

# **Feasibility of Distributional Analysis for the Scottish Government Budget**

**March 2021**

## Executive Summary

The Scottish Parliament's Budget Process Review Group recommended that Scottish Government "consider the feasibility of distributional analysis for tax, benefit and expenditure by protected characteristic and income distribution".

This report describes the project that was undertaken and its findings. Data from the 2019-20 Scottish Budget was used to develop and test whether a statistical model could be built for Scotland. By using Budget data it was also possible to produce outputs that could test wider issues of feasibility such as the range of assumptions that need to be made, the resource and practical implications of undertaking the work and the value and utility of results.

The feasibility project showed that it is possible to produce cumulative distributional impact analysis of the Scottish Budget, for some if not all equality characteristics. Breakdowns were possible for household net income deciles, household type and, by making certain assumptions, for age, sex and disability. Some breakdowns by ethnic and religious groupings are included in the report although the data here is based on small sample sizes and therefore are less robust. It was not possible to provide breakdowns for the other protected characteristics (sexual orientation, gender reassignment and pregnancy and maternity).

The feasibility study also showed that:

- This type of distributional analysis is a highly resource intensive and complex task.
- It is possible for the outputs to be misinterpreted, therefore distributional analysis should be accompanied by clear explanations of assumptions and guidance about interpretation of findings.
- Life stage plays a key role in determining distributional outcomes. Consideration of this is critical in the interpretation of results as it contributes significantly to the complex interplay between different characteristics.
- Even relatively large changes in spend to individual budget lines will be very difficult to spot as part of the overall expenditure, but there is potential for these methods to be utilised at individual policy level for 'what-if' analysis.
- Comparability with other models and outputs (including that used by HM Treasury), will be limited as different data sources and methods will have been used in some aspects of the model development.

In summary, the feasibility work found that cumulative distributional analysis can be a valuable tool to understand the impact of the Scottish Budget in total has on different households and individuals in Scotland. Its value was considered to be greater in providing a baseline assessment - updated at regular intervals - which can help identify areas where more detailed analysis at individual policy level might be useful.

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# 1. Introduction

This report presents findings about the feasibility of undertaking distributional analysis for tax, benefits and public services expenditure of the Scottish Budget.

Developing distributional analysis tools within the Scottish Government could help inform future policy decisions and enable the government and others to understand the value of the Scottish offer.<sup>1</sup> This type of analysis is produced by both HM Treasury<sup>2</sup> and Office for National Statistics<sup>3</sup> to show the impacts of the UK budgets in terms of tax, social security benefits (welfare) and expenditure on public services (benefits in kind) by income decile.

This report summarises the approaches and methods used in undertaking this challenging task. All distributional analysis requires a range of decisions and assumptions to be made about the benefits, taxes and services that should or could be included in the analysis and the modelling approaches used to define them.<sup>4</sup> The report outlines the chosen approach taken for the feasibility work and sets out the decisions taken including the pros and cons of each. It also highlights some of the challenges and limitations of interpreting any form of distributional analysis.

In this report the feasibility of undertaking distributional analysis has been tested by income distribution and also by protected characteristics. Further details, including technical details, are included in Annexes A to G.

## 1.1 Background

Scottish Government has for some time undertaken distributional analysis of individual direct tax and social security benefit policies. They are an analytical part of the policy development process intended to provide information about the impact on different groups. However, there have been calls in the past few years for this budget analysis to be extended to produce a cumulative assessment in order to understand the full impact of both direct and indirect taxes alongside other budget decisions on individuals and households. In particular, the Scottish Parliament's Budget Process Review Group recommended that Scottish Government "consider the feasibility of distributional analysis for tax, benefit and expenditure by protected characteristic and income distribution".<sup>5</sup> A similar call was made by the Parliament's Equality and Human Rights Committee and the Equality and Human Rights Commission (EHRC).

Distributional analysis is commonly used to estimate the effects of direct taxes and benefits on people with different levels of income. The call from the Scottish Parliament's Budget Process Review Group was to extend this to consider distributional analysis by protected characteristics, enabling investigation of how different groups – by protected characteristic – fare in terms of tax and benefit policy. It might also provide a better understanding of the intersection of different characteristics. The further expansion to include public expenditure allows for a better understanding of how the Scottish offer, in full, impacts on those in different income brackets and also by protected characteristic. The addition of analysis by equality

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<sup>1</sup> In this report this is concerned with the welfare benefits and public services provided via Scottish Government and the tax levels/rates that generates government income.

<sup>2</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/871883/Budget\\_2020\\_DA\\_publication.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/871883/Budget_2020_DA_publication.pdf)

<sup>3</sup> <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/bulletins/theeffectsoftaxesandbenefitsonhouseholdincome/financialyearending2019>

<sup>4</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/458248/HM\\_Treasury\\_review\\_of\\_the\\_OBR\\_03092015.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/458248/HM_Treasury_review_of_the_OBR_03092015.pdf)

<sup>5</sup> [http://www.parliament.scot/S5\\_Finance/Reports/BPRG\\_-\\_Final\\_Report\\_30.06.17.pdf](http://www.parliament.scot/S5_Finance/Reports/BPRG_-_Final_Report_30.06.17.pdf) Recommendation 43

characteristics and the inclusion of public spending alongside direct taxes and benefits, were the two major novel features of the project.

