ScotBen Peer Review

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1 Background

Future Economy Scotland is engaged in a research project to explore how the Scottish Government should use fiscal policy to support delivering a just transition to net zero. A key part of this project involves modelling potential changes to the existing suite of devolved taxes in Scotland, as well as examining the scope to introduce new taxes. For each policy examined, the project will model the revenue-raising potential and effects on the income distribution, poverty and inequality. The research also aims to examine effects on different regions in Scotland where possible, and consider questions of efficiency, deadweight loss, and scope for behavioural change and unintended consequences, drawing on relevant literature.

Modelling work conducted as part of the project is based on a new tax-benefit model for Scotland, ScotBen. Future Economy Scotland has commissioned this peer review to comment on the design and functionality of ScotBen, and to identify areas of possible improvement of the model as a basis for analysing tax-benefit counterfactuals for Scotland.

1.1 About the authors

Matteo Richiardi is the director of the Centre for Microsimulation and Policy Analysis (CeMPA), the centre that develops and maintains the tax-benefit model UKMOD. Justin van de Ven is the primary developer of UKMOD.

UKMOD is a well-established tax-benefit model for the UK and its devolved nations, having been under continuous development for more than two decades. It uses the EUROMOD platform to analyse the effects of taxes and social benefits on household incomes and work incentives for researchers, policymakers, and the public. The model is freely available and updated with recent data, allowing users to simulate policy reforms and compare their distributional impacts across the UK's constituent nations.

2 Objectives

The review focusses on four key issues:

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1) Scope: review the coverage of taxes and benefits described by ScotBen;
2) Assumptions: identify key assumptions underpinning ScotBen;
3) Coding: undertake a brief review of ScotBen's programming code; and
4) Comparison: contrasting projections from ScotBen against those of UKMOD.

Each of these four issues is addressed in a separate section below, with a summary of findings provided in the concluding remarks.

An important remark relates to the version of ScotBen considered for the review. ScotBen is under continuous development, with no official model releases (and associated documentation) available. This review considers the version of ScotBen which was available – broadly speaking – in Summer 2025.

3 Model Scope

ScotBen is a tax-benefit microsimulation model with a primary focus on the Scottish fiscal system. In lay terms, this means that the model is designed to project the effects of tax and benefit payments for a sample of individuals that reflect the population of interest. This section discusses three aspects concerning the model's scope: (i) input data; (ii) fiscal policy; and (iii) model projections. This section consequently provides an overview of some subjects that are considered at further length in other parts of the report.

ScotBen is an open-source model with development actively undertaken using a Github repository that anyone can access freely over the internet.[1] This is fundamentally important as it exposes the model's workings to independent scrutiny, avoiding the "black box" that characterises many models in the related field. Nevertheless, at the current time ScotBen has very thin publicly available documentation, which complicates third party review of the model's scope. This limitation was mitigated for the current review by an unpublished document supplied by Stark (2025). One of the recommendations that we offer under the concluding remarks in Section 7 is that (detailed) documentation for the model be made publicly available.

3.1 Input data

Like most tax-benefit microsimulation models ScotBen simulates tax and benefit payments for a sample of individuals described by an input dataset. The input dataset used by comparable models is usually drawn from a survey data source, although synthetically generated data can also be used. In the case of ScotBen, the principal data source for the required input data is the Family Resources Survey (FRS).

Utilisation of the FRS for model input data is common for tax-benefit models for the UK, including UKMOD. The FRS is used by the Department for Work and Pensions for departmental modelling of the UK tax and benefits system, and to produce its periodical

[1] https://github.com/grahamstark/ScottishTaxBenefitModel.jl

Households Below Average Income study. This survey, and its Household Below Average Income (HBAI) extension, is referred to by the Office for National Statistics as "the foremost source of UK data and information about household net income and poverty" (ONS, 2016, p. 17).

Both ScotBen and UKMOD pool multiple waves of FRS data to mitigate small sample issues for Scotland. Furthermore, both ScotBen and UKMOD adjust for inflation between survey years using a combination of adjustment factors derived from a variety of sources including the Office for National Statistics, Office for Budget Responsibility, and the Scottish Fiscal Commission. We return to discuss how the input data for ScotBen and UKMOD compare in Section 6.1 of the report.

It may also be noted here that ScotBen is adapted to draw upon input data reported by alternative data sources. These include the Wealth and Assets Survey (WAS) for exploring counterfactual wealth taxes, the Living Costs and Food survey for exploring indirect taxes, and the Scottish Household Survey to obtain local authority indicators. These extensions are beyond the scope of the current review.

3.2 Fiscal policy

ScotBen is designed to reflect policy rules for taxes and benefits to which residents of Scotland are subject. Furthermore, the model's design is such that many parameters describing existing policy are accessible, facilitating exploration of associated counterfactual analyses.

Table 3.1 summarises existing tax-benefit policy that ScotBen is designed to reflect, alongside an indication of whether the same set of policies are reflected by UKMOD. The table indicates that, of the 49 alternative benefit schemes listed in the table, UKMOD omits 4 and ScotBen omits 22. Furthermore, ScotBen simulates one benefit that UKMOD does not (Scottish civil legal aid). Hence, UKMOD simulates 19 benefits that ScotBen does not.

Of the 19 schemes that UKMOD reflects but ScotBen does not, 5 are in-kind benefits (not direct financial transfers), and a further 10 are not simulated by UKMOD but imputed from the input data.[2] That leaves 4 payments simulated by UKMOD but not ScotBen: cost of living payment, winter heating allowances (child and pensioner), and the sure start maternity grant.

[2] In-kind benefits: best start foods, best start grant, free school meals, healthy start (food), school clothing grant. UKMOD imputed from survey data but not simulated by ScotBen: child support, foster allowances, industrial injuries benefit, private pensions, severe disablement allowance, statutory sick pay, student loans, training and education allowances, additional state pensions war pension.

Table 3.1: Model scope with respect to existing tax-benefit policies

Policy	ScotBen	UKMOD
Attendance Allowance (pension age disability payment)	x	x
Benefit Cap	x	x
Bereavement Benefit	x	x
Best Start Foods		x
Best Start Grant		x
Carer's Allowance (carer support payment)	x	x
Child Benefit	x	x
Child support		x
Child Tax Credit	x	x
Cost of Living Payment		x
Council Tax Reduction	x	x
Disability Living Allowance (adult disability payment)	x	x
Discretionary Housing Payment	x	x
Employment Support Allowance (income-based)	x	x
Employment Support Allowance (contribution-based)	x	x
Food banks		
Foster Allowances		x
Free School Meals		x
Guardian's Allowance		
Healthy Start (food)		x
Housing Benefit	x	x
Income Support	x	x
Industrial Injuries Disablement Benefit		x
Jobseeker's Allowance (income-based)	x	x
Jobseeker's Allowance (contribution-based)	x	x
Local Housing Allowance	x	x
Minimum wages	x	x
Maternity Allowance	x	x
Pension Credit	x	x
Personal Independence Payment	x	x
Private pensions		x
School Clothing Grant		x
Scottish Carer's Allowance Supplement	x	x
Scottish Child Payment	x	x
Scottish Child Winter Heating Assistance		x
Scottish Civil Legal Aid	x	
Severe Disablement Allowance		x
Social Fund		
State Pension - additional		x
State Pension - basic/new	x	x
Statutory Maternity/Paternity Pay	x	x
Statutory Sick Pay		x

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Table 3.1: Model scope with respect to existing tax-benefit policies (cont.)

Policy	ScotBen	UKMOD
Student loans		x
Sure Start Maternity Grant		x
Training and educational maintenance allowances		x
Universal Credit	x	x
War Pension		x
Winter Fuel Allowance		x
Working Tax Credit	x	x
Taxes and duties		
Income tax	x	x
National Insurance	x	x
Council tax	x	x
Wealth tax	x	
Capital Gains tax		
Inheritance tax		
Property and Stamp Duties		
Value Added Tax*	~	x
Specific Excise*	~	x
Ad valorem Excise*	~	x

Note: * Extension of ScotBen to include indirect taxes is incomplete at the time of writing

It may consequently be concluded that UKMOD and ScotBen are both designed to project an almost identical set of direct benefit schemes, with the marginal exception of the omission of winter fuel payments from ScotBen. We also note that inclusion of in-kind benefits into UKMOD was at the request of Scottish Government, as these are considered important in meeting contemporary policy targets to mitigate child poverty. Our recommendations in Section 7 consequently suggest including both winter fuel payments and in-kind benefits in ScotBen.

In terms of projected tax schemes, the bottom panel of Table 3.1 indicates that both UKMOD and ScotBen are designed to reflect income taxes, national insurance payments and council taxes. ScotBen has been extended to permit (counterfactual) consideration of wealth taxes, whereas indirect taxes – value added tax, specific and ad valorem excise duties – are fully integrated into UKMOD.

3.2.1 Policy counterfactuals

ScotBen is designed to facilitate experimentation with alternative policy assumptions. These experiments can range from simple parameter changes of existing policy descriptions, to inclusion of schemes that are entirely novel to the existing transfer system.

It may be noted that the model structure appears to be well-adapted to integration of web-interfaces. Examples of which we are aware include:[3]

[3] Note some of these links appear no longer functional at the time of writing.

- https://ubi.virtual-worlds.scot (Universal Basic Income)
- https://scotben.virtual-worlds.scot (construct a national budget)
- https://stb.virtual-worlds.scot/bcd (explores incentive effects of the fiscal system)
- https://triplepc.northumbria.ac.uk (public policy preference calculator)

These web interfaces can facilitate model interaction by non-specialists and are especially useful for presenting results of existing policy descriptions and exploring the influence of selected policy parameters.

Consideration of policy alternatives that extend beyond parameter adjustments of existing policy normally require interaction with the model's programming code. We return to discuss code related issues with ScotBen in Section 5.

3.3 Model projections

Given input data for a population and descriptions for the incidence of tax and benefit policies, there are a range of methods that microsimulation models can use to impute transfer payments. The most straightforward approach is to take the characteristics of each individual described by the input data as given, and apply the rules governing taxes and benefits on the assumption that all eligible benefits are received and all applicable taxes are paid. Transfer payments imputed in this fashion can subsequently be used to evaluate summary statistics of interest.

It is our understanding that the above "straightforward approach" is currently adopted for ScotBen. Nevertheless, various alternatives are available and are often a key focus of policy interest. Examples include allowing for imperfect benefits take-up, incomplete tax compliance, and behavioural responses to policy counterfactuals. We discuss these alternatives in Section 4.

4 Modelling Assumptions

As noted in Section 3.3, it is our understanding that ScotBen currently imputes transfer payments for individuals described by an input dataset on the assumption that all eligible benefits are received, all applicable taxes are paid, and that behaviour remains invariant to simulated policy counterfactuals.

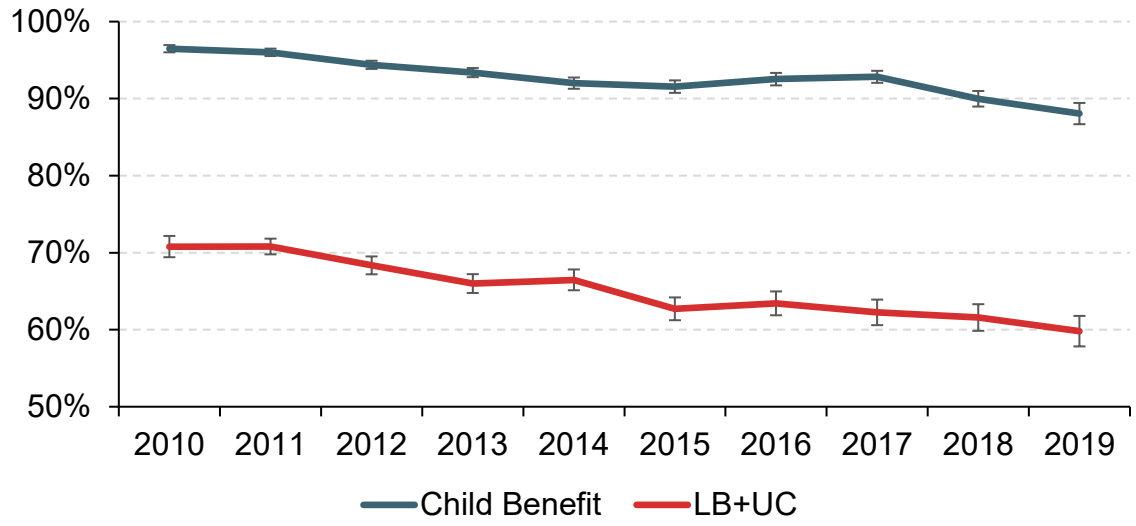
4.1 Benefits take-up

We understand that ScotBen is not currently adapted to account for imperfect take-up of benefits to which individuals are eligible, although this appears to be in the developmental pipeline. This is crucially important, as take-up rates can be substantially below 100%, especially for means-tested benefits in the UK.

Figure 4.1 provides an indication of the extent of imperfect take-up with respect to Child Benefit (CB) and Legacy Benefit / Universal Credit (LB/UC) in the UK. This figure reveals

two key features. First, take-up rates in the UK can fall substantially below 100%: in 2019 the estimated take-up rate was 88% for CB and 60% for LB/UC. Furthermore, take-up rates appear to have been falling through time, by around 8% between 2010 and 2019 for CB, and around 10% for LB/UC. Hence, failure to account for imperfect benefits take-up is likely to substantially over-state benefits receipt and associated budgetary costs, both now and likely into the (near) future. **For this reason, it is our view that accommodating imperfect take-up in ScotBen should be considered a high-priority issue to be achieved before any associated analysis is finalised.**

Figure 4.1: Estimated take-up rates for Child Benefit and Legacy Benefits/Universal Credit



Note: Bars indicate 95% confidence intervals
Source: Authors' calculations on UKMOD-UKHLS data, 2010-2019

Various strategies exist to account for imperfect take-up. The simplest approach is to randomly select non-take-up from the set of individuals who are projected to be eligible to the benefit. A slightly more sophisticated approach – which is adopted for UKMOD – involves first projecting benefits take-up based on benefits receipt reported by the input dataset, and then randomly allocating any residual imperfect take-up randomly among the imputed eligible population (priority queue). Both of these strategies depend crucially upon take-up estimates. In the past, these estimates were reported at annual intervals for broad population subgroups by the Department for Work and Pensions. Unfortunately, that is no longer the case and additional effort needs to be expended to identify the scale of imperfect take-up. In the case of ScotBen, it may currently be sensible to leverage associated work undertaken by third party models to address this issue.[4]

[4] The parameters of UKMOD are frequently updated and include estimates of take-up for selected benefit schemes.

4.2 Calibration

Model calibration refers to the process of adjusting model parameters to hit desired targets. For example, a modeller might choose to adjust assumed take-up rates for a benefit so that the model reflects administrative aggregates for case-load numbers or budgetary costs. It is our view that calibration should be avoided wherever possible, as it can often risk papering-over problems with a model that would be more appropriately addressed in an alternative fashion. The extent to which a model fails to capture budgetary aggregates for a given benefit, for example, can help to identify scale of disparities between a model structure and the practical reality. This metric becomes meaningless, however, if take-up rates are calibrated to match the model to budgetary aggregates.

We are unaware of any calibration that is currently employed for identifying the parameters of ScotBen. Our review consequently proceeds on the assumption that such methods have not been employed.

4.3 Behaviour

It is common to distinguish between two alternative types of effect when analysing reforms to transfer policy. "Impact effects" of a policy reform refer to changes that are attributable directly to the implemented policy change. These effects are identified on the assumption that nothing in the world alters other than the policy features of interest. The impact effects of an increase in the basic rate of income taxes, for example, refer to the rise in revenue projected on the assumption that everything else in the policy context – including the scale of taxable income – remain unchanged.

The "full effects" of a policy reform take into consideration both the changes directly attributable to the altered policy, and how the underlying policy context might also alter. The Scottish Fiscal Commission, for example, assumes that a rise in income tax rates will lead to a decline in the tax base when reporting its budgetary forecasts. It is noted that ScotBen's modular structure is well adapted to incorporating behavioural responses, but this is not currently a feature of the model. We recommend addressing this gap when time permits.

5 Coding

A formal review of the accuracy of ScotBen's programming code is beyond the scope of this review. Rather, accuracy of the model is evaluated indirectly via comparisons with a third-party model (UKMOD), as reported in Section 6. It may also be noted that ScotBen includes a series of "unit tests" in its structure that compare model projections for isolated features against test thresholds. The thresholds were obtained from a variety of sources including online calculators, taxation textbooks, and benefit manuals.

This section focuses on the costs and benefits of the programming language upon which ScotBen depends, and reports reviewer impressions following an admittedly superficial reading through the model's Github repository.

5.1 Approach to coding

ScotBen is coded in Julia, following modern programming practices that emphasise use of short testable blocks of code in a clear and readable format.

Julia is a high-level programming language that is designed for technical and scientific computing, widely recognised for its computational efficiency. The language is typically fast, includes an intuitive syntax that accommodates integration with alternative programming languages, and has built-in parallelism. These advantages are off-set by costs including longer run times during first use (just-in-time compiler), limited community, changing programming implementations (relatively new language), and limited tooling (Integrated Development Environment, IDE, support and debugging).

With specific regard to tax-benefit modelling, the choice of Julia as a programming language facilitates use of ScotBen by people with some programming experience. Furthermore, the increased accessibility of modern programming languages and growing popularity of programming help to widen the pool of individuals who are comfortable with using programming text to manipulate a model like ScotBen.

Nevertheless, the transparency of the substantive analyses that ScotBen will be used for depends to some degree on the popularity of the programming language used, and – especially when the programming language is still a niche choice – on the quality and quantity of the available documentation.

Moreover, it is our experience that many people who might be interested in using or evaluating a tool like ScotBen, including government policy analysts, remain hesitant to the use of programming code. For this reason, tools that obfuscate the formal code can be helpful in facilitating use of the model by a wider pool of individuals. In this regard, the apparent ease with which the model can be integrated with stylised web interfaces is particularly valuable, even if such interfaces impose non-trivial constraints on the types of analyses that can be undertaken.

5.2 Github repository

As noted in the beginning of Section 3, a key advantage of ScotBen is that it is *actively developed* in an entirely open-source Github repository (https://github.com/grahamstark/ScottishTaxBenefitModel.jl). This makes the model transparent in a way that many associated models in the field are not. Nevertheless, as suggested in Section 5.1, the transparency of a public Github repository should be considered "potential" in the sense that it depends on other related factors, including user documentation, programming language, and code organisation.

5.2.1 Documentation

ScotBen's documentation remains very thin, both in the Github repository and more generally. This is entirely understandable, as the model remains under intensive development: 2,273 Github commits in total with 388 commits since January 2025. It should be noted that all of the developmental activity for ScotBen has been undertaken by one developer (Graham Stark), which does pose non-trivial personnel risk. That said, it is not uncommon for a project to begin with a single developer and the progress that Stark has made on this project should be commended.

5.2.2 Programming language and organisation

In terms of programming language, it might be useful to note that the authors have a great deal of experience over a very wide range of languages, from high performance computing, to personal computing, and "full-stack" web-development. Notably, however, Julia is not one of the languages with which we have prior experience, echoing one of the potential hurdles to model use that we mention in Section 5.1. That said, most programming languages follow similar patterns, and Julia appears to be no exception in that regard.

Our impression of the programming code is that it is "clean" in the sense that it is well-organised, with use of discernible syntax. Hence, it is our view that someone with reasonable programming experience might access the model effectively within a month or two of use. That said, third-party reading of the code would be facilitated by more frequent commenting. We recognise that such comments may be of limited value for a project with a single developer, but these can be invaluable to facilitate third-party access and evaluation, even if limited - e.g. providing an explanation of function purpose.

6 Model Comparisons

This section compares statistics derived from ScotBen with those of UKMOD. As noted in Section 1.1, UKMOD is an alternative tax-benefit microsimulation model for Scotland with over two decades of development and consequently presents a useful basis for comparison.

6.1 Input data

As discussed in Section 3.1, both ScotBen and UKMOD draw upon the FRS to derive input data sets. In the case of UKMOD, a rolling three year sample of data are pooled from (generally consecutive) survey waves.[5] Associated simulation weights are the same as those reported with each survey data, divided by three to adjust for the pooling.

[5] Data from the 2020 wave were discarded due to quality concerns relating to the Covid-19 pandemic.

In contrast, at the time of writing ScotBen projections for Scotland pool data from seven consecutive years of FRS data reported between 2016 and 2022 inclusive.[6] Simulation weights are computed by ScotBen to ensure representativeness of the Scottish population with respect to employment totals, disability benefit receipts, local authority level populations and occupations. This implies that ScotBen may provide a better reflection of the Scottish population than UKMOD, to the extent that the bespoke weights it generates improve upon weights reported directly by the FRS.

For the current exercise we consider the 2022 pooled UKMOD input data – composed of the 2019, 2021 and 2022 waves of the FRS, and a subset of the ScotBen input data covering the same period.[7] Whenever possible, and to facilitate interpretation, we have also reported the corresponding values as described by the Scottish 2022 census.

The choice of the variables to compare was heavily constrained by difficulties in reconciling definitions and categories – for instance, the education variable has 5 categories in UKMOD, and 79 categories in ScotBen. Marginal distributions from the Census also cover a small subset of the variables available in ScotBen/UKMOD.[8]

Table 6.1 provides the results of the comparison, for variables also available in the census. Socio-demographics characteristics are broadly consistent between ScotBen and UKMOD, and in line with the census. When there are significant discrepancies, they seem to affect both ScotBen and UMOD in similar ways, suggesting a misalignment between census and FRS data. In particular, ScotBen (and UKMOD) under-represent ethnic minorities (the share of non-white is around 5%, against 7% in the census), and over-represents married couples at the expenses of divorced ones. ScotBen (and UKMOD) also over-represent individuals that classify themselves as long-term sick or disables (around 5% against 4% in the census), possibly reflecting differences in definitions. To be noted, ScotBen is closer than UKMOD to the census with respect to other categories of inactive individuals (students and pensioners).

A key area of interest for a tax-benefit model is income. Table 6.2 compares income-related indicators for ScotBen and UKMOD (related census data are unavailable). Comparison of monetary variables entails a further layer of complexity, as UKMOD data is uprated to 2022, while ScotBen data is uprated to 2025, and the two models use different

[6] ScotBen can also be used to project data for the whole of the UK, in which case data from a single year of the FRS are considered for analysis.

[7] The FRS data is organised along fiscal years – each wave covering the period going from April to March of the following year. For simplicity, in the text we refer to the 2022 wave instead of the 2022-23 wave, and similarly for the other years.

[8] To be noted, the input data for ScotBen include more variables than the input data for UKMOD, for instance covering also wealth and assets. This allows to investigate the distributional and budgetary effects of hypothetical wealth taxes, and to characterise outcomes along the wealth distribution, in addition to the income distribution. Common variables are often included with a finer disaggregation in ScotBen, as the example of education shows.

uprating factors.[9] For our analysis we have deflated ScotBen values using the following indexes for 2022-25:

- Employment and self-employment income: index of earnings growth.
- Income from properties: index of rents growth.
- Private pensions: index of GDP growth.

Table 6.1: Input data, basic socio-demographic and economic variables. Comparison between ScotBen, UKMOD and census.

	SCOTBEN	UKMOD	CENSUS	SCOTBEN/ CENSUS	UKMOD/ CENSUS
	pooled 2019-21-22, monetary values uprated		2022		
Age	42.40	41.58	42.25	1.003	0.984
Gender: Female	0.514	0.516	0.514	0.999	1.004
Ethnicity: Non-white	0.051	0.052	0.071	0.716	0.725
Marital status: Married	0.484	0.493	0.368	1.316	1.341
Marital status: Separated	0.022	0.021	0.020	1.074	1.002
Marital status: Divorced	0.063	0.056	0.070	0.893	0.803
Marital status: Widowed	0.064	0.066	0.059	1.090	1.113
Economically Active	0.522	0.486	0.476	1.096	1.021
Economically inactive: Retired	0.195	0.173	0.195	0.999	0.887
Economically inactive: Student	0.192	0.178	0.205	0.938	0.870
Economically inactive: LTSD (*)	0.053	0.058	0.043	1.230	1.335
Housing tenure: Outright ownership	0.306	0.303	0.290	1.056	1.045
Housing tenure: Mortgage	0.356	0.350	0.350	1.019	1.002
Housing tenure: Rent	0.114	0.113	0.122	0.939	0.927
Housing tenure: Social housing	0.213	0.209	0.199	1.073	1.053

(*) LTSD: Long-term sick or disabled

Note: The first three columns report average values. The last two column reports the ratio between ScotBen and UKMOD values respectively, and census values. Cells are highlighted in red when values are 10% or more above those of the census, and in blue when values are 10% or more below those of the census.

[9] For UKMOD, the uprating factors are discussed in the Annual reports - see van de Ven and Popova (2025) for the most up to date one.

Table 6.2: Input data, additional economic variables. Comparison between ScotBen and UKMOD.

	SCOTBEN	UKMOD	SCOTBEN/UK
	pooled 2019-21-22, monetary values uprated		
Usual hours worked	36.63	35.98	1.018
Income: Employment (GBP/year)	34,727	31,323	1.109
Income: Self-employment (GBP/year)	29,859	29,569	1.010
Income: Private pensions (GBP/year)	13,664	11,205	1.220
Income: Properties	5,739	5,539	1.036

Note: The first two columns report average values. The last column reports the ratio between ScotBen and UKMOD values. Cells are highlighted in red when the ratio is above 1.1, and in blue when the ratio is below 0.9.

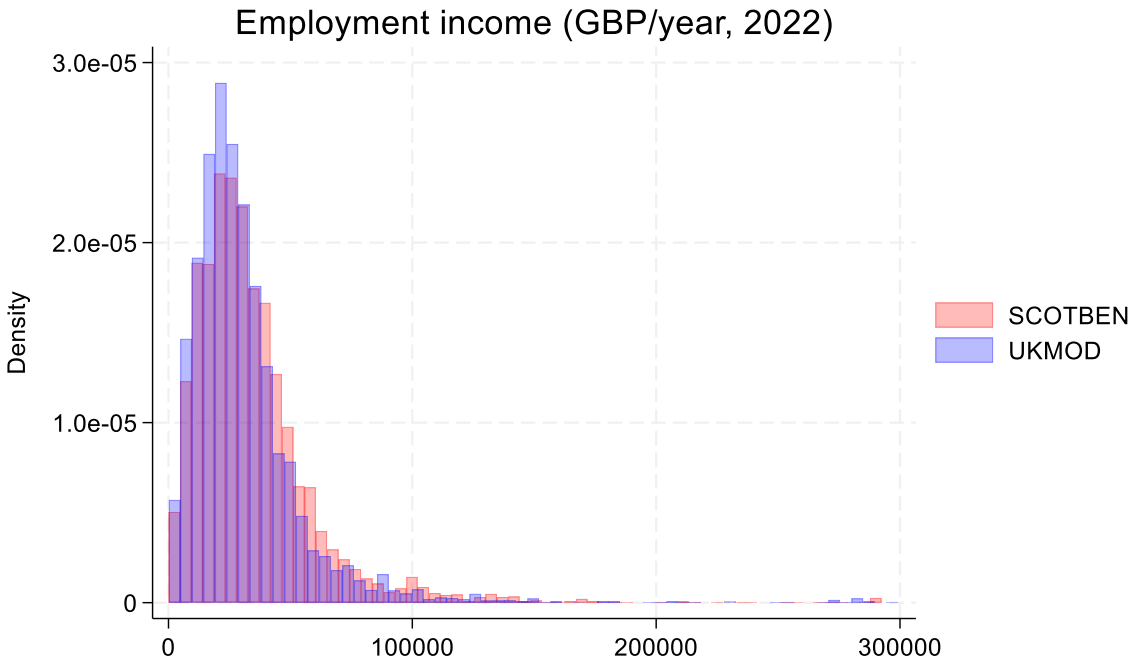
Average hours worked are similar between ScotBen and UKMOD. Self-employment income and income from properties are also in line, with differences below 5%. However, ScotBen reports values of employment incomes that are more than 10% higher than those of UKMOD (almost £35,000 per year against a little more than £31,000).[10] Differences in private pensions are even higher, in the order of 20% or more.

For comparison, the Annual Survey of Hours and Earnings (ASHE) data for 2022 indicates a median pay of £27,756 in Scotland (Aiton, 2023), against a median of £28,712 for ScotBen and of £ 25,740 for UKMOD.

Figure 6.1 shows the distribution of employment income in the two datasets, indicating more density in the upper half of the distribution, in the ScotBen data.

[10] The input data for UKMOD also include HBAI-adjusted values for income. However, their distribution is very similar to the standard FRS measure (with an even lower average).

Figure 6.1: Employment income



The impact on inequality is however limited (Table 6.3).[11]

Table 6.3: Inequality of employment income. Comparison between ScotBen and UKMOD.

Income: Employment (GBP/year)	ScotBen	UKMOD
p90/p10	5.781	5.508
p90/p50	2.112	2.103
p10/p50	0.365	0.382
p75/p25	2.335	2.219
Gini	0.3672	0.3667

Differences between sociodemographic groups also reflect the general pattern described above (Table 6.4), with some indication that the higher incomes in ScotBen are in part attributable to incomes of married individuals.[12]

[11] The impact on poverty is further mediated by the application of tax-benefit rules, and is analysed when considering model outputs.

[12] To be noted, the white/non-white categorisation is non-exhaustive, as information on ethnicity is missing for a large fraction of both samples (28.2% in ScotBen and 43.0% in UKMOD).

Table 6.4: Disaggregation of average employment income. Comparison between ScotBen and UKMOD.

Income: Employment (GBP/year)	SCOTBEN	UKMOD	SCOTBEN / UKMOD
	pooled 2019-21-22, monetary values uprated		
Overall	34,727	31,323	1.109
Gender:			
Female	28,787	25,898	1.112
Male	40,888	36,981	1.106
Ethnicity:			
Non-white	36,651	29,625	1.237
White	34,607	29,399	1.177
Marital status:			
Single	26,733	26,698	1.001
Married	40,230	35,686	1.127
Separated	34,119	31,142	1.096
Divorced	29,958	27,402	1.093
Widowed	25,562	25,437	1.005
Tenure:			
Mortgage	39,904	35,687	1.118
Outright ownership	34,220	31,569	1.084
Rent	30,576	26,768	1.142
Social housing	20,642	20,322	1.016

Note: The first two columns report average values. The last column reports the ratio between ScotBen and UKMOD values.

6.1.1 Conclusions

The input data of ScotBen are representative of the Scottish population to a slightly higher degree than those of UKMOD, with the most relevant differences relating to employment income, where ScotBen seems to be more aligned to external information contained in ASHE than UKMOD.

6.2 Tax-benefit profiles for selected family types

This section compares net tax and benefit payments imputed for 2024/25 by ScotBen against measures imputed by UKMOD. Following discussion in Section 3.2, this section reports results generated by limiting the set of transfer payments projected by UKMOD to those that are also projected by ScotBen.[13] Results that reflect the full set of tax and transfer payments projected by UKMOD are provided in Appendix B.1. Comparison with the projections that

[13] Omitted benefits are: best start foods, best start grant, free school meals, healthy start (food), school clothing grant, Scottish child winter heating assistance, sure start maternity grant, and winter fuel allowance.

are the focus of discussion in this section suggests that the set of benefits omitted by ScotBen tends to depress projections for (after housing costs) disposable incomes by a small margin.

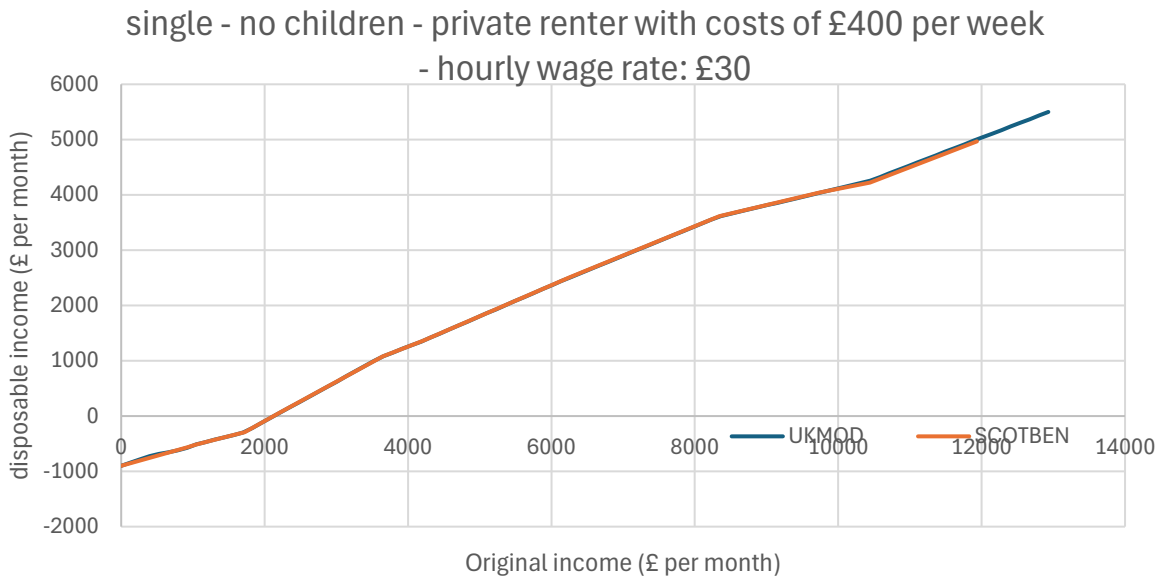
The simulated profiles considered here focus on families distinguished by:

- Adults under state pension age, singles / couples
- 0 / 3 children aged under 6
- 0 / 3 children aged 6+
- Housing costs 200 / 400 per week
- Private renters and owner occupiers
- Hourly wages £12p.h / £30p.h.

