2014 the reported number of recipients in the survey is at least twice as high as the number of recipients according to the external data. Accordingly, spending on Maternity Allowance are under-estimated until 2014 and overestimated afterwards by 1.7-2.7 times afterwards. This is likely due to a break in the UKHLS data which needs to be further investigated.

The actual number of people in receipt of Carer's Allowance has been growing over the period between 2010-2019. In UKHLS the number of recipients is over-estimated by 30-40%. The expenditures on Carer's Allowance are over-estimated in UKHLS by 3 to 12% up to 2014, and by 14 to 19% in the later years.

Severe Disablement Allowance (SDA) is significantly over-reported in UKHLS, and this might be explained by respondents not being able to distinguish between SDA and the disability premia in the Pension Credit (PC). In the external data the number of recipients is falling steeply starting from 2016 but this is not captured by the UKHLS data, thus the discrepancy between UKHLS and external estimates reaches 10 times in 2019. Spending on SDA is over-estimated in UKHLS, especially after 2015.

Attendance allowance (AA) is under-reported by almost 50% in 2010, but the match becomes better over the years (in 2019 the under-reporting is at 28%). Spending on Attendance allowance (AA) follow a similar pattern, being under-reported by 40-60% up to 2018, when the mismatch with external data drops to 35%.

Disability Living Allowance (DLA) is being replaced by Personal Independence Payment (PIP) for new claimants from 2013. UKHLS underestimates the number of recipients of DLA up to 2016. In contrast, between 2017-2019 the number of recipients in UKHLS is over-reported by 8-15%. The match between total spending on this allowance and the external data is quite good in 2017-2019, while up to 2017 the expenditure seem to be under-estimated in the survey data. For PIP, in 2013, when the benefit was just introduced, UKHLS overestimated the number of recipients by 5 times, but a good match with external data is observed in more recent waves of UKHLS. Spending on PIP is underestimated in all years, expect for 2013. The match with external data improved over the years, from 41% in 2014 to 78% in 2019.

Finally, on the basis of an earlier comparison[3] (later figures are not available) the number of Council Tax (CT) payers in UKHLS appears to remain well in-trend with external data. It should be noted though that past external figures correspond to the number of dwellings on which payments were potentially due and includes second homes and empty properties which are not captured by the UKHLS data. The data on CT revenues is only available up to 2015. In those years when statistics are available the revenues are over-estimated in the UKHLS data by 9-24%.

Under-representation of non-simulated benefits has implications for the values of the benefits that are simulated that depend in some way upon receipt of the non-simulated benefits. Where receipt of the

[3] See the EUROMOD Country Report for the UK released in 2010: https://euromod-web.jrc.ec.europa.eu/sites/default/files/2020-05/CR_UK2005-09_final_14-12-10.pdf

latter automatically defines eligibility for a simulated benefit, this will lead to under-estimation of that benefit. On the other hand, if income from the non-simulated benefit is included in a means-test for a simulated benefit, under-estimation of the former will lead to over-simulation of the latter. Similar mechanisms apply in reverse in case non-simulated benefits are over-estimated in the data.

4.1.2 Validation of outputted (simulated) incomes

In this section validation of simulated elements of income in relation to independent external sources is carried out.

	Variable name	UKMOD (1)										External (2)				
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	
Benefits																
Incapacity Benefit	**bdict01**	5,731	5,128	4,220	2,485	2,106	1,893	1,581	1,290	1,114	1,170	5,556	4,935	3,276	1,187	
Contributory ESA	**bdict02**	502	480	738	1,069	1,189	1,348	1,405	1,543	1,592	1,783	955	1,399	2,305	3,539	
Retirement Pension, incl Second State Pension	**boact00+ boactcm**	66,855	72,138	80,200	84,693	90,256	93,334	96,824	100,440	109,330	113,542	67,172	71,527	76,923	80,155	
Bereavement Benefits	**bsuwd**	921	1,096	815	1,132	960	985	1,340	1,139	863	993	614	594	593	582	
Attendance Allowance	**bdioa**	2,461	2,217	2,580	2,543	2,714	2,805	3,136	2,971	3,712	3,903	5,228	5,339	5,476	5,360	
Disability Living Allowance (either part)	**bditot**	8,609	9,364	9,613	9,824	10,195	10,687	9,793	8,546	7,851	7,225	11,877	12,566	13,430	13,763	
Severe Disablement Allowance	**bdisv**	1,209	1,253	1,206	1,250	1,192	1,089	1,039	788	784	906	888	881	887	860	
Carer's Allowance	**bcrdi**	1,757	1,832	1,993	2,316	2,538	3,030	3,083	3,258	3,397	3,339	1,572	1,733	1,927	2,088	
Industrial Injuries Disablement Allowance	**bdiwi**	409	474	506	514	600	609	574	504	650	521	888	888	905	901	
Maternity allowances	**bmana**	93	66	40	159	719	1,222	728	1,000	930	755	343	366	396	400	
War Pension and allowances	**boawr**	396	343	385	351	471	429	451	398	460	386	-	-	-	-	
PIP (total)	**bdiscwa+ bdimbwa**	-	-	-	256	637	1,930	3,368	5,627	7,907	9,748	-	-	-	161	
Taxes and Social Insurance contributions																
Council tax (payers)		31,676	32,853	32,882	32,857	34,004	34,659	35,989				25,464	30,100	30,400	27,500	

Sources: Unless otherwise specified: Department for Work and Pensions https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2021

Notes: External Statistics for War Pension and allowances no longer avaialble

Table 3 (Annex 2: Validation Tables) shows comparisons of the number of benefit recipients and tax and contribution payers against official statistics based on administrative sources. These comparisons apply non-take-up probabilities as described in the previous section. **Table 4** (Annex 2: Validation Tables) shows the aggregate annual expenditure, or revenue from each instrument, compared with official sources. Finally, Table 4.2 below compares UKMOD-UKHLS and external estimates of expenditure for 2019 for selected simulated benefits and tax credits with aggregates from the UKMOD-FRS.

Table 4.2 Selected benefits simulated by UKMOD-UKHLS: comparison of aggregates with external statistics and results based on UKMOD-FRS (2019/20) assuming partial take-up in UKMOD estimates. Expenditure/revenue (£million/year)

	UKMOD-UKHLS 2019	UKMOD-FRS 2019	External 2019	Ratio UKMOD-UKHLS / External	Ratio UKMOD-FRS / External
Child Benefit	9,859	10,614	11,081	0.89	0.96
Working Tax Credit (WTC)	2,842	2,133	3,825	0.74	0.56
Child Tax Credit (CTC)	9,031	8,795	13,875	0.65	0.63
CTC and WTC	11,872	10,928	17,700	0.67	0.62
WTC only	637	396	560	1.14	0.71
Income Support+JSAinc+ESA	15,131	10,706	11,318	1.34	0.95
Universal Credit	20,084	17,782	18,386	1.09	0.97
Pension Credit (PC)	5,346	4,808	5,061	1.06	0.95
Housing benefit (HB)	13,033	13,703	18,364	0.71	0.75

Source: See Table 4 (Annex 2: Validation Tables).

- ***Child Benefit***

Given the universal nature of child benefit, UKMOD-UKHLS produces estimates that are very close to the administrative figures for the number of families/children in receipt of Child Benefit. Up to 2016 the mismatch does not exceed 5%. In 2016-2019 the estimated received from UKMOD are 9-13% lower than the external numbers. The expenditure on the benefit under-estimated by 7-10% in 2016-2019, while a better match is achieved in the preceding years.

- ***Winter Fuel Allowance***

UKMOD over-estimates the number of recipients of Winter Fuel Payment by 10-35% and expenditure by 3-31%, compared to the external statistics. The match with external data is quite good in 2010 but becomes worse over the years.

- ***Means-tested benefits and tax credits***

Table 4.2 shows that in 2019, the expenditure on Income Support (including income-tested JSA and income-tested ESA) simulated in UKMOD-UKHLS are significantly higher relative to external statistics (by 34%). Spending on Universal Credit and Pension Credit are simulated quite well, slightly exceeding external estimates (by 9 and 6%, respectively). Spending on all other means-tested benefits are under-simulated: by 26% for Working Tax Credit, by 29% for Housing Benefit, and by 35% for Child Tax Credit.

Interestingly, UKMOD-FRS similarly under-estimates expenditures on all means-tested benefits apart from Income Support, Universal Credit and Pension Credit. One of the possible explanations for this is that the standard take-up adjustment procedure applied in UKMOD[4] does not account for the fact that within client group, those with small entitlements are the most likely to not claim. Thus, our caseload-based correction probably over-corrects for some legacy means-tested benefits on the legacy system.

[4] The detailed description of standard non-take-up adjustment is available in the UKMOD Country Reports.

We now consider each benefit/credit separately and discuss reasons for the apparent discrepancies.

- ***Tax Credits***

For WTC, both the number of recipients and expenditures are under-simulated (by 15-22%, and by 25-32%, respectively), across 2010-2019. For CTC, the number of recipients is over-simulated by 13-44%, while annual expenditures appear to be 13-35% lower compared to the external data.