## 1.2 Challenges in extending distributional analysis

The calls to extend distributional analysis also recognised that this would present considerable challenges. A seminar of experts brought together in October 2018<sup>6</sup> to discuss the feasibility of distributional analysis in Scotland identified a range of issues that would need to be addressed.

A key initial question was which components of government activity to include in the model. On the one hand, distributional analysis which incorporates indirect tax and public services is desirable because it provides a more complete picture of the relationship between individuals and the state than an analysis which focuses solely on direct taxes and benefits. On the other hand, while public services tend to be progressive, they are based on the principle of universality and as such are not intended to be redistributive in the manner of tax and benefits. For this reason, performing distributional analysis on public spending is conceptually problematic. This may explain why despite quite a few governments undertaking and presenting distributional analysis of changes to tax and welfare benefit policies – very few attempt to present analysis of the overall offer/package that people receive.<sup>7</sup>

One of the main challenges of performing distributional analysis in Scotland is the relatively small size of the Scottish sample in UK-wide surveys such as the Family Resources Survey (FRS) and the Living Costs and Food Survey (LCF), the two main data sources for most distributional analysis in the UK. Although the Scottish FRS sample has been boosted, and the Scottish LCF sample is due to be boosted, it is still necessary to pool multiple years of data. Pooling, however, runs the risk of concealing distributional changes within rolling averages.

There are also issues with the quality of the data sources themselves. The FRS, for example, is known to underreport benefit take-up and mis-report very high and very low incomes. Gender also poses unique challenges for distributional analysis due to the lack of data on how income is shared within households, which obscures both distributive impacts and behavioural responses. Ethnicity and religion and belief data is affected by small sample size and other characteristics such as sexual orientation, gender reassignment and pregnancy and maternity are absent from the data.

Public spending is the most difficult component to model from a technical perspective. Generally speaking, the first step involves determining patterns of service use, either by gathering usage data or by estimating usage patterns based on household characteristics. However, the benefits of a given service cannot always be ascertained from usage of that service. Additionally, some services benefit everyone equally and are not exactly 'used' by anyone. This is the case with defence and environmental protection, for example, which are generally excluded from distributional analyses. Even when usage differs between groups it may present a misleading picture. For example, individuals who do not use a given service may still benefit from it, and one person's use may have knock-on benefits to others. The NHS, for example, provides insurance to all members of society, not just those who have existing health conditions, and also benefits employers by supporting a healthy workforce. Conversely, it is simplistic to assume that, because certain people use a public service more, they would necessarily benefit more from public spending on that service. For example, women use buses more than men, but it would be misleading to conclude that spending on buses is

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<sup>6</sup> <https://www.gov.scot/publications/distributional-analysis/>

<sup>7</sup> <http://www.oecd.org/governance/budgeting-and-public-expenditures-in-oecd-countries-2018-9789264307957-en.htm>

straightforwardly positive for gender equality, since asymmetric bus use is likely to reflect underlying inequalities.

The second step in incorporating public services in distributional analysis is to combine service use with some kind of 'price' in order to translate in-kind benefits into monetary values. Some aspects of public service expenditure are easier to model than others. Resource expenditure, for example, is generally more straightforward than capital, the benefits of which may not accrue immediately and may be more dispersed across the population. Even resource expenditure raises problems, however, since the benefits may spill over from the immediate beneficiaries. For example, if NHS pensions were increased, and morale and productivity improved as a result, it could be argued that the wider public would benefit in addition to NHS workers and their families through an improvement in the service.

In summary the technical challenges of distributional analysis can be broken down into three sets of issues:

- Data availability challenges include:
  - lack of sufficient Scottish sample size in some surveys – which provide the basis for analysis for protected characteristics
  - data gaps about income sharing in families
  - data gaps about income and benefits received (including under-reporting of benefit take-up and inaccuracies in reporting of income received).
- Modelling of public spending on services is difficult for several reasons, including:
  - determining patterns of usage
  - determining the value/price attached to usage
  - quantifying the benefit produced by, and who benefits from, usage.
- The interpretation of findings can be complex.

### **1.3 Feasibility project**

In December 2018, it was agreed with Ministers that the Scottish Government would take forward work to consider the feasibility of distributional analysis as a specific element of budget analysis.

The project aimed to look at the feasibility of developing analysis of the cumulative impact of different taxes, cash benefits and spending on public services. Many individual policies make up the overall package of the 'Scottish offer' but the aim of this work is to understand how the different parts of the spend and revenue of the Scottish Budget combine and the impact of that combination on people and households in Scotland. It does not look at the impact of changes in individual policies, but only at the overall offer at a point in time for different individuals and households. The results from the project in effect produce a baseline of the current offer in total. This could help highlight areas where a separate 'what-if' analysis might be usefully undertaken to understand the effect of making a change to a particular aspect of tax or expenditure.