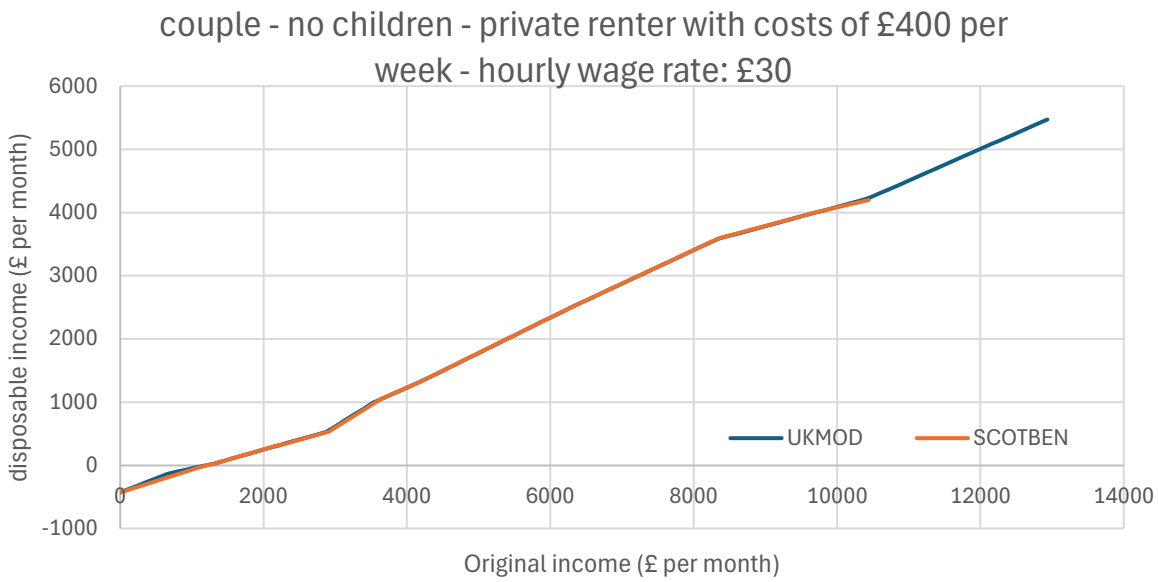
This gives 64 alternative household types in total (2^6). Profiles for ScotBen were supplied by Graham Stark. Profiles for UKMOD were obtained as described in the analytical walkthrough provided in Appendix A. Note that the profiles reported here were obtained following an interactive process that saw some corrections to the ScotBen programming code. We are grateful to Stark for his willingness to engage actively with the current evaluation.

This section presents selected results that outline key conclusions obtained from our review, with an extended set of results provided in Appendix B for completeness. We begin by noting that ScotBen and UKMOD were found to impute almost identical transfer payments for working aged adults without dependent children. Figure 6.2 indicates this correspondence, which was found to hold for both private renters and owner-occupiers, irrespective of the scale of assumed housing costs.

Figure 6.2: Relationship between original and imputed disposable (after housing costs) income of working aged adults without dependent children, by simulation model



Panel A: Singles



Panel B: Couples

Source: Authors' calculations based on simulated data derived from UKMOD and ScotBen.
Notes: Simulated systems for Scottish residents in 2024. Original income includes all private non-government transfers, limited to earnings income in the current context. Disposable income is equal to original income plus all eligible simulated benefits less all simulated applicable taxes and less considered housing costs. All adults aged 30 years.

In contrast, families with children were found to display non-trivial differences between the projections generated by the two models. Examples of these differences are displayed in Figure 6.3 for adult couples with three dependent children under 6 years of age; see Appendix B for additional comparisons.

UKMOD projections reported in Panel A of Figure 6.3 suggest a gradual increase in after housing costs disposable income with original (employment) income, from just under £2,000 per month to approximately £3,600 per month for families with £6,000 of original income. Importantly within this range of original income, UKMOD suggests that benefits fully off-set an increase in (private) rental costs from £200 to £400 per week. Thereafter, rental costs are found to alter disposable incomes projected by UKMOD, so that those with original income worth £10,000 per month or more are projected to fully bear the difference in rental charges. A small discontinuity is displayed in each rental-costs profile – at approximately £6,000 per month for low rental costs and just over £9,000 per month for higher rental costs – where eligible benefits are withdrawn.

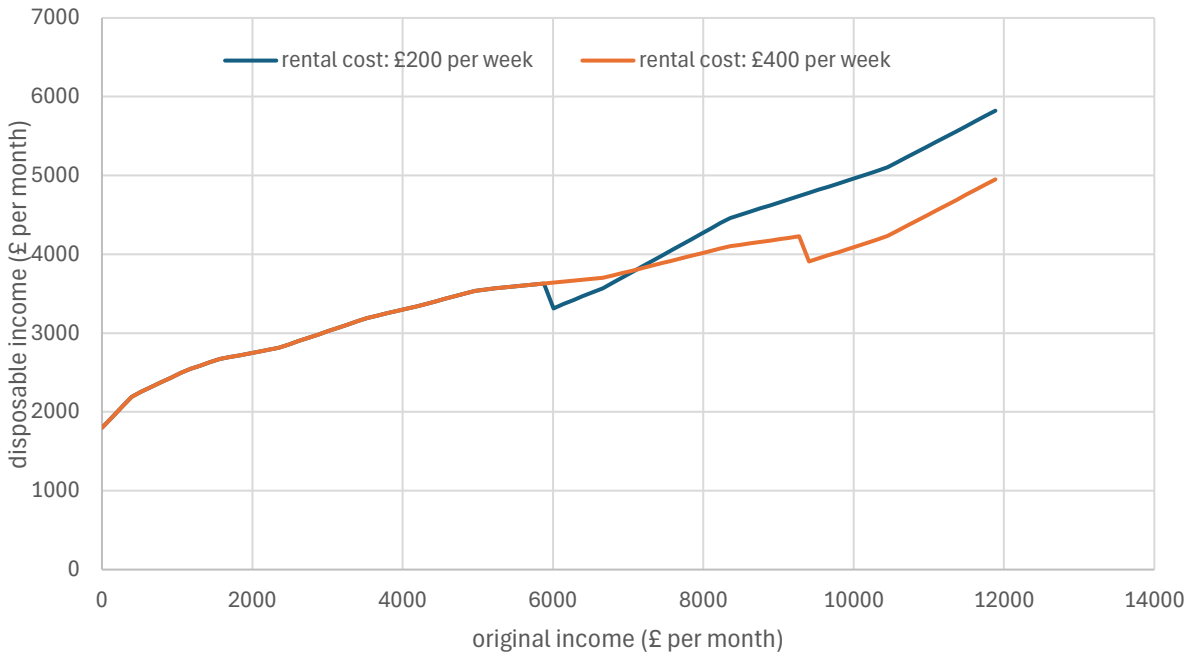
A number of clear differences to those discussed above are displayed by the profiles projected by ScotBen, displayed in Panel B of Figure 6.3. In contrast to UKMOD projections, the relationship between original incomes and disposable (after housing costs) incomes projected by ScotBen display considerably more discontinuity. ScotBen suggests sharp increases in disposable incomes at original incomes worth just over £700 per month, declines

in disposable incomes between £4,200 and £4,700 per month, and a sharp decline in disposable incomes at original incomes worth approximately £6,000 per month. Furthermore, ScotBen suggests that the considered rise in rental costs from £200 to £400 per week is borne by the family, irrespective of their original income.

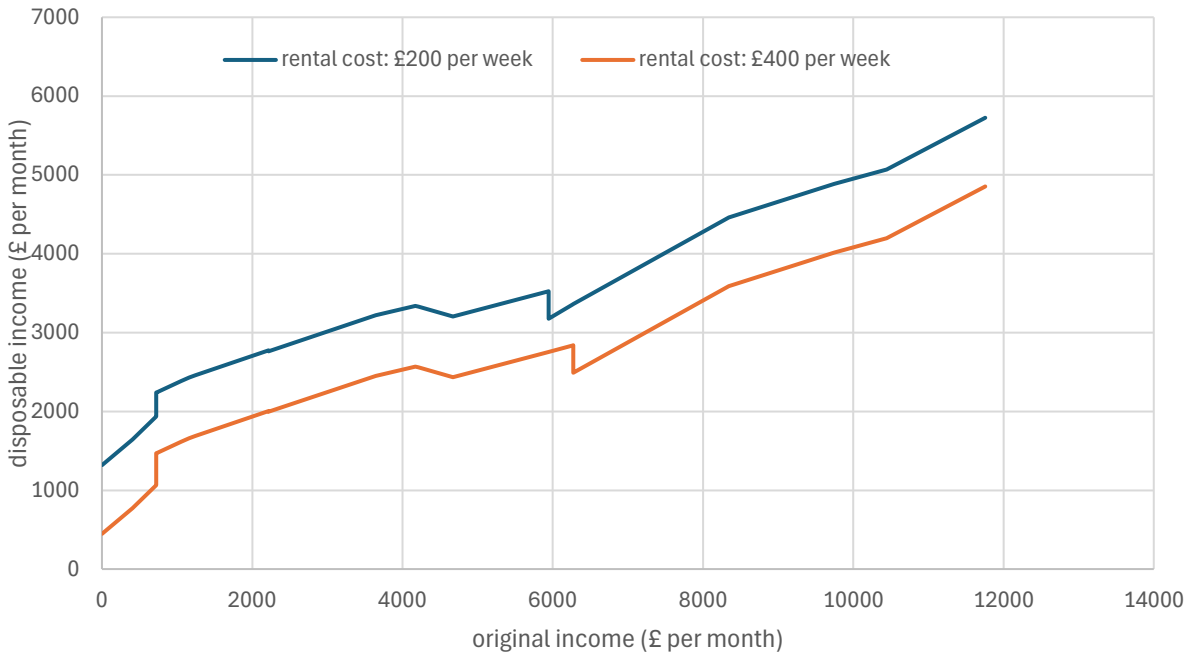
It was beyond the scope of the current review to identify the source of the differences displayed in the figure, although some effort was expended both by the authors and Graham Stark to mitigate differences for the purpose of evaluation. Nevertheless, what we can say with certainty is that the differences identified here are attributable to projected transfer payments by the respective models. Specifically, at higher incomes where means-tested welfare benefits are fully withdrawn, projections derived from the two models are almost identical.

It is unknown to the authors how important the differences identified here will be for the analysis envisaged by Future Economy Scotland. Where the policy focus of the envisaged analysis is on features of the transfer system that are orthogonal to the factors underlying the differences identified here, any associated problems might be mitigated by focussing on differences between policy counterfactual and base scenarios. Nevertheless, it may be important to bear the differences identified here in mind when interpreting any results that are obtained.

Figure 6.3: Relationship between original and imputed disposable (after housing costs) income of working age couples living in rented accommodation with 3 children under age 6, by scale of rental costs and simulation model



Panel A: UKMOD



Panel B: ScotBen

Notes: See Figure 6.2. Families with two children aged 4, and one child aged 5.

6.3 Aggregate cross-sectional projections

This section compares population aggregate projections derived from ScotBen and UKMOD. Projections for each model are based on the same input data as discussed in Section 6.1. Analysis focuses on projections that start from descriptions for the tax and benefit system applicable to Scottish residents in 2025/26. Population aggregate statistics for this system are presented in Section 6.3.1, before comparing projected effects of two policy counterfactuals in Section 6.3.2. All results for ScotBen that are reported here were provided by Graham Stark. Results for UKMOD were obtained following the analytical walkthrough that is provided in Appendix A.1.

6.3.1 Baseline projections for 2025/26

Table 6.5 reports a side-by-side comparison of Scottish population aggregate tax and benefit payments projected by UKMOD with those projected by ScotBen. The general impression made by this table is that there exists a close correspondence between projections generated by ScotBen and UKMOD.

In terms of projected income taxes and national insurance contributions, ScotBen projections understate UKMOD by around 20%, both of which exceed Government Expenditure and Revenue Scotland statistics (Table 1.4) for 2024/25. In contrast, benefit projections by ScotBen tend to overstate associated projections by UKMOD, by approximately 18% in aggregate over simulated transfer payments projected by both models. Over the same set of benefits, this time with respect to those for which third-party amounts are available, UKMOD tends to understate the third-party values by approximately

6% whereas ScotBen tends to overstate the same by approximately 12%. The overstatement of benefits by ScotBen is consistent with the fact that no allowance is made by that model for imperfect benefits take-up.

On balance, the statistics reported in Table 6.5 provide some reassurance that the differences between models that are identified in Section 6.1 and 6.2 do not indicate critical problems with either one of the two models. We turn now to discuss model projections for selected policy counterfactuals.

Table 6.5: Overview of simulated tax and benefit payments for residents in Scotland 2025/26 (£million, caseload '000s), by simulation model

	ukmod		scotben		third-party (2024/25)	
	amount	case load	amount	case load	amount	case load
Government revenue through direct taxes and national insurance contributions						
income taxes	28909	3471	22141	3056	20714	
national insurance	15436	2334	14466	2263	12904	
Government expenditure on benefits and tax credits						
Universal Credit	5313	541	6437	633	5827	550
Pension Credit	421	116	608	137	488	111
Winter fuel allowance	91	989				
Council Tax Reduction	572	494	659	705	390	458
Housing Benefit	553	122	648	136	595	115
Best Start Grant	23	53	120	6		
Child Benefit	967	516	994	577	992	
Scottish Child Payment	449	180	462	218	467	188
Best Start Foods	20	49				
Free School Meals	223	275	123	193		
School Clothing Grant	18	65				
Discretionary Housing Payments	108	96	91	94	93	
Maternity Allowance	22	2	16	2		
Contribution based JSA	11	2	9	2		
Child Winter Heating Ass.	1	3				
Carer's Allowance Supplement	34	58	81	139	64	
Benefits not included in UKMOD projections but not simulated						
State pensions	10598	996	10967	992	11770	1056
Attendance Allowance	431	87	611	148		
Government Training Allowances	17	3	25	5		
Funeral Grant			162	3		
Widow's Payment			20	7		
Contributory ESA	286	39	294	40	581	
Carer's Allowance	251	58	602	139	452	92
Other disability	2124		2548			

Source: ScotBen projections provided by Graham Stark. UKMOD projections produced by authors using UKMOD software version B2025.05.
Notes: Third-party statistics compiled from various sources – refer to Graham Stark for details. "Other disability" includes following benefits: disability living allowance and personal independence payments, industrial injuries and severe disablement.

6.3.2 Counterfactual policy projections

Two policy counterfactuals were considered for the current review. The first involves setting an upper limit of 21% on income tax rates, and the second reduces all income tax rates by 1 percentage point. Table 6.6 reports the projected effects of these adjustments to income tax rates implied by each model, obtained by taking differences relative to the baseline projections discussed in Section 6.3.1.

As in Section 6.3.1, Table 6.6 indicates that the two simulation model produce qualitatively similar results for the policy counterfactuals considered here. Both models indicate that the lower income tax rates imply lower returns to the government, with effects of omitting higher rate tax bands over five times as large as those projected for a 1 percentage point decline in all tax bands. Both models also indicate that the reduced income tax rates are associated with lower government expenditure on means-tested benefits: Universal Credit, Council Tax Reduction, and Scottish Child Payments. The overall effects on the government budget projected for the two counterfactual scenarios by the two models are within 10 percentage of one-another.

Beyond the above similarities, a number of noticeable differences in model projections can also be identified from Table 6.6. First, omission of the higher rates of income tax reduce projected government revenues by a wider margin when simulated using UKMOD than ScotBen. This is broadly consistent with the higher revenues generated by UKMOD in the simulation baseline discussed in Section 6.3.1. In contrast, ScotBen implies larger revenue effects than UKMOD for the 1 percentage point income tax reduction scenario. This difference highlights the potential effects of distributional differences described by each model's input data, as discussed in Section 6.1. Furthermore, UKMOD generally indicates larger knock-on effects of the policy counterfactuals on simulated welfare benefits, especially in relation to imputed Scottish Child Payments, further underscoring distributional differences between the respective models.

Table 6.6: Simulated effects of counterfactual adjustments to income tax parameters for Scotland in 2025/26, by simulation model (£million)

	ukmod		scotben	
	no higher	1p cut	no higher	1p cut
Government revenue through direct taxes and national insurance contributions				
income taxes	-5488.41	-756.36	-5045.53	-820.35
national insurnace	0.00	0.00	0.00	0.00
total revenue	-5488.41	-756.36	-5045.53	-820.35
Government expenditure on benefits and tax credits				
Universal Credit	-3.78	-10.07	-1.83	-9.60
Pension Credit	0.00	-0.49	0.00	0.00
Winter fuel allowance	0.00	-0.06	0.00	0.00
Councli Tax Reduction	-1.04	-2.03	-0.45	-0.79
Housing Benefit	0.00	-1.25	0.00	-0.03
Best Start Grant	-0.22	-0.31	0.00	0.00
Child Benefit	0.00	0.00	0.00	0.00
Scottish Chld Payment	-6.06	-1.66	-0.28	0.00
Best Start Foods	-0.35	-0.30	0.00	0.00
Free School Meals	-0.68	0.00	0.00	0.00
School Clothing Grant	0.00	0.00	0.00	0.00
Discretionary Housing Payments	0.00	0.00	0.00	0.00
Maternity Allowance	0.00	0.00	0.00	0.00
Contribution based JSA	0.00	0.00	0.00	0.00
Child Winter Heating Ass.	0.00	0.00	0.00	0.00
Carer's Allowance Supplement	0.00	0.00	0.00	0.00
total expenditure	-12.14	-16.16	-2.57	-10.42
net revenue	-5476.28	-740.20	-5042.96	-809.94

Source: ScotBen projections provided by Graham Stark. UKMOD projections produced by authors using UKMOD software version B2025.05.

Notes: "no higher" scenario omits all higher rates of income tax above 21%. "1p cut" scenario reduces all income tax rates by 1 percentage point.

7 Concluding Remarks

Overall, ScotBen presents an exciting addition to the set of static tax-benefit models available for Scotland. The model combines "cutting-edge" programming languages, innovative approaches in the construction of micro-data input, and a wealth of developer experience in tax-benefit rules and regulations. These ingredients help to ensure a firm analytical basis for exploring policy counterfactuals in Scotland.

The above said, ScotBen remains a new model and certain limitations are therefore to be expected. These limitations are currently most evident in the policy coverage offered by the model, its flexibility for considering alternative analytical assumptions, and accompanying

documentation. We offer a range of recommendations below that are targeted to mitigate these limitations.

Comparisons between ScotBen and UKMOD indicate that the two models are closely related in most respects. Our review supports the innovative techniques that are employed by to re-weight the input data assumed for ScotBen. We find that relationships between pre-tax and benefit and post-tax and benefit incomes can vary appreciably between the two models for some population subgroups. Nevertheless, population aggregate projections generated by UKMOD and ScotBen generally appear well aligned in context of the related literature.

7.1 Summary of recommendations

- **It is our view that accommodating imperfect take-up in ScotBen should be considered a high-priority issue to be achieved before any associated analysis is finalised.**
- Double check benefits that off-set housing costs (HB, UC, benefits cap), particularly where there are dependent children.
- Make detailed model documentation publicly available. This might be either as a snapshot of the model structure prevailing at a point in time, or as a dynamic document evolving with the model's development.
    - Publish a paper in an appropriate field journal that describes the model at a point in time.
    - Provide dynamic documentation on the model's Github repository.
    - Provide more comments in the code.
- Integrate winter fuel payments into ScotBen.
- Integrate allowance for selected in-kind benefits into ScotBen – especially those targeted at dependent children.
- Allow for behavioural feedback effects in relation to policy counterfactuals.

References

Aiton A. (2023), "Earnings in Scotland 2022", SPICe Briefing SB 23-08, Scottish Parliament, 27 February.

ONS (2016), *A guide to sources of data on earnings and income*. Office for National Statistics: London.

Stark G. (2025), "ScotBen - summary note", *mimeo*.

Van de Ven J., Popova D. (2025), "UKMOD Country Report 2022-2029", CeMPA WP2/25.

Appendix A Analysis Walkthrough

Imputed data generated using public release version B2025.05 of UKMOD and Stata programs available from the authors upon request.

A.1 Simulating tax-benefit profiles

- Hypothetical Household Tool:
    - Single without children
        - Age = 30
        - Employee
        - Hours: 0-130 step 1
        - Main employment income to £12 per hour
        - Rent set to £200 times 4.354 (weeks per month)
    - Generate
- In output file UK_2024_hhot.txt
    - yem = £12 * 4.354 * lhw
    - drgn1 = 12
    - bhoro = 1 (number of bedrooms)
    - tpceepx = 0 (employee pension contributions)
    - Add xhc_hbai and copy rent values over
- Repeat for:
    - Single with 3 children aged under 6 (two aged 4 and one aged 5)
    - Single with 3 children aged 6+ (aged 9, 12, 14)
    - Single with 3 children aged under 6 and three aged 6+
    - Couple with no children (both aged 30)
    - Couple with 3 children aged under 6
    - Couple with 3 children aged 6+
    - Couple with 3 children aged under 6 and three aged 6+
- Run Stata program: "Input data processing.do"
- UKMOD
    - Copy generated data to UKMOD input directory and re-name file "UK_2023_hhot.txt"
    - Open UKMOD
        - Delete all countries other than Scotland
        - Delete all system years other than 2024 and 2025
        - Set parameter $HousingWSShrSc to 0
        - Set parameters 23.3.67 to 23.3.71 to Bedroom Allowance for Greater Glasgow:
            - 103.56, 159.95, 195.62, 223.23, 414.25.
        - For restricted transfer payments, turn off:

        - Boaht_sc
        - Bmamt_sc
        - Bmamt01_sc
        - Bmascmt_sc
        - Bmamscmt01_sc
        - Bchht_sc
        - Bched01_sc
        - Bched02_sc
    - Run model with the UCA extension turned on.
- Copy output to the Excel file "output all UC.xlsx", worksheet "output UKMOD"
    - Analysis conducted using "Comparisons" worksheet

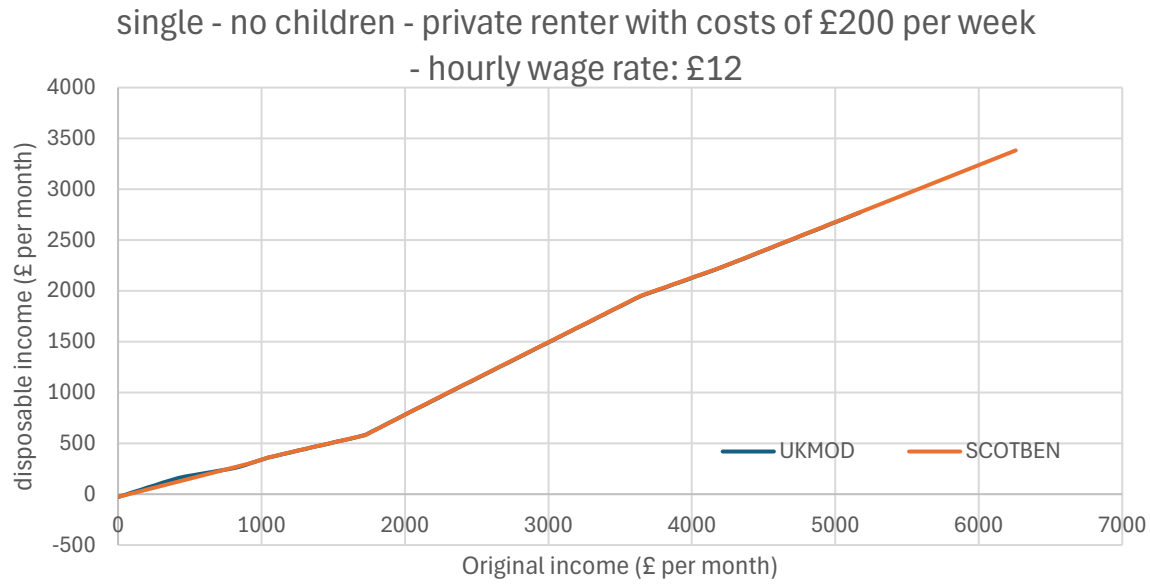
A.2 Aggregate cross-sectional projections

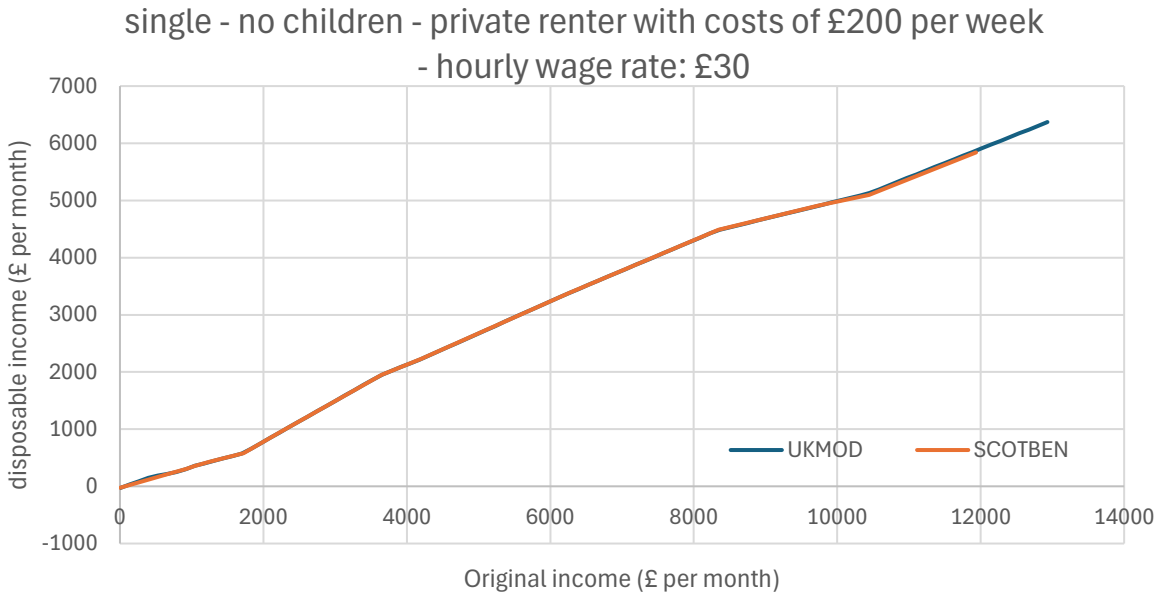
- All scenarios run from 2025 system year for Scotland, using UK_2022_b1 input data
- Baseline scenario:
    - Run using default model parameters.
    - Following simulation, run default Statistics Presenter template to generate all summary statistics reported in Section 6.3.1.
- No higher tax rates scenario:
    - Set parameters:
        - $ITRate4s, ITRate5s, ITRate6s to 0.21
    - Run model
    - Use Baseline/Reform Statistics Presenter template to report effects
- 1p cut tax rates scenario
    - Set parameters:
        - $ITRate1S = 0.18
        - $ITRate2S = 0.19
        - $ITRate3S = 0.20
        - $ITRate4S = 0.41
        - $ITRate5S = 0.44
        - $ITRate6S = 0.47
    - Run model
    - Use Baseline/Reform Statistics Presenter template to report effects

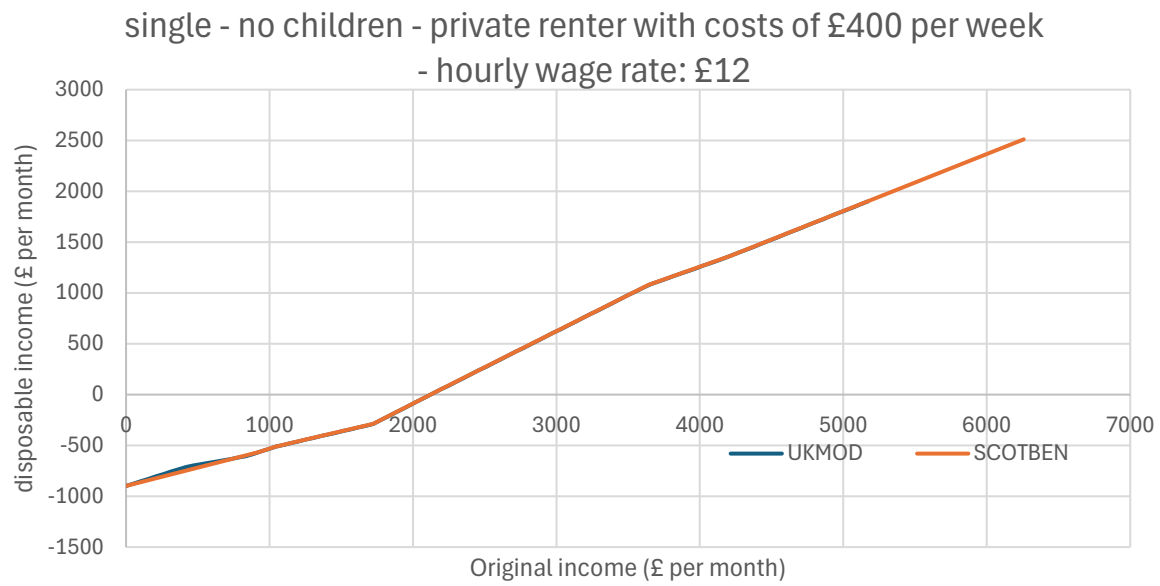
Appendix B Supplementary Results

B.1 Unrestricted UKMOD transfer payments

This appendix reports profiles generated by the full set of tax and benefit programmes included in UKMOD.






single - no children - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
3000
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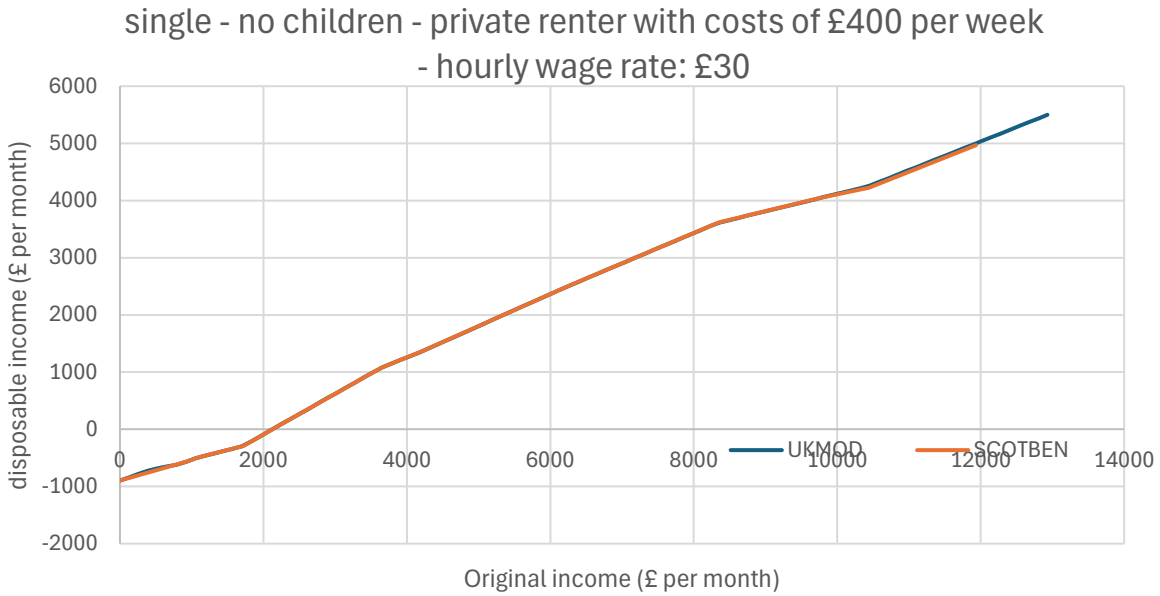
UKMOD
SCOTBEN
Original income (£ per month)


single - no children - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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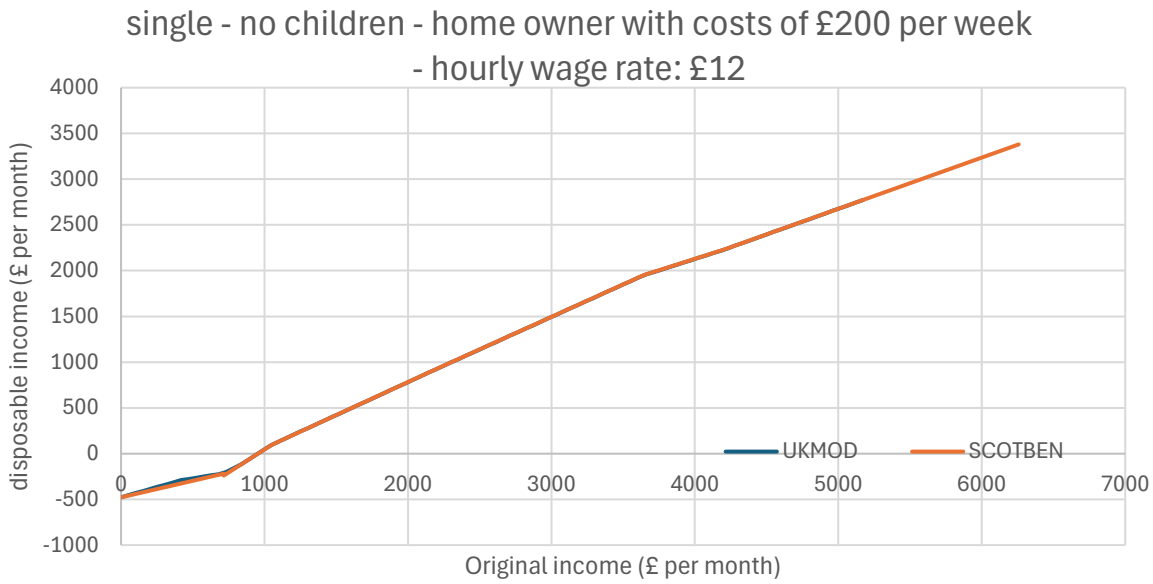
UKMOD
SCOTBEN
Original income (£ per month)


single - no children - home owner with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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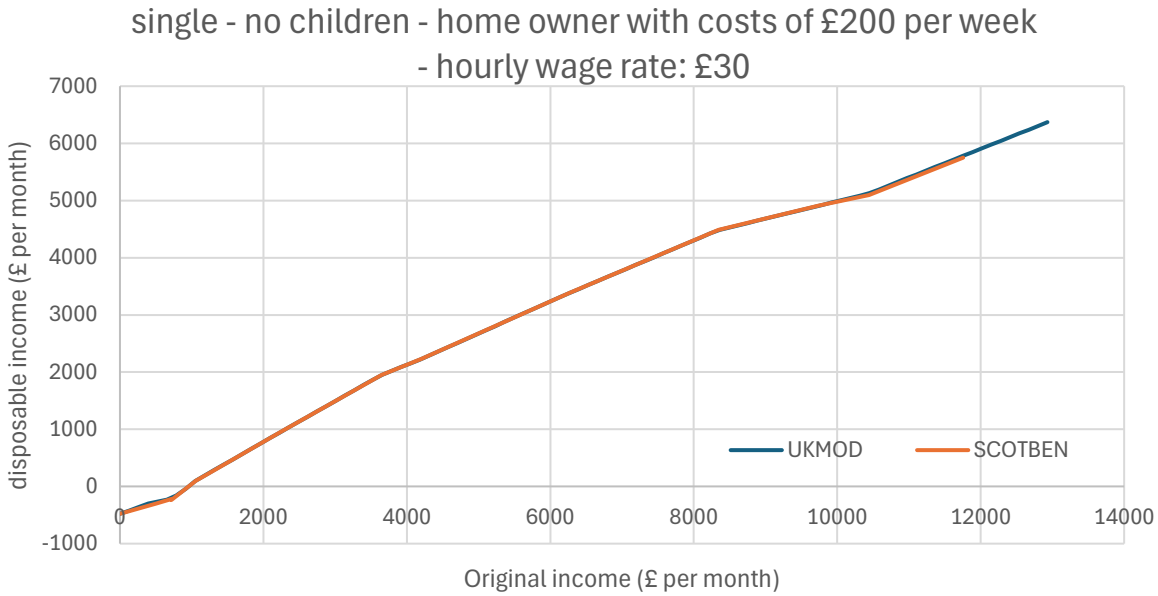
SCOTBEN
Original income (£ per month)