One possible cause for the under-estimation of total spending on tax credits is that as a benchmark we use administrative statistics for finalised awards of tax credits. Adjustments are made after the end of the tax year to take account of changes in beneficiaries' income during the year. It is likely that those with changes that lead to increased entitlement would re-claim during the year. Thus those with end of year adjustments are likely to see reductions in their awards. Our simulations, on the other hand, are based on current incomes and circumstances. If circumstances stay the same all year around, our simulation should match the (probably lower) final awards. Entitlement is even more likely to vary over the year as this depends on being in low-paid work which is likely to be unstable in various ways. Moreover, as shown in Table 4.2, UKMOD-FRS also reports lower annual spending on WTC and CTC compared to the administrative totals.

Second, the over-simulation of the number of CTC recipients and under-simulation of the number of WTC recipients may be due to respondents not knowing how much of their total tax credit payment is from WTC or from CTC. Third, for their part, families are unlikely to shift on and off Child Tax Credit but are likely to meet the eligibility criteria for Working Tax Credit for shorter periods. Finally, some of the mismatching might be due to the introduction of Universal Credit, replacing the 'legacy benefits' from 2013. UKMOD randomly allocates potential benefit recipients to either the legacy system or the Universal Credit system. It is possible that all the above reasons contribute to the mismatch described above.

- ***Income Support***

The number of recipients of Income Support (IS) and income-based JSA, which in UKMOD are simulated together, is close to the external data in 2010-2011 and is over-simulated in all subsequent years. In 2019 the number of recipients is over-simulated by more than 3 times. The expenditure on the two benefits are, consequently, over-estimated by 2.8 times in 2019. The combined total expenditure on IS, ib-JSA and ib-ESA from UKMOD are still over-simulated by less significantly (from 10% in 2010 to 34% in 2019). The period of transition for those potentially qualifying for IS or ib-ESA was supposed to last until 2014, however in reality there were still people receiving Incapacity Benefit in our data. Thus, it is difficult to replicate the individual components correctly in UKMOD simulations because the entitlement to ib-ESA is based on a "limited capability for work" which is not explicitly measured in the UKHLS data.

- ***Pension Credit***

The total number of the Pension Credit recipients is simulated quite well, with a less than 5% discrepancy from the external data in 2010-2013, while the total spending on PC is over-simulated 31-62%. In 2014-2017 the numbers are under-simulated by 8-19%, and spending are also under-simulated (by 10-32%). In 2018-2019 the match with external data improves, both for the number of recipients (11-12% over-simulation) and for the total amounts (5-6% over-simulation).

- ***Housing Benefit***

The number Housing Benefit (HB) recipients is simulated very well in 2018-2019, and slightly under-simulated in the preceding years (by 7-13%). Expenditure of HB are under-simulated throughout the whole period, and especially so in 2013-2017. In 2018-2019 they are under-simulated by 14-29%. Since HB is calculated at the end of the UKMOD spine and entitlement depends on income including other simulated components, the main explanation for the under-simulation of expenditure probably lies in

the over-simulation of some benefits/tax credits, perhaps for certain groups of people that cannot be identified in the sort of aggregate validation exercise reported here. Moreover, the gradual introduction of Universal Credit, which accelerated starting from 2018 onwards, should contribute to the reduction of spending on HB for working-age individuals. At the same time, UKMOD transfers people from the legacy benefit system to the Universal Credit system based on a random selection. In reality, the gradual introduction of Universal Credit has been done by groups of claimants based on the specific means-tested benefits they are claiming. Our results suggest that such random allocation may not be capturing properly the transition process to Universal Credit.

- ***Universal Credit***

Since 2013 means-tested benefits for working age individuals are being replaced by Universal Credit (UC). While the initial plan was to transfer people from the so-called 'legacy benefit' system to UC by the end of 2018, the process has slowed down, and the full introduction of Universal Credit has been moved forward. UKMOD attempts to simulate this graduate transition by transferring only a fraction of people to the Universal Credit system each year. We do not simulate any cases of UC before 2015. After controlling for take-up correction, in 2015 the number of beneficiaries is under-simulated by 34% compared to the external data. Starting from 2016 the number of beneficiaries is over-simulated, with the exception of 2018, when a 100% match is achieved between the model and the external data. The expenditures on UC are always over-simulated by UKMOD, but in 2019 the match improves, with annual expenditures being over-estimated by 9%. The over-estimation of the coverage of UC probably explains why the coverage of legacy benefits is under-simulated in UKMOD.

- ***Benefit cap***

From April 2013 a benefit cap was introduced to reduce the maximum income from benefits received by a benefit unit. A benefit unit whose entitlement exceeds the benefit cap limit has the amount of HB or UC (whichever it receives) reduced to match the benefit cap limit. The benefit cap was fully functional from September 2013.[5] The number of individuals affected by the benefit cap is over-simulated in 2013 and 2015 and under-simulated in 2016-2019 (by 12-41%).

- ***Income Tax***

Compared with tax statistics, UKMOD simulates the number of Income Tax payers quite well. Up to 2014, the number is over-simulated by 4-9%. Starting from 2015 UKMOD under-simulates the numbers by 3-5%. Not surprisingly, the under-simulation is especially high for the taxpayers in the additional (top) tax bracket, while the best match is achieved for the standard (bottom) tax bracket. Consequently, total revenues from Income Tax are under-simulated by 9-19%. Again, the match in quite good for the standard and higher tax brackets, with a larger discrepancy for the top tax bracket. The most likely explanation is that there is some under-reporting of high incomes and under-representation of high-income earners in the UKHLS. It should be noted that the assumption that some of the incomes recorded in the UKHLS for the previous week or month are in fact received for the whole tax year is likely to have an effect on the UKMOD estimates.

- ***Social insurance contributions***

Comparable external figures on the number of taxpayers (including employees and the self-employed) is only available for 2014-2018. In these years the number of taxpayers in UKMOD by 25-27%. From the revenue side, UKMOD under-simulates by 2-11% the revenues from the employee NIC, and over-simulates the revenues from self-employed NIC. In 2018-2019 the self-employed NIC are over-simulated just by 15 and 10%, but in the preceding years the discrepancy is much higher (e.g. over 2 times in 2014).

[5] The first external statistics on the numbers of households affected can be found here https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/542734/benefit-cap-statistics-to-may-2016.pdf

4.1.3 Income distribution

All income distribution results presented here are computed for individuals according to their household disposable income (HDI) equivalised by the "modified OECD" equivalence scale. HDI are calculated as the sum of all income sources of all household members net of income tax and social insurance contributions. The weights in the OECD equivalence are: first adult=1; additional people aged 14+ = 0.5; additional people aged under 14 = 0.3.

- ***Income inequality***

Table 5 compares estimates of income inequality and descriptions of the income distribution from UKMOD-UKHLS with those published in the official UK statistics based on Households Below Average Income or HBAI. It should be noted that because of differences due to using simulated rather than recorded income components and any differences in the precise sample or disposable income concept[6] there are no reasons to expect the HBAI and UKMOD results to be identical.

The UKMOD estimates of the Gini coefficient are 10-17% lower than the HBAI Gini estimates. The main contributory factor is the way in which the HBAI statistics are corrected for the under-representation of high-income households in the FRS data. The HBAI correction uses information from tax statistics to inflate the incomes of some of the higher income households in the data (DWP, 2016). This has no effect on the median or poverty estimates but does affect the HBAI estimates shown in Table 5 for the Gini index and the income share of the top decile group, which is 6-17% lower in the UKMOD. The share of the bottom decile is, in contrast, over-estimated in UKMOD compared to HBAI, with the over-estimation ranging from 17 to 28% and going down to 9% in 2019.

[6] HBAI excludes cases with spouses living away from home. UKMOD includes them. HBAI includes, for students, top-up loans and deducts loan repayments. UKMOD ignores the loan repayments. HBAI adds the cash value of certain forms of income in kind (free school meals, Healthy Start vouchers and free school milk for children and free TV licences for those aged 75 and over); UKMOD does not include these income components.