The aims of the project were:

- to undertake feasibility work, on the technical aspects of cumulative distributional analysis
- to undertake feasibility work on the potential outputs, applications and interpretation of the results from cumulative distributional analysis
- to advise Ministers and stakeholders on the technical feasibility and potential usefulness of distributional analysis of the Scottish budget for informing policy development.

To undertake the technical feasibility of a cumulative distributional analysis it was necessary to design, populate and test a model. To test the model, data was used from a previous budget (Scottish Budget 2019-20). The results allowed us to consider wider aspects of feasibility such as issues in interpretation and potential usefulness of the analysis.

The project was guided by a project board and internal quality assurance was provided by a group of Scottish Government analysts and policy advisers. External quality assurance was provided by IPPR.

## **1.4 Structure of report**

Chapter 2 of this report sets out which budget items our analysis is based on. Annex A gives references to the individual budget lines.

Chapter 3 gives an overview of our approach to modelling and the model we have developed, which brings together taxes, benefits and public services. It shows what is included in the model and gives an estimate of coverage. Annexes B, C and D give technical overviews of how we have approached each aspect of the modelling, together with some descriptive output.

Chapter 4 shows the outputs of the model and gives a commentary on the charts produced. The charts and chart data can be found in Annex F and G. Annex E gives additional information about the composition of the different income deciles.

Finally, Chapter 5 presents our conclusions of the feasibility study.

## 2. Which Budget Items are we considering?

This chapter presents information about the different sources and expenditure information we used.

### 2.1 Principles of what to include

To identify the relevant budget items to consider in the analysis we needed to identify those items that impacted on individuals or households in a measureable way. For example, welfare benefits are received by households or individuals, but taxes may be paid by individuals, households or businesses. At the same time, public services may be used by individuals, households or businesses. As the purpose was primarily to gain insight into the impact on households and individuals a decision was taken to exclude taxes and benefits pertaining to businesses. The analysis also excluded public spending on services which benefit everyone equally and are not exactly 'used' by anyone such as defence or environmental protection.

Therefore:

For the purpose of this work we considered only taxes, benefits and public services which are paid or used **by individuals or households within a given year**.

To be included in the work, individuals or households need to be clearly identifiable as a beneficiary of a public service.

### 2.2 The Budgets and other supporting documents

Taxes, welfare benefits and public services are not determined in isolation by the Scottish Government. Local Government for example is paid a block grant by the Government but they can also raise additional revenue - through Council Tax and Non-Domestic Rates – and they allocate expenditure (apart from ring fenced policy) and provide services. For welfare benefits, the majority of expenditure in Scotland is currently funded by the UK Government. Therefore choices about revenue raising and expenditure are made by different bodies – and they all need to be looked at to undertake the analysis.

#### 2.2.1 The Scottish Government Budget for 2019/20.

Passed on the 1 April 2019, the Scottish Government Budget for 2019/20 included a total expenditure of £42.6 billion. The Scottish Budget comprises of four categories of public expenditure.

- **Fiscal Resource** makes up over two-thirds of the Scottish budget (67%). It includes staff costs, benefit payments, grants to NHS boards and local governments, and other spending on day-to-day management and administration.
- **Annually Managed Expenditure (AME)** (19% of the Scottish Budget) includes funding which is ring-fenced for less predictable expenses, such as pensions in the health and education sectors (c £4.4bn for 2019/20), non-domestic rates (£2.6bn) and student loans (c £400m).
- **Capital expenditure** (12% of the Scottish Budget) comprises investment in infrastructure and other long-term assets. In the 2019/20 budget, the largest items of

capital expenditure were house construction (£775m), planning support (£704m), rail services (£836m), and motorways/trunk roads (£409m).

- **Non-cash expenditure** (2% of the Scottish Budget) covers the depreciation of public-sector assets.

The majority of expenditure which falls within the scope set out above – services used by individuals or households within a given year - is likely to come under the Fiscal Resource budget. As a result **we include only the fiscal resource part of the budget** in our analysis.<sup>8</sup>

Fiscal resource expenditure contains £7.1 billion of funding for the Communities and Local Government budget portfolio. However, as noted above Local Government are a primary beneficiary of the Scottish Budget with this funding often split across different budget lines. A document called the Local Government Revenue Expenditure and Financing 2019-2020: provisional outturn and budget estimates (POBE) sets out all local government expenditure on public services (funded not only by the General Revenue Grant from Scottish Government but also by local revenue streams such as Council Tax and Non Domestic Rates). To avoid double counting, we therefore exclude the Communities and Local Government budget line and use the information in Local Government POBE returns instead.<sup>9</sup>

#### 2.2.2 Local Government Provisional outturn and budget estimates (POBE)

Published in June 2019, the POBE budget estimates for 2019/20 contain £12.635 billion of expenditure on public services. These public services include:

- Education
- Social Work
- Environmental Services
- Culture & Related Services
- Roads & Transport
- Planning & Development.

#### 2.2.3 Scottish Government - Autumn Budget Revision 2019/20

Published at the end of September 2019, the Autumn Budget Revision (ABR) makes revisions to the 2019/20 budget passed in April 2019. For the purposes of this analysis, the ABR is used to update information on concessionary fares, bus services and the level of higher education student support for 2019/20.