single - no children - home owner with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
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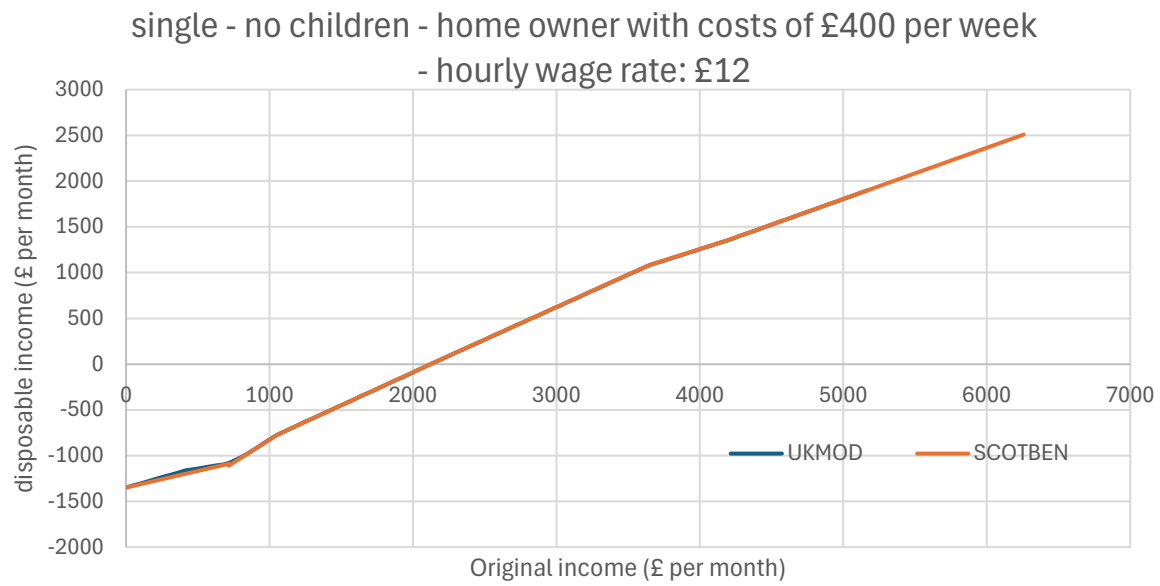
UKMOD
SCOTBEN
Original income (£ per month)


single - no children - home owner with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
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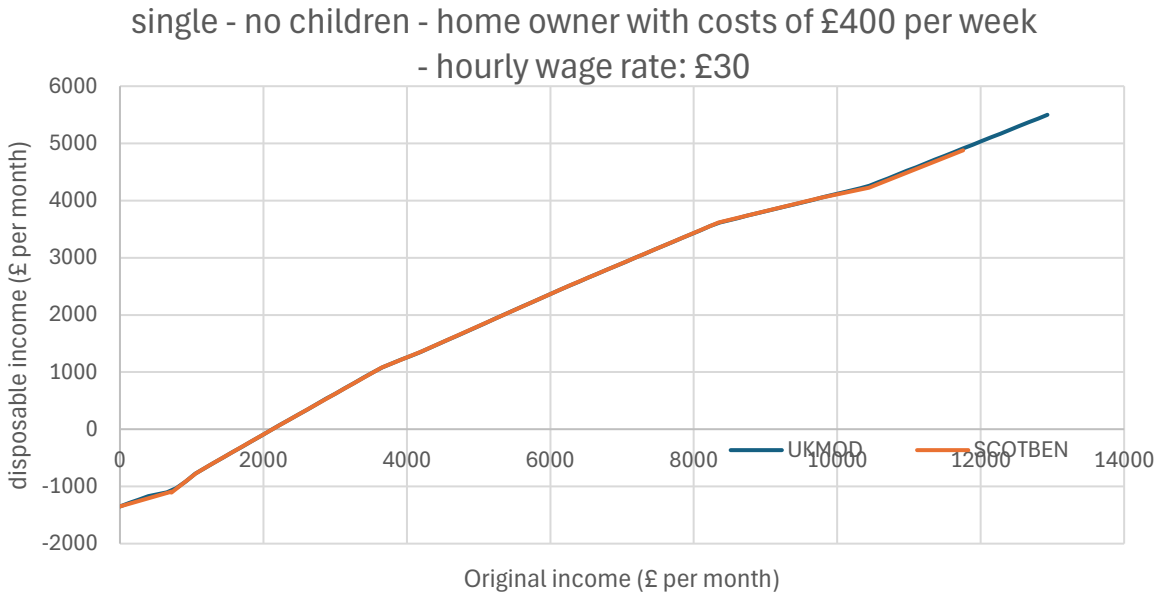
UKMOD
SCOTBEN
Original income (£ per month)


single - no children - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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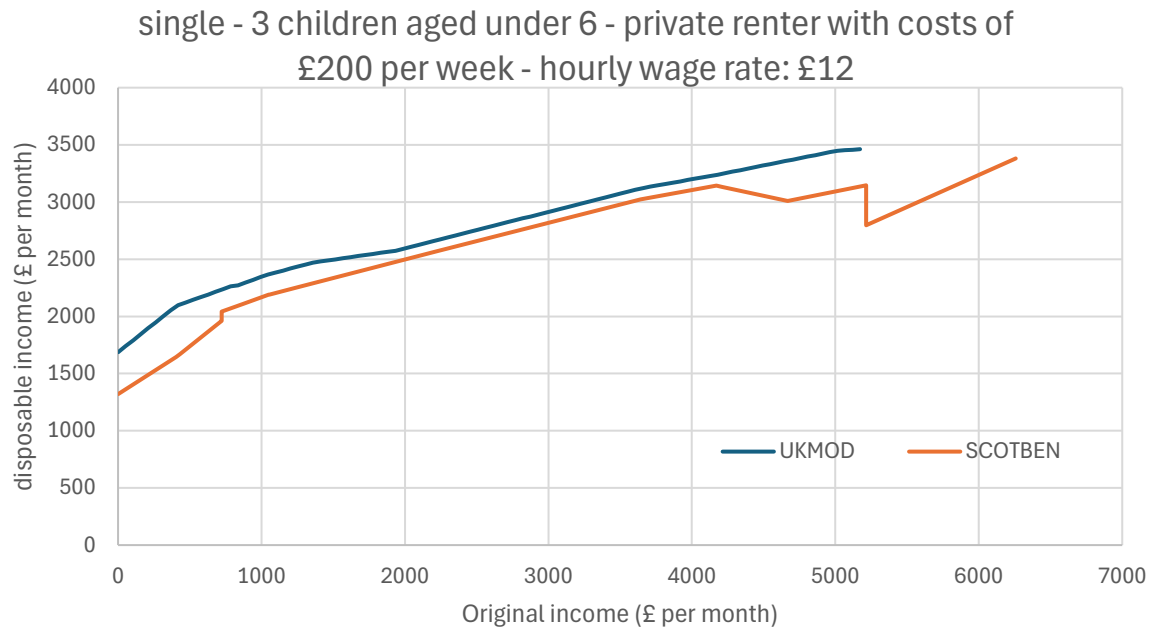
UKMOD
SCOTBEN
Original income (£ per month)


single - 3 children aged under 6 - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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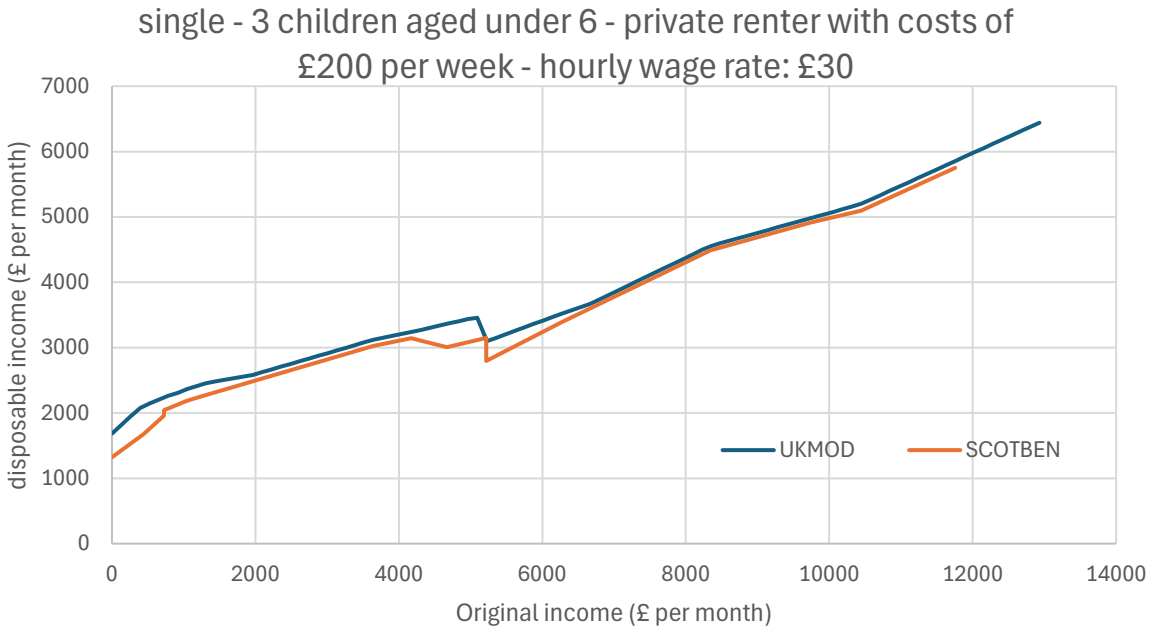
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
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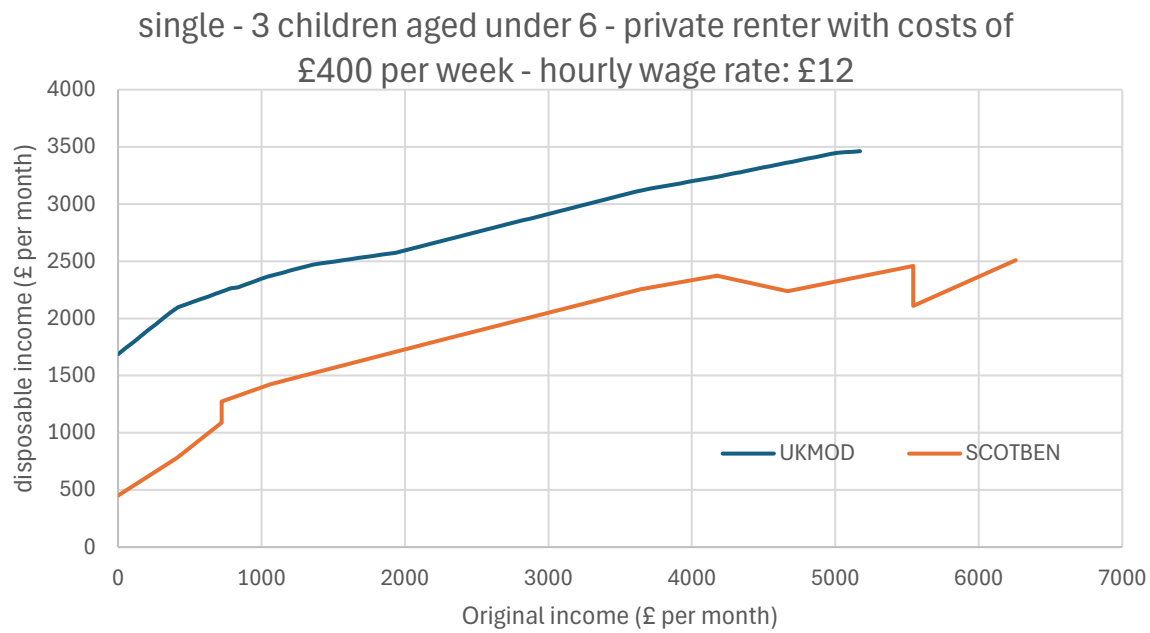
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
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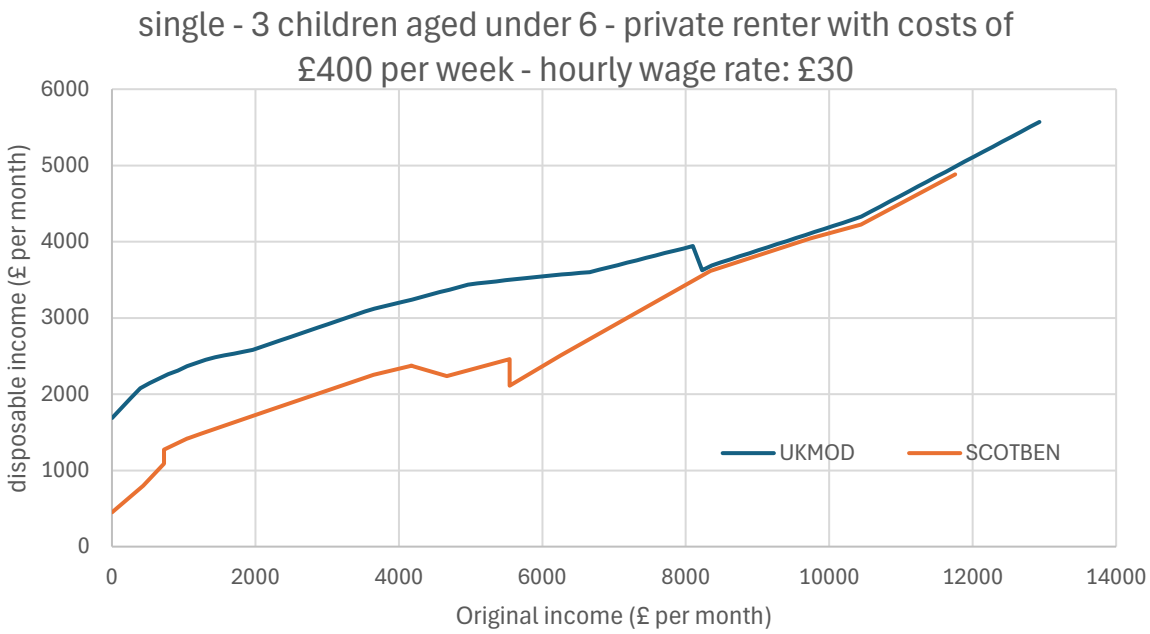
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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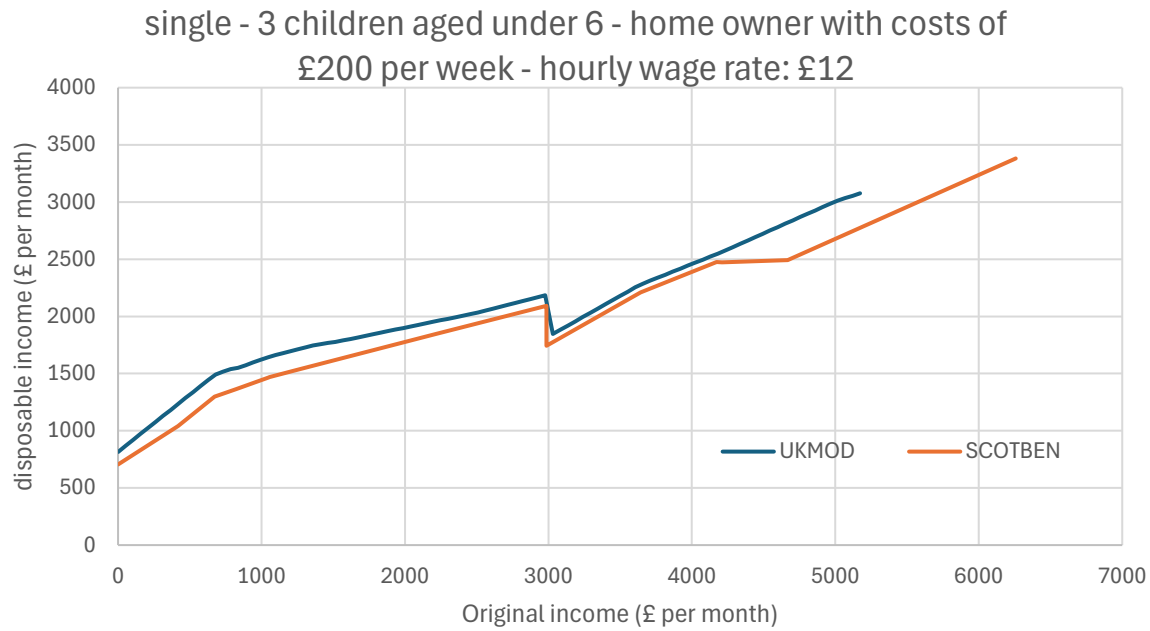
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - home owner with costs of £200 per week - hourly wage rate: £12
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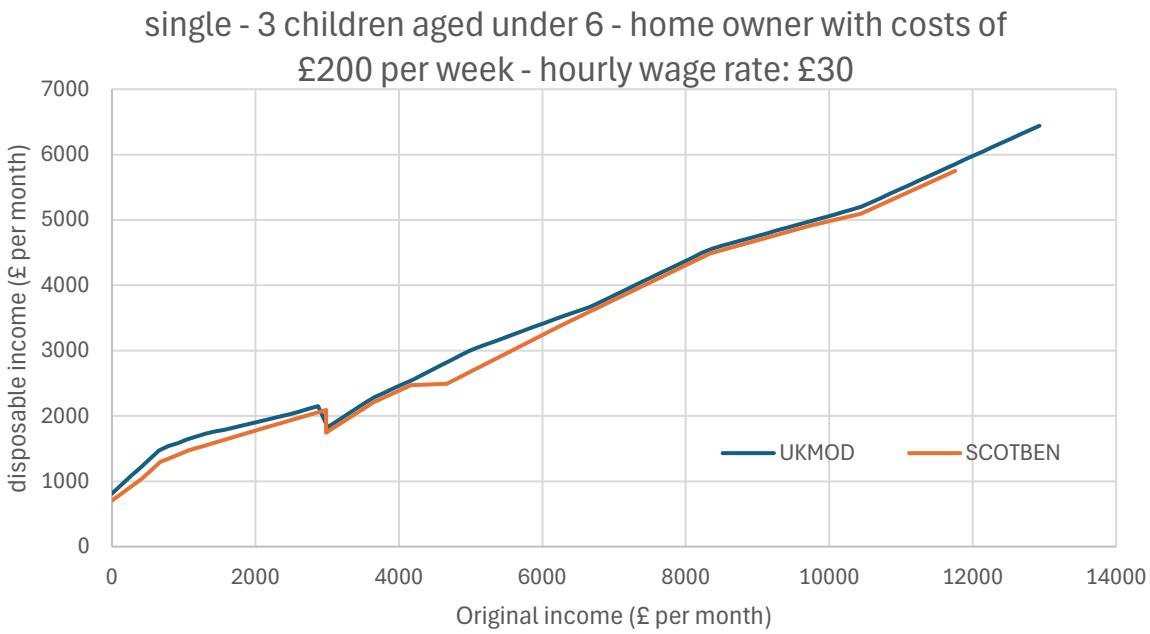
7000
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - home owner with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
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2000
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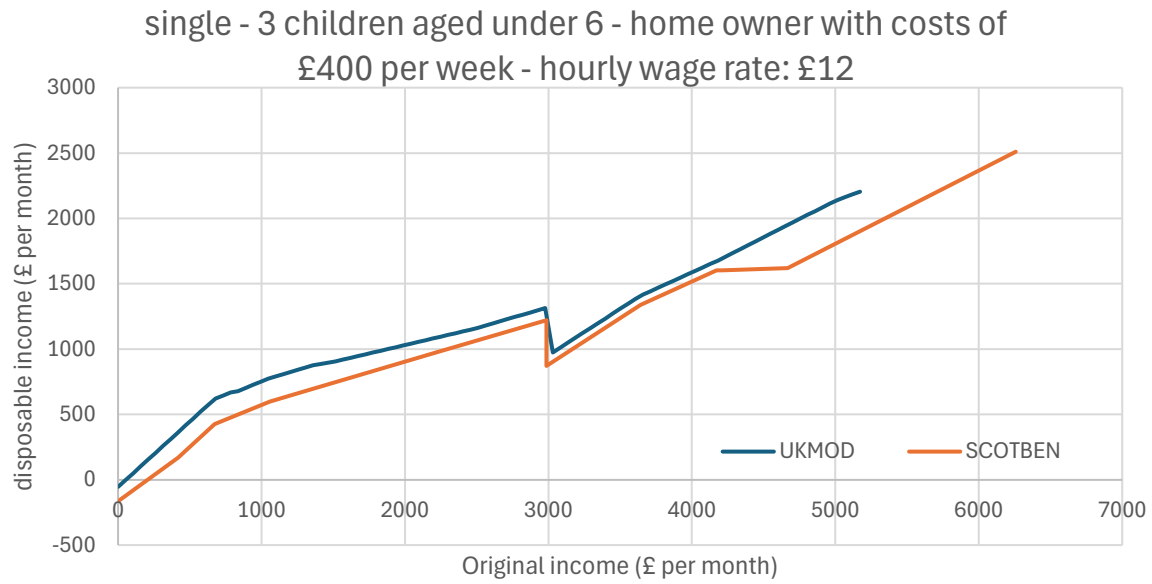
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - home owner with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
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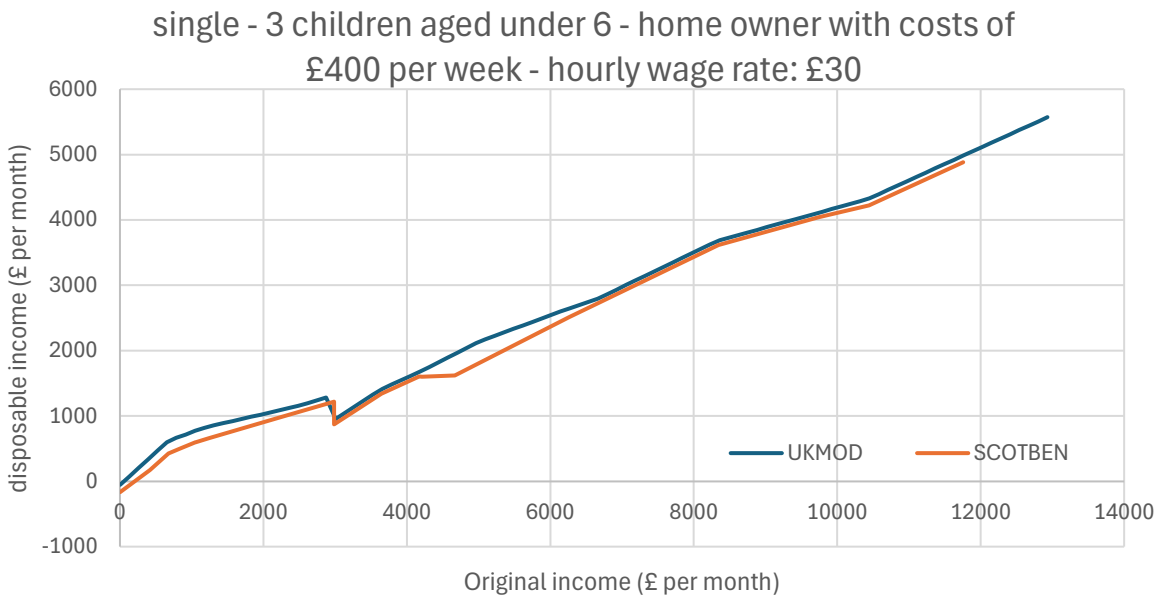
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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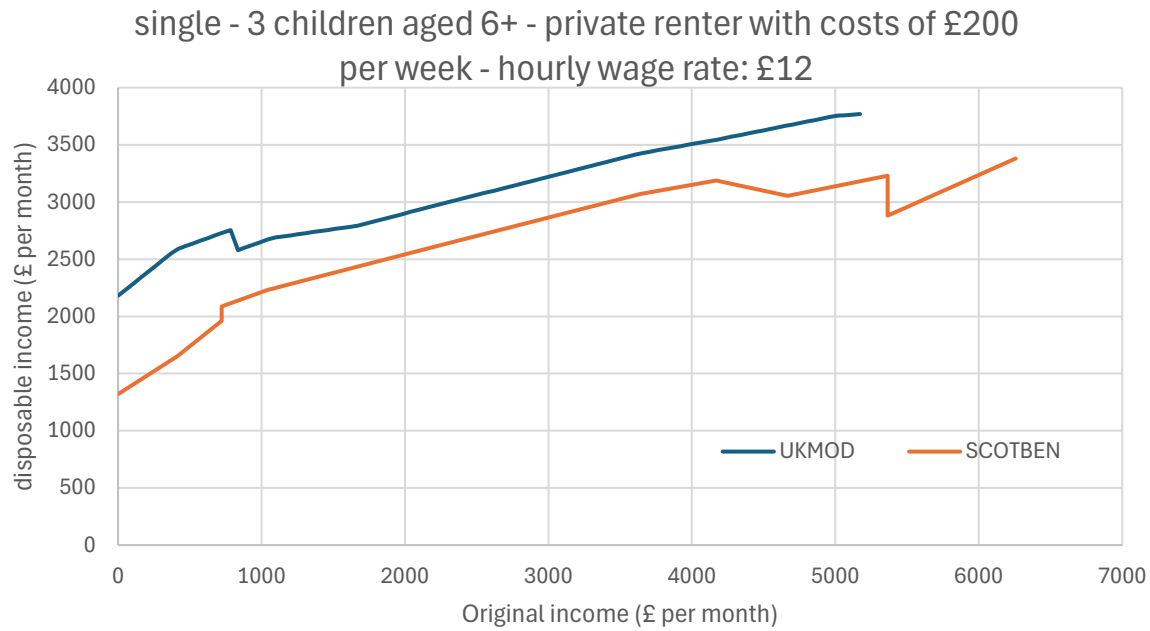
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged 6+ - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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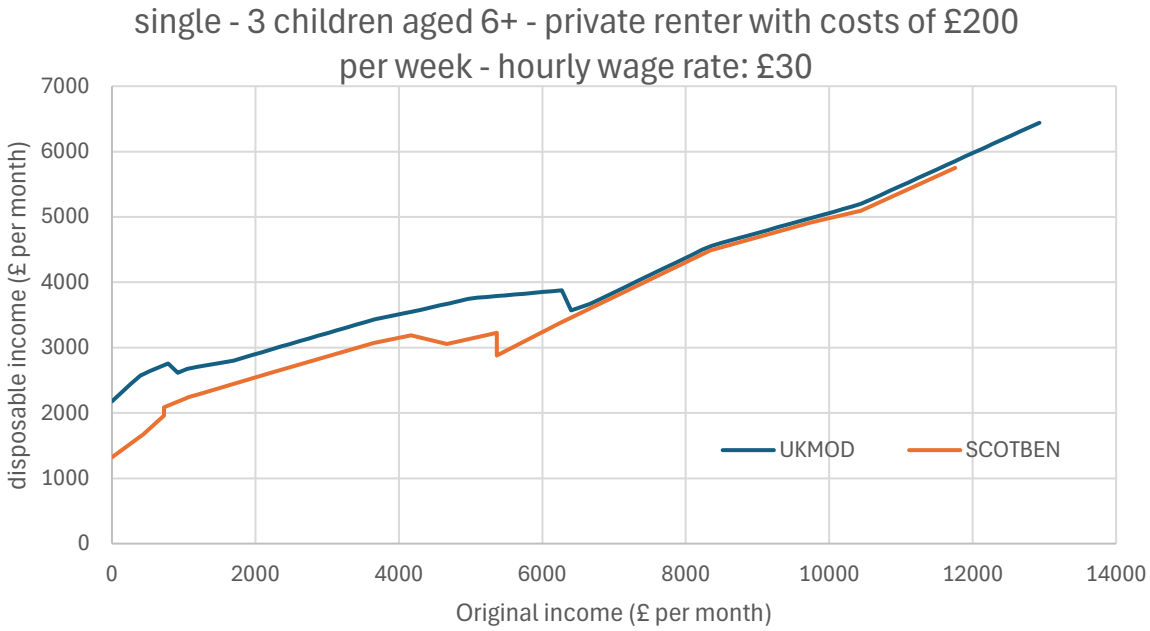
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged 6+ - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
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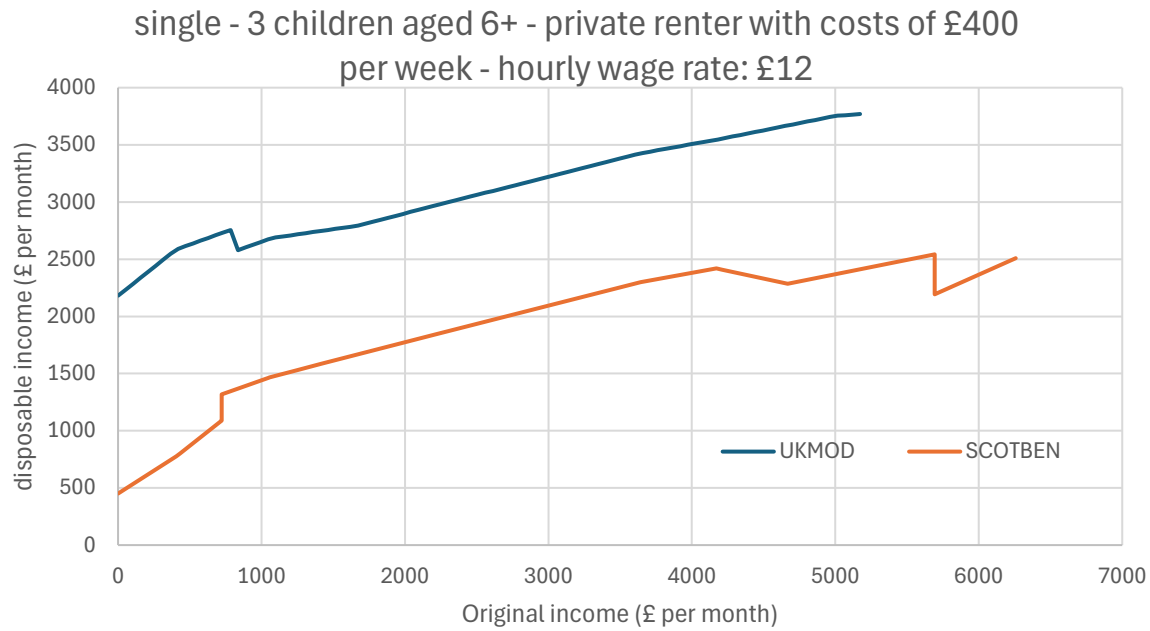
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged 6+ - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
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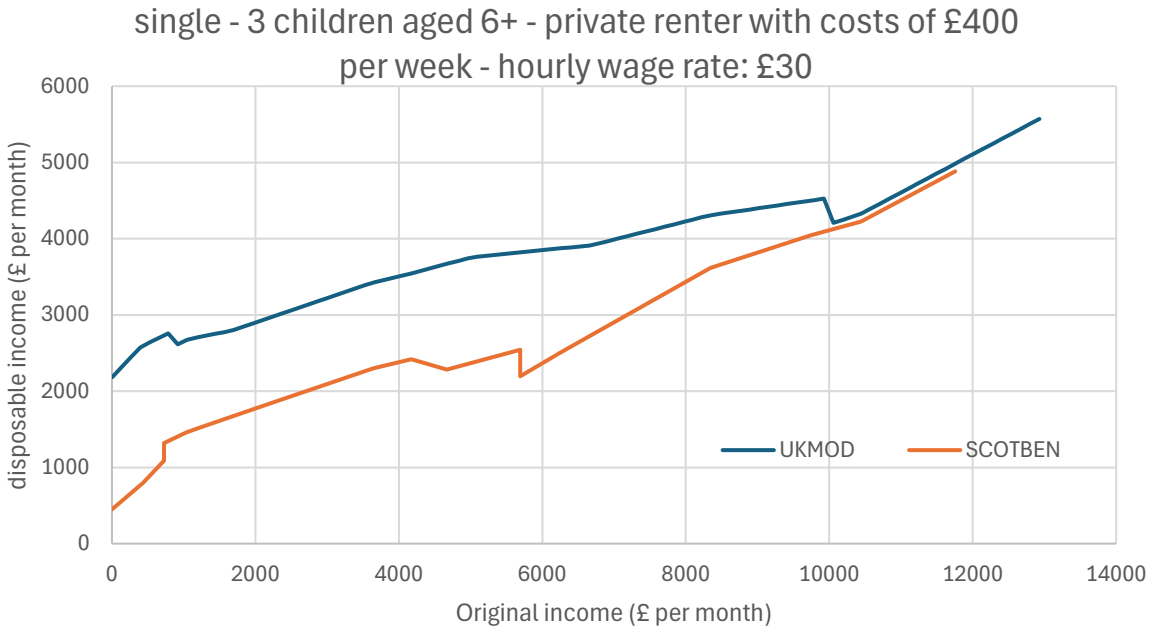
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged 6+ - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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Original income (£ per month)
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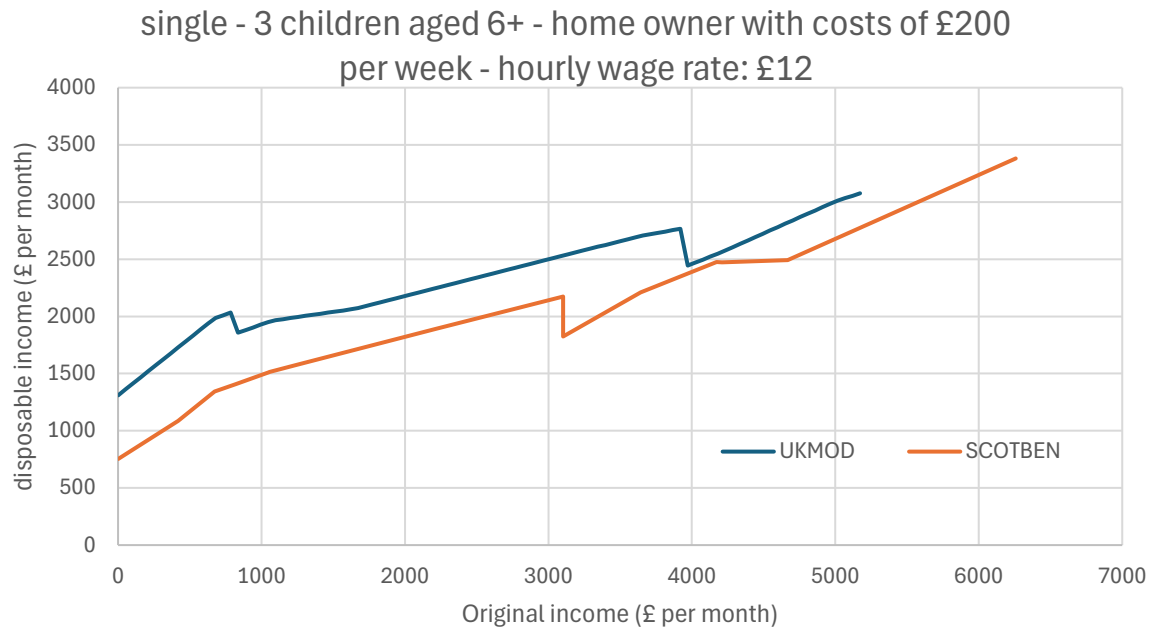
SCOTBEN