- ***Poverty rates***

	UKMOD (1)										External (HBAI) (2)				
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	20
Gini	0.29	0.30	0.28	0.29	0.30	0.31	0.30	0.29	0.29	0.29	0.34	0.34	0.34	0.34	0
Mean	1,425	1,484	1,512	1,561	1,654	1,727	1,711	1,701	1,731	1,757	1,761	1,745	1,728	1,772	1,8
Median	1,223	1,254	1,293	1,327	1,385	1,426	1,453	1,467	1,492	1,520	1,446	1,414	1,420	1,431	1,4
Decile medians (£/month equivalised)															
D1	581	608	645	651	663	694	682	662	679	646	579	585	575	583	5
D2	765	798	838	841	876	899	905	902	924	931	851	835	844	854	8
D3	899	926	959	979	1,011	1,043	1,051	1,059	1,087	1,108	1,016	998	1,002	1,015	1,0
D4	1,016	1,047	1,082	1,111	1,147	1,181	1,205	1,219	1,249	1,263	1,178	1,159	1,159	1,162	1,2
D5	1,150	1,182	1,215	1,255	1,297	1,339	1,363	1,375	1,416	1,425	1,354	1,323	1,326	1,336	1,3
D6	1,301	1,330	1,369	1,415	1,475	1,517	1,546	1,559	1,586	1,622	1,546	1,514	1,512	1,530	1,5
D7	1,479	1,513	1,556	1,616	1,682	1,717	1,750	1,766	1,798	1,834	1,769	1,746	1,733	1,769	1,8
D8	1,712	1,753	1,794	1,857	1,942	1,976	2,008	2,025	2,062	2,128	2,053	2,039	2,018	2,066	2,1
D9	2,041	2,101	2,158	2,226	2,308	2,384	2,408	2,421	2,493	2,564	2,516	2,492	2,463	2,498	2,5
D10	2,854	2,954	2,998	3,069	3,271	3,344	3,423	3,360	3,477	3,502	3,703	3,650	3,606	3,641	3,6
Decile group share															
D1	3.6	3.7	3.8	3.8	3.6	3.6	3.6	3.5	3.6	3.3	3.0	3.0	3.0	3.0	
D2	5.4	5.4	5.5	5.4	5.3	5.2	5.3	5.3	5.3	5.3	5.0	5.0	5.0	5.0	
D3	6.3	6.3	6.3	6.3	6.2	6.0	6.1	6.2	6.3	6.3	5.0	5.0	6.0	5.0	
D4	7.1	7.1	7.2	7.1	6.9	6.9	7.0	7.2	7.2	7.2	7.0	7.0	6.0	7.0	
D5	8.1	8.0	8.1	8.0	7.8	7.8	8.0	8.1	8.2	8.1	8.0	8.0	8.0	8.0	
D6	9.2	9.0	9.1	9.1	8.9	8.8	9.1	9.1	9.1	9.2	9.0	8.0	9.0	8.0	
D7	10.4	10.2	10.3	10.3	10.2	10.0	10.2	10.4	10.4	10.5	10.0	10.0	10.0	10.0	1
D8	12.0	11.8	11.9	11.9	11.8	11.5	11.8	11.9	12.0	12.2	11.0	12.0	11.0	12.0	1
D9	14.4	14.3	14.3	14.3	14.2	13.9	14.2	14.3	14.5	14.7	15.0	14.0	15.0	14.0	1
D10	23.5	24.4	23.5	23.7	25.2	26.5	24.8	23.9	23.5	23.2	27.0	28.0	27.0	28.0	2

Source: HBAI data from https://www.gov.uk/government/statistics/households-below-average-income-for-financial-years-ending-1995-to-2020

Table 6 shows a comparison of poverty figures based on UKMOD versus the HBAI Before Housing Costs poverty statistics. Compared to HBAI, UKMOD produces a slightly lower poverty threshold (median). At the same time, UKMOD produces lower poverty estimates, especially at the 50% threshold. Using the 60% of median poverty threshold, the total poverty rates from UKMOD are 19-28% lower compared with HBAI estimates. In 2019, poverty rate at 60% of median income in UKMOD amounted to 14.1%, while the HBAI estimate was at 18%. At the 60% threshold the UKMOD child poverty rate in 2019 was at 16.2% against 22.9% reported by HBAI. For older people, the UKMOD poverty rate in 2019 was at 12.3 against 19.2% in HBAI.

One plausible explanation for the under-estimation of poverty rates in UKMOD relative to those shown by HBAI is that the FRS data – and hence HBAI – underreport receipt of means-tested benefits. At the same time, UKMOD may over-estimate the receipt of due to the use of simulated values (see section 4.1.2 for details).

5. VALIDATION AGAINST THE FRS DATA

In this section UKMOD-UKHLS results are validated against the UKMOD-FRS results. Detailed comparisons of the number of people receiving a given income component, total yearly amounts, and inequality and poverty figures for 2019 are shown in Annex 3: Tables Comparing UKMOD Outputs Based on FRS and UKHLS Data.

5.1 Aggregate Validation

UKMOD-UKHLS produces very similar estimates of market incomes compared to UKMOD-FRS in 2019, both in terms of the number of recipients and total amounts (see Table 7). There are, however, discrepancies as regards to the composition of market incomes. UKMOD-UKHLS underestimates total amount of income from employment, but over-estimates incomes from other sources, including investment and property income, income from odd jobs and personal private pension. Total income from alimony payments received is over-estimated in UKMOD-UKHLS compared to FRS but income from other private transfers is under-estimated, so for all private transfers combined together the discrepancy is not that large.

The aggregate estimates of direct taxes in UKMOD-UKHLS are close to the ones in UKMOD-FRS. Total revenues from NIC are under-simulated in UKMOD-UKHLS by 15% in 2019.

Total annual amounts of benefits are over-simulated in UKMOD-UKHLS by 12% in 2019, while the total number of benefit recipients is over-stimulated by 17%, compared to FRS. The main discrepancy comes from the over-estimation of pension income in the UKHLS data (by 29% in 2019). Total amounts of means-tested benefits are over-simulated by 8%, while non-means-tested benefits are under-simulated by 11% in terms of their amounts. The benefits for which the over-simulation is especially high in the UKHLS version include contribution-based Jobseeker's Allowance, income-related Employment and Support Allowance, Pension Credit, Scottish Carer's Allowance Supplement, Student payments, Disability Living Allowance, Personal Independence Payment living allowance, Invalid Carer's Allowance, Severe Disablement Allowance. Statutory Maternity Pay is not captured separately from earnings in UKHLS data, but Maternity Allowance is, and it is over-estimated by a large extent in UKHLS data.

Despite these discrepancies in the simulation of single instruments, the total amounts and numbers of recipients of disposable income both before and after housing costs in UKMOD-UKHLS match those in the FRS version of UKMOD very well.

5.2 Income distribution

Table 8 and Table 9 compare estimates of income inequality and income distribution from UKMOD-UKHLS with those produced using the FRS version for 2019.

The UKMOD-UKHLS estimates of the Gini coefficient and the quantile ratio (S80/20) closely match those produced using FRS (Table 8). The shares of disposable income accrued by each decile are also almost identical in the UKHLS and FRS version of UKMOD for 2019 (Table 9).

Table 10 shows that UKMOD-UKHLS produces lower estimates of the national poverty headcount (14.2 vs 15.5% of the population in 2019). This is the result of the over-estimation of poverty rates of adult population and under-estimation of poverty rates of children and elderly individuals in the UKHLS version of UKMOD compared to the FRS version. Poverty gap estimates are very close in the two version of the UKMOD.

6. SUMMARY OF "HEALTH WARNINGS"

This final section summarises the main findings in terms of particular aspects of the UKHLS version of UKMOD that should be borne in mind when planning appropriate uses of the model and in interpreting results.

- Although the sample size of UKHLS is large by international standards, care should still be taken in interpreting results for small sub-groups of the population.
- The UKHLS sample used in UKMOD includes complete households only and is divided according to the fiscal year, from the beginning of April of Year 1 to the end of March of Year 2 for each UKHLS wave. The weights are adjusted to account for the use of only complete households in UKMOD input data and then scaled to match population totals provided by the FRS.
- High-income individuals are generally underrepresented in the UKHLS sample, possibly due to higher survey non-response for these people. This leads to lower aggregate inequality estimates in UKMOD compared to HBAI (the latter is corrected for the under-representation of high-income households). This, together with the over-simulation of some means-tested benefits, leads to a lower poverty threshold and poverty estimates in UKMOD using UKHLS data, compared to HBAI.
- Another feature of the UKHLS sample is over-representation of the older people which is typical of longitudinal surveys. Consequently, pension income and allowances typically received by the elderly are over-estimated in UKHLS.
- While building the UKMOD input data using the UKHLS dataset, the aim was to re-create as closely as possible FRS input data variables. This, however, was not always possible due to the discrepancies in the definitions of some variables between the two data sources. Users are invited to consult section 2.3 of this report that highlights these discrepancies.
- Some income sources appear to be better captured in UKHLS than in the FRS. In particular, this applies to investment and property income, income from odd jobs and private pension.
- The aggregate estimates of the main income concepts (market income, disposable income before and after housing costs, direct taxes and NIC, and all benefits) are very close in the two versions of UKMOD based on UKHLS and FRS.
- Receipt of benefits or tax credits based on past circumstances is not modelled in the current version of UKMOD. It is effectively assumed that entitlement is based on current circumstances. Given the availability of repeated observations in UKHLS, policy simulations for some benefits can be adjusted by the user to account for incomes received in the previous year.
- UKMOD baseline simulations apply a correction for non-take-up of means-tested benefits and tax credits to reduce the proportions of those entitled who are modelled to receive the benefit/credit. This correction is based on external data available and on the reported receipt of benefits and is only approximate. It improves poverty and inequality estimates relative to those produced by official statistics. Yet some benefits remain over-simulated or under-simulated. The users are advised to explore other options, such as the full-take-up (i.e. running simulations with BTO extension off).
- The validation exercises conducted so far point to some puzzles that require further work to fully understand their drivers. Users are advised to read the validation section of this

report, as well as the UKMOD Country report, and be aware of the issues raised in interpreting the results of their simulations.