#### 2.2.4 Scottish Funding Council Allocations

For students we use Scottish Funding Council budget allocations to Universities and Colleges for Academic Years 2018/19 and 2019/20. These documents give detailed information on funding to universities and colleges. This information is based on academic years (running September to August) so the information in them is converted to financial

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<sup>8</sup> We have not included student loans. We excluded them for several reasons which are outlined in Annex D. One reason was that student loans come from the AME budget rather than resource funding – therefore we excluded these from our modelling. Also they would need to be treated as negative income and we have not included debt in gross income calculations elsewhere in the model.

<sup>9</sup> CLG portfolio includes funding for local authorities as well as policy areas such as planning, housing, homelessness, regeneration, supporting third sector, social enterprise and social justice. The vast majority of the budget across policy areas goes to local authorities through block grant or ring fenced payments so use of POBE was thought to be the better option, acknowledging that funding going to third sector bodies will be excluded from the analysis.

years (April to March). The more detailed information ensures that, for example, teaching is allocated just to undergraduate students benefitting from it. The modelling takes account of place of domicile, level of study and whether full or part time (see Annex D for more details).

#### 2.2.5 Student Awards Agency for Scotland Statistics

We used Student Award Agency for Scotland Statistics (2019/20) to determine the correct number of students receiving support for tuition fees, grants and bursaries. As outlined above, we do not include student loan funding in this analysis.

#### 2.2.6 Skills Development Scotland Annual Procurement Report

For apprenticeships, we use the Skills Development Scotland Annual Procurement Report for 2018/19. This document gives details on Modern Apprenticeships and Foundation Apprenticeships.

All of the above documents detail the financial amounts spent on each public service included in the model. Links to further data sources - detailing the number of people or households benefitting from each service – are contained in the annexes.

Budgets are written in advance of the financial year, and relate to future spend. However, there is often a significant time lag between budgets and outturn data on spend. For example, in the case of the 2019/20 budget, outturn data for 2019/20 - the data on what was actually spent - will not become available until September 2021. This is around eighteen months after the original budget. Outturn information on the amount of income tax paid and expenditure on benefits follows a similar time lag.

In order to undertake a distributional analysis of the budget – which relates to spend in the future – we need to use historical data and various modelling techniques to “nowcast” this information - about the population, the economy and public service usage - to the year of interest. In this case 2019/20. The next section of the report describes how we operationalised this for the feasibility project.

### 3. The Model

The first step was to consider the range of existing models available to undertake this work. Table 1 outlines the models and their characteristics. It became apparent from this review that existing models did not provide what was needed for the purpose of a cumulative impact assessment of the budget. They were either not available to Scottish Government to use; did not provide sufficient coverage of taxes, benefits or services; or they were not without constraints about how we could use them or publish findings from them. Importantly, some of the models were not designed to undertake this type of cumulative distributional analysis – but had been developed to undertake ‘what if’ analysis. This led us to conclude that a bespoke model was necessary.

**Table 1: Comparison of models**

Model	Owner	Available to SG?	Main Data Source	Coverage			
				Direct Tax	Benefits	Indirect Tax	Public Services
Tax and Welfare Model	Scottish Government	Yes	FRS	Yes	Yes	No	No
Tax Transfer Model <sup>10</sup>	Landman Economics	No	FRS	Yes	Yes	Yes	Yes
Intra-Gov Tax Benefit Model (IGOTM) <sup>11</sup>	HM Treasury	Yes	LCF	Yes	Yes	Yes	Yes – as add on
Policy Simulation Model (PSM) <sup>12</sup>	DWP	Partially	FRS	Yes	Yes	No	No
Euromod <sup>13</sup>	ISER, Univ. of Essex	Yes	FRS	Yes	Yes	No	No
TaxBen <sup>14</sup>	IFS	No	LCF	Yes	Yes	Yes	No
ONS microsimulation model <sup>15</sup>	ONS	No	LCF	Yes	Yes	Yes	Yes

To perform this work our preference was to have a single model. Hence we have created a model that comprises components to model the tax system, welfare benefits system and public service expenditure. It is a static model and does not take into account behavioural effects, such as how people might restructure their affairs in the event of a tax rise. More detailed information on each part of the model is contained in Annexes B, C and D. What follows is a brief technical overview of the model.

#### 3.1 Approaches to modelling

Having decided upon our overarching principles - that it must be possible to allocate expenditure to individuals or households and that we are concerned only with taxes, benefits and public services which are paid or used within a given year – the next step was to decide which taxes, benefits and public service expenditure to include.

An overview of approaches taken in the modelling is presented below – and more detail is provided in the annexes.