single - 3 children aged 6+ - home owner with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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Original income (£ per month)
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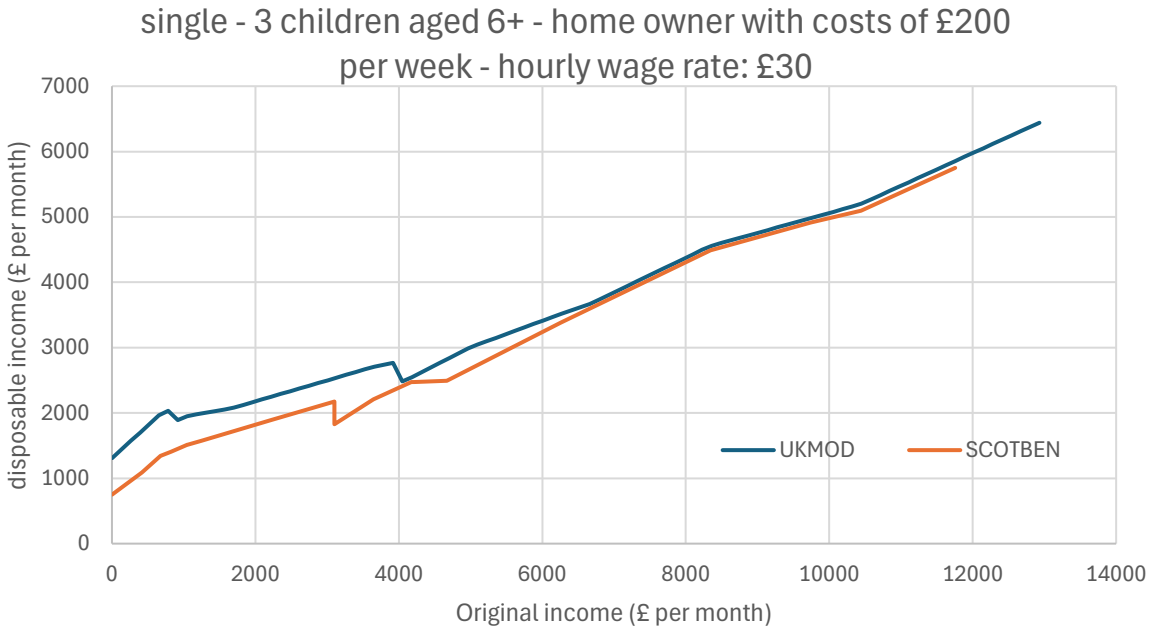
SCOTBEN


single - 3 children aged 6+ - home owner with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
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Original income (£ per month)
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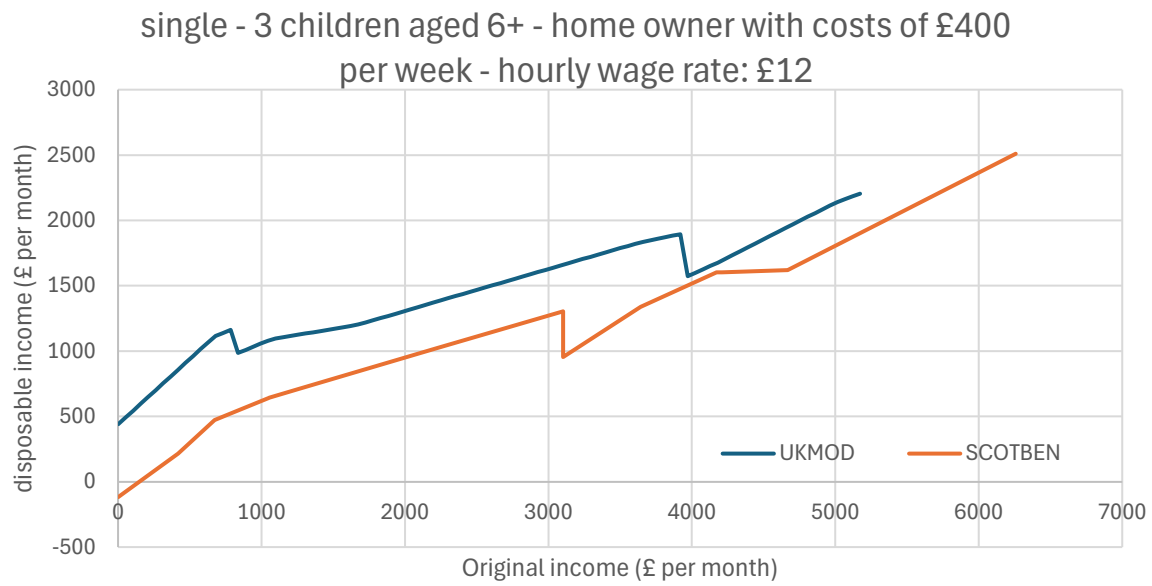
SCOTBEN


single - 3 children aged 6+ - home owner with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
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Original income (£ per month)
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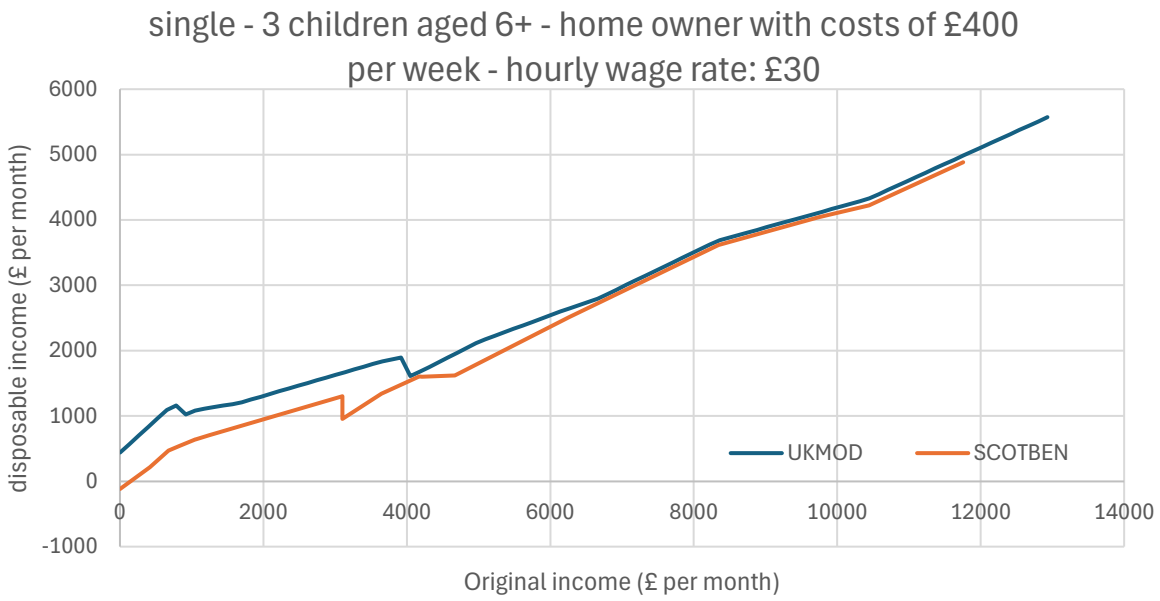
single - 3 children aged 6+ - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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Original income (£ per month)
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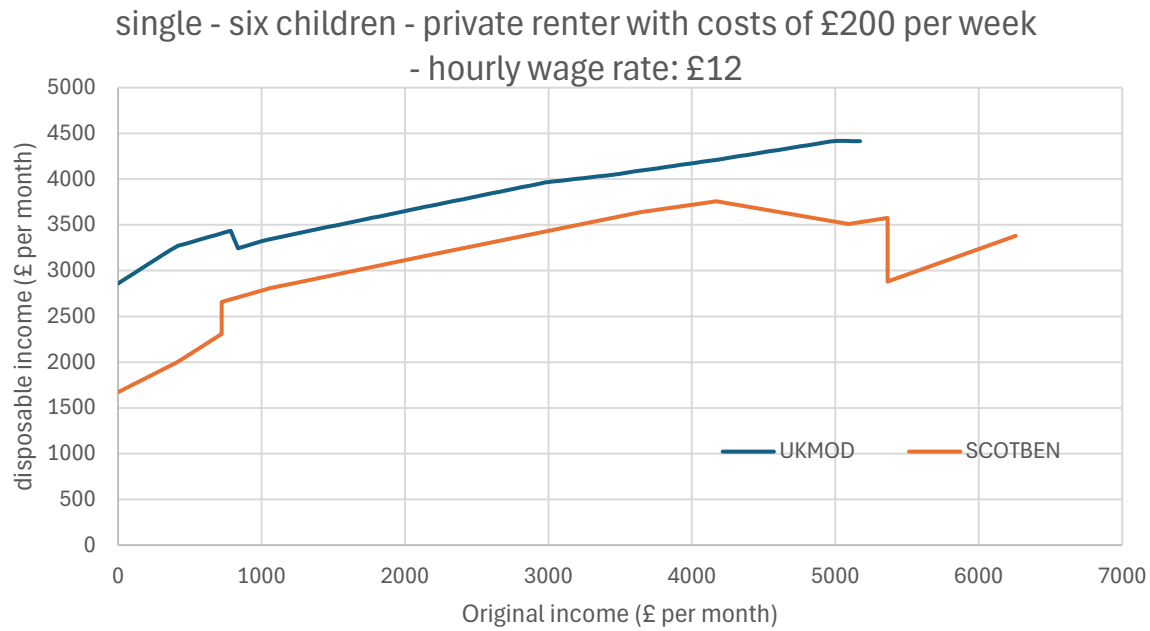
single - six children - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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Original income (£ per month)
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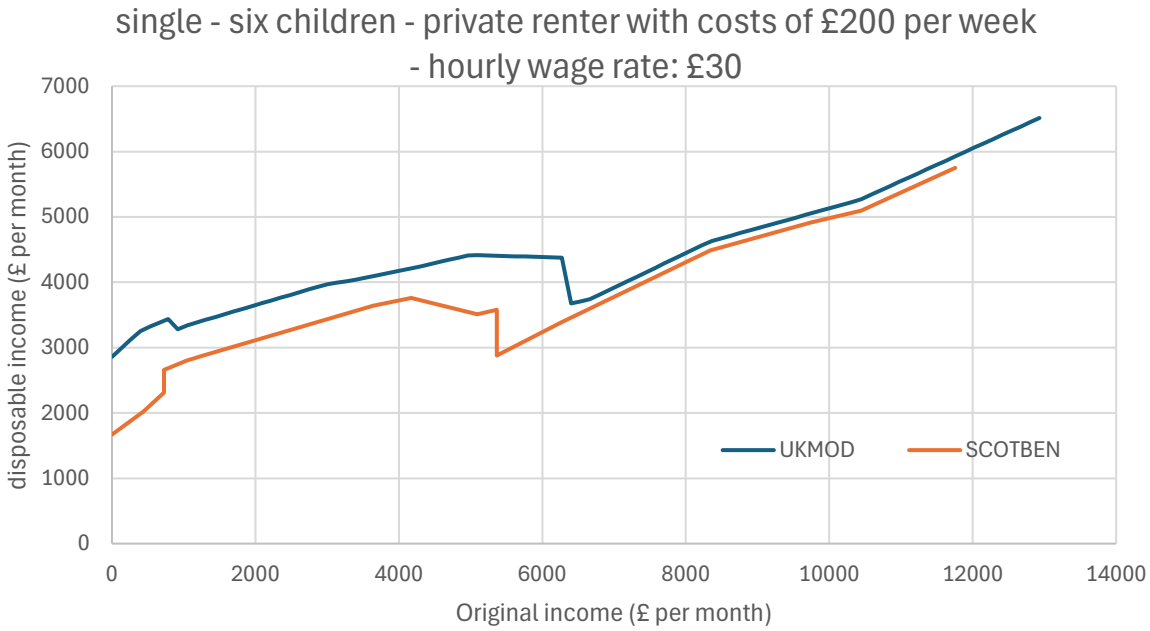
single - six children - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
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Original income (£ per month)
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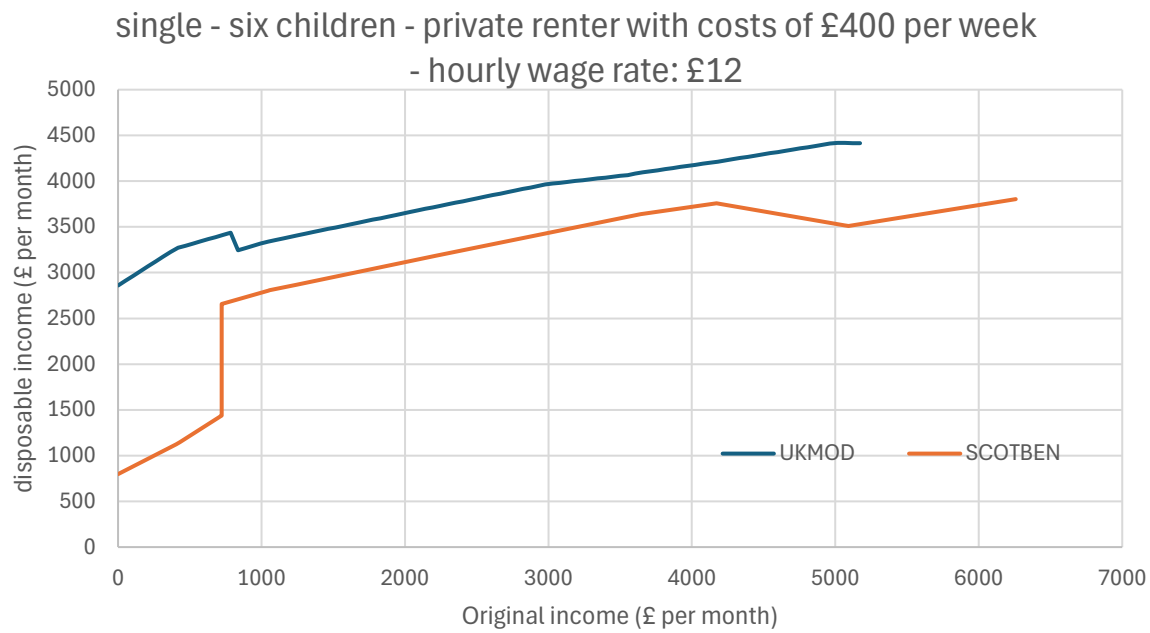
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Original income (£ per month)
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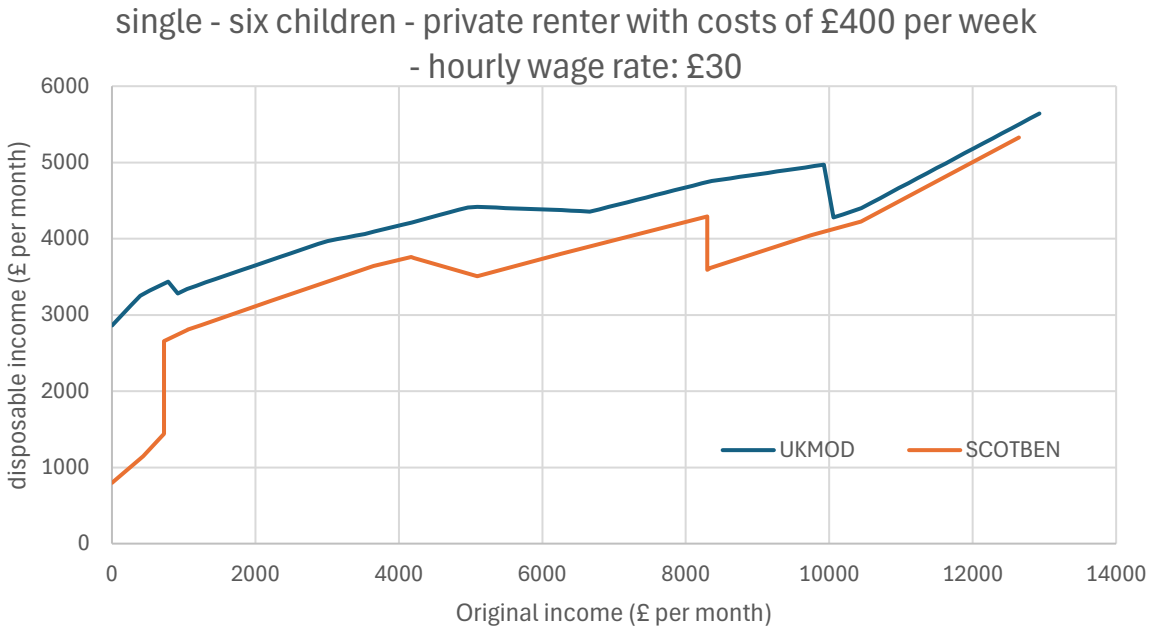
single - six children - private renter with costs of £400 per week - hourly wage rate: £30
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Original income (£ per month)
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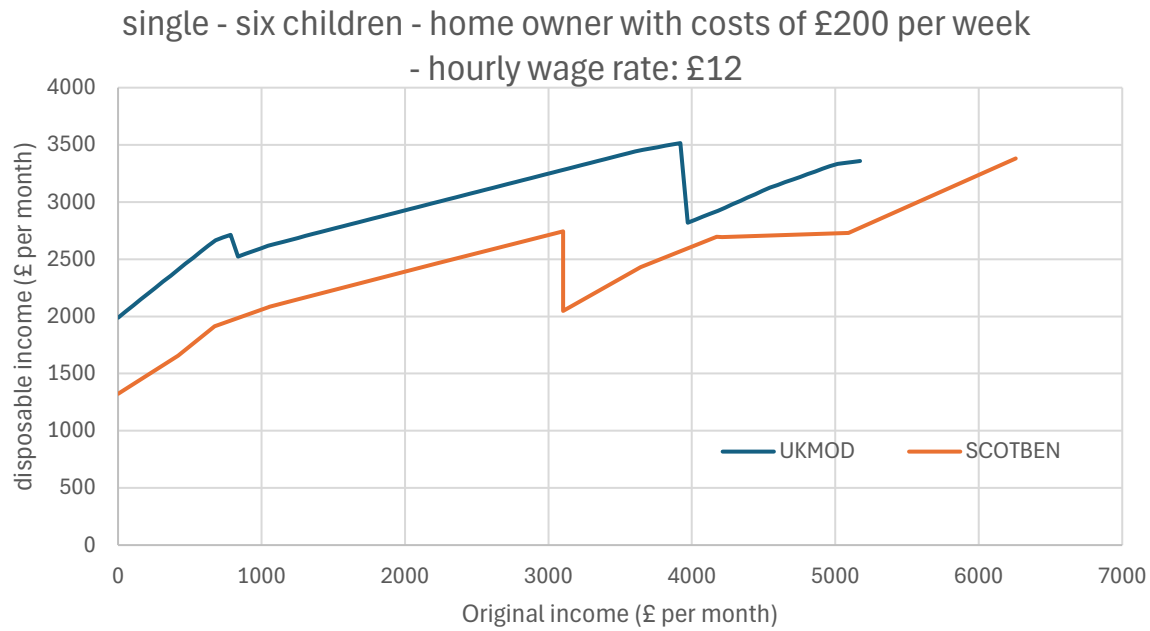
SCOTBEN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disposable income (£ per month)
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Original income (£ per month)
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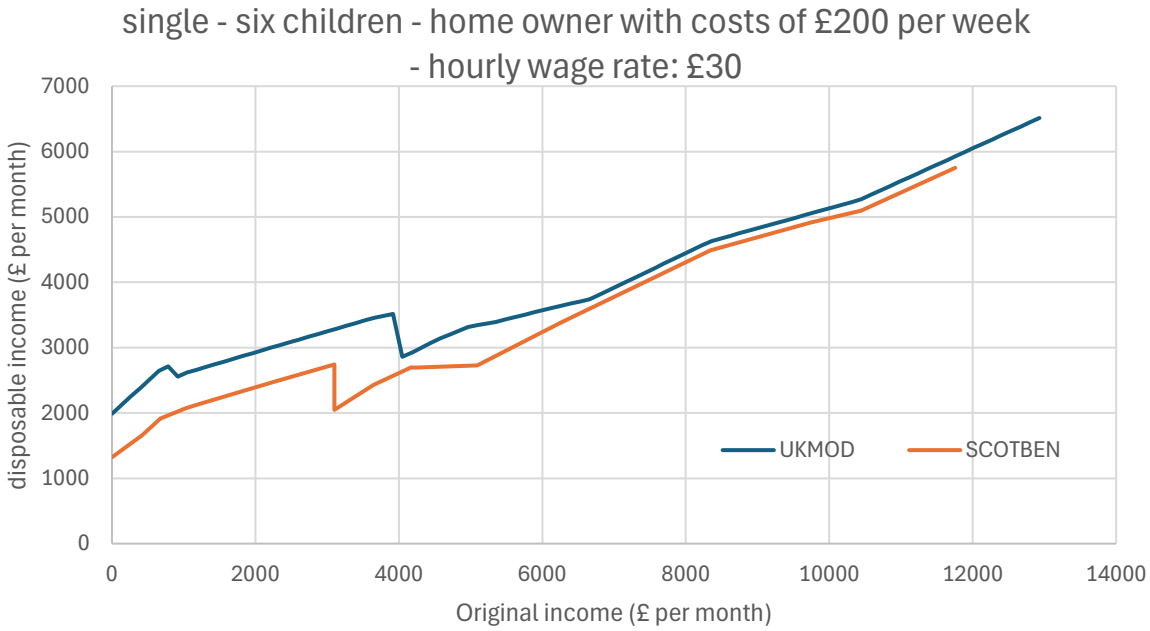
SCOTBEN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disposable income (£ per month)
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Original income (£ per month)
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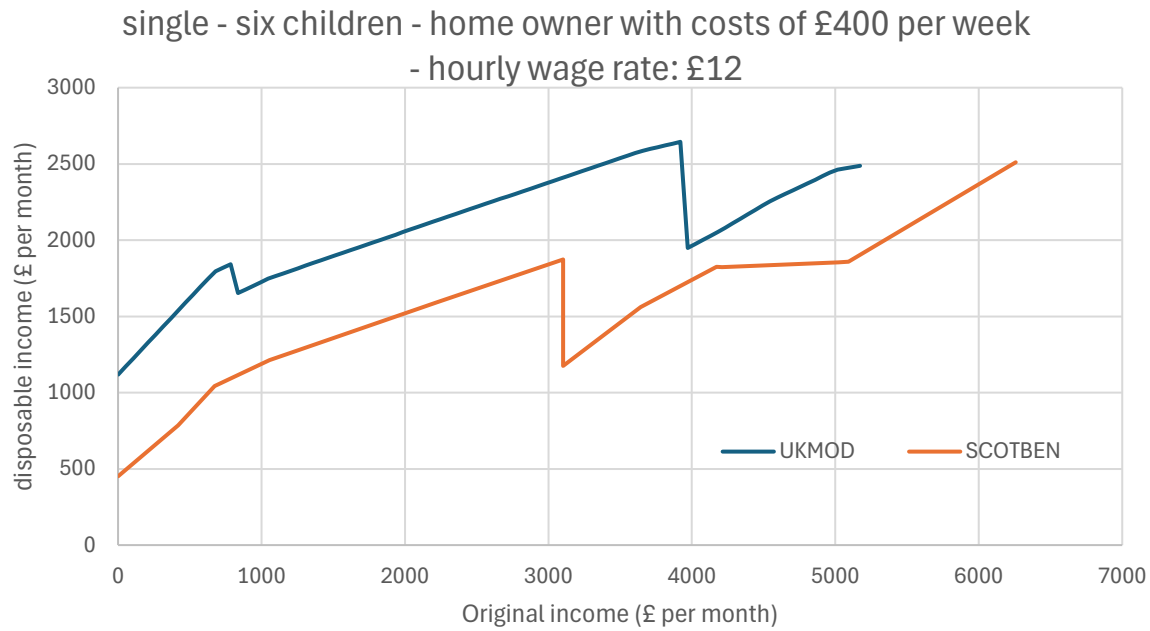
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Original income (£ per month)
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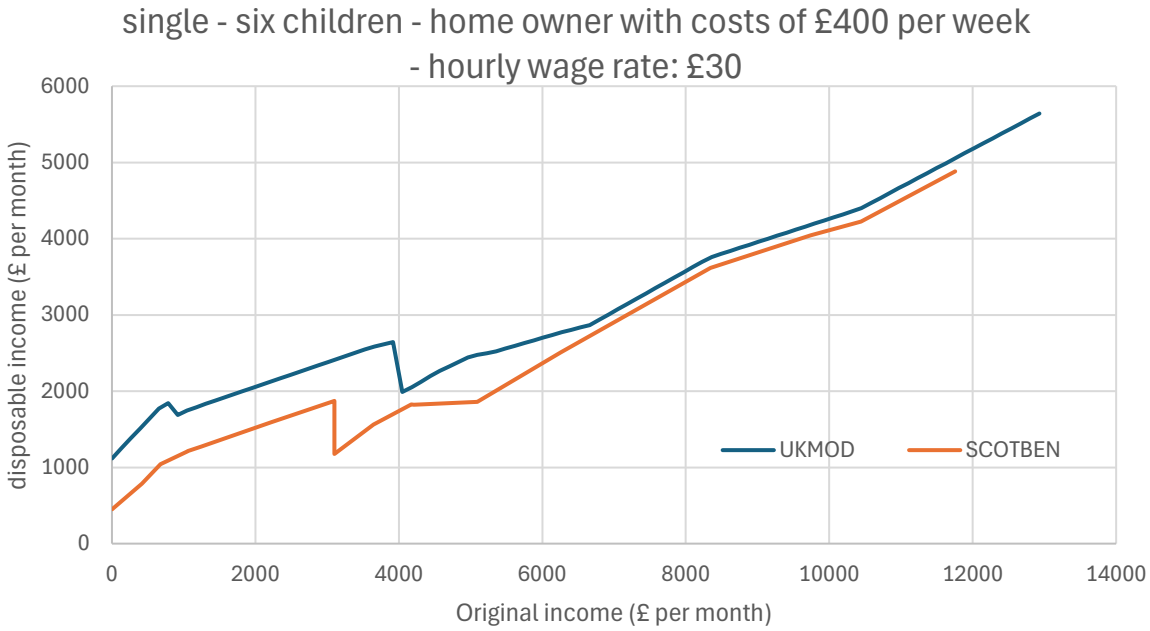
single - six children - home owner with costs of £400 per week
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disposable income (£ per month)
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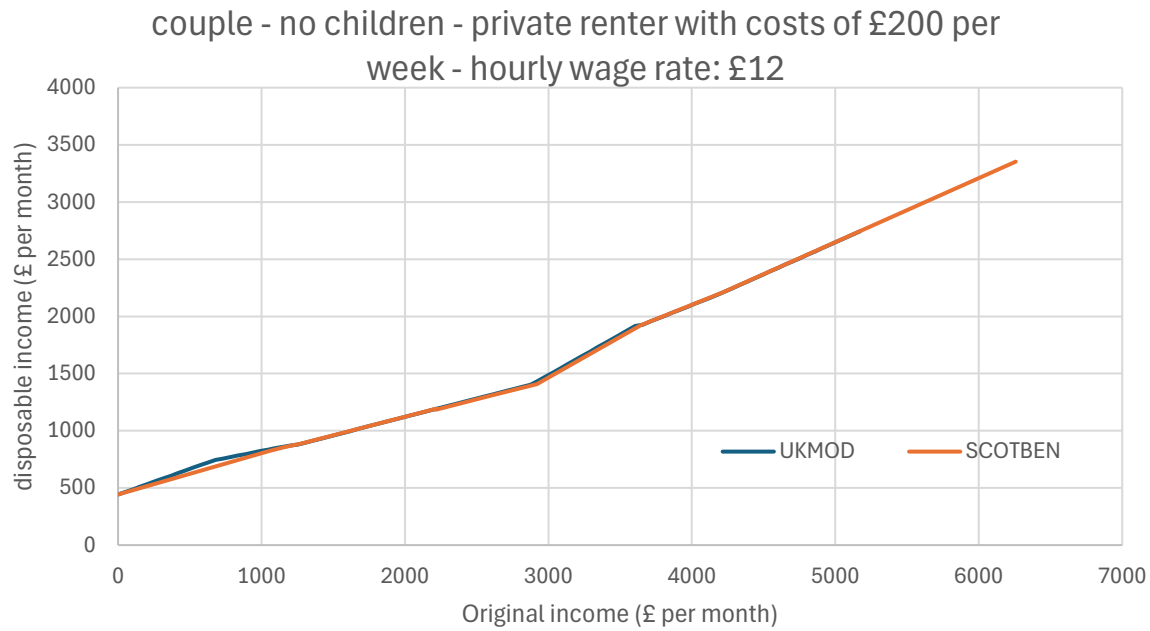
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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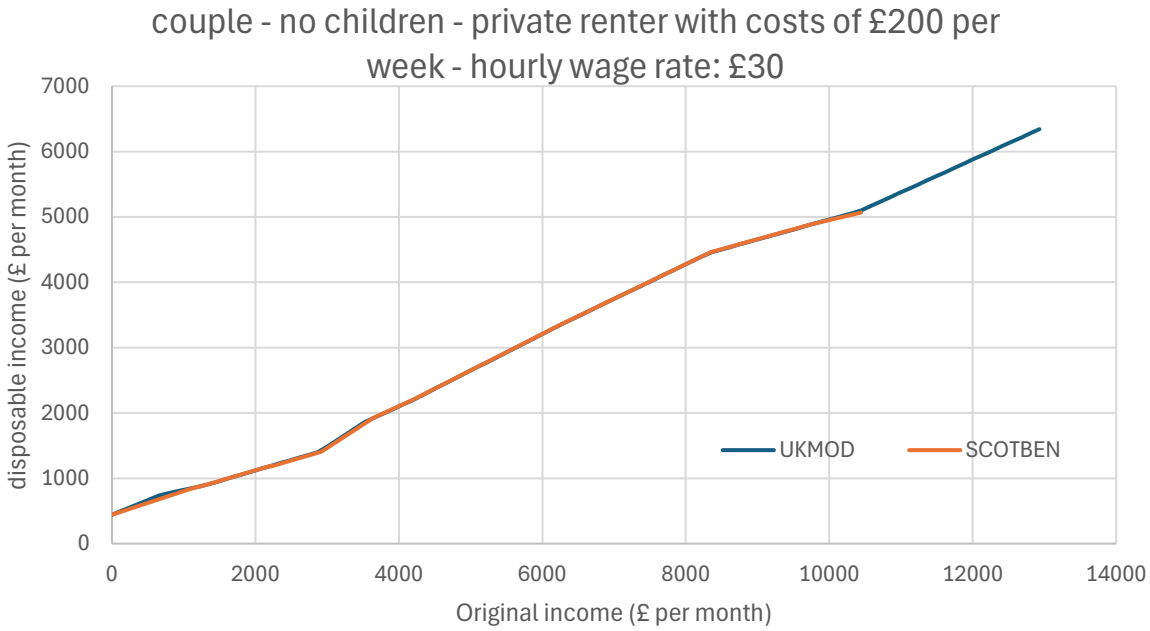
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - private renter with costs of £200 per week - hourly wage rate: £30
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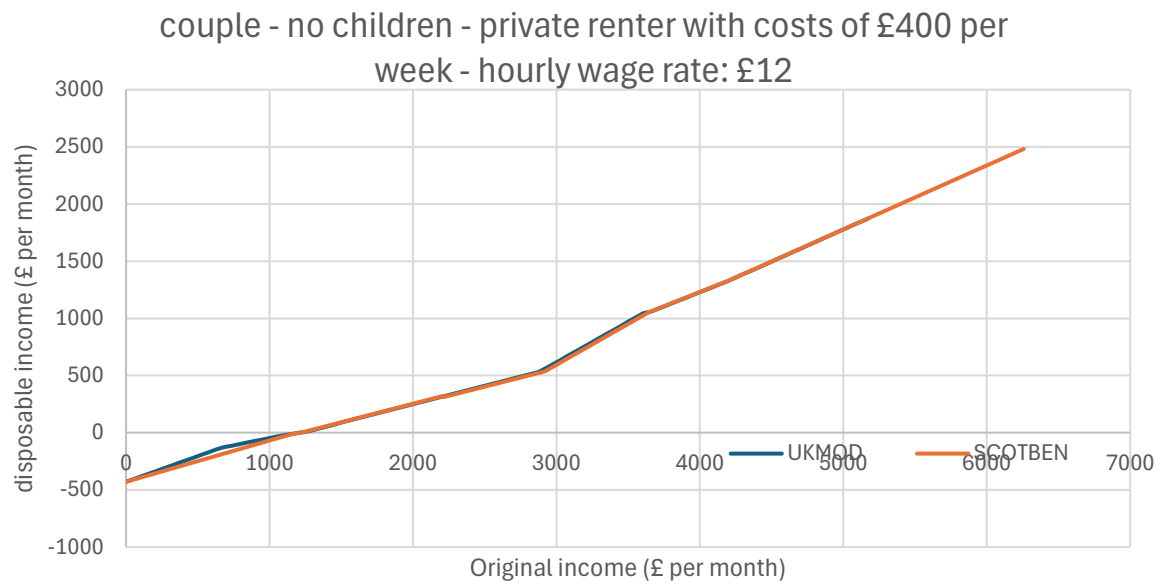
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
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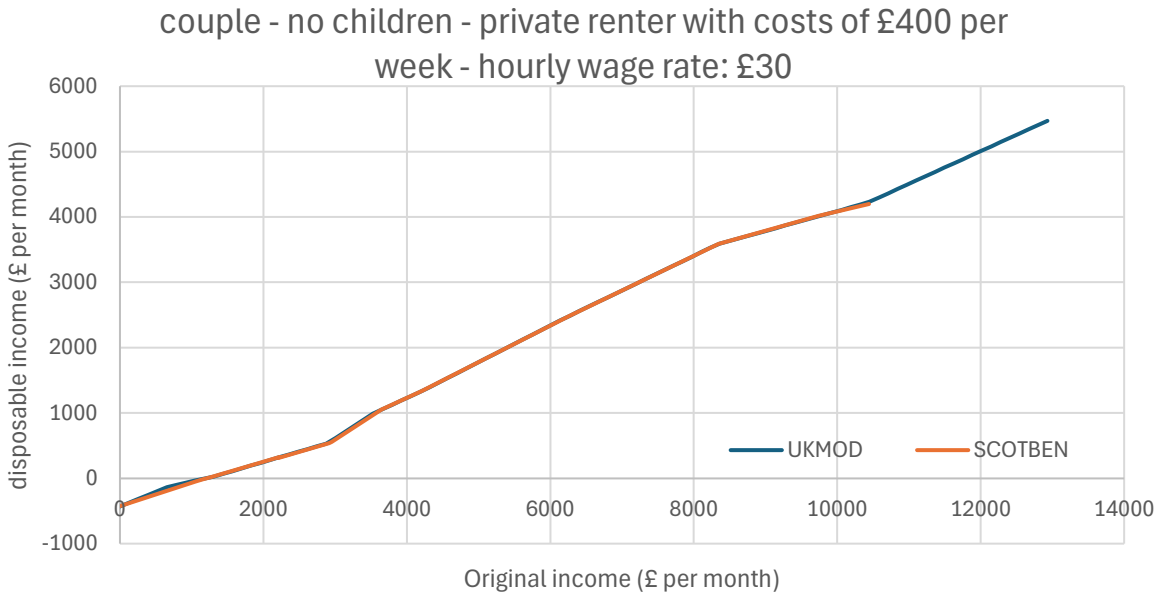
UKMOD
SCOTBEN
Original income (£ per month)