7. REFERENCES

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For previous versions of the EUROMOD/UKMOD Country Reports, see:

https://euromod-web.jrc.ec.europa.eu/resources/country-reports

8. ANNEXES

Annex 1: UKMOD key income concepts

Annex 3 describes some of the key income concepts in UKMOD and lists their corresponding variable names:

- **Components of disposable income:**

Income from employment and self-employment: ils_earns (UKMOD variable name)
Original/market income: ils_origy
Means-tested non-pension benefits: ils_benmt
Non-means-tested non-pension benefits: ils_bennt
Pensions: ils_pen
All benefits: ils_ben = ils_pen + ils_benmt + ils_bennt
Direct taxes: ils_tax
Employee National Insurance contributions: ils_sicee
Self-employed National Insurance contributions: ils_sicse
Other National Insurance contributions (non-existent in the UK): ils_sicot
All employee/self-employed/other National Insurance Contributions: ils_sicdy = ils_sicee + ils_sicse + ils_sicot
Disposable income: ils_dispy = ils_origy + ils_ben – ils_tax – ils_sicdy

- **National Insurance contributions paid by the employer/state:**

Employer National Insurance contributions: ils_sicer
Credited National Insurance contributions (in 2020 only with simulation of Covid-19 shocks and Coronavirus Job Retention Scheme): ils_sicct

- **Original/market income in more detail:**

Non-simulated:
Employment income: yem
Self-employment income: yse
Investment income: yiy
Income from odd jobs: yot01
Property income: ypr
Personal pension: ypp
Private transfers (non-taxable): yptot
Received maintenance payment: yptmp
Maintenance paid: xmp
Coronavirus Job Retention Scheme contribution paid by employer (in 2020 only with simulation of Covid-19 shocks): yemmc_s

Grouped in income lists:
Income from employment and self-employment: ils_earns = yem + yse + yemmc_s (in 2020)
Original/market income: ils_origy = yem + yse + yiy + yot01 + ypr + ypp + yptot + yptmp – xmp + yemmc_s (in 2020)

- **National Insurance contributions in more detail:**

Simulated:
Employee National Insurance Contributions: tscee_s
Occupational pension contribution: tpcee_s
Self-employed National Insurance contributions: tscse_s
Employer National Insurance contributions: tscer_s

Credited (State) National Insurance contributions (in 2020 only with simulation of Covid-19 shocks): tscct_s
Health and Social Health Care Levy: teehl_s, tsehl_s, terhl_s

Grouped in income lists:
Employee National Insurance contributions: ils_sicee = tscee_s + tpcee_s + teehl_s
Self-employed National Insurance contributions: ils_sicse = tscse_s + tsehl_s
Employer National Insurance contributions: ils_sicer = tscer_s + terhl_s
Credited (State) National Insurance contributions (in 2020 only with simulation of Covid-19 shocks): ils_sicct = tscct_s

- **Taxes in more detail:**

Simulated:
Personal Income Tax: tin_s (and although not included in any income list, we also create tin12_s, tin11_s and tin00_s that included the revenues going to Scotland, Wales and the rest of the UK and add up to tin_s)

Non-simulated:
Council tax: tmu

Grouped in income lists:
Direct taxes: ils_tax = tin_s + tmu
Simulated taxes: ils_taxsim = tin_s

- **Benefits in more detail:**

Simulated:
Working Tax Credit: bwkmt_s
Child Tax Credit: bfamt_s
Income Support & income-based Jobseeker's Allowance (unless simulated separately): bsa_s
Income-based Jobseeker's Allowance: bunmt_s
Income-related Employment and Support Allowance: bsadi_s
Pension Credit: boamt_s
Housing Benefit: bho_s
Council Tax Reduction: bmu_s
Sure Start Maternity Grant: bmamt_s
Best Start Grant (Scotland) (since 2019): bmascmt_s
Universal Credit: bsauc_s
Scottish Child Payment (since 2021): bchmt_s
Scottish Child Payment Bridging Payments (2021-2022): bchmt01_s
Benefit cap (reducing Housing Benefit): brd_s
Benefit cap (reducing Universal Credit): brduc_s
Winter Fuel Allowance:boaht_s
Child Benefit: bch_s
Contribution-based Jobseeker's Allowance: bunct_s
Scottish Carer's Allowance Supplement: bcrdicm_s
Scottish Child Winter Heating Assistance (since 2020): bchht_s
Coronavirus Job Retention Scheme (in 2020 only with simulation of Covid-19 shocks): bwkmcee_s
Self-Employment Income Support Scheme (in 2020 only with simulation of Covid-19 shocks): bwkmcse_s

Non-simulated:
Student payments: bedes

Student Loan: bedsl
Attendance allowance: bdioa
Disability Living Allowance: bdisc
Disability Living (mobility) Allowance: bdimb
Personal Independence Payment living allowance: bdiscwa
Personal Independence Payment mobility: bdimbwa
Incapacity Benefit: bdict01
Contributory Employment and Support Allowance: bdict02
Industrial injuries pension: bdiwi
Invalid Care Allowance: bcrdi
Severe Disablement Allowance: bdisv
Statutory Sick Pay: bhlwk
Training Allowance: buntr
Statutory Maternity Pay: bmaer
Maternity Allowance: bmana
other non-means-tested benefits: bot
Basic State pension: boact00
Second State Pension: boactcm
War pension: boawr
Widow's pension: bsuwd

Grouped in income lists:
Means-tested non-pension benefits: ils_benmt = bwkmt_s + bfamt_s + bsa_s + bsadi_s + boamt_s + bho_s + bmu_s + bunmt_s + bmamt_s + bmascmt_s (since 2019) + bsauc_s + bchmt_s (since 2021) + bchmt01_s (2021-2022) - brd_s - brduc_s
Non-means-tested non-pension benefits: ils_bennt = bedes + bedsl + bdioa + bdisc + bdimb + bdiscwa + bdimbwa + bdict01 + bdict02 + bdiwi + bcrdi + bdisv + bhlwk + buntr + bot + bmaer + bmana + boaht_s + bch_s + bunct_s + bcrdicm_s + bchht_s (since 2020) + bwkmcee_s (in 2020) + bwkmcse_s (in 2020)
Pensions: ils_pen = boact00 + boactcm + boawr + bsuwd
Simulated benefits: ils_bensim = bwkmt_s + bfamt_s + bsa_s + bsadi_s + boamt_s + bho_s + bmu_s + bunmt_s + bsauc_s + boaht_s + bch_s + bunct_s + bmamt_s + bmascmt_s (since 2019) + bchmt_s (since 2021) + bchmt01_s (2021-2022) + bchht_s (since 2020) + bwkmcee_s (in 2020) + bwkmcse_s (in 2020)- brd_s - brduc_s

<u>Benefits by function:</u>
Childbirth-related benefits: ils_b1_bcb = bmana + bmanc_s + bmaer + bmact_s + bpact_s + bmamt_s + bmascmt_s (since 2019)
Family-related benefits: ils_b1_bfa = ils_b1_bcb + bfamt_s + bch_s + bchmt_s (since 2021) + bchmt01_s (2021-2022)
Education-related benefits: ils_b1_bed = bedes + bedsl + bot
Old-age benefits: ils_b1_boa = boact00 + boactcm + boamt_s + boaht_s
Survivor benefits: ils_b1_bsu = bsuwd + boawr
Disability-related benefits: ils_b1_bdi = bdict02 + bsadi_s + bdioa + bdisc + bdimb + bdiscwa + bdimbwa + bdisv + bdiwi + bchrdi + bchht_s (since 2020)
Unemployment benefits: ils_b1_bun = bunct_s + bunmt_s + buntr + bwkmcee_s (in 2020) + bwkmcse_s (in 2020)
Health and sickness-related benefits: ils_b1_bhl = bdict01 + bhlwk
Housing benefits: ils_b1_bho = bho_s + bmu_s – brd_s
Social assistance/exclusion benefits: ils_b1_bsa = bwkmt_s + bsa_s + bsauc_s – brduc_s
Family and education benefits: ils_b2_bfaed = ils_b1_bfa + ils_b1_bed
Old-age and health benefits: ils_b2_penhl = ils_b1_boa + ils_b1_bsu + ils_b1_bhl + ils_b1_bdi
Social assistance and housing benefits: ils_b2_bsaho = ils_b1_bsa + ils_b1_bho

Annex 2: Validation Tables

Table 1 Tax benefit instruments included but not simulated in UKMOD - Number of recipients/ payers (in thousands)

	Variable name	UKMOD-UKHLS (1)										External (2)									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Benefits																					
Incapacity Benefit	**bdict01**	1,313	1,148	902	583	489	435	346	282	248	240	1,054	909	566	192	38	10	3	2	-	-
Contributory Employment and Support Allowance (ESA)	**bdict02**	118	109	157	220	225	241	251	279	257	275	199	262	364	492	507	489	483	460	404	360
Retirement Pension, incl Second State Pension	**boact00**	11,693	12,059	12,599	12,744	13,358	13,456	13,616	13,825	14,486	14,467	12,460	12,556	12,737	12,814	12,887	12,890	12,681	12,144	11,679	11,224
Bereavement Benefits	**bsuwd**	201	220	194	180	203	223	254	237	224	221	112	106	102	98	94	93	91	87	101	101
Attendance Allowance	**bdioa**	820	731	816	798	805	823	879	855	1,004	1,032	1,619	1,597	1,553	1,490	1,462	1,459	1,445	1,435	1,431	1,443
Disability Living Allowance (either part)	**bditot**	2,644	2,809	2,836	2,833	2,861	2,864	2,582	2,310	1,935	1,790	3,205	3,253	3,307	3,307	3,214	3,018	2,631	2,128	1,791	1,556
Severe Disablement Allowance	**bdisv**	354	347	317	316	300	286	268	217	228	241	230	220	211	198	163	113	58	33	27	24
Carer's Allowance	**bcrdi**	726	757	767	876	946	1,049	1,064	1,110	1,153	1,144	553	584	618	653	699	760	798	826	815	808
Industrial Injuries Disablement Allowance	**bdiwi**	216	202	217	226	243	255	237	241	264	219	334	330	324	326	320	313	305	296	288	280
Maternity allowances	**bmana**	15	12	6	25	122	197	117	161	148	122	54	57	60	58	59	62	61	59	58	55
War Pension and allowances	**boawr**	129	124	114	123	132	109	118	112	99	92	180	171	161	153	145	-	-	-	-	-
Personal Independence Payment (total)	**bdiscwa+ bdimbwa**	0	0	0	75	166	491	814	1,376	1,938	2,264	-	-	-	13	198	588	1,045	1,541	1,898	2,190
Taxes and Social Insurance contributions																					
Council tax	**tmu**	25,284	25,808	25,878	25,869	26,470	26,701	26,972	27,244	27,803	27,786	-	-	-	-	-	-	-	-	-	-