<sup>10</sup> <https://www.equalityhumanrights.com/sites/default/files/cumulative-impact-assessment-report.pdf>

<sup>11</sup> [https://www.sas.com/content/dam/SAS/en\\_gb/doc/other1/events/sasforum/slides/day1/W.Bryce%20SAS%20Forum%20UK%20-%20HMT%20slides.pdf](https://www.sas.com/content/dam/SAS/en_gb/doc/other1/events/sasforum/slides/day1/W.Bryce%20SAS%20Forum%20UK%20-%20HMT%20slides.pdf)

<sup>12</sup> <https://www.ukdataservice.ac.uk/media/428511/chomikmcdonagh.pdf>

<sup>13</sup> The freely accessible UKMOD is now available – but was not available when the project started - see <https://www.microsimulation.ac.uk/ukmod/> and EUROMOD - [https://www.euromod.ac.uk/sites/default/files/country-reports/year10/Y10\\_CR\\_UK\\_Final.pdf](https://www.euromod.ac.uk/sites/default/files/country-reports/year10/Y10_CR_UK_Final.pdf)

<sup>14</sup> [https://www.ifs.org.uk/uploads/Presentations/Adams\\_microsimulation\\_in\\_the\\_uk\\_-\\_taxben.pdf](https://www.ifs.org.uk/uploads/Presentations/Adams_microsimulation_in_the_uk_-_taxben.pdf)

<sup>15</sup> None on model per se - see <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/articles/theeffectsoftaxesandbenefitsonhouseholdincome/technicalreport>

## Taxes<sup>16</sup>

To model a given tax, we have to be able to assign it to either an individual or a household. Some taxes cannot be assigned to either because they are paid by businesses (e.g. corporation tax) or because there is insufficient data to model them (e.g. inheritance tax, capital gains tax).<sup>17</sup> Other taxes may be paid by both households and businesses – e.g. around 70% of VAT is paid by households.<sup>18</sup> Some taxes, such as Land and Buildings Transaction Tax (LBTT), are also challenging to model because they are paid infrequently. We decided to include only those taxes which can easily be assigned to individuals. This includes Income Tax, National Insurance (NI), VAT, Council Tax and all duties, including for example alcohol, tobacco and fuel duties.

In Scotland, non-savings non-dividend (NSND) income<sup>19</sup> tax is modelled by the Scottish Fiscal Commission for budget purposes. To do this they use a model which is based on the Survey of Personal Incomes – the best source for modelling NSND income tax. It would be technically possible to constrain the NSND income tax output from our modelling to that forecast by the Scottish Fiscal Commission. However, in order to ensure the integrity of our modelling we took an approach in which our NSND income tax model shares the same assumptions as the Scottish Fiscal Commission, but the model is allowed to generate slightly different tax results, as would be usual with different models. The differences are very small and make no discernible difference to the analysis. See Annex B for further detail.

## Welfare benefits

Welfare benefits may be paid to individuals or households – and therefore can be attributed, thus meeting our principles. There is considerable range in the amount of spend on benefits (from UK and Scottish governments) and the number of recipients of each benefit. The smaller benefits present some challenges for distributional analysis, for example the Scottish Welfare Fund or Best Start Grant. They may be difficult to model due to the relatively small number of recipients involved who may not appear in surveys. These smaller benefits are therefore unlikely to have discernible impacts in the distributional analysis outputs. However, they may have a significant impact on the people who receive them and they form part of the overall Scottish offer.

## Public Services

Whilst the methodology to undertake distributional analysis of tax and welfare (cash) benefits is well established and has been used for some time – there is no standard methodology for carrying out a distributional analysis of public service provision. Studies that have been published have tended to be concerned with methodological issues<sup>20</sup> or undertaken by external bodies<sup>21</sup> – very few governments publish this type of analysis. There are several key areas that present particular difficulties, including:

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<sup>16</sup> We only include taxes, we are not including charges or fees – such as care home fees, tuition fees, or charges for uses of services that may be provided by central or local government – e.g. access to sports facilities.

<sup>17</sup> Annex B gives further details of the tax modelling. The amount of some taxes in relation to overall tax take are small – e.g. capital gains tax – as well as having limited data availability.

<sup>18</sup> [HMRC A disaggregation of HMRC tax receipts between England, Wales, Scotland & Northern Ireland. Methodology Note. October 2018](#)

<sup>19</sup> Non-savings, non-dividend income includes wages, pensions, taxable state benefits, profits from self-employment and rental income.

<sup>20</sup> Verbist, G., M. Förster and M. Vaalavuo (2012), *The Impact of Publicly Provided Services on the Distribution of Resources: Review of New Results and Methods*, OECD Social, Employment and Migration Working Papers, No. 130, OECD Publishing, Paris. <http://dx.doi.org/10.1787/5k9h363c5szq-en>

<sup>21</sup> [The cumulative impact of tax and welfare reforms | Equality and Human Rights Commission \(equalityhumanrights.com\)](#)

- lack of information about who uses services and how this differs amongst different groups
- who benefits from use of the service
- lack of clarity about how different people/groups value the services they receive – in quantitative terms
- what impact changes in level of spending on services might have.

As a result of these challenges, modelling public services is the area of greatest uncertainty.

We – like others such as the HM Treasury – decided to exclude services that could not be attributed to individuals such as defence and environmental services. For most services we have adopted the usage principle – in that services are distributed amongst users in the analysis. However for health, following OECD<sup>22</sup> we have adopted an insurance approach – so spend is spread across the entire population rather than by usage - as it is argued that the population as a whole benefits from the insurance and knowledge of free health provision, in particular in public health provisions. Detailed breakdowns of usage at individual level are also scarce – even if we wanted to use that approach. However, we have made adjustments for age, sex and deprivation as this reflects differences in usage at population level. This in part recognises that any increase or decrease in health spend would not be felt equally amongst different groups. Further details of approach are in Annex D.