couple - no children - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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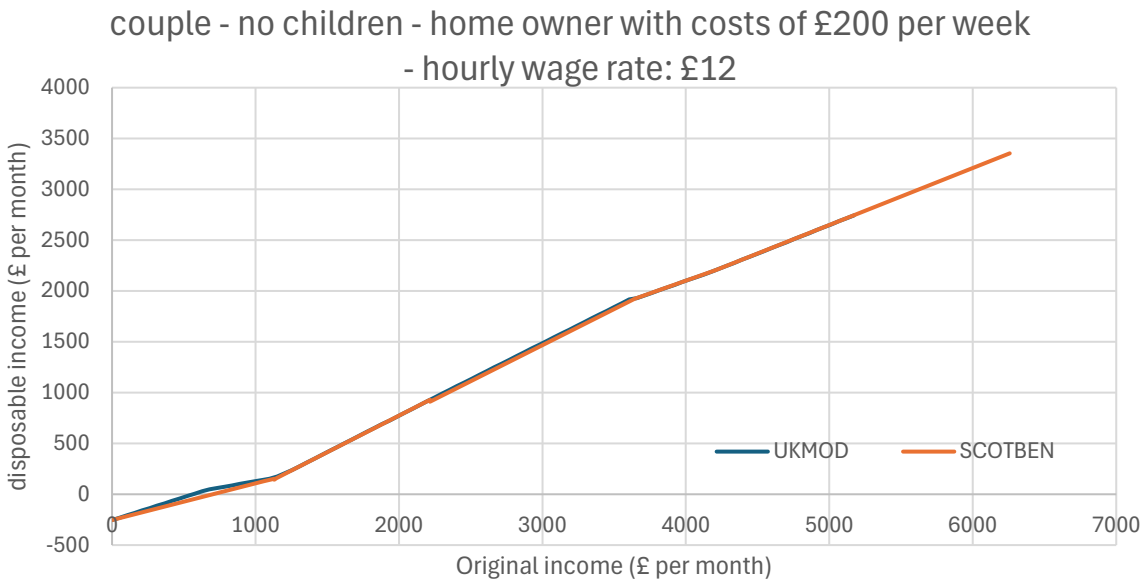
SCOTBEN
Original income (£ per month)


couple - no children - home owner with costs of £200 per week
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disposable income (£ per month)
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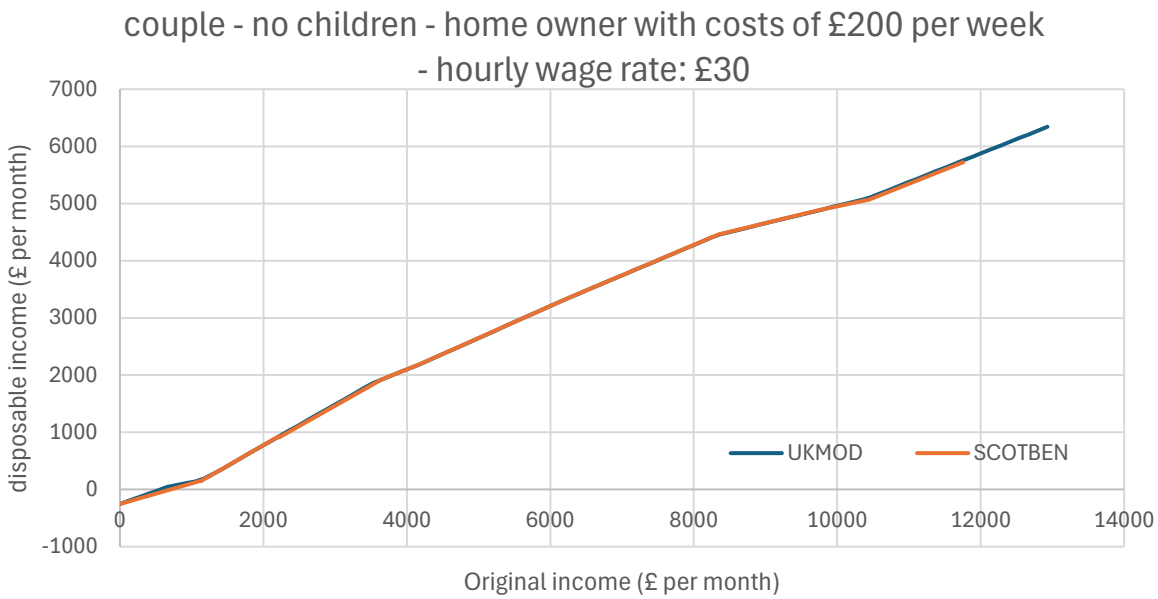
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - home owner with costs of £200 per week
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Original income (£ per month)
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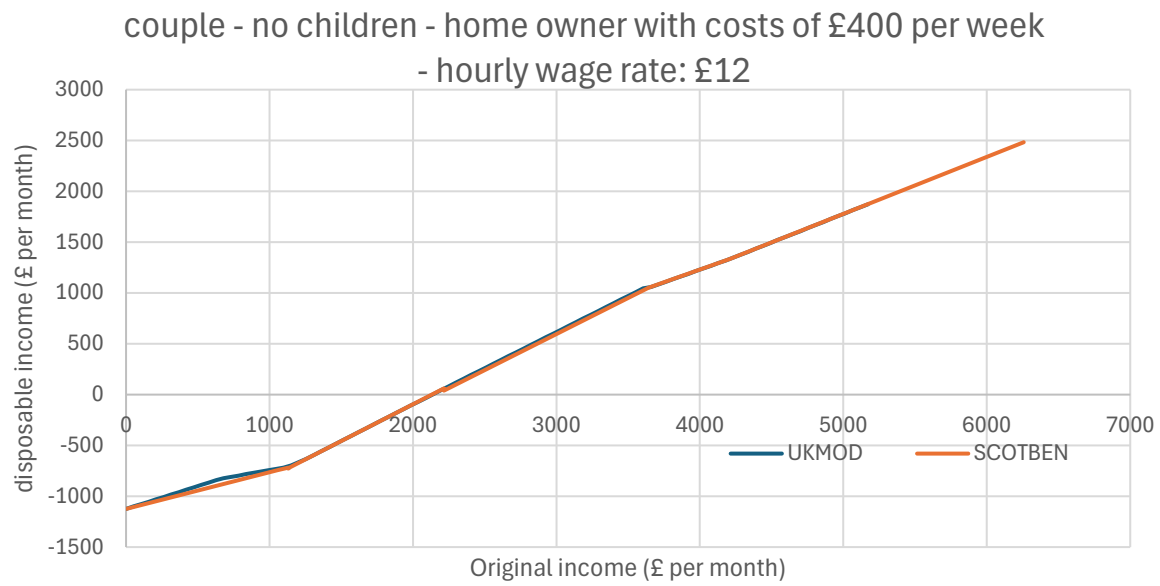
SCOTBEN


couple - no children - home owner with costs of £400 per week
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disposable income (£ per month)
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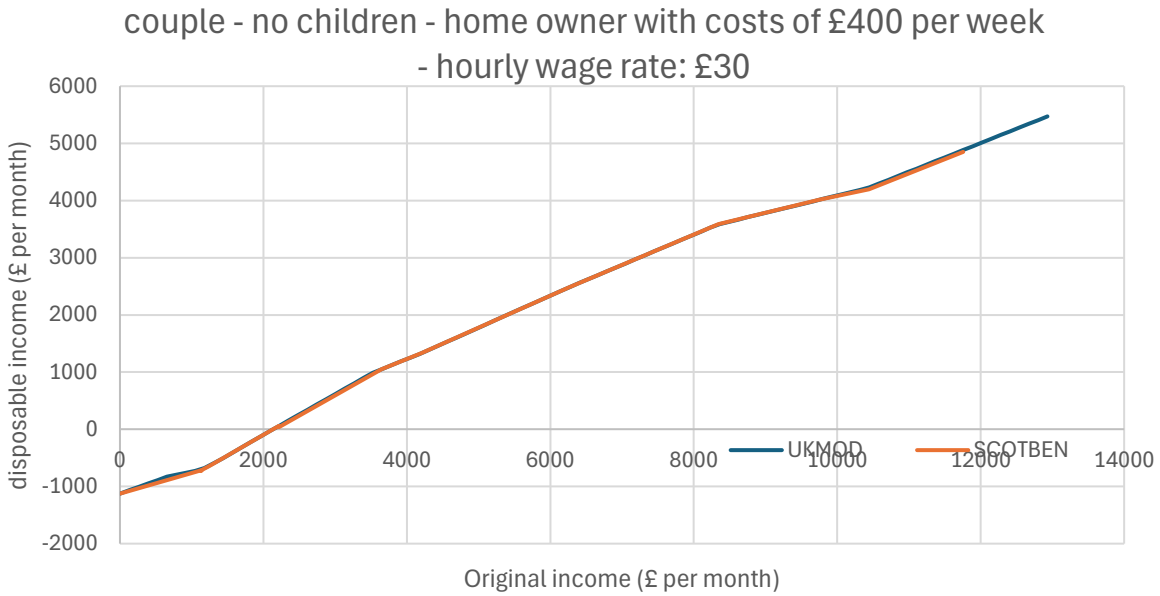
SCOTBEN
Original income (£ per month)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- hourly wage rate: £30
disposable income (£ per month)
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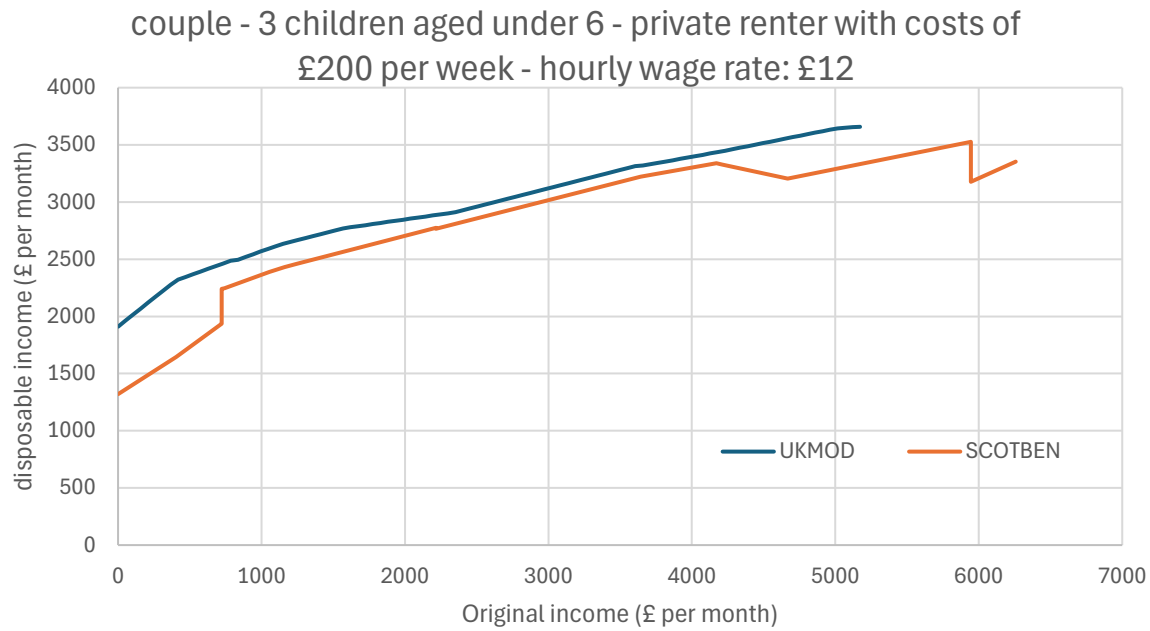
SCOTBEN
Original income (£ per month)


couple - 3 children aged under 6 - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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Original income (£ per month)
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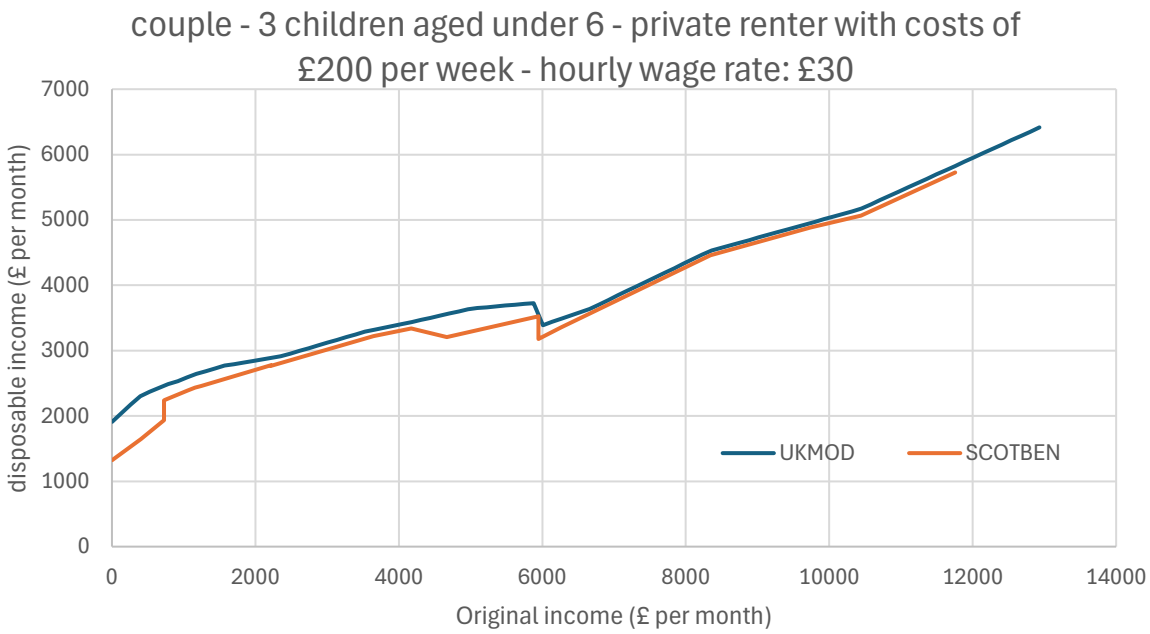
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Original income (£ per month)
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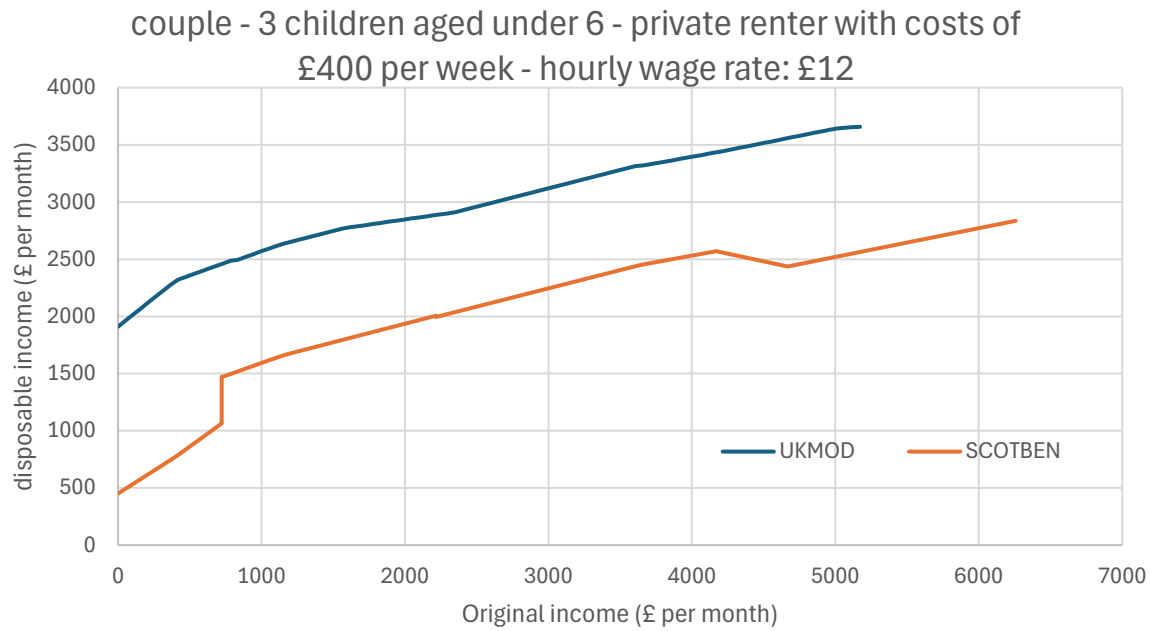
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Original income (£ per month)
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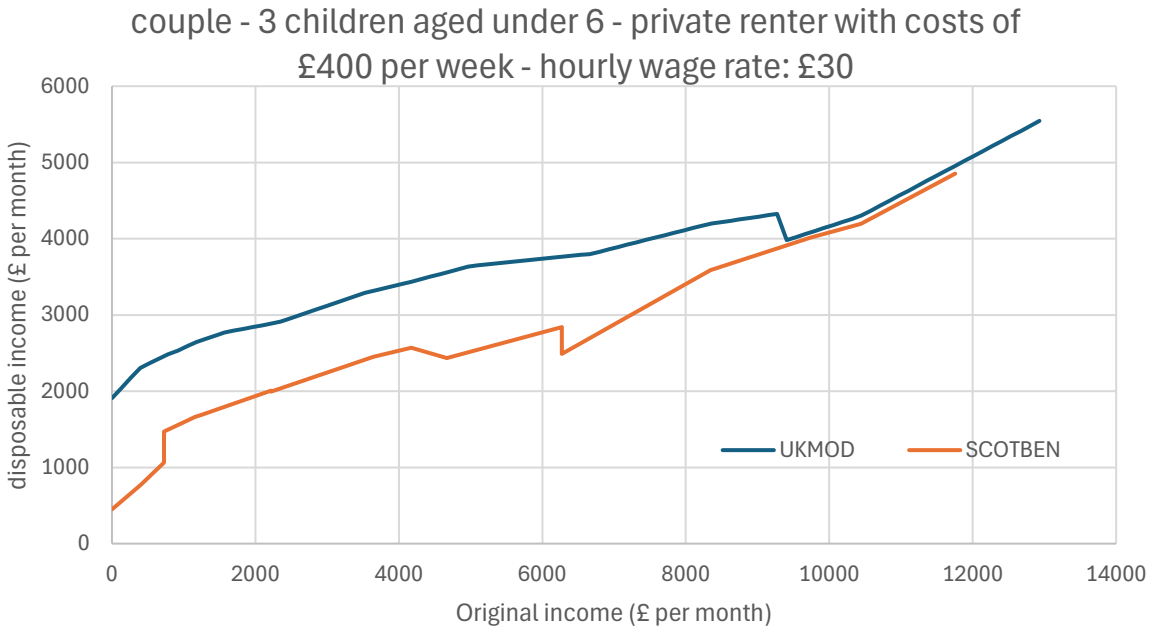
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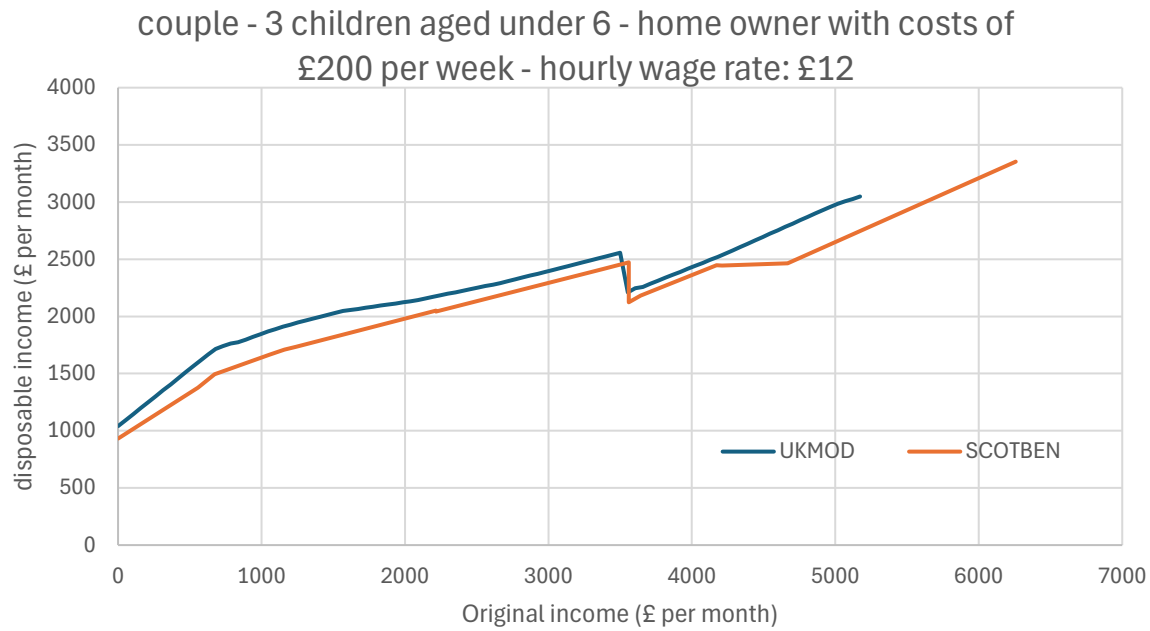
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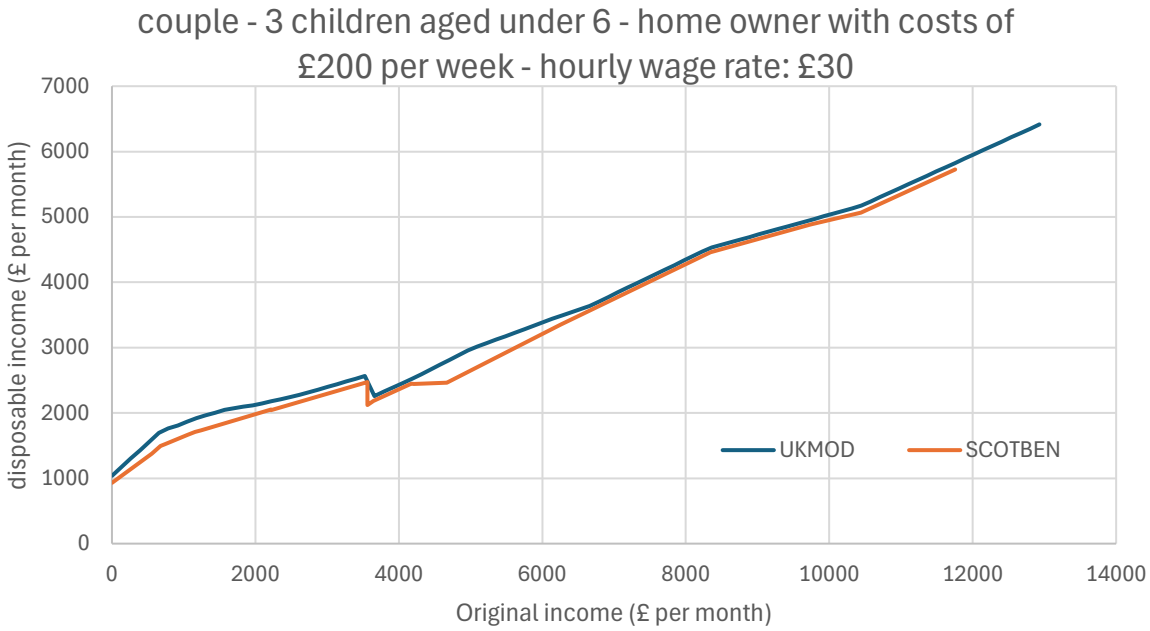
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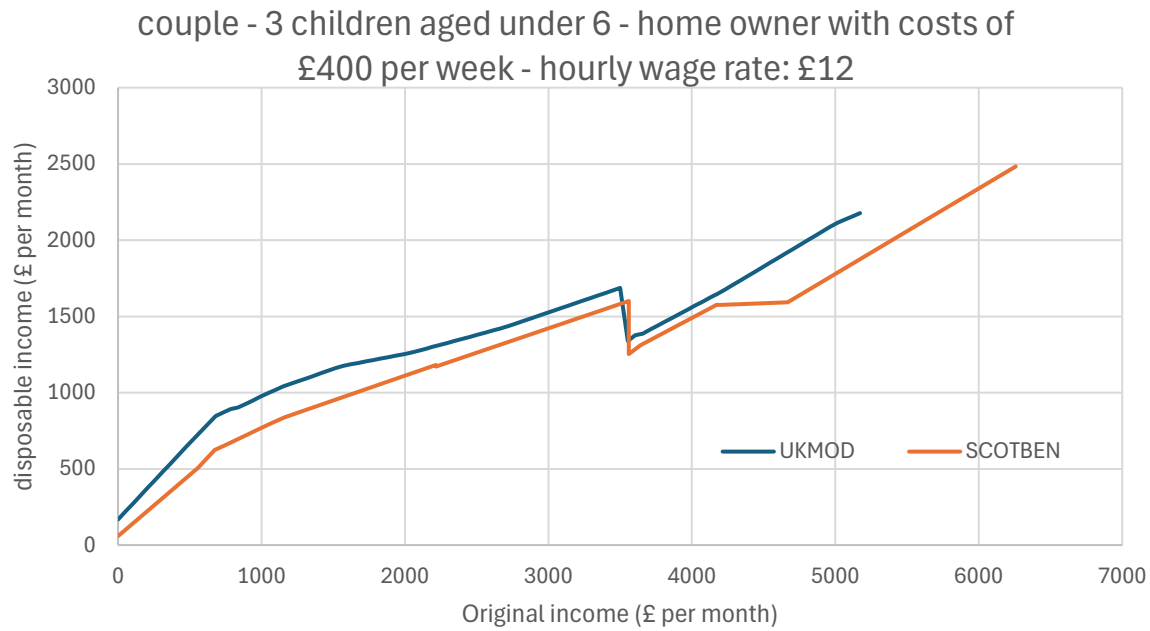
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disposable income (£ per month)
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Original income (£ per month)
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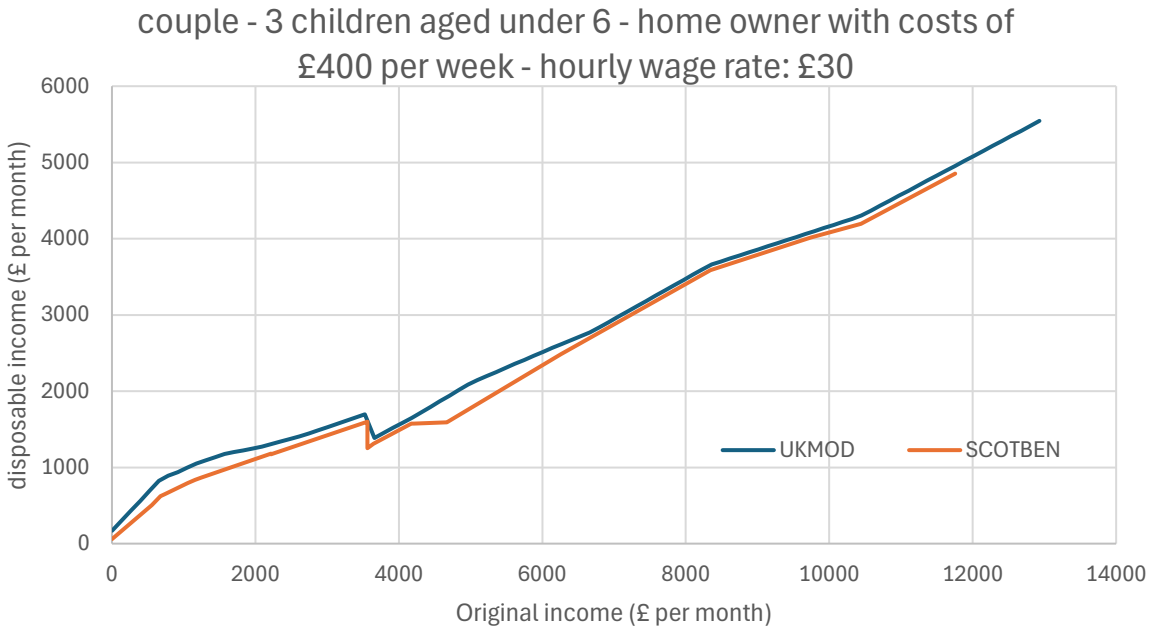
couple - 3 children aged under 6 - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
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Original income (£ per month)
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couple - 3 children aged 6+ - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
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Original income (£ per month)
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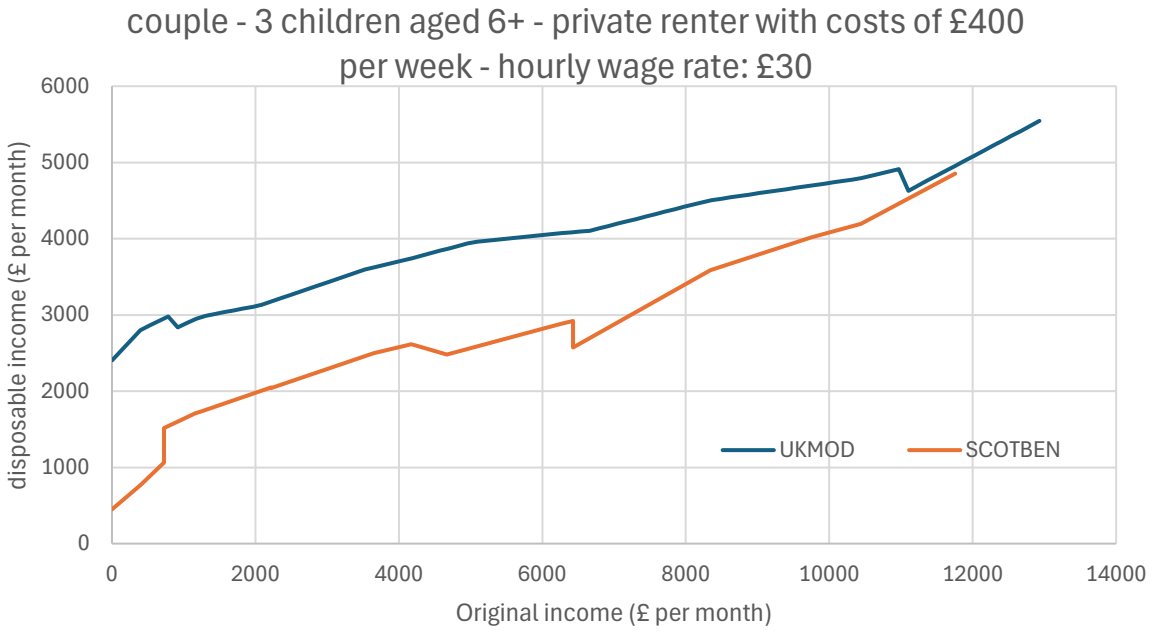
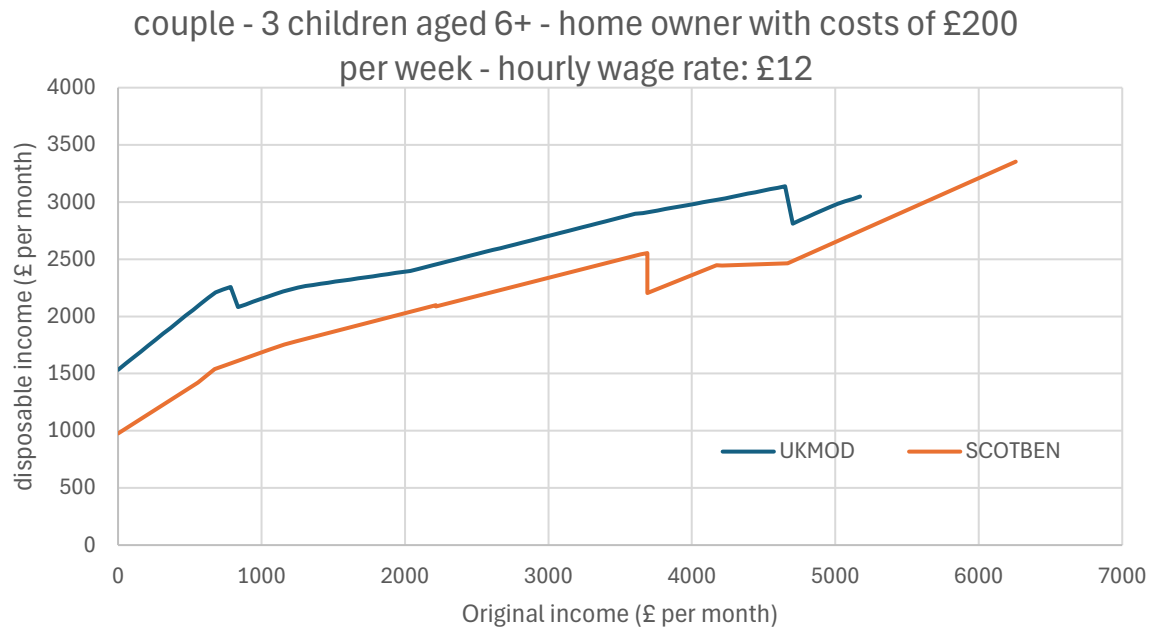
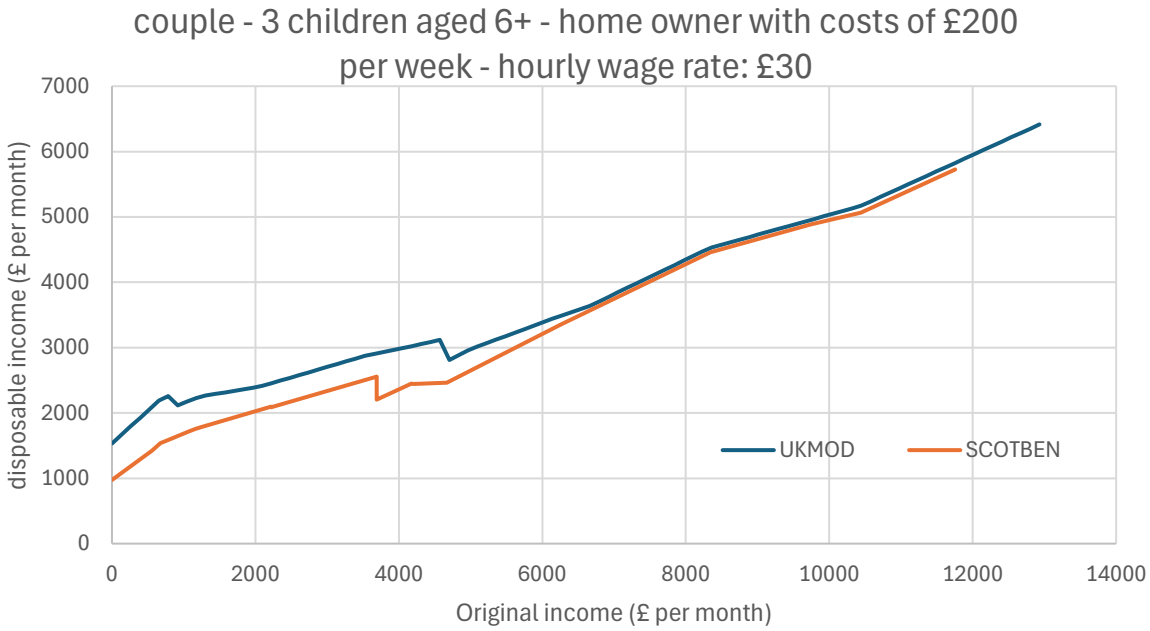
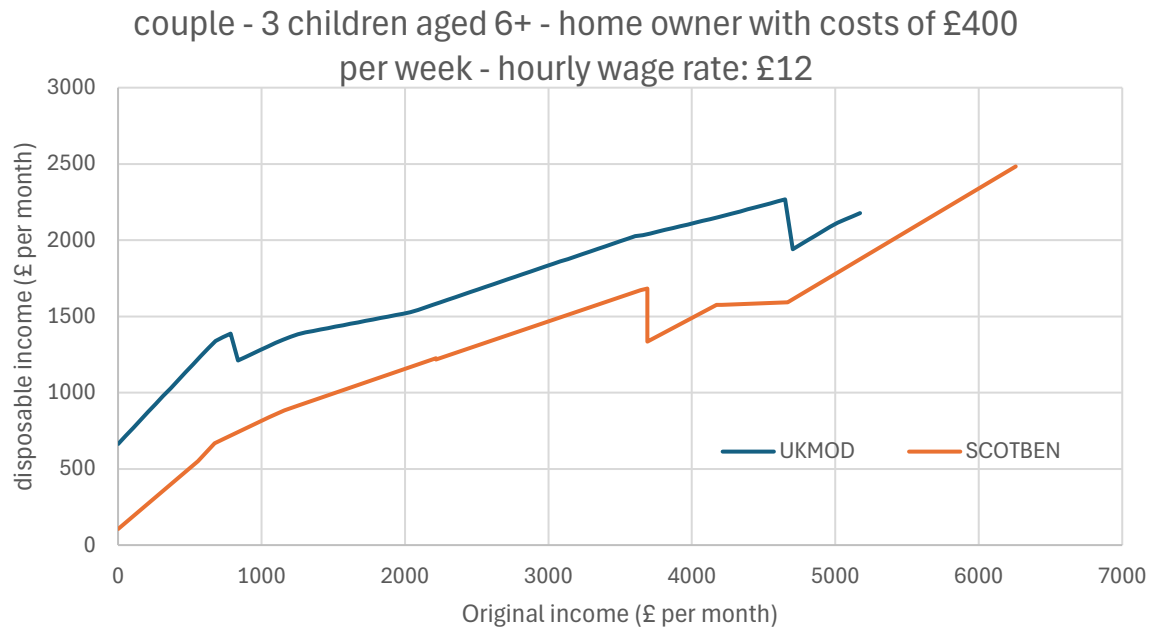
SCOTBEN