Sources: Unless otherwise specified: Department for Work and Pensions https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2021

Notes: External Statistics for War Pension and allowances no longer avaialble

Table 2 Tax benefit instruments included but not simulated in UKMOD - Annual amounts (in mil. GBP)

	Variable name	UKMOD (1)										External (2)									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Benefits																					
Incapacity Benefit	bdict01	5,731	5,128	4,220	2,485	2,106	1,893	1,581	1,290	1,114	1,170	5,556	4,935	3,276	1,187	245	62	15	9	-	-
Contributory ESA	bdict02	502	480	738	1,069	1,189	1,348	1,405	1,543	1,592	1,783	955	1,399	2,305	3,539	4,101	4,457	4,687	4,711	4,563	4,512
Retirement Pension, incl Second State Pension	boact00+ boactcm	66,855	72,138	80,200	84,693	90,256	93,334	96,824	100,440	109,330	113,542	67,172	71,527	76,923	80,155	83,498	86,317	87,071	86,219	85,788	85,122
Bereavement Benefits	bsuwd	921	1,096	815	1,132	960	985	1,340	1,139	863	993	614	594	593	582	571	569	557	503	463	506
Attendance Allowance	bdioa	2,461	2,217	2,580	2,543	2,714	2,805	3,136	2,971	3,712	3,903	5,228	5,339	5,476	5,360	5,422	5,490	5,483	5,529	5,676	5,908
Disability Living Allowance (either part)	bditot	8,609	9,364	9,613	9,824	10,195	10,687	9,793	8,546	7,851	7,225	11,877	12,566	13,430	13,763	13,798	13,233	11,514	9,380	8,126	7,233
Severe Disablement Allowance	bdisv	1,209	1,253	1,206	1,250	1,192	1,089	1,039	788	784	906	888	881	887	860	735	470	234	120	97	89
Carer's Allowance	bcrdi	1,757	1,832	1,993	2,316	2,538	3,030	3,083	3,258	3,397	3,339	1,572	1,733	1,927	2,088	2,319	2,545	2,667	2,830	2,885	2,941
Industrial Injuries Disablement Allowance	bdiwi	409	474	506	514	600	609	574	504	650	521	888	888	905	901	908	892	861	840	838	831
Maternity allowances	bmana	93	66	40	159	719	1,222	728	1,000	930	755	343	366	396	400	417	441	436	427	428	419
War Pension and allowances	boawr	396	343	385	351	471	429	451	398	460	386	-	-	-	-	-	-	-	-	-	-
PIP (total)	bdiscwa+ bdimbwa	-	-	-	256	637	1,930	3,368	5,627	7,907	9,748	-	-	-	161	1,565	3,005	5,160	8,638	10,625	12,500
Taxes and Social Insurance contributions																					
Council tax (payers)		31,676	32,853	32,882	32,857	34,004	34,659	35,989				25,464	30,100	30,400	27,500	27,900	28,300	-	-	-	-

Sources: Unless otherwise specified: Department for Work and Pensions https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2021

Notes: External Statistics for War Pension and allowances no longer avaialble

Table 3 Tax benefit instruments simulated in UKMOD - Number of recipients/payers (in thousands) - partial benefit take-up

	Variable name		UKMOD (1)										External (2)									
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Benefits		**Unit**																				
Child Benefit		Children	13,181	13,507	13,439	12,705	12,288	12,295	11,736	11,425	11,225	11,026	13,685	13,721	13,772	13,107	12,962	12,896	12,877	12,847	12,746	12,660
Child Benefit	**bch_s**	Families	7,665	7,759	7,777	7,286	6,966	6,997	6,600	6,306	6,309	6,250	7,842	7,885	7,920	7,550	7,462	7,417	7,396	7,377	7,326	7,282
Sure Maternity Grant	**bmamt_s**	Families	597	165	127	85	77	89	65	55	41	32	257	89	77	73	66	59	55	-	-	-
Scottish Best Start Grant	**bmascmt_s**	Families	0	0	0	0	0	0	0	0	0	25	-	-	-	-	-	-	-	-	-	80
Working Tax credit (WTC) (all)	**bwkmt_s**	Families	1,943	1,991	1,952	1,929	1,892	1,831	1,701	1,475	1,343	1,077	2,508	2,444	2,295	2,292	2,293	2,239	2,055	1,898	1,643	1,268
Child Tax Credit (CTC) (all)	**bfamt_s**	Families	5,470	4,740	3,959	3,769	3,511	3,349	3,064	2,764	2,536	1,838	4,302	3,684	2,625	2,618	2,610	2,564	2,456	2,321	2,051	1,612
Both CTC and WTC		Families	1,458	1,490	1,417	1,429	1,383	1,327	1,257	1,024	910	735	1,964	1,904	1,783	1,780	1,785	1,759	1,654	1,556	1,365	1,056
Either CTC or WTC		Families	5,956	5,241	4,494	4,269	4,019	3,852	3,508	3,215	2,969	2,180	6,308	5,670	4,622	4,528	4,429	4,284	4,047	3,785	3,295	2,534
Without children (WTC only)		Families	401	432	463	446	455	436	396	408	393	312	544	540	512	512	508	480	401	342	278	212
contribution-based Jobseeker's Allowance (JSA)	**bunct_s**	Families	93	115	154	118	106	67	79	45	23	22	234	212	178	145	111	86	92	68	38	24
Income Support + income-based JSA	**bsa_s**	Families	2,854	2,817	2,925	2,901	2,463	2,200	2,028	1,980	1,904	1,606	2,872	2,827	2,496	1,984	1,509	1,228	1,049	921	768	497
income-based Employment and Support Allowance	**bsadi_s**	Families	1,096	1,233	1,435	1,577	1,703	1,767	1,874	1,940	1,821	1,575	275	424	784	1,116	1,340	1,398	1,381	1,335	1,227	1,056
Income Support+income-based JSA+ESA		Families	3,950	4,051	4,361	4,478	4,165	3,967	3,902	3,920	3,725	3,181	3,147	3,251	3,280	3,100	2,849	2,626	2,430	2,256	1,995	1,553
Income Support lone parents only		Families	616	625	610	507	437	358	340	278	207	162	653	589	534	491	462	431	395	379	314	218
Universal Credit	**bsauc_s**	Families	0	0	0	0	0	86	517	776	1,285	2,717	-	-	-	2	13	130	373	627	1,282	2,159
Pension credit - any	**boamt_s**	Families	2,621	2,671	2,520	2,489	1,815	1,658	1,642	1,661	1,864	1,735	2,718	2,649	2,505	2,380	2,228	2,098	1,903	1,792	1,654	1,563
Pension Credit GC only		Families	1,369	1,447	1,309	1,310	694	788	759	834	880	811	951	958	1,002	967	947	946	918	884	803	776
Pension Credit GC+SC		Families	687	668	687	653	622	525	537	537	675	646	1,186	1,108	948	885	802	723	646	599	568	533
Pension Credit SC only		Families	565	556	525	526	499	345	346	290	310	278	581	583	555	528	478	429	339	309	282	254
Housing Benefit	**bho_s**	Households	4,202	4,456	4,639	4,412	4,282	4,179	4,159	4,080	4,001	3,412	4,798	4,932	5,053	5,026	4,921	4,777	4,594	4,371	3,984	3,394
Council Tax Reduction	**bmu_s**	Households	6,189	6,555	6,462	6,336	5,849	5,803	4,954	5,064	5,500	5,598	5,805	5,874	5,911	-	-	-	-	-	-	-
Winter Fuel Payment	**boaht_s**	Households	14,094	14,697	14,464	14,878	14,977	15,358	14,995	14,774	15,664	15,200	12,783	12,686	12,683	12,585	12,467	12,215	12,025	11,808	11,568	11,391
Benefit cap (Housing Benefit)	**brd_s**	Families	0	0	0	33	6	28	29	40	27	34	-	-	-	18	25	22	31	65	55	40
Benefit cap (Universal Credit)	**brduc_s**	Families	0	0	0	0	0	0	0	1	18	34	-	-	-	-	-	-	2	4	10	38
Benefit cap (Total)		Families	0	0	0	33	6	28	29	40	45	68	-	-	-	18	25	22	33	68	65	79
Scottish Carer's Allowance Supplement	**bcrdicm_s**	Individuals	0	0	0	0	0	0	0	0	117	108	-	-	-	-	-	-	-	-	46	81
Scottish Child Payment	**bchmt_s**	Children	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-
Scottish Child Winter Heating Assistance	**bchht_s**	Children	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-
Coronavirus Job Retention Scheme	**bwkmcee_s**	Individuals	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-
Self-employment Income Support Scheme	**bwkmcse_s**	Individuals	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-
Taxes and Social Insurance contributions																						
Income tax	**tin_s**	Individuals	32,986	32,116	32,291	32,232	33,534	30,159	30,065	29,932	30,082	29,743	31,300	30,800	30,600	30,400	30,700	31,000	31,200	31,200	31,600	31,400
Basic rate		Individuals	30,336	28,893	28,982	28,435	29,380	25,974	25,769	25,970	23,852	24,318	27,100	26,000	25,700	24,900	25,100	25,300	25,900	26,000	26,300	26,400
Higher rate		Individuals	2,650	3,074	3,170	3,616	3,920	3,982	4,030	3,782	3,720	3,168	3,020	3,570	3,720	4,200	4,300	4,510	4,410	4,210	4,230	3,860
Additional rate		Individuals	142	150	139	181	233	203	267	180	187	161	236	262	273	311	328	362	356	392	399	425
NIC Employees (Class 1)	**tscee_s**	Individuals	21,252	19,702	19,702	20,022	20,644	21,039	21,352	21,842	21,628	21,607	-	-	-	-	-	-	-	-	-	-
NIC Self employed (Class 2 + any Class 4)	**tscse_s**	Individuals	2,485	2,559	2,487	2,748	2,721	2,654	2,776	2,515	2,323	2,382	-	-	-	-	-	-	-	-	-	-
NIC Employees and Self-Employed		Individuals	23,737	22,261	22,190	22,770	23,365	23,693	24,129	24,357	23,950	23,990	-	-	-	-	31,260	31,960	32,390	32,710	33,010	-