### **Equality/protected characteristics**

For some equality characteristics available data is scarce and even where information is available, small sample sizes often mean that reliable modelling cannot be carried out. Developments such as the recent boosts to the FRS Scottish sample has allowed more detailed breakdowns but information for some characteristics remains scarce.

No suitable data is available on maternity and pregnancy, gender reassignment, or sexual orientation.<sup>23</sup> In addition to the Family Resources Survey, other potential sources such as the Scottish Household and Scottish Health surveys were considered. While these surveys are useful for sense checking and providing contextual information, they did not provide data that could be used in the modelling – because of small sample sizes. These characteristics are therefore excluded from the analysis.

In keeping with other equality analysis produced by Scottish Government and with the approach taken by EHRC in their distributional analysis<sup>24</sup> - we have produced some analysis at the level of the household. We have also produced analyses for individuals.

### **Income sharing within households**

Sharing of income within households has been a problematic issue for analysis of this type, particularly for gender analysis. However, recent data from the Scottish Social Attitudes Survey shows that the most common way people living with a partner organise their own income is to put all of it, or nearly all of it, into a joint pool and the majority of those living with a partner also organise their income in the same way their partner does.<sup>25</sup> The survey also reported that women were much more likely (60%) than men (8%) to have child benefit paid

<sup>22</sup> Verbist, G., M. Förster and M. Vaalavuo (2012), *The Impact of Publicly Provided Services on the Distribution of Resources: Review of New Results and Methods*, OECD Social, Employment and Migration Working Papers, No. 130, OECD Publishing, Paris. <http://dx.doi.org/10.1787/5k9h363c5szq-en>

<sup>23</sup> Our data contains same-sex couples, but not enough to produce robust analysis. The EHRC, which used the same data source, found the sample of same-sex couples too small to produce results for Scotland.

<sup>24</sup> <https://www.equalityhumanrights.com/sites/default/files/cumulative-impact-on-living-standards-of-public-spending-changes.pdf>

<sup>25</sup> <https://www.gov.scot/publications/scottish-social-attitudes-survey-2019-intra-household-distribution-resources/>

into their own account. However, detailed information about withdrawal from/use of pooled income is not available.

On the basis of an equal joint pool, we assume that taxes paid at the household level (e.g. council tax and indirect taxes such as VAT) are divided equally between the adults in the household. Similarly, household benefits – such as Council Tax Reduction and Housing Benefit – are assumed to benefit all adults equally in the household. We know that this is not the case in all instances, but the absence of data curtails our ability to make more accurate allocations within the household.

All other income from earnings or benefits is assumed to be retained at an individual level. For example, if a person receives all the child benefit for a household, this is retained by that person. Further sensitivity testing around income sharing is recommended if the model is to be utilised in future years.

### 3.2 The model - brief technical overview

- **The model uses six years of the Department for Work and Pension’s Family Resources Survey (FRS), from 2012/13 to 2017/18.** The reason for choosing this survey was that it is the main source of household income data for the UK. Whilst distributional analysis work done by HM Treasury uses the Living Cost and Food Survey (LCFS), the small sample size in this survey for Scotland meant that it was unsuitable for our analysis. Multiple years of the FRS were combined to reduce volatility in the estimates of the Scottish Rate of Income Tax.
- **We correct for benefit under-reporting in the dataset.** It is reported that a fifth of benefit spending is missing from the best source of household income data<sup>26</sup> - the Households Below Average Earnings (HBAI) dataset based on the FRS.
- The six-year combined FRS dataset is **re-weighted to the age-sex profile for Scotland contained within the Mid-Year 2019 population estimates.** The FRS is a survey of private households. Therefore, by design, it will not include students living in halls of residence, prisoners or care home residents. By re-weighting the data, we are making the assumption that young people missing from the FRS have similar incomes to people in the survey of the same age and sex. The same is true for care home residents missing from the survey.
- As we have combined multiple years of the FRS, **we have uprated the incomes in each survey year to bring them to 2019/20 prices.** Using the same method as the Office for National Statistics,<sup>27</sup> we uprate employment and self-employment with average earnings, private pensions are increased using the retail price index (RPI) and incomes from bank and building society interest are increased using deposit rates (RDEP).

#### Students

- In the construction of income deciles, we have **assigned higher education students to the household net income decile of their parents** using the typical population level socio-economic background of their parents.<sup>28</sup> Using these adjusted income

<sup>26</sup> <https://www.resolutionfoundation.org/app/uploads/2018/07/Living-Standards-Audit-2018-3.pdf>

<sup>27</sup> <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/methodologies/nowcastinghouseholdincomeintheukmethodology2016> (Table 1)

<sup>28</sup> We used information from sources such as [HESA](#) to look at the socio-economic background (including deprivation levels) of students’ parents.

deciles for students, higher education funding is distributed across the income deciles. Without such an adjustment, higher education funding would fall only within the lowest deciles as higher education students have low incomes. Whilst higher education students have been moved for modelling purposes to a different household net income decile, their individual income is not changed in the model. There is no adjustment required for further education students because in the vast majority of cases they continue to live with their parents.