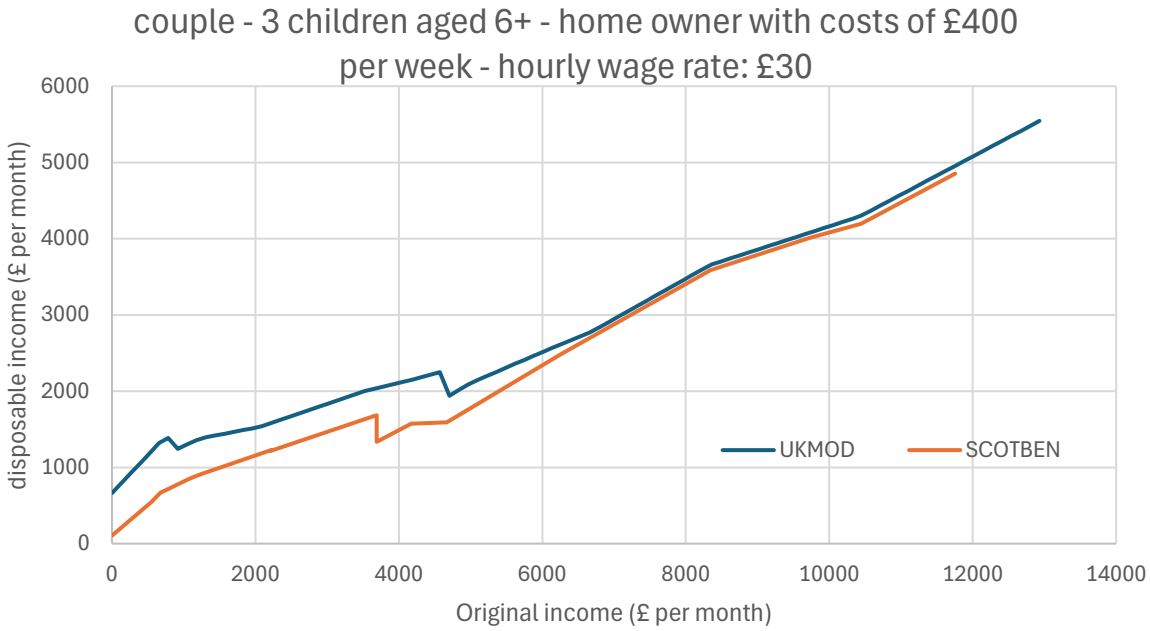

couple - 3 children aged 6+ - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - 3 children aged 6+ - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN

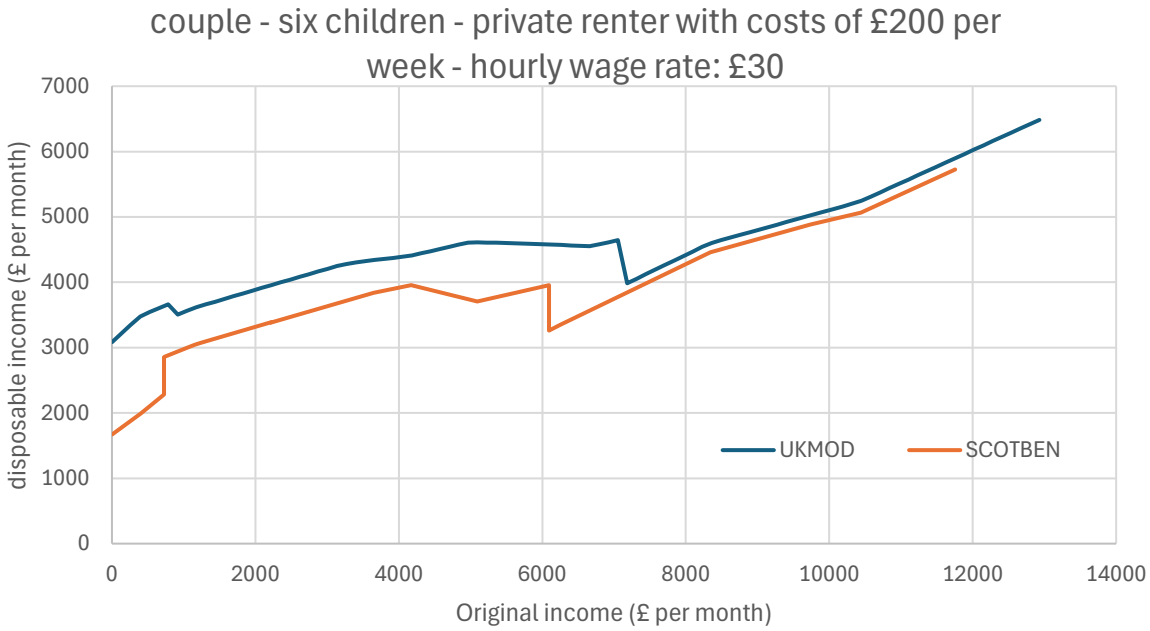

couple - 3 children aged 6+ - home owner with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - 3 children aged 6+ - home owner with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN

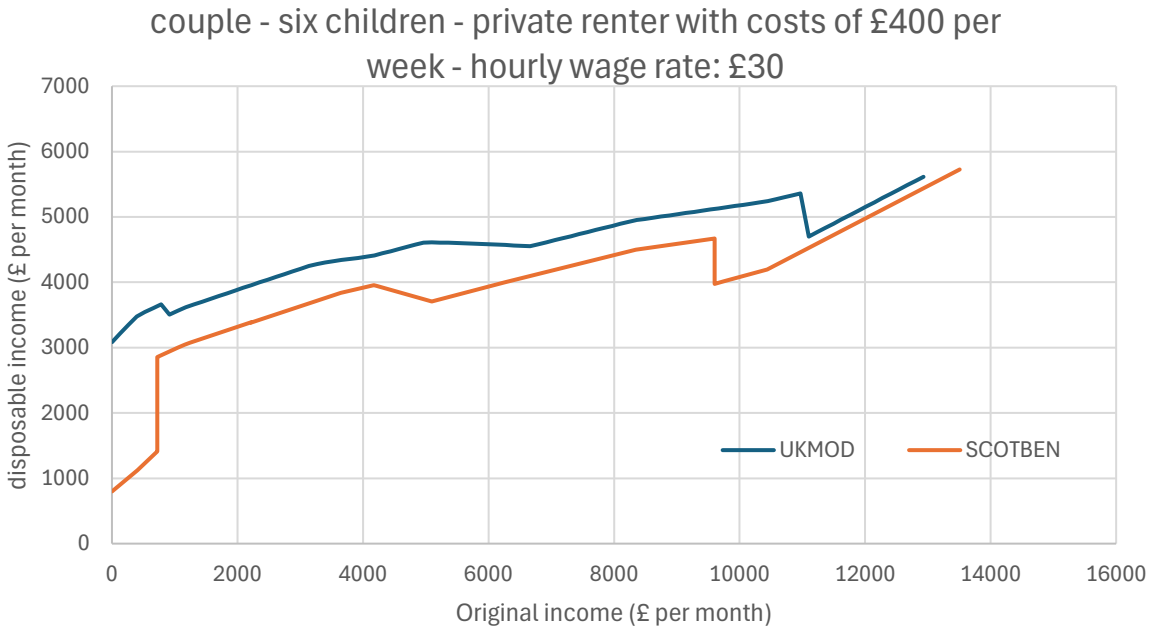

couple - 3 children aged 6+ - home owner with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN

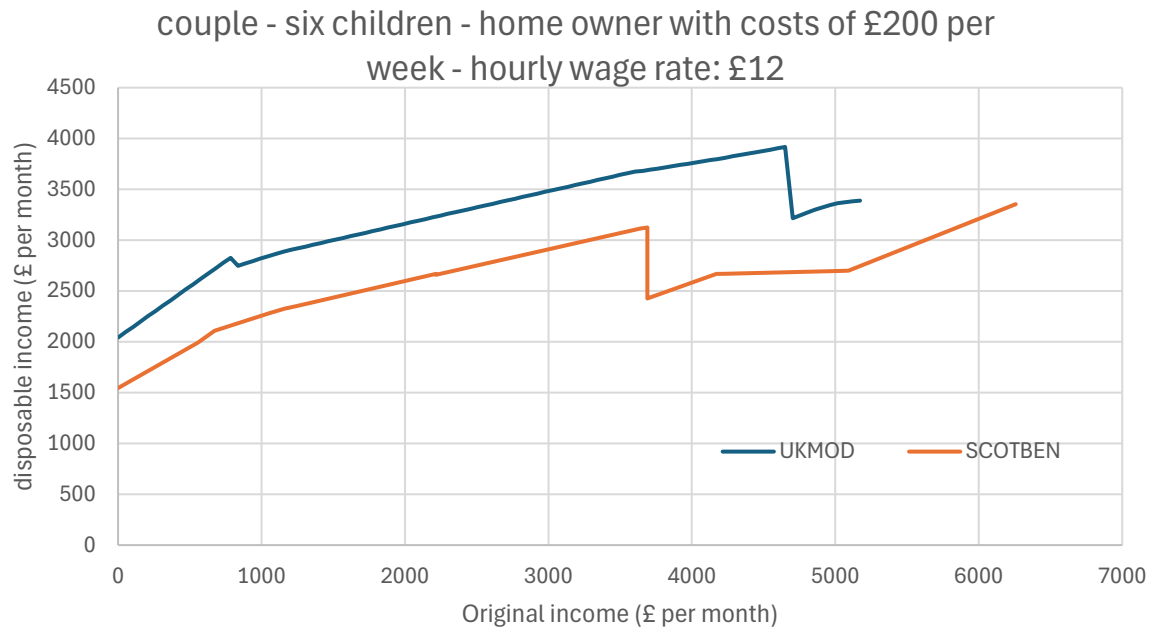

couple - 3 children aged 6+ - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN

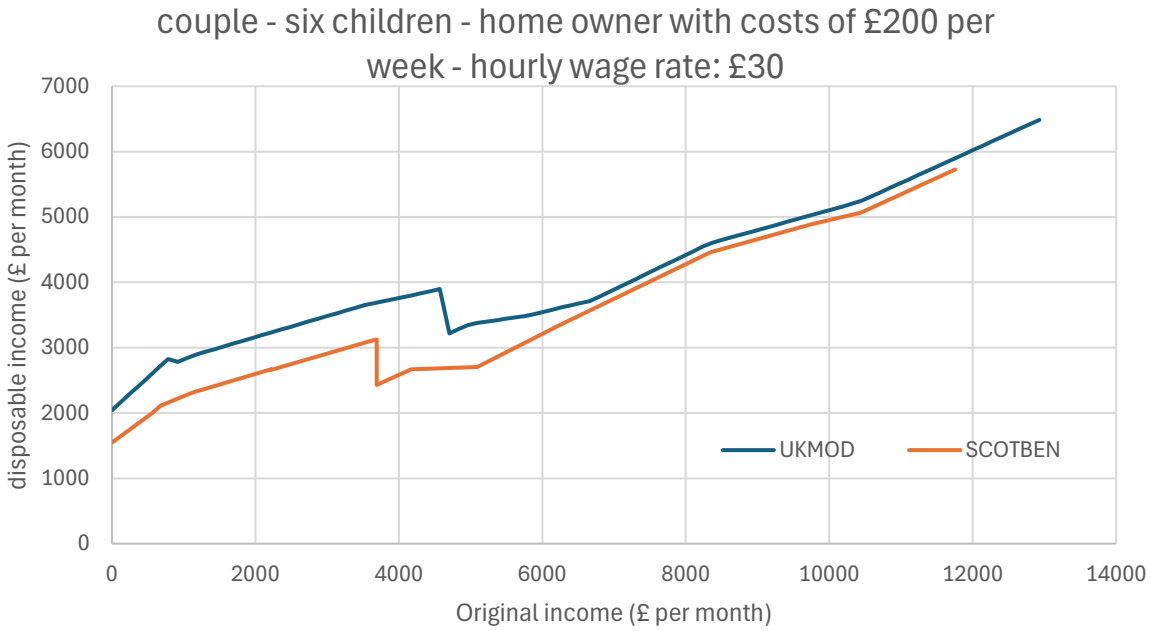

couple - six children - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN

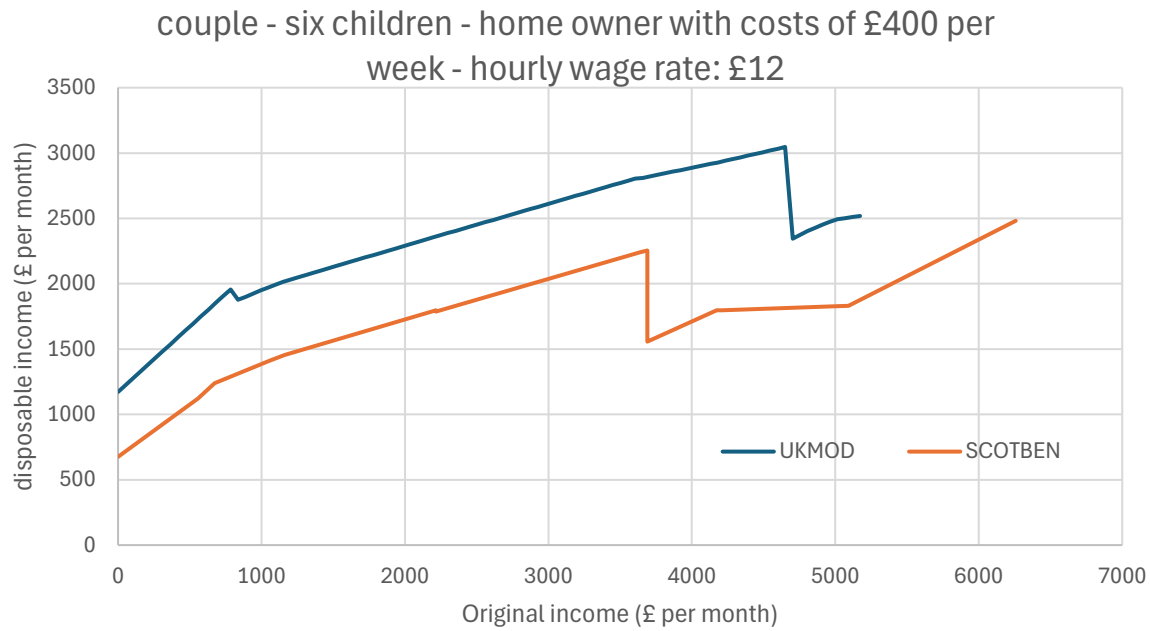

couple - six children - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN

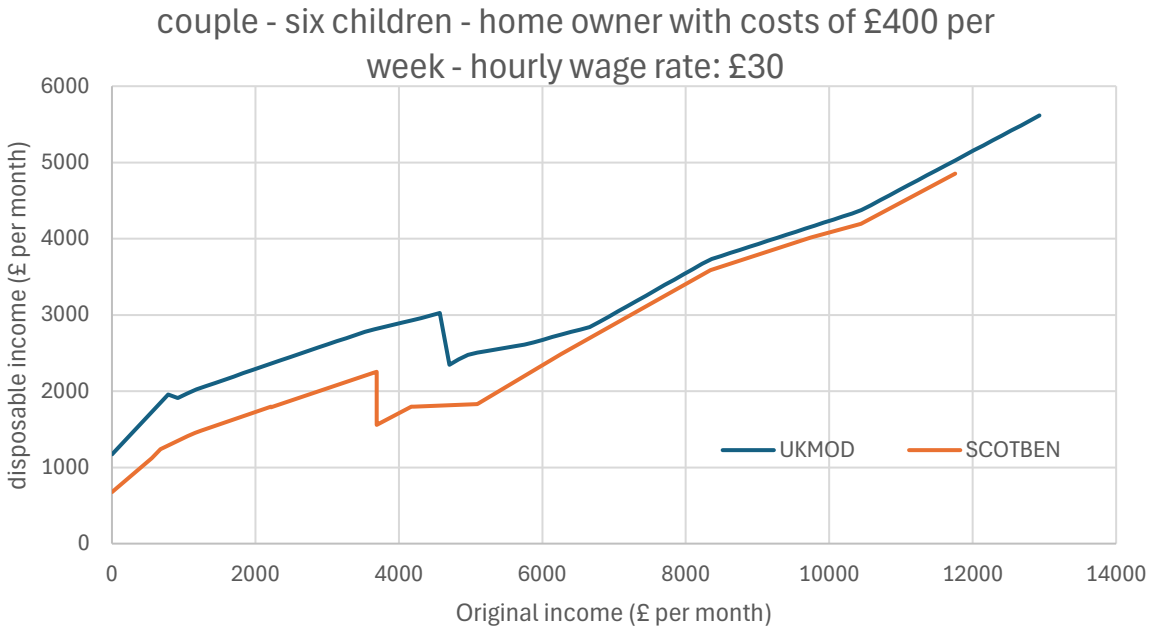

couple - six children - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
16000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - home owner with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN

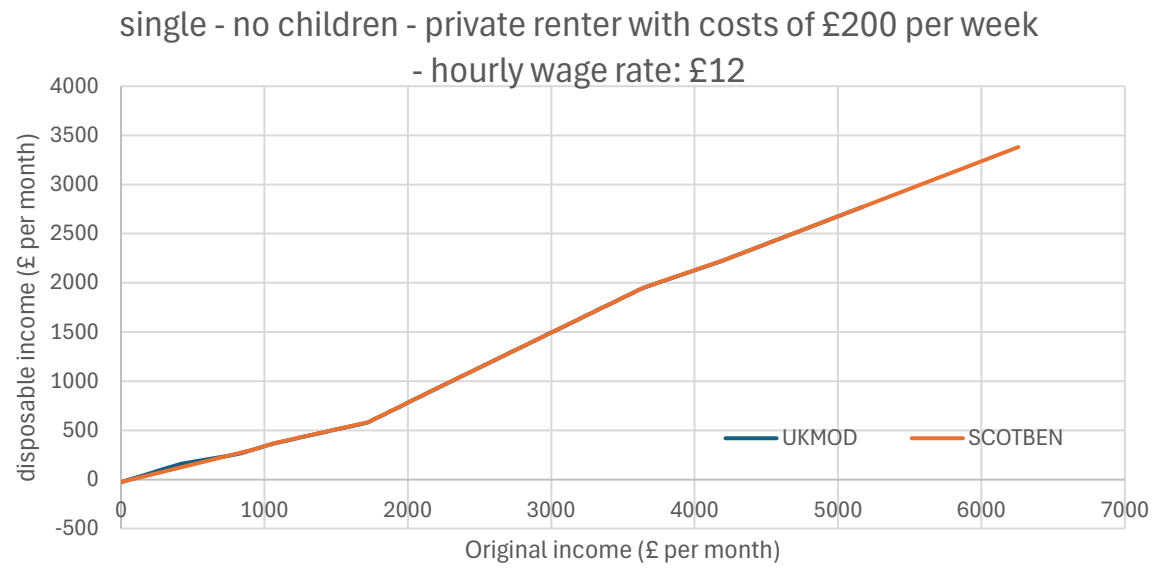

couple - six children - home owner with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN

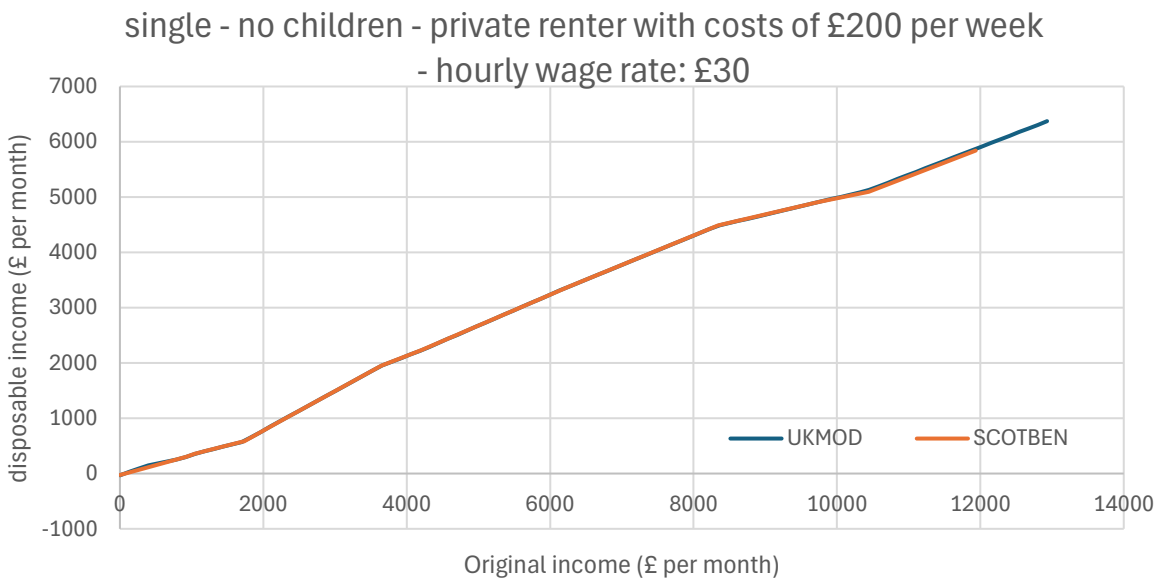

couple - six children - home owner with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN

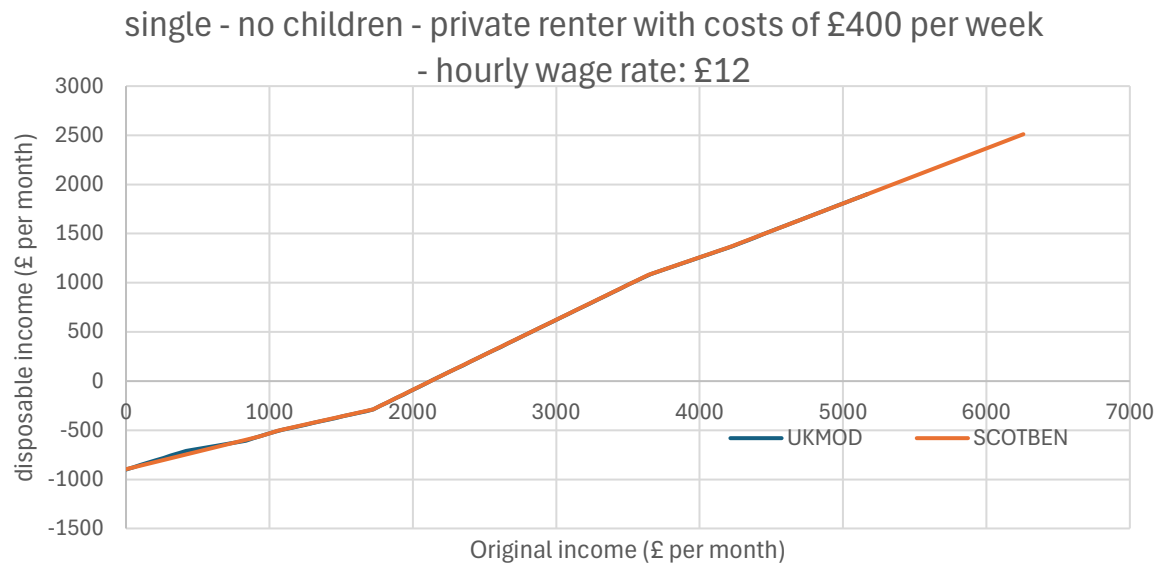

couple - six children - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN

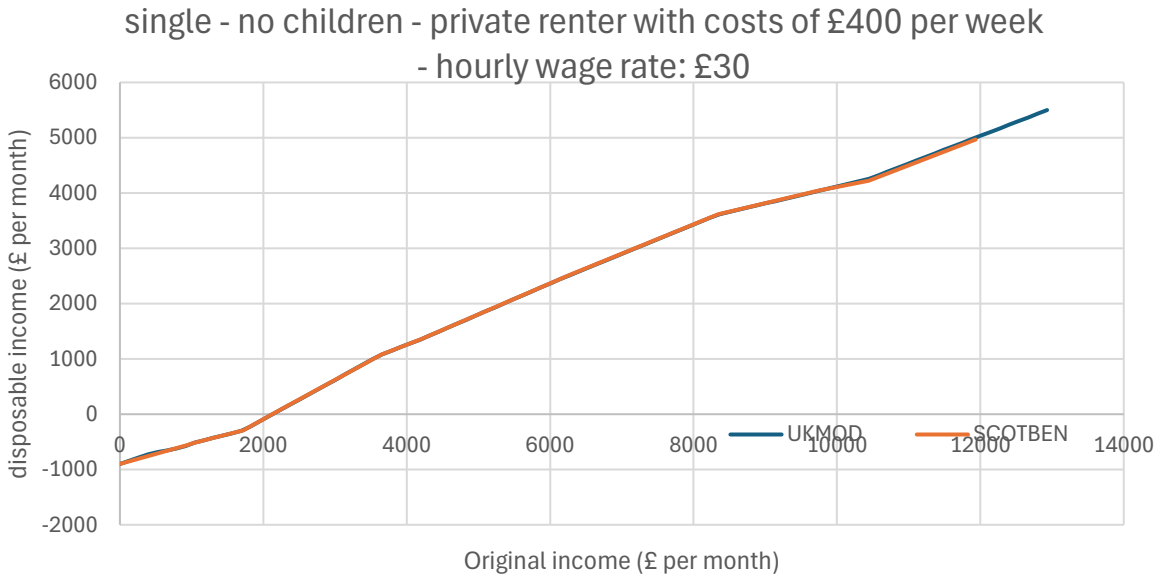
B.2 Restricted UKMOD transfer payments

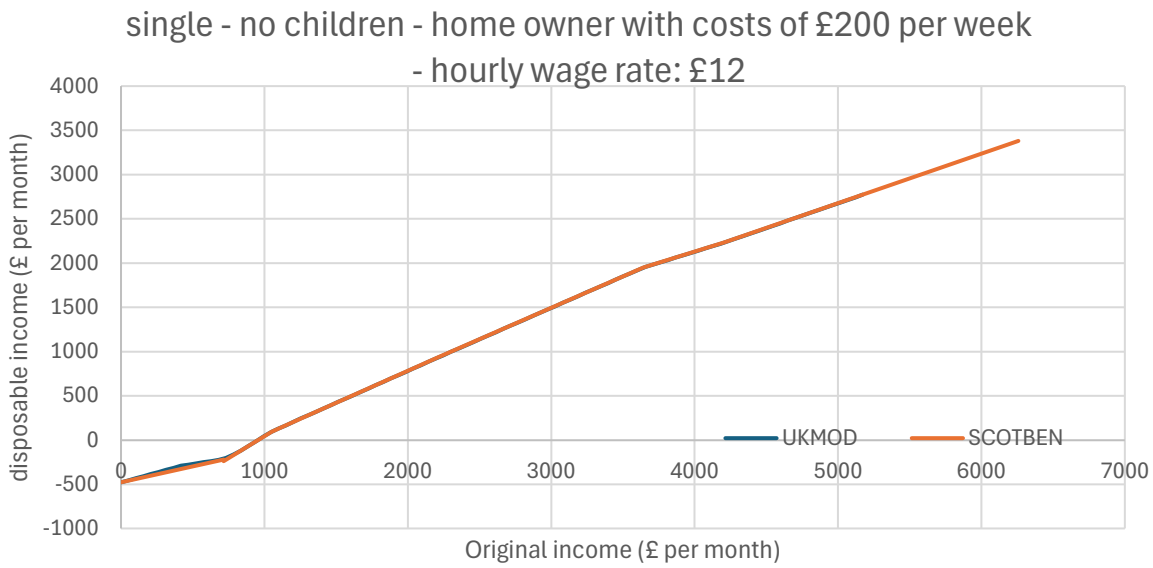
This appendix reports profiles that omit selected payments that are projected by UKMOD but not by ScotBen: best start foods, best start grant, free school meals, healthy start (food), school clothing grant, Scottish child winter heating assistance, sure start maternity grant, and winter fuel allowance.