Notes: benefit cap external data do not include Northern Ireland.

Sources:

A https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2021 (Outturn and forecast: Spring Budget 2021)

B Child Benefit statistics https://www.gov.uk/government/statistics/child-benefit-statistics-annual-release-august-2020

C Scottish Best Start Grant: https://www.gov.scot/publications/best-start-grant-and-best-start-foods-high-level-statistics-to-31-may-2021/

D Child and Working Tax Credit statistics https://www.gov.uk/government/statistics/child-and-working-tax-credits-statistics-finalised-annual-awards-2019-to-2020

E Benefit cap statistics https://www.gov.uk/government/statistics/benefit-cap-number-of-households-capped-to-may-2020

F Scottish Carer's Allowance Supplement https://www.gov.scot/publications/carers-allowance-supplement-april-eligibility-date-2021-and-carers-allowance-disability-living-allowance-attendance-allowance-and-severe-disablement-allowance-at-february-2021-statistics/

G Scottish Child Payment: Scottish Fiscal Commission https://www.fiscalcommission.scot/forecast/supplementary-costing-scottish-child-payment

H Scottish Child Winter Heating Assistance: Scottish Fiscal Commission https://www.fiscalcommission.scot/forecast/supplementary-costing-child-winter-heating-assistance

I Coronavirus Job Retention Scheme https://www.gov.uk/government/statistics/coronavirus-job-retention-scheme-statistics-4-november-2021

J Self-Employment Income Support https://www.gov.uk/government/statistics/self-employment-income-support-scheme-statistics-november-2021

K Income Tax Statistics and Distributions https://www.gov.uk/government/collections/income-tax-statistics-and-distributions

Table 4 Tax benefit instruments simulated in UKMOD - Annual amounts (in mil. GBP) - partial benefit take-up

	Variable name	UKMOD (1)										External (2)									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Benefits																					
Child Benefit	**bch_s**	11,968	12,229	12,188	11,335	11,059	11,181	10,494	10,148	10,027	9,861	11,771	11,788	11,780	11,062	11,198	11,294	11,255	11,216	11,170	11,081
Sure Maternity Grant	**bmamt_s**	305	84	65	42	38	46	33	28	21	16	131	46	39	37	34	30	28	26	25	26
Scottish Best Start Grant	**bmascmt_s**	0	0	0	0	0	0	0	0	0	8	-	-	-	-	-	-	-	-	-	19
Working Tax credit (WTC) (all)	**bwkmt_s**	5,484	5,405	5,236	5,123	5,363	5,166	4,716	4,060	3,663	2,844	8,069	7,734	7,094	7,063	7,154	7,017	6,299	5,796	5,003	3,825
Child Tax Credit (CTC) (all)	**bfamt_s**	17,349	18,855	18,884	18,485	17,323	17,106	15,956	14,518	13,298	9,053	20,474	21,469	21,685	21,628	21,555	21,351	20,726	19,741	17,656	13,875
CTC and WTC		22,833	24,260	24,120	23,609	22,685	22,272	20,672	18,577	16,961	11,898	28,542	29,203	28,779	28,691	28,710	28,368	27,025	25,537	22,659	17,700
Without children (WTC only)		744	780	852	898	905	974	769	851	806	637	1,298	1,304	1,191	1,175	1,186	1,131	931	818	695	560
contribution-based Jobseeker's Allowance (JSA)	**bunct_s**	305	377	530	390	385	241	285	157	84	77	801	750	662	527	369	310	264	224	155	111
Income Support + income-based JSA	**bsa_s**	8,547	8,847	9,679	9,686	7,865	6,954	6,545	6,601	6,344	5,496	11,529	11,181	9,816	7,394	5,589	4,543	3,843	3,581	2,983	1,979
income-based Employment and Support Allowance	**bsadi_s**	5,665	6,613	7,961	8,721	9,775	10,383	10,826	11,386	11,232	9,563	1,277	2,156	4,475	6,898	8,726	9,815	10,143	10,642	10,535	9,339
Income Support+income-based JSA+ESA		14,212	15,460	17,639	18,407	17,640	17,338	17,371	17,987	17,577	15,059	12,806	13,337	14,291	14,292	14,316	14,358	13,987	14,223	13,518	11,318
Income support lone parents only		2,085	2,166	2,243	1,877	1,571	1,345	1,264	987	783	619	2,586	2,304	2,110	1,857	1,699	1,558	1,397	1,344	1,124	810
Universal Credit	**bsauc_s**	0	0	0	0	0	670	4,084	5,432	9,412	20,357	-	-	-	6	56	491	1,586	3,323	8,135	18,386
Pension Credit Guarantee Credit	**boamtmm_s**	12,538	10,511	9,117	10,030	3,838	3,806	3,877	4,473	5,001	4,927	6,948	6,810	6,513	6,130	5,797	5,456	5,244	4,973	4,732	4,668
Pension Credit Savings Credit	**boamtxp_s**	831	820	763	706	639	438	367	354	446	431	1,294	1,243	998	911	779	622	422	395	408	392
Pension Credit (PC) total	**boamt_s**	13,369	11,331	9,880	10,736	4,477	4,244	4,244	4,828	5,447	5,358	8,242	8,052	7,511	7,042	6,576	6,079	5,666	5,368	5,140	5,061
Housing Benefit	**bho_s**	17,002	21,093	23,588	16,819	17,450	16,480	15,782	15,190	17,884	12,973	21,427	22,820	23,900	24,170	24,317	24,244	23,441	22,301	20,730	18,364
Council Tax Reduction	**bmu_s**	6,876	7,344	7,237	6,433	5,957	5,770	5,014	5,157	5,875	6,183	4,925	4,918	4,912	-	-	-	-	-	-	-
Winter Fuel Payment	**boaht_s**	2,853	2,315	2,316	2,389	2,437	2,505	2,463	2,462	2,624	2,592	2,759	2,149	2,144	2,140	2,117	2,073	2,049	2,023	1,995	1,974
all IS+PC+income-based JSA		27,581	26,791	27,519	29,144	22,117	21,582	21,615	22,814	23,024	20,417	19,771	19,233	17,327	14,436	12,165	10,621	9,509	8,949	8,123	7,039
Benefit cap (Housing Benefit)	**brd_s**	0	0	0	136	23	82	148	156	1,135	133	-	-	-	-	-	-	-	-	-	-
Benefit cap (Universal Credit)	**brduc_s**	0	0	0	0	0	0	0	1	45	321	-	-	-	-	-	-	-	-	-	-
Benefit cap (Total)		0	0	0	136	23	82	148	157	1,180	454	-	-	-	-	-	-	-	-	-	-
Scottish Carer's Allowance Supplement	**bcrdicm_s**	0	0	0	0	0	0	0	0	52	49	-	-	-	-	-	-	-	-	17	18
Taxes and Social Insurance contributions																					
Income tax	**tin_s**	122,572	132,332	125,016	132,193	151,180	162,013	145,731	141,359	139,864	136,507	152,000	156,000	157,000	165,000	167,000	178,000	174,000	181,000	187,000	192,000
Basic rate		71,935	64,857	63,243	57,907	59,280	58,238	58,048	59,052	55,558	59,974	68,600	62,700	61,400	56,200	56,400	56,700	57,300	59,800	61,600	65,000
Higher rate		50,638	45,812	47,130	51,981	58,171	59,681	59,916	57,736	58,653	51,522	47,700	54,400	56,800	61,400	62,600	66,100	64,900	64,500	65,600	63,600
Additional rate		13,552	21,662	14,643	22,305	33,728	44,095	27,768	24,571	19,989	19,038	34,500	37,500	38,000	46,000	46,700	54,400	51,500	56,400	58,600	62,000
NIC Employees (Class 1)	**tscee_s**	37,633	37,761	37,836	38,226	39,829	40,710	46,145	47,644	48,581	50,091	38,732	40,651	41,182	41,500	42,571	44,465	47,316	50,341	52,149	56,161
SIC Self employed (Class 2 + any Class 4)	**tscse_s**	3,692	4,364	3,977	4,441	5,324	5,707	4,954	4,606	4,219	4,378	2,711	2,603	2,512	2,536	2,624	3,089	3,158	3,420	3,681	3,997
NIC Employers	**tscer_s**	45,239	46,589	46,828	48,735	50,237	50,340	61,596	62,830	64,576	65,497	55,887	58,174	60,600	62,019	63,892	66,491	71,539	76,472	79,327	82,728
NIC total (any NIC)		86,564	88,714	88,641	91,402	95,390	96,757	112,695	115,080	117,376	119,966	96,548	101,617	102,037	107,690	110,406	113,701	122,013	130,233	135,157	142,886

Notes: Income Support (IS) also takes into account the income-based JSA; income-based ESA is effectively simulated as part of IS.