### **3.3 Overview of what's in the Model**

Applying our principles and approach to modelling, the taxes, benefits and public services included in the model are summarised in Table 2. More detailed information on how each component has been modelled is provided in annexes B, C and D.

**Table 2: Model - Summary of What's Included, Excluded and Coverage**

Taxes	Benefits	Public Services
<b>What's Included</b>		
<p><b>Direct Taxes</b></p> <ul style="list-style-type: none"> <li>• Non Savings Non Dividend Income Tax</li> <li>• Employee NI Contributions</li> <li>• Council Tax</li> </ul> <p><b>Indirect Taxes</b></p> <ul style="list-style-type: none"> <li>• VAT</li> <li>• Insurance Premium Tax</li> <li>• Fuel Duty</li> <li>• Alcohol Duty</li> <li>• Tobacco Duty</li> <li>• Land and Buildings Transaction Tax</li> <li>• Air Passenger Duty</li> <li>• Vehicle excise duty</li> <li>• Total customs duties</li> <li>• Total intermediate taxes<sup>29</sup></li> <li>• Taxes on final goods and services</li> <li>• Betting taxes</li> <li>• Television licence</li> <li>• Camelot national lottery fund</li> </ul>	<ul style="list-style-type: none"> <li>• State Pension</li> <li>• Pension Credit</li> <li>• Winter Fuel Payments</li> <li>• Attendance Allowance</li> <li>• Jobseeker's Allowance</li> <li>• Employment and Support Allowance</li> <li>• Income Support</li> <li>• Working Tax Credit</li> <li>• Child Tax Credit</li> <li>• Child Benefit</li> <li>• Disability Living Allowance</li> <li>• Personal Independence Payment</li> <li>• Housing Benefit</li> <li>• Universal Credit</li> <li>• Council Tax Reduction</li> <li>• Statutory Maternity Pay</li> <li>• Carer's Allowance</li> <li>• Industrial Injuries Disablement Benefit</li> <li>• Discretionary Housing Payments</li> <li>• Over 75 TV Licences</li> <li>• Bereavement Benefit / Widow's Benefit</li> <li>• Scottish Welfare Fund</li> <li>• Maternity Allowance</li> <li>• Severe Disablement Allowance</li> <li>• Cold Weather Payments</li> <li>• Funeral Expenses Payments</li> <li>• Sure Start Maternity Grant</li> <li>• Incapacity Benefit</li> <li>• Scottish Child payment when this comes on stream in 2021</li> </ul>	<ul style="list-style-type: none"> <li>• Health</li> <li>• Schools</li> <li>• Social Work – includes social care such as care homes</li> <li>• Universities and Colleges</li> <li>• Apprenticeships</li> <li>• Early learning &amp; childcare</li> <li>• Transport - Rail, bus and concessionary fares</li> </ul>
<b>What's Excluded (Main Exclusions only)</b>		
<ul style="list-style-type: none"> <li>• VAT paid by businesses</li> <li>• Scottish Water charges</li> <li>• Employer National Insurance</li> <li>• All other taxes</li> </ul>		<ul style="list-style-type: none"> <li>• services that are not frontline</li> <li>• services where spend is not in the given year</li> <li>• services where benefit from service is not realised in same given year</li> <li>• services that cannot be attributed to individuals such as defence, environment</li> </ul>
<b>Coverage</b>		
£33.247 billion	£19.273 billion	£24.514 billion
58%	100%	73%
of total Non-North Sea Taxes paid in Scotland.	of welfare benefits in Scotland.	of resource funding and local government expenditure on public services.
<b>Further Information</b>		
See Annex B	See Annex C	See Annex D

<sup>29</sup> These are taxes paid by businesses in the production of intermediate goods (e.g. making washers for taps) which are then passed on to the household. All indirect taxes are derived by ONS in the [Effect of Tax and Benefit Dataset](#), derived from the Living Cost and Food Survey.

## 4. Results

In this chapter we present outputs from the modelling to provide an illustration of the type of findings that would be possible from this type of distributional analysis. To accompany charts we present some descriptive information about what the chart shows. We also identify any issues or caveats that should be considered when looking at the chart to help interpretation and avoid misinterpretation.

Distributional analysis involves assumptions and decisions about approaches and inclusion of material – these assumptions obviously influence the results produced. Using different assumptions would produce different results. These value judgements mean that some have argued that in particular results on impacts of public services/benefits in kind should be interpreted very cautiously.<sup>30</sup>

This analysis is based on a single point in time. At that point in time some people will be paying tax and receiving little in terms of benefits and services, whilst others will be paying relatively little tax and receiving more in benefits and services. The analysis does not show how that changes over time; that is the nature of snapshots. We also need to remember that people contribute on the basis of their ability to pay – whilst they receive support on the basis of need – and this may also change over time. This type of snapshot analysis does not provide the ability to see how people fare over their entire lifetime in terms of contributions and receipts – other types of analysis do that.<sup>31</sup>

All charts produced are in Annex F and the underlying data is given in Annex G.