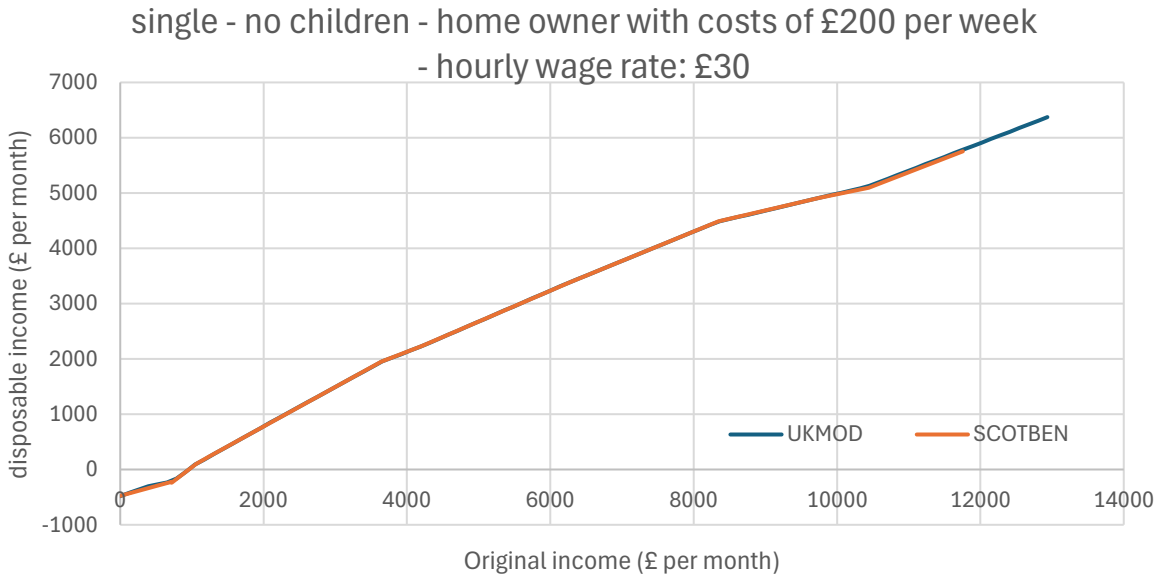


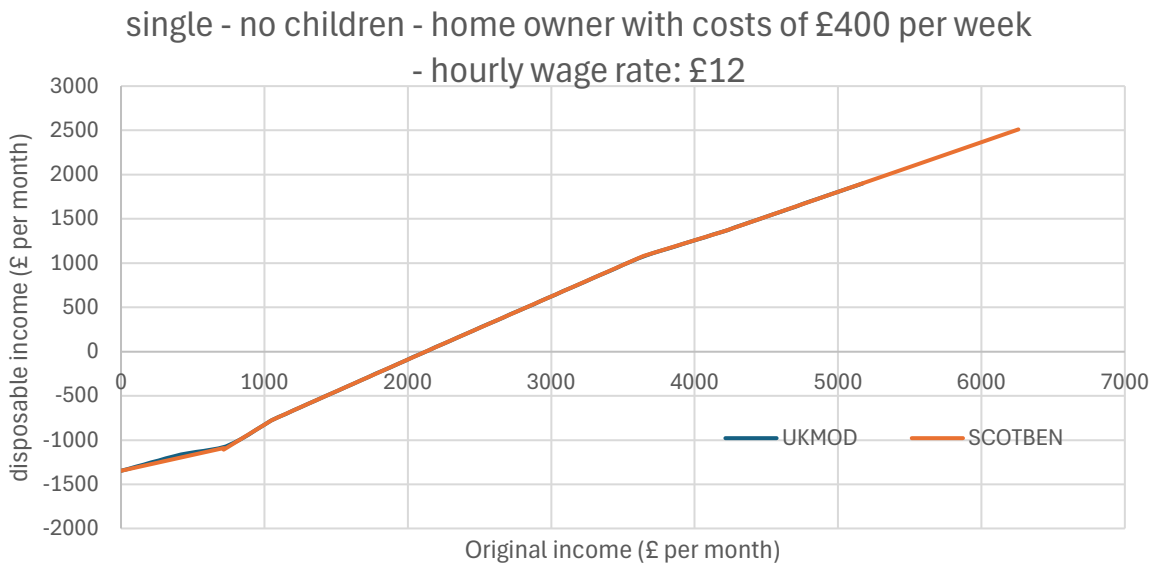


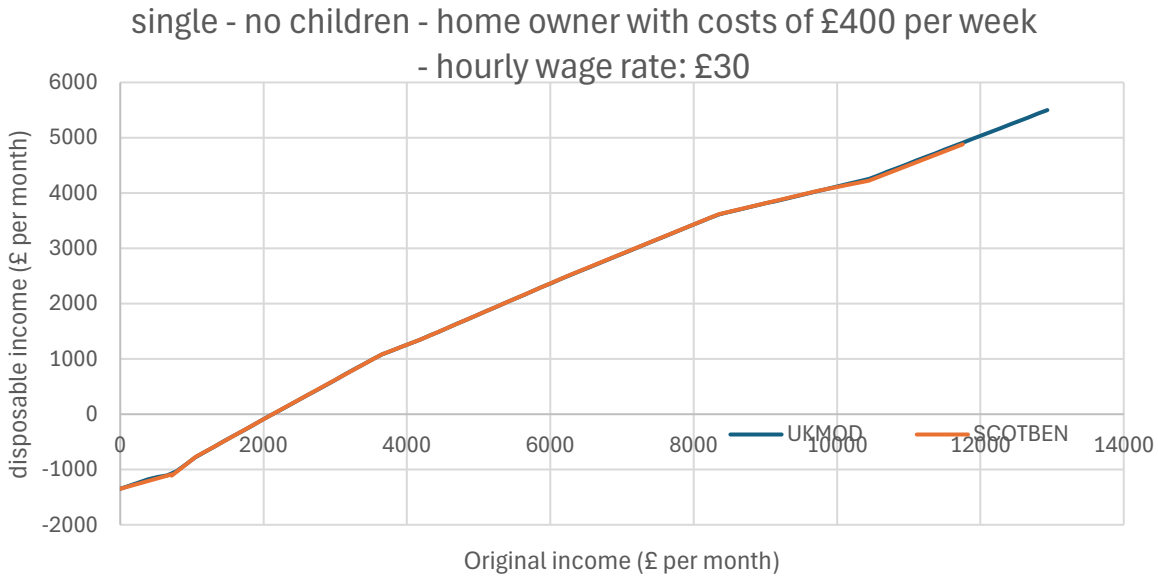

single - no children - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
3000
2500
2000
1500
1000
500
0
-500
-1000
-1500
0
1000
2000
3000
4000
5000
6000
7000
UKMOD
SCOTBEN
Original income (£ per month)

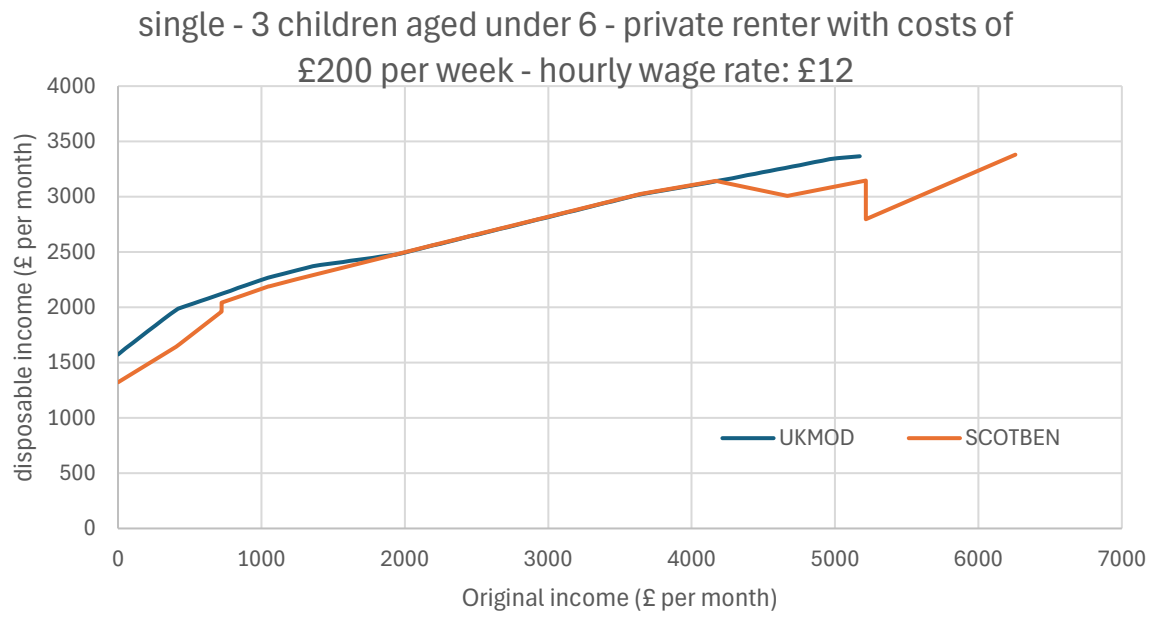

single - no children - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
6000
5000
4000
3000
2000
1000
0
-1000
-2000
0
2000
4000
6000
8000
10000
12000
14000
UKMOD
SCOTBEN
Original income (£ per month)

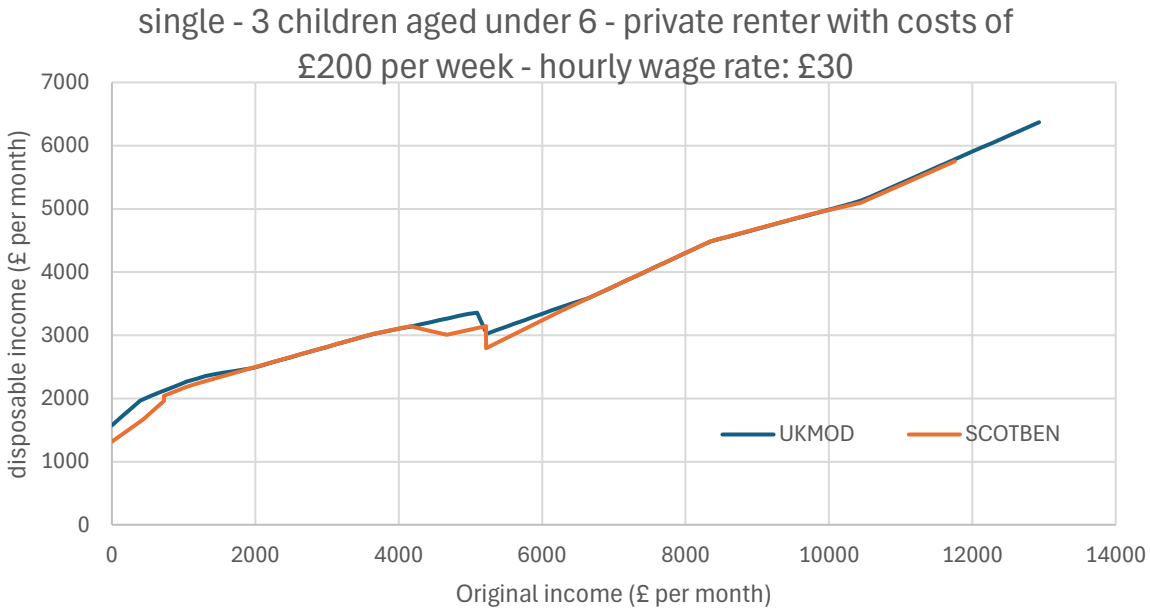

single - no children - home owner with costs of £200 per week
- hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
0
1000
2000
3000
4000
5000
6000
7000
UKMOD
SCOTBEN
Original income (£ per month)


single - no children - home owner with costs of £200 per week
- hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
-1000
0
2000
4000
6000
8000
10000
12000
14000
UKMOD
SCOTBEN
Original income (£ per month)


single - no children - home owner with costs of £400 per week
- hourly wage rate: £12
disposable income (£ per month)
3000
2500
2000
1500
1000
500
0
-500
-1000
-1500
-2000
0
1000
2000
3000
4000
5000
6000
7000
UKMOD
SCOTBEN
Original income (£ per month)

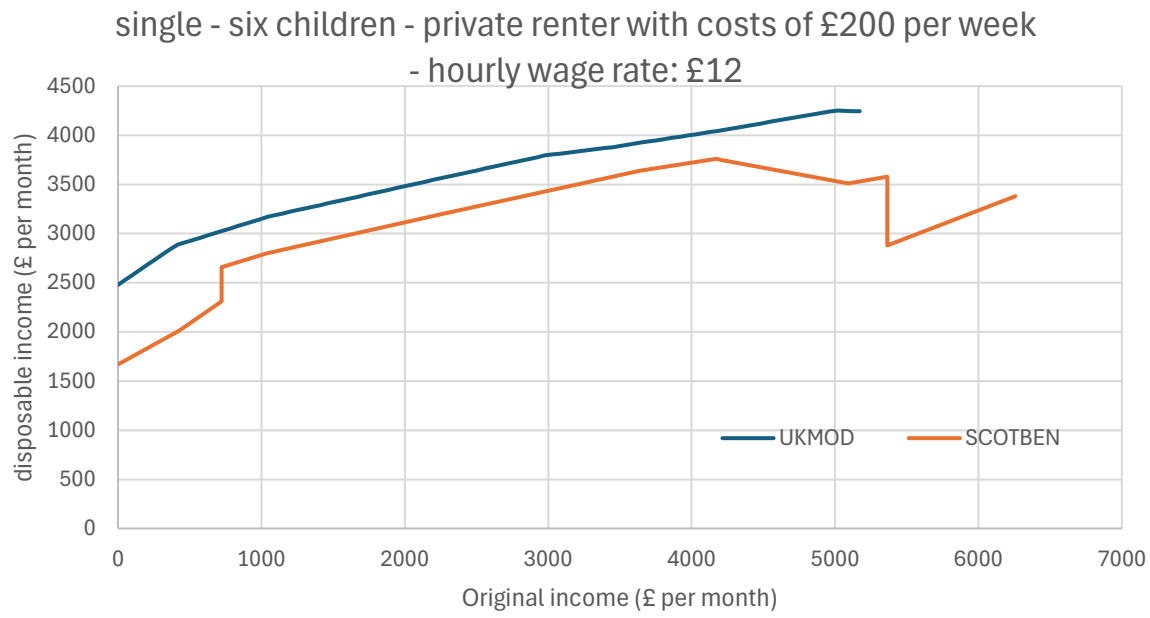

single - no children - home owner with costs of £400 per week
- hourly wage rate: £30
disposable income (£ per month)
6000
5000
4000
3000
2000
1000
0
-1000
-2000
0
2000
4000
6000
8000
10000
12000
14000
UKMOD
SCOTBEN
Original income (£ per month)


single - 3 children aged under 6 - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged under 6 - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged 6+ - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


single - 3 children aged 6+ - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - private renter with costs of £200 per week
- hourly wage rate: £12
disposable income (£ per month)
4500
4000
3500
3000
2500
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1500
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2000
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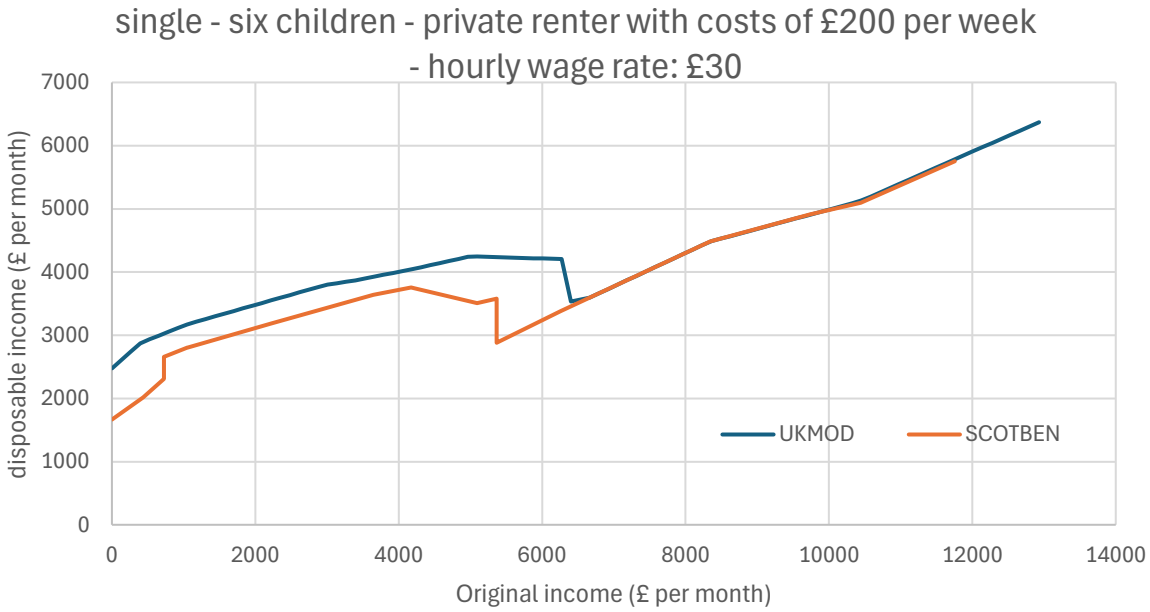
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - private renter with costs of £200 per week
- hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
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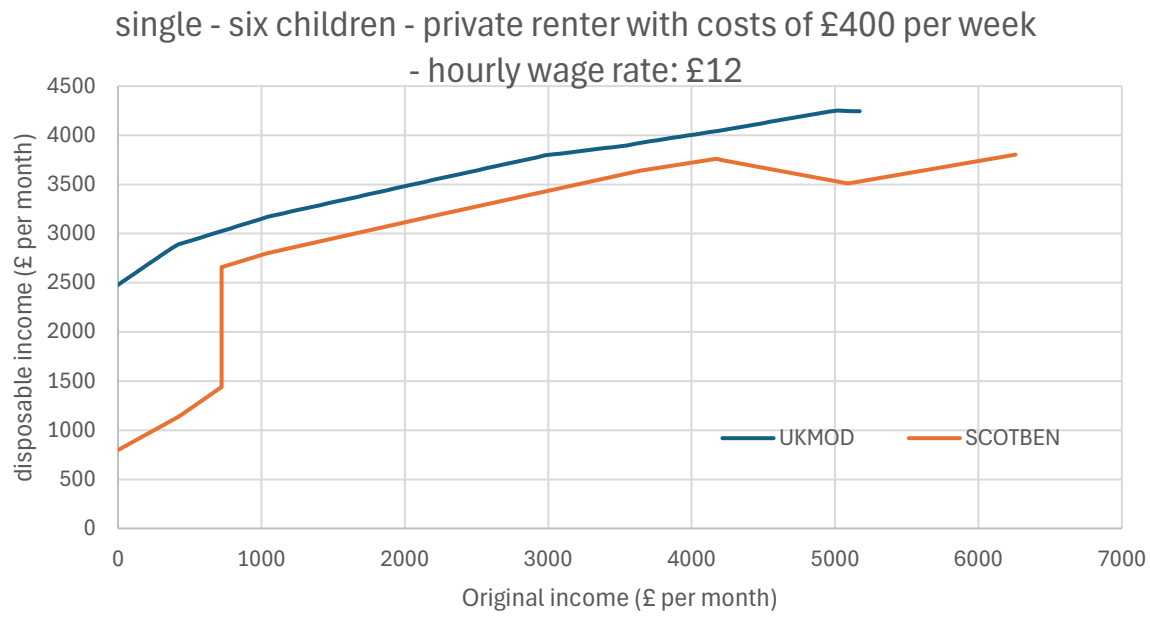
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - private renter with costs of £400 per week
- hourly wage rate: £12
disposable income (£ per month)
4500
4000
3500
3000
2500
2000
1500
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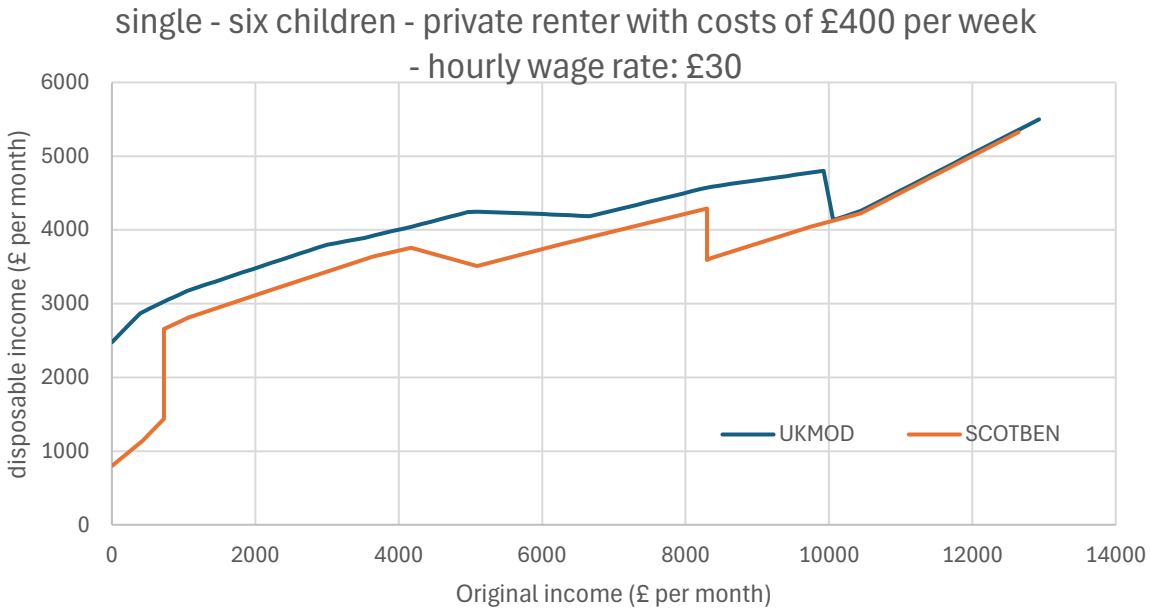
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - private renter with costs of £400 per week
- hourly wage rate: £30
disposable income (£ per month)
6000
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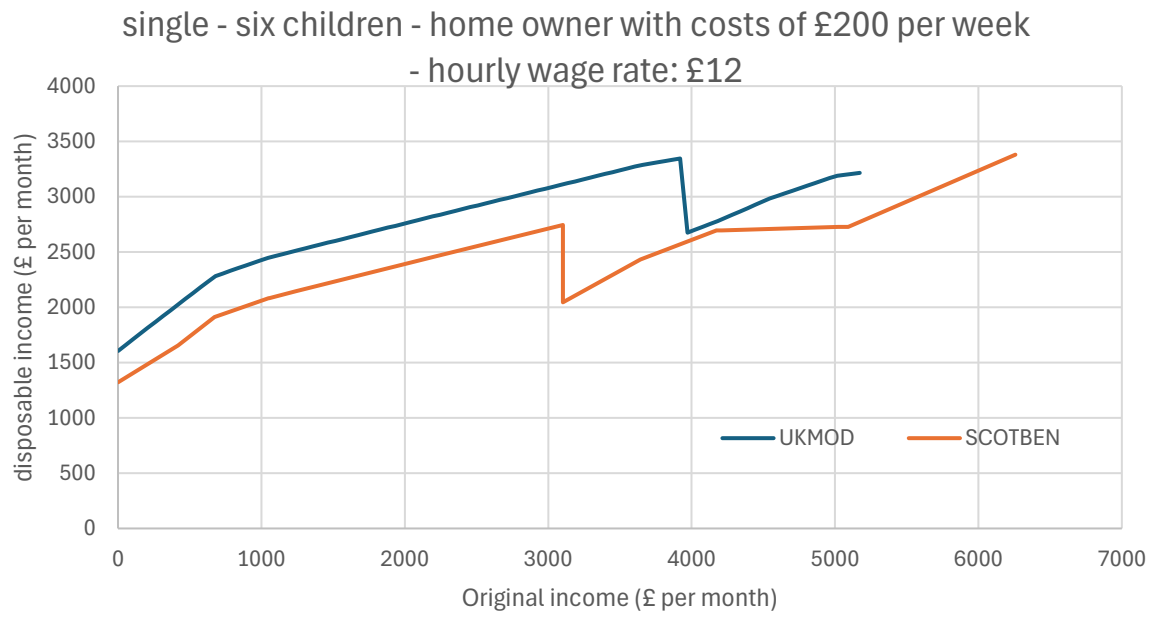
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - home owner with costs of £200 per week
- hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
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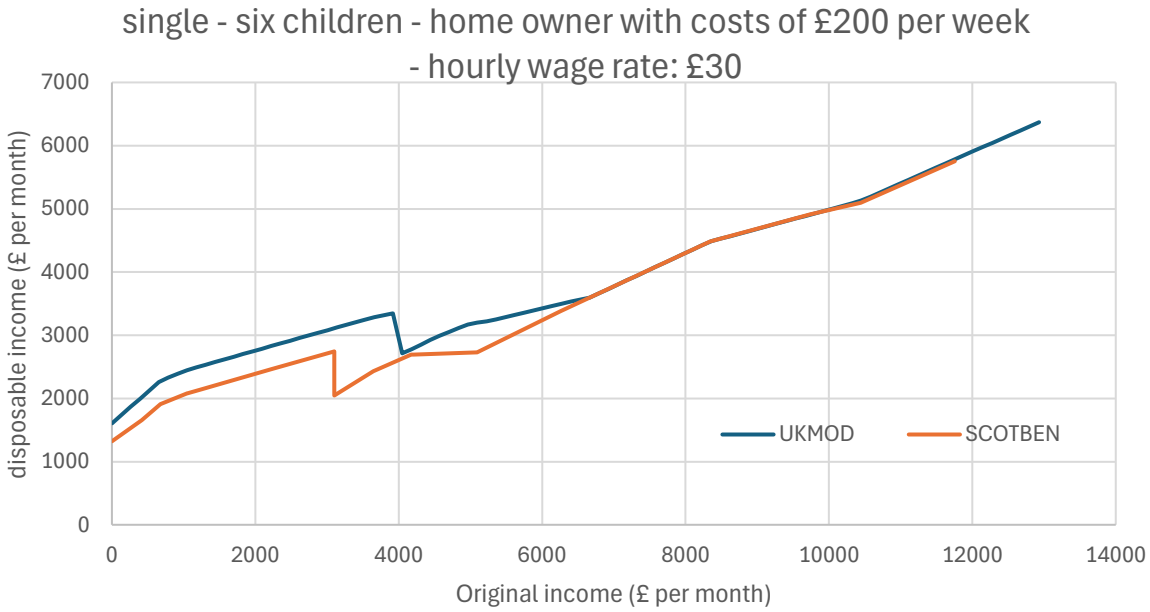
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - home owner with costs of £200 per week
- hourly wage rate: £30
disposable income (£ per month)
7000
6000
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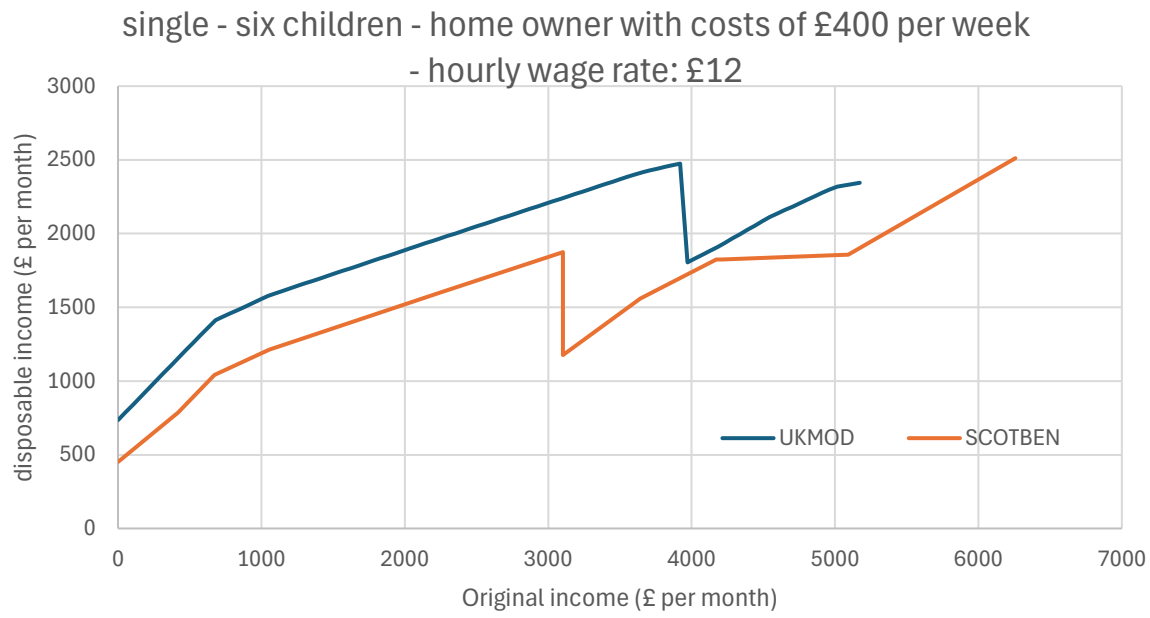
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - home owner with costs of £400 per week
- hourly wage rate: £12
disposable income (£ per month)
3000
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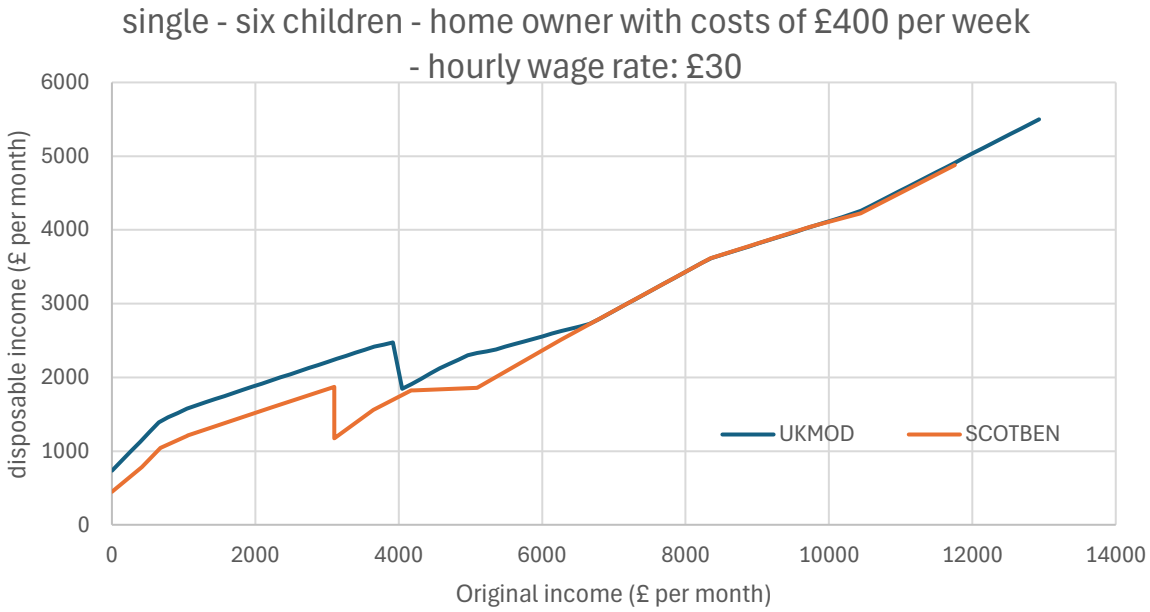
7000
Original income (£ per month)
UKMOD
SCOTBEN


single - six children - home owner with costs of £400 per week
- hourly wage rate: £30
disposable income (£ per month)
6000
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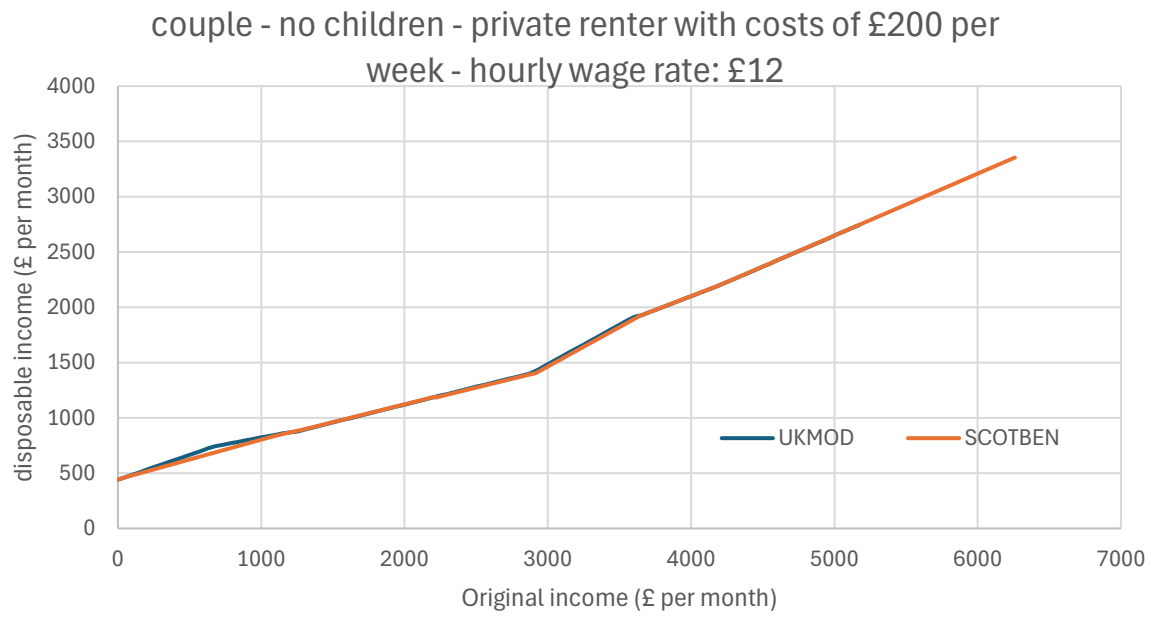
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
2500
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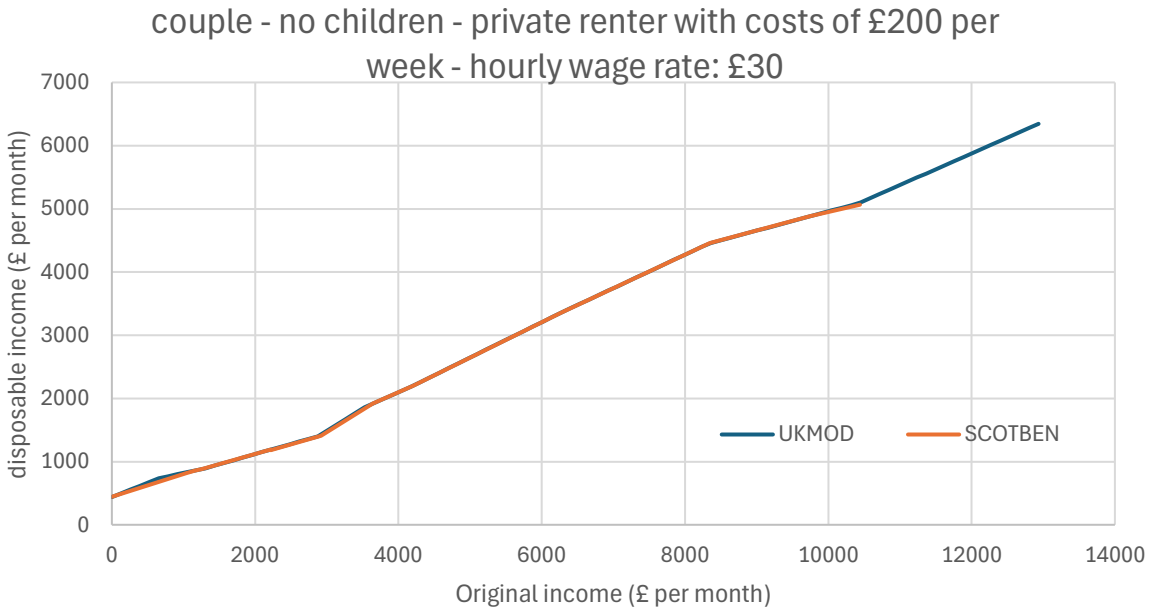
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
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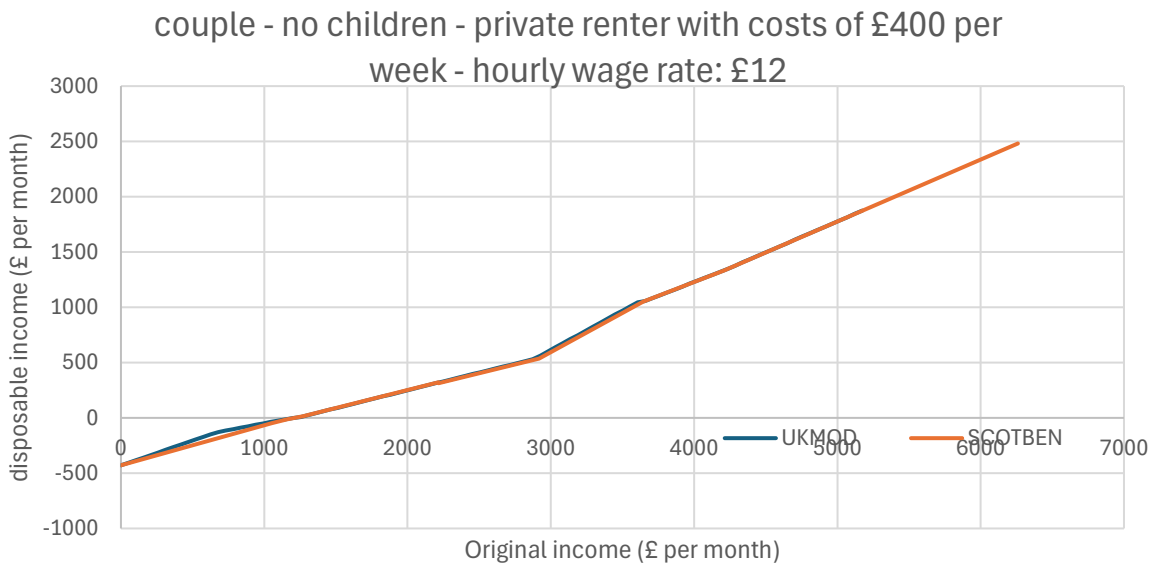
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
3000
2500
2000
1500
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500
0
-500
-1000
0
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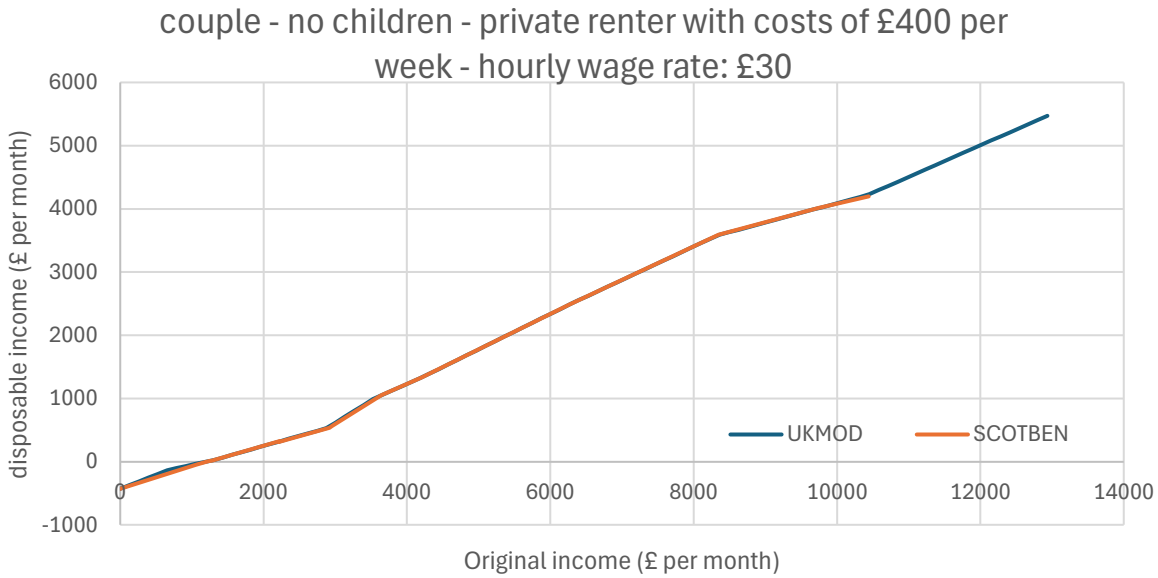
3000
4000
5000
6000
7000
UKMOD
SCOTBEN
Original income (£ per month)