Sources:

A https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2021 (Outturn and forecast: Spring Budget 2021) (Child Benefit in this source also include One Parent Benefit & Guardian's Allowance)

C Scottish Best Start Grant: https://www.gov.scot/publications/best-start-grant-and-best-start-foods-high-level-statistics-to-31-may-2021/

D Child and Working Tax Credit statistics https://www.gov.uk/government/statistics/child-and-working-tax-credits-statistics-finalised-annual-awards-2019-to-2020

F Scottish Carer's Allowance Supplement https://www.gov.scot/publications/carers-allowance-supplement-april-eligibility-date-2021-and-carers-allowance-disability-living-allowance-attendance-allowance-and-severe-disablement-allowance-at-february-2021-statistics/

G Scottish Child Payment: Scottish Fiscal Commission https://www.fiscalcommission.scot/forecast/supplementary-costing-scottish-child-payment

H Scottish Child Winter Heating Assistance: Scottish Fiscal Commission https://www.fiscalcommission.scot/forecast/supplementary-costing-child-winter-heating-assistance

I Coronavirus Job Retention Scheme https://www.gov.uk/government/statistics/coronavirus-job-retention-scheme-statistics-4-november-2021

J Self-Employment Income Support https://www.gov.uk/government/statistics/self-employment-income-support-scheme-statistics-november-2021

K Income Tax Statistics and Distributions https://www.gov.uk/government/collections/income-tax-statistics-and-distributions

L National Insurance Contributions https://www.ons.gov.uk/economy/grossdomesticproductgdp/compendium/unitedkingdomnationalaccountsthebluebook/2021

Table 5 Distribution of equivalised disposable income - partial benefit take-up

	UKMOD (1)										External (HBAI) (2)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gini	0.29	0.30	0.28	0.29	0.30	0.31	0.30	0.29	0.29	0.29	0.34	0.34	0.34	0.34	0.34	0.35	0.34	0.34	0.35	0.35
Mean	1,425	1,484	1,512	1,561	1,654	1,727	1,711	1,701	1,731	1,757	1,761	1,745	1,728	1,772	1,814	1,852	1,836	1,847	1,868	1,926
Median	1,223	1,254	1,293	1,327	1,385	1,426	1,453	1,467	1,492	1,520	1,446	1,414	1,420	1,431	1,480	1,502	1,528	1,528	1,512	1,579
Decile medians (£/month equivalised)																				
D1	581	608	645	651	663	694	682	662	679	646	579	585	575	583	598	600	581	576	560	589
D2	765	798	838	841	876	899	905	902	924	931	851	835	844	854	872	874	893	875	870	886
D3	899	926	959	979	1,011	1,043	1,051	1,059	1,087	1,108	1,016	998	1,002	1,015	1,047	1,054	1,067	1,067	1,063	1,086
D4	1,016	1,047	1,082	1,111	1,147	1,181	1,205	1,219	1,249	1,263	1,178	1,159	1,159	1,162	1,205	1,220	1,236	1,243	1,244	1,284
D5	1,150	1,182	1,215	1,255	1,297	1,339	1,363	1,375	1,416	1,425	1,354	1,323	1,326	1,336	1,383	1,402	1,423	1,431	1,414	1,479
D6	1,301	1,330	1,369	1,415	1,475	1,517	1,546	1,559	1,586	1,622	1,546	1,514	1,512	1,530	1,579	1,609	1,634	1,628	1,626	1,681
D7	1,479	1,513	1,556	1,616	1,682	1,717	1,750	1,766	1,798	1,834	1,769	1,746	1,733	1,769	1,824	1,855	1,870	1,867	1,868	1,922
D8	1,712	1,753	1,794	1,857	1,942	1,976	2,008	2,025	2,062	2,128	2,053	2,039	2,018	2,066	2,118	2,162	2,149	2,165	2,169	2,228
D9	2,041	2,101	2,158	2,226	2,308	2,384	2,408	2,421	2,493	2,564	2,516	2,492	2,463	2,498	2,568	2,596	2,598	2,623	2,648	2,679
D10	2,854	2,954	2,998	3,069	3,271	3,344	3,423	3,360	3,477	3,502	3,703	3,650	3,606	3,641	3,689	3,796	3,724	3,719	3,860	3,938
Decile group share																				
D1	3.6	3.7	3.8	3.8	3.6	3.6	3.6	3.5	3.6	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
D2	5.4	5.4	5.5	5.4	5.3	5.2	5.3	5.3	5.3	5.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0
D3	6.3	6.3	6.3	6.3	6.2	6.0	6.1	6.2	6.3	6.3	5.0	5.0	6.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0
D4	7.1	7.1	7.2	7.1	6.9	6.9	7.0	7.2	7.2	7.2	7.0	7.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
D5	8.1	8.0	8.1	8.0	7.8	7.8	8.0	8.1	8.2	8.1	8.0	8.0	8.0	8.0	8.0	7.0	8.0	8.0	7.0	7.0
D6	9.2	9.0	9.1	9.1	8.9	8.8	9.1	9.1	9.1	9.2	9.0	8.0	9.0	8.0	8.0	9.0	9.0	8.0	9.0	9.0
D7	10.4	10.2	10.3	10.3	10.2	10.0	10.2	10.4	10.4	10.5	10.0	10.0	10.0	10.0	11.0	10.0	10.0	11.0	10.0	10.0
D8	12.0	11.8	11.9	11.9	11.8	11.5	11.8	11.9	12.0	12.2	11.0	12.0	11.0	12.0	11.0	12.0	12.0	11.0	12.0	12.0
D9	14.4	14.3	14.3	14.3	14.2	13.9	14.2	14.3	14.5	14.7	15.0	14.0	15.0	14.0	15.0	14.0	14.0	15.0	14.0	14.0
D10	23.5	24.4	23.5	23.7	25.2	26.5	24.8	23.9	23.5	23.2	27.0	28.0	27.0	28.0	27.0	28.0	27.0	27.0	28.0	28.0

Source: HBAI data from https://www.gov.uk/government/statistics/households-below-average-income-for-financial-years-ending-1995-to-2020

Table 6 Poverty rates by age and gender - partial benefit take-up

	UKMOD (1)										External (HBAI) (2)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Median (£/month)																				
	1,223	1,254	1,293	1,327	1,385	1,426	1,453	1,467	1,492	1,520	1,446	1,414	1,420	1,431	1,480	1,502	1,528	1,528	1,512	1,579
Poverty risk: all																				
50%	6.2	5.9	5.0	5.5	6.1	5.7	6.7	6.9	6.9	7.9	9.0	9.0	9.0	9.0	9.0	10.0	10.0	10.0	10.0	11.0
60%	12.7	11.5	10.8	11.7	12.4	12.5	13.1	13.7	13.4	14.0	16.0	16.0	15.0	15.0	16.0	16.0	16.0	17.0	17.0	18.0
70%	21.7	20.9	20.5	21.0	21.6	21.7	22.8	22.7	22.5	22.0	25.0	25.0	24.0	24.0	24.0	25.0	25.0	25.0	25.0	26.0
Poverty risk: children																				
50%	6.5	5.6	4.3	5.4	5.6	4.5	6.3	7.3	7.1	8.5	9.0	9.0	9.0	9.0	10.0	10.0	11.0	12.0	11.0	13.1
60%	14.6	11.7	10.5	13.1	12.8	12.7	14.2	16.3	16.2	16.1	18.0	18.0	17.0	17.0	19.0	20.0	19.0	22.0	20.0	22.9
70%	26.2	24.3	23.9	25.5	25.0	25.7	28.2	28.4	28.3	27.6	30.0	30.0	30.0	30.0	31.0	32.0	33.0	33.0	32.0	33.9
Poverty risk: older people																				
50%	4.2	4.0	3.6	3.1	6.1	6.1	6.2	6.4	6.4	6.1	9.0	8.0	8.0	8.0	9.0	10.0	10.0	10.0	10.0	11.1
60%	12.3	11.5	10.5	10.0	14.2	14.4	13.1	13.8	12.6	12.3	17.0	16.0	16.0	16.0	16.0	17.0	17.0	18.0	18.0	19.2
70%	24.1	22.6	20.8	20.8	25.6	24.4	24.0	24.0	21.7	21.4	28.0	27.0	25.0	26.0	26.0	27.0	28.0	28.0	27.0	30.7
Poverty risk: gender																				
60% male adult	12.2	11.1	10.4	11.1	11.7	12.1	12.5	13.3	12.9	13.9	15.4	14.9	14.8	14.3	14.3	14.9	14.6	15.0	15.2	15.7
60% female adult	13.2	12.0	11.1	12.2	13.0	12.9	13.7	14.1	13.8	14.2	15.6	15.6	15.0	15.1	15.9	16.0	16.2	16.7	16.5	17.3

Source: HBAI data from https://www.gov.uk/government/statistics/households-below-average-income-for-financial-years-ending-1995-to-2020

Annex 3: Tables Comparing UKMOD Outputs Based on FRS and UKHLS Data

Table 7 Annual amounts (in mil. GBP) and Number of recipients/ payers (in thousands), 2019

	FRS	FRS	USoc	USoc	USoc as % of FRS	USoc as % of FRS
	Total amount, yearly, mill.	Number of recipients/payers	Total amount, yearly, mill.	Number of recipients/payers	Total amount, yearly, mill.	Number of recipients/payers
Total market income: ils_origy = ils_earns + ils_oth	**1,056,168**	**43,574,778**	**967,007**	**44,466,493**	**92**	**102**
Employment and self-employment income: ils_earns = yem + yse + yemmc_s (in 2020)	*943,689*	*30,891,275*	*787,521*	*29,186,590*	*83*	*94*
Employment income: yem	836,128	26,958,555	688,903	25,505,741	82	95
Self-employment income: yse	107,562	4,247,531	98,618	4,303,365	92	101
Other sources: yiy + yot01 + ypr + ypp + yptot + yptmp – xmp	*112,479*	*36,534,038*	*179,486*	*37,602,621*	*160*	*103*
Investment income: yiy	15,579	22,671,486	28,989	19,689,416	186	87
Income from odd jobs: yot01	1,885	464,537	3,679	534,320	195	115
Property income: ypr	12,988	1,992,272	28,415	2,289,825	219	115
Personal pension: ypp	105,551	9,638,883	145,457	14,258,073	138	148
Private transfers (non-taxable): yptot	8,239	1,274,568	3,530	806,303	43	63
Received maintenance payment: yptmp	2,358	747,849	3,551	858,417	151	115
Maintenance paid: xmp	2,759	727,856	1,684	469,567	61	65
Direct taxes: ils_tax = tin_s + tmu	**204,131**	**39,005,722**	**178,879**	**41,475,439**	**88**	**106**
Personal Income Tax: tin_s	162,278	29,736,870	136,507	29,742,692	84	100
Council tax: tmu	41,853	26,985,170	42,372	27,785,534	101	103
All SIC included in disposable income: ils_sicdy = ils_sicee + ils_sicse + ils_sicot	**65,624**	**26,817,544**	**54,469**	**23,852,873**	**83**	**89**

Employee National Insurance contributions: ils_sicee = tscee_s	60,241	23,825,716	50,091	21,607,392	83	91
Self-employed National Insurance contributions: ils_sicse = tscse_s	5,382	3,096,864	4,378	2,382,160	81	77
Employer National Insurance contributions (not part of disposable income): ils_sicer = tscer_s	83,789	23,696,585	65,497	21,441,233	78	90
All benefits: ils_ben = ils_pen + ils_benmt + ils_bennt	**208,680**	**25,166,181**	**233,517**	**28,975,148**	**112**	**115**
Means-tested non-pension benefits: ils_benmt = bwkmt_s + bfamt_s + bsa_s + bsadi_s + boamt_s + bho_s + bmu_s + bunmt_s + bmamt_s + bmascmt_s + bsauc_s + bchmt_s - brd_s - brduc_s	*64,780*	*9,275,760*	*71,742*	*11,980,570*	*111*	*129*
Working Tax Credit: bwkmt_s	2,133	848,579	2,844	1,076,922	133	127
Child Tax Credit: bfamt_s	8,795	1,717,561	9,053	1,837,635	103	107
Income Support; income-based Jobseekers Allowance: bsa_s	4,713	1,274,080	5,496	1,605,760	117	126
Income-related Employment and Support Allowance: bsadi_s	5,993	853,400	9,563	1,574,921	160	185
Pension Credit: boamt_s	4,808	1,525,987	5,358	1,735,276	111	114
Housing Benefit: bho_s	13,703	3,057,587	12,973	3,411,774	95	112
Sure Start Maternity Grant: bmamt_s	36	69,099	16	31,520	44	46
Best Start Grant (Scotland): bmascmt_s	18	52,152	8	24,826	43	48
Council Tax Benefit/Reduction: bmu_s	6,789	5,315,564	6,183	5,598,293	91	105
Universal Credit: bsauc_s	17,782	2,026,304	20,357	2,717,478	114	134
Scottish Child Payment: bchmt_s	0	0	0	0		
Benefit cap (reducing Housing Benefit): brd_s	153	48,561	133	34,004	87	70

Benefit cap (reducing Universal Credit): brduc_s	108	44,042	321	34,471	297	78
Non-means-tested non-pension benefits: ils_bennt = bedes + bedsl + bdioa + bdisc + bdimb + bdiscwa + bdimbwa + bdict01 + bdict02 + bdiwi + bcrdi + bcrdicm_s + bdisv + bhlwk + buntr + bot + bmaer + bmana + boaht_s + bch_s + bunct_s + bchht_s + bwkmcee_s (in 2020) + bwkmcse_s (in 2020)	*54,504*	*22,744,774*	*46,853*	*25,067,765*	*86*	*110*
Winter Fuel Allowance: boaht_s	1,997	11,926,149	2,592	15,199,840	130	127
Child Benefit: bch_s	10,614	6,739,871	9,861	6,249,743	93	93
Contribution-based Jobseeker's Allowance: bunct_s	94	24,681	77	21,560	82	87
Scottish Carer's Allowance Supplement: bcrdicm_s	23	51,716	49	108,252	209	209
Student payments: bedes	3,104	594,480	4,337	613,820	140	103
Student Loan: bedsl	14,782	1,440,269	0	0		
Attendance allowance: bdioa	3,216	812,886	3,903	1,032,245	121	127
Disability Living Allowance: bdisc	3,225	1,015,019	7,225	1,790,499	224	176
Disability Living (mobility) Allowance: bdimb	2,145	828,914	0	0		
Personal Independence Payment living allowance: bdiscwa	6,039	1,616,764	9,748	2,263,651	161	140
Personal Independence Payment mobility: bdimbwa	2,848	1,209,793	0	0		
Incapacity Benefit: bdict01	0	0	1,170	239,566		
Contributory Employment and Support Allowance: bdict02	1,833	291,147	1,783	274,838	97	94
Industrial injuries pension: bdiwi	479	152,041	521	218,878	109	144
Invalid Carer's Allowance: bcrdi	2,271	662,945	3,339	1,144,119	147	173
Severe Disablement Allowance: bdisv	64	15,110	906	241,498	1,418	1,598

Statutory Sick Pay: bhlwk	409	111,236	0	0		
Training Allowance: buntr	55	9,893	0	0		
other non-means-tested benefits: bot	0	0	589	257,404		
Statutory Maternity Pay: bmaer	1,211	163,314	0	0		
Maternity Allowance: bmana	95	13,961	755	121,924	793	873
Pensions: ils_pen = boact00 + boactcm + boawr + bsuwd	*89,396*	*11,429,931*	*114,922*	*14,588,132*	*129*	*128*
Base State pension: boact00	70,479	11,313,213	113,542	14,467,117	161	128
Second State Pension: boactcm	17,776	8,423,368	0	0		
War pension: boawr	280	58,179	386	92,038	138	158
Widow's pension: bsuwd	862	168,692	993	220,604	115	131
Disposable income BHC: ils_dispy = ils_origy + ils_ben – ils_tax – ils_sicdy	**995,093**	**50,046,262**	**967,175**	**52,447,782**	**97**	**105**
housing costs based on HBAI (FRS only)	114,668	28,152,812	0	0		
housing costs	115,490	27,908,373	96,605	16,912,850	84	61
Disposable income AHC: il_dispy_ahc = ils_dispy – xhc_hbai	**880,426**	**50,050,222**	**870,570**	**52,466,085**	**99**	**105**

Table 8 Inequality indices - partial benefit take-up, 2019

	FRS		USoc		USoc as % of FRS	
	Gini	S80/20	Gini	S80/20	Gini	S80/20
Market income	0.480	36.9	0.480	37.3	100	101
Disposable income	0.299	4.5	0.292	4.4	98	98

Table 9 Shares of equivalised disposable income by deciles - partial benefit take-up, 2019

	FRS	USOC	USoc as % of FRS
Shares of disposable income by decile group			
1 decile	3.4	3.3	96
2	5.1	5.3	104
3	6.1	6.3	104
4	7.0	7.2	102
5	8.1	8.1	101
6	9.2	9.3	102
7	10.5	10.4	99
8	12.2	12.2	100
9	14.6	14.7	100
10 decile	23.8	23.2	97
poor	6.1	5.3	87

Table 10 Poverty rates by age - partial benefit take-up, 2019

	FRS	USoc	USoc as % of FRS
Poverty headcount by population group:			
All	13.2	12.5	95
Children	14.8	13.6	92
Adults	12.9	11.9	93
Adults Economically Active	5.3	5.0	95
Elderly	12.5	13.1	105
Poverty Gap	14.5	16.4	113
Poverty Line	*755.2*	*737.0*	*98*