couple - no children - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
6000
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-1000
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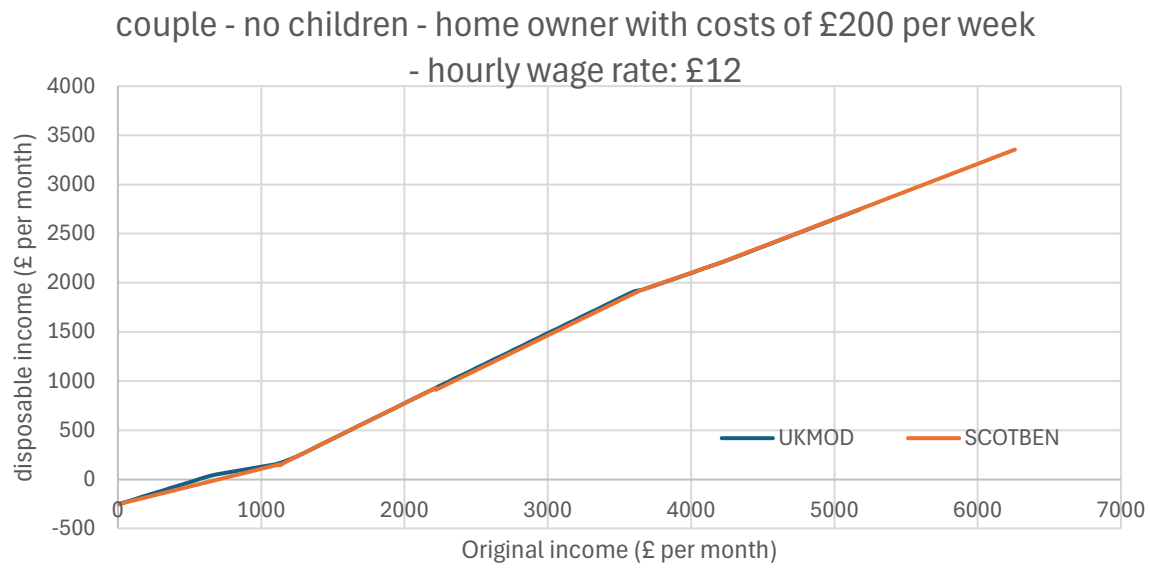
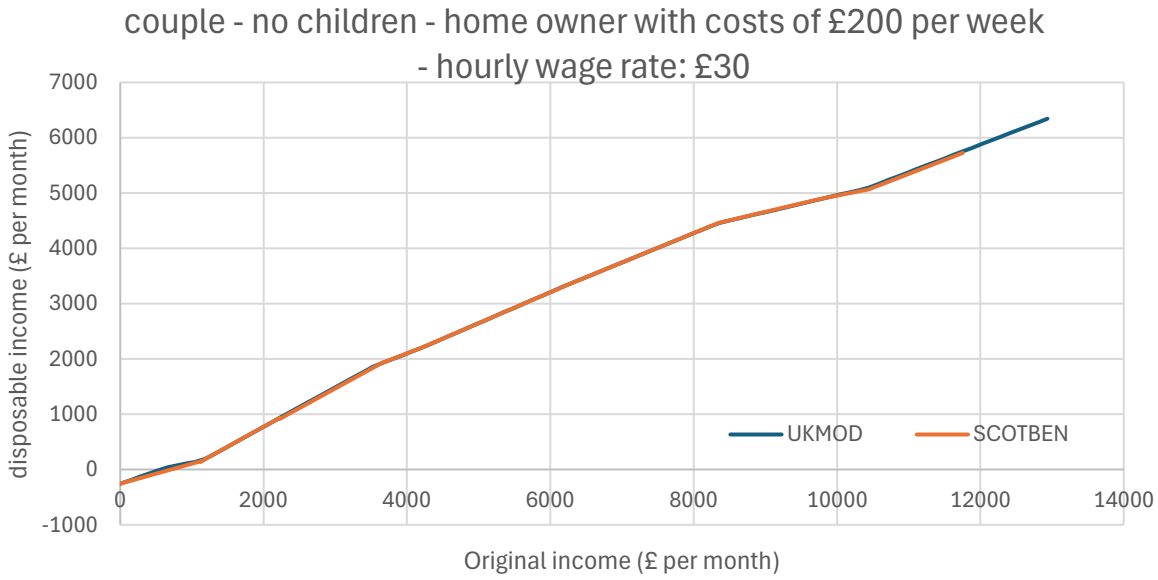
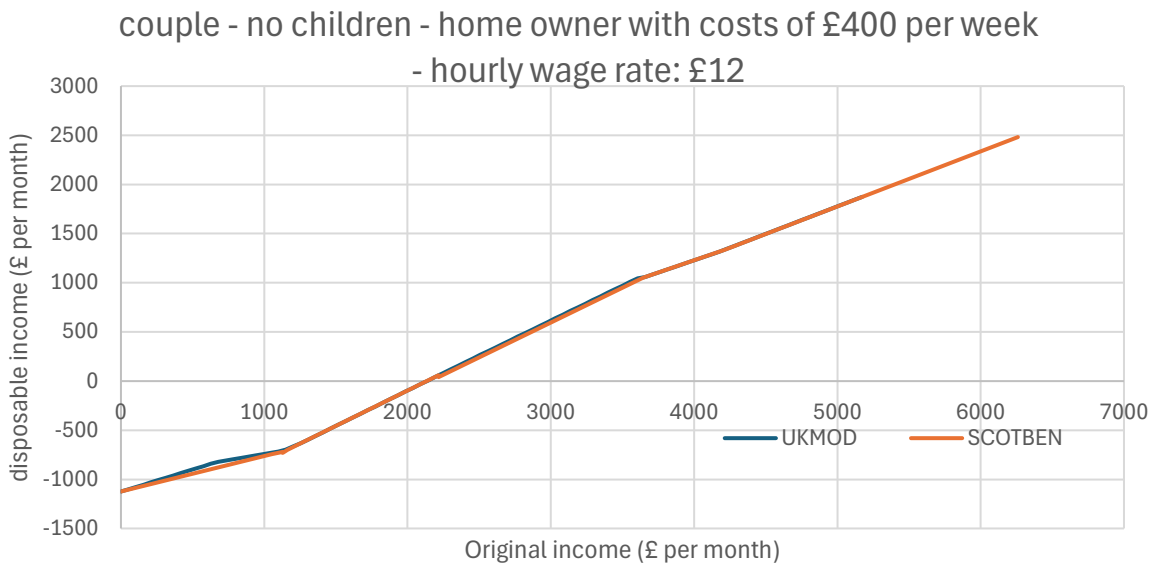
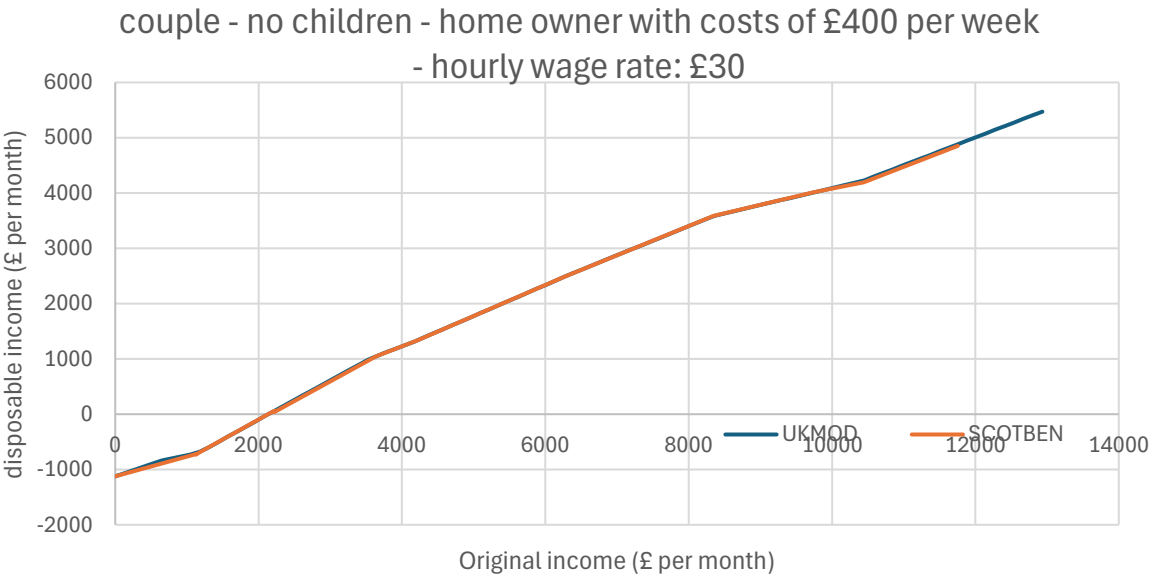
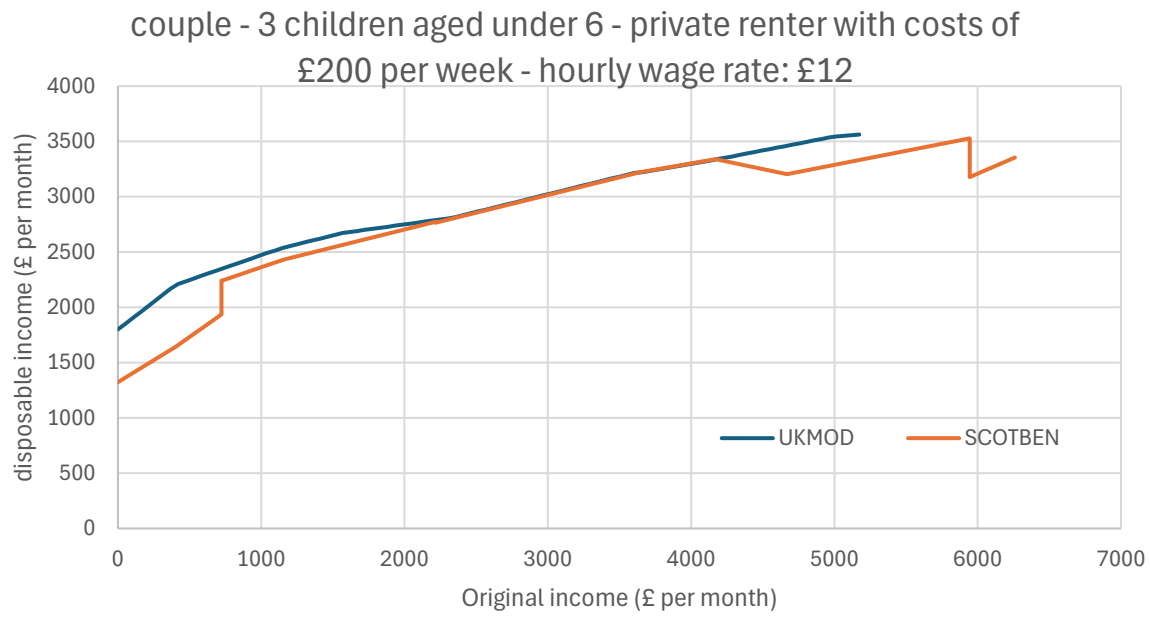
2000
4000
6000
8000
10000
12000
14000
UKMOD
SCOTBEN
Original income (£ per month)

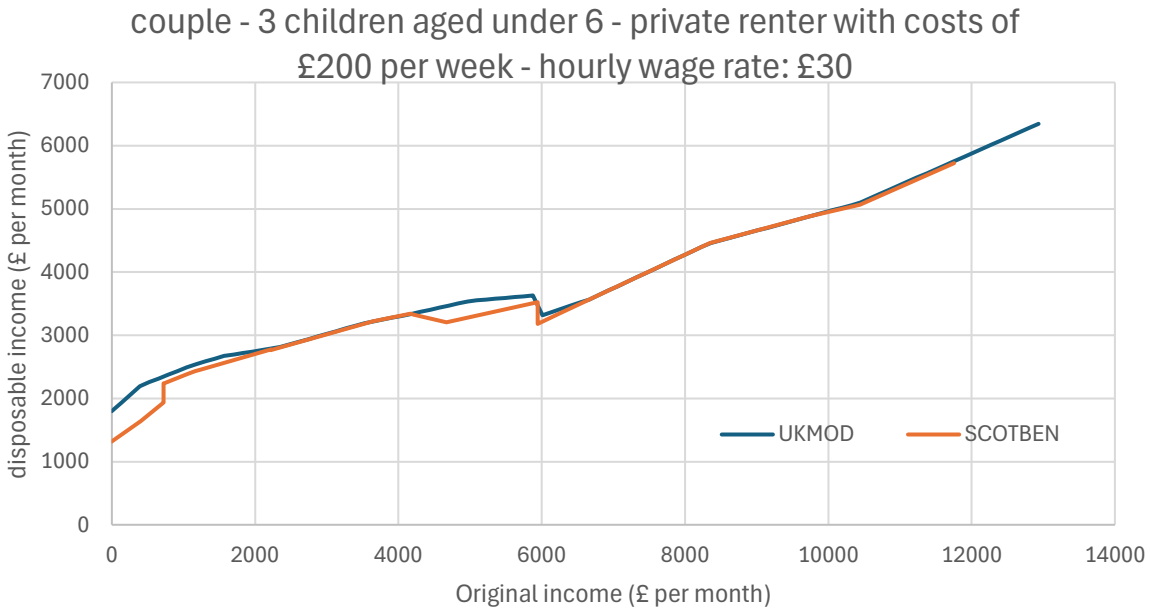

couple - no children - home owner with costs of £200 per week
- hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
2500
2000
1500
1000
500
0
-500
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - home owner with costs of £200 per week
- hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
-1000
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


couple - no children - home owner with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
3000
2500
2000
1500
1000
500
0
-500
-1000
-1500
0
1000
2000
3000
4000
5000
6000
7000
UKMOD
SCOTBEN
Original income (£ per month)

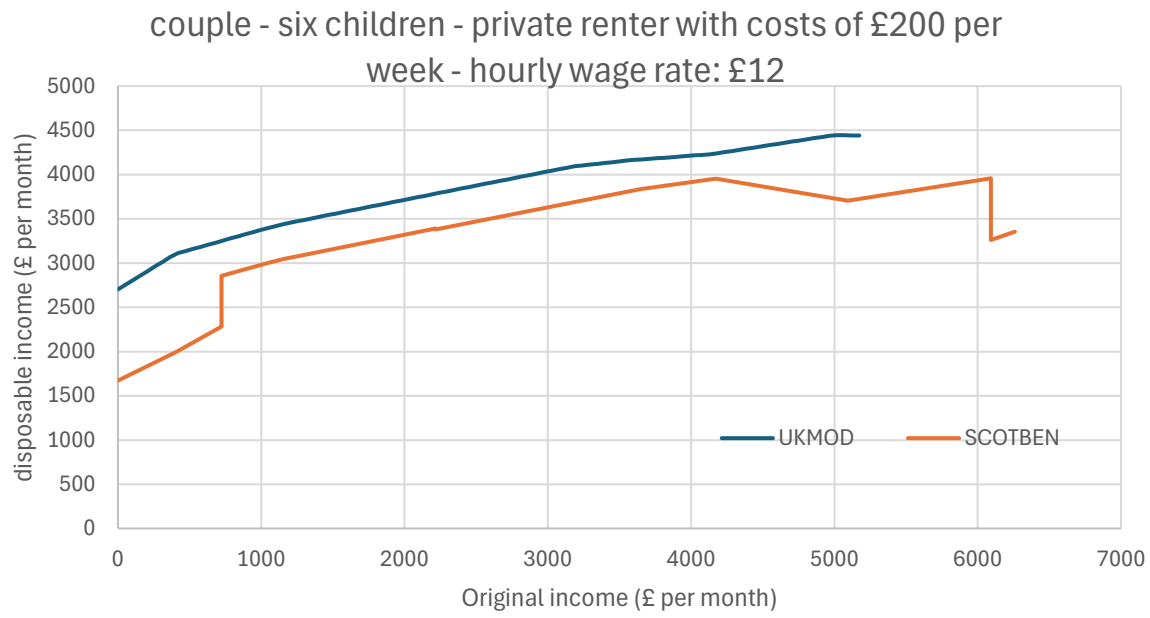

couple - no children - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
6000
5000
4000
3000
2000
1000
0
-1000
-2000
0
2000
4000
6000
8000
10000
12000
14000
UKMOD
SCOTBEN
Original income (£ per month)


couple - 3 children aged under 6 - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN

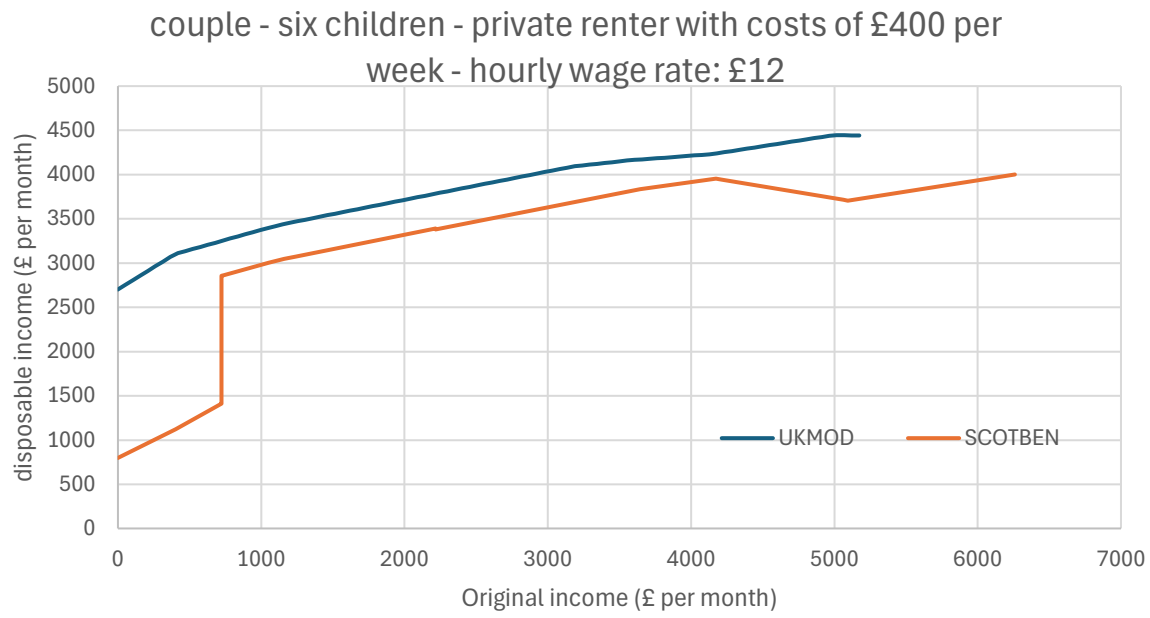

couple - 3 children aged under 6 - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN

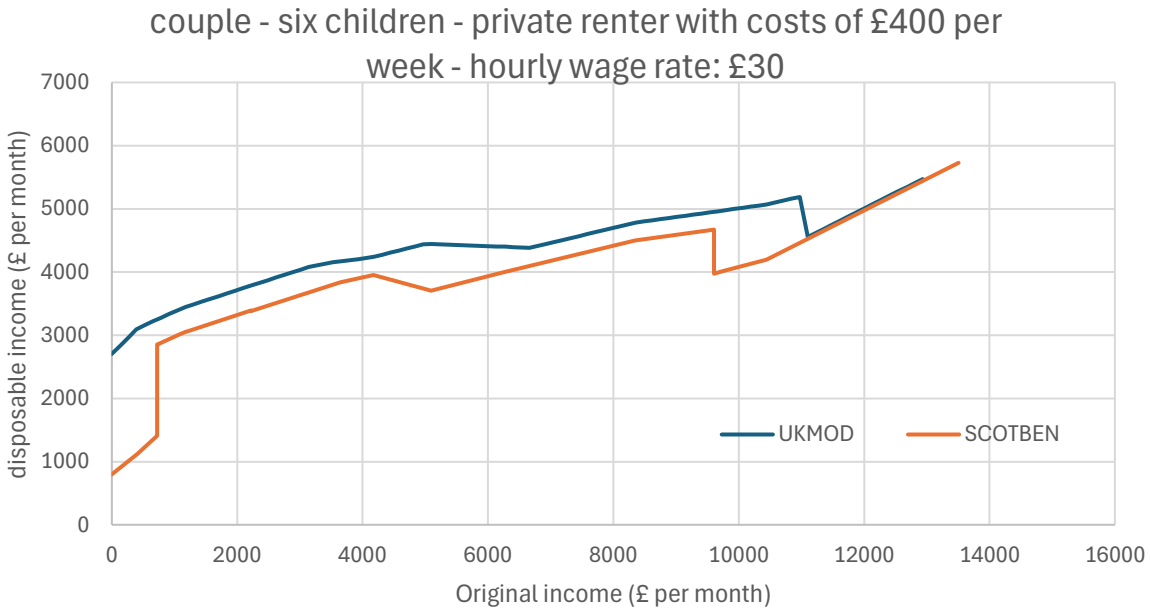

couple - 3 children aged 6+ - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN

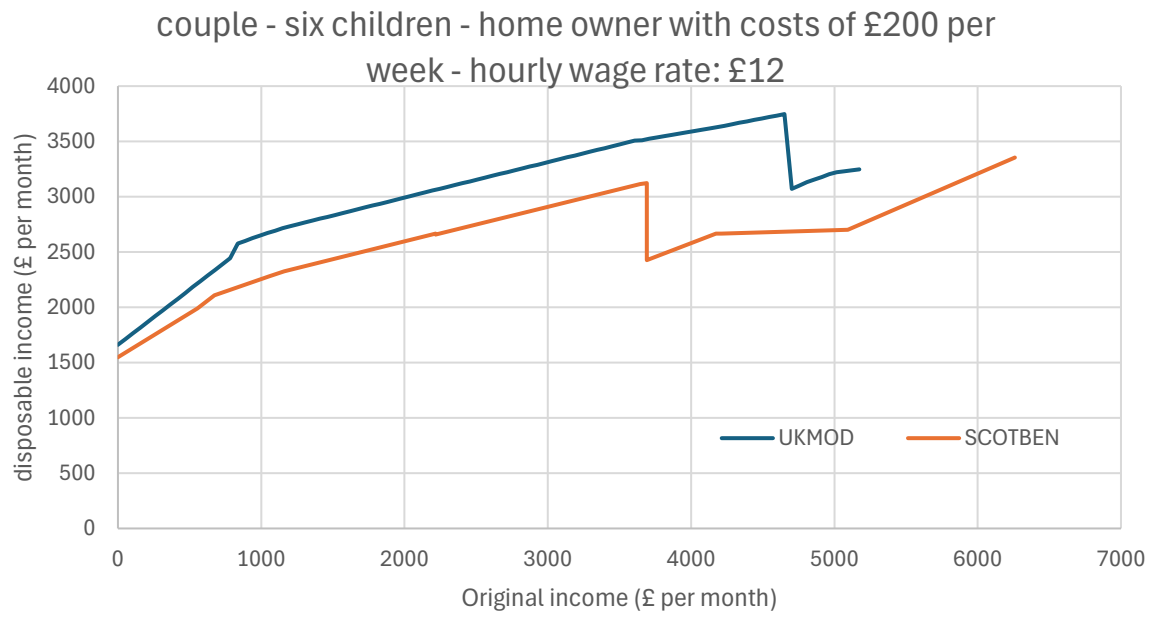

couple - 3 children aged 6+ - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - private renter with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - private renter with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - private renter with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
1000
2000
3000
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - private renter with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
5000
4000
3000
2000
1000
0
0
2000
4000
6000
8000
10000
12000
14000
16000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - home owner with costs of £200 per week - hourly wage rate: £12
disposable income (£ per month)
4000
3500
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2500
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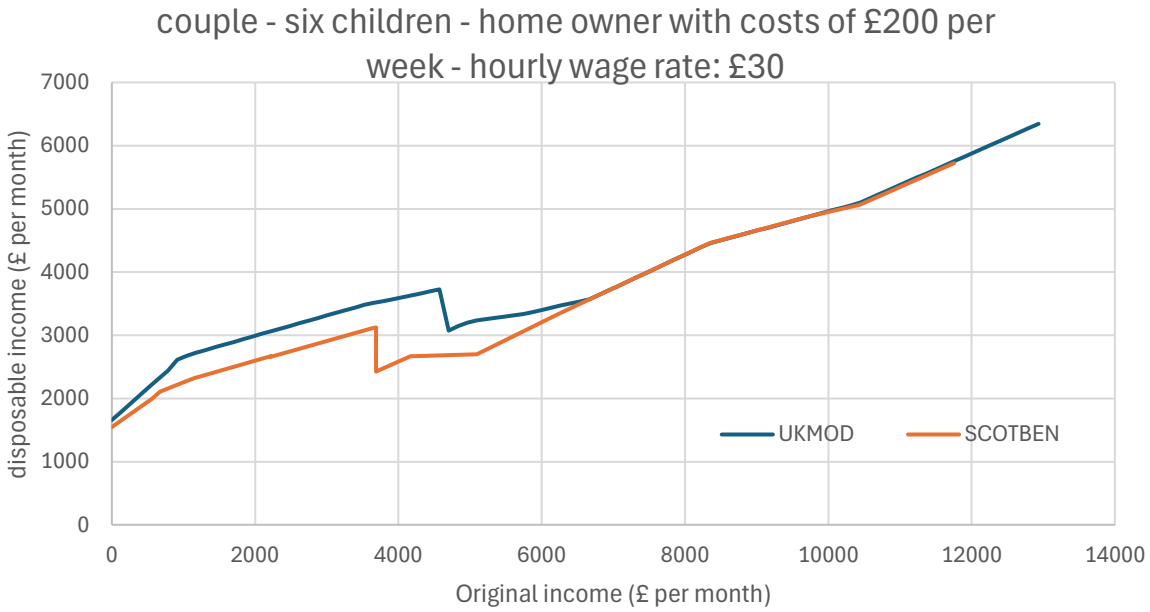
4000
5000
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - home owner with costs of £200 per week - hourly wage rate: £30
disposable income (£ per month)
7000
6000
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4000
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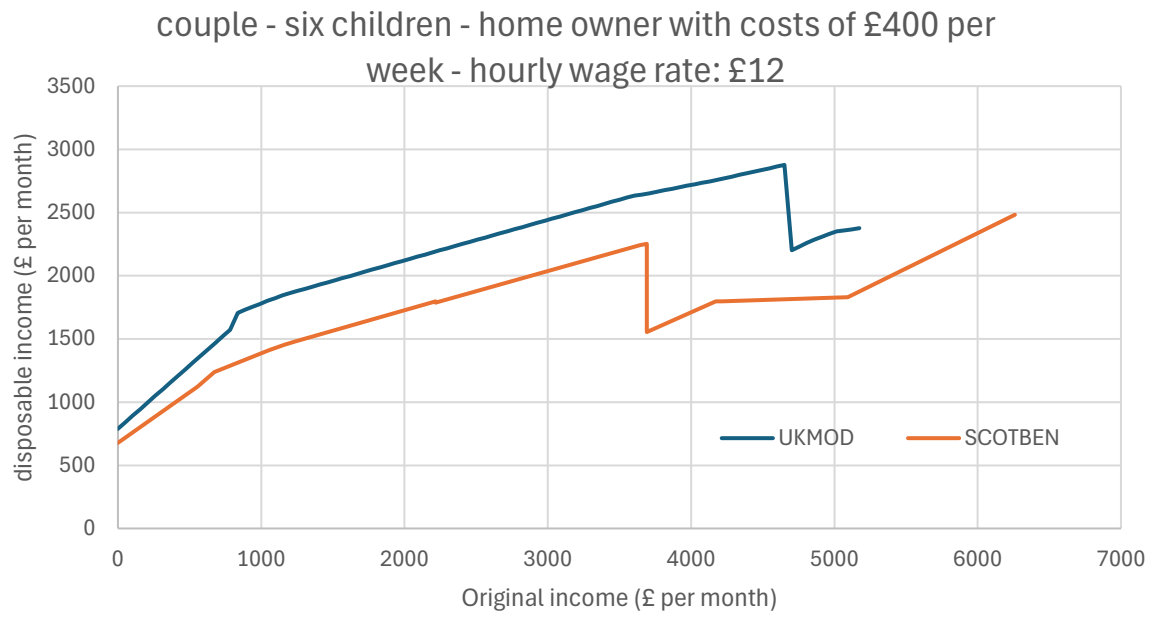
8000
10000
12000
14000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - home owner with costs of £400 per week - hourly wage rate: £12
disposable income (£ per month)
3500
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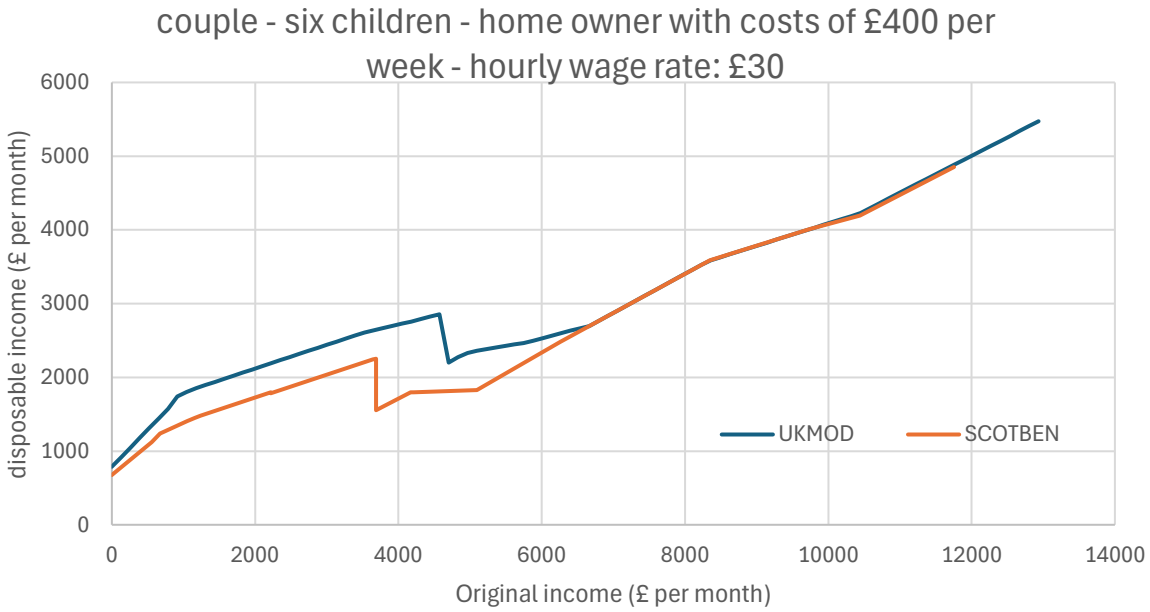
6000
7000
Original income (£ per month)
UKMOD
SCOTBEN


couple - six children - home owner with costs of £400 per week - hourly wage rate: £30
disposable income (£ per month)
6000
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12000
14000
Original income (£ per month)
UKMOD
SCOTBEN