### 4.1 Household level charts

For household level charts, we have divided tax, benefits and public services by the number of people within each income decile or household type. This gives us an average amount per person.

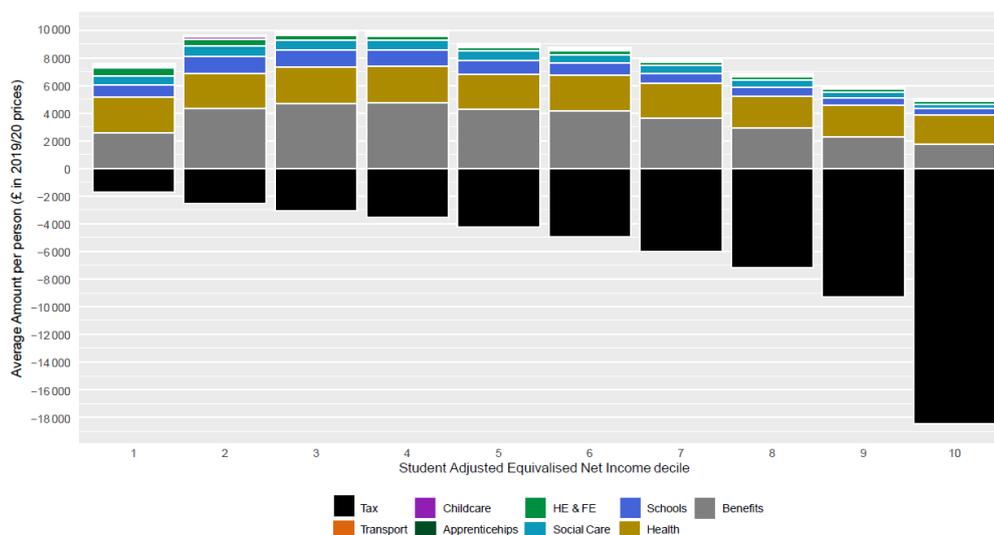
Household net income deciles are calculated by taking the household's gross income and then deducting all taxes paid by the household. The household net income is then assigned to each person in the household. For students in higher education, we use their parents' net household income to re-order where they appear in the income distribution. Using these household net incomes, people are ordered from those with the lowest household net income (decile 1) to the highest (decile 10). The deciles are calculated in such a way to ensure there are the ten equal groups of people (see Annex E for details of the people in each income decile).

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<sup>30</sup> O'Dea C & Preston I (2014) *Can We Measure Who Loses Most from Public Service Spending Cuts?* Budget Perspective 2015 Paper 2 Economic and Social Research Institute, Dublin <https://www.esri.ie/publications/can-we-measure-who-loses-most-from-public-service-spending-cuts>

<sup>31</sup> [Redistribution from a lifetime perspective: current tax and benefit system - Institute For Fiscal Studies - IFS](#)

#### 4.1.1 Chart 1: Average Amounts per person by Income Deciles - Scotland 2019/20



Source: FRS et al.

Chart 1 shows the average tax paid and spend on benefits and public services per person by student adjusted household net income deciles.

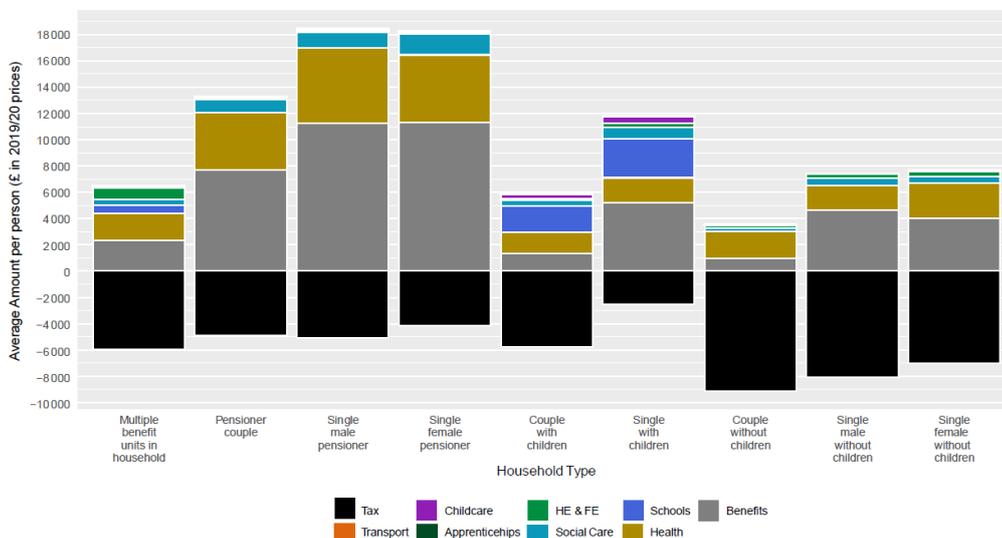
This shows the progressive nature of taxation. The average amount of tax paid increases as you move up the income deciles, with decile 10 paying the most in tax. It should be noted that this is based on the absolute amount of tax paid; the percentage of total income paid in tax has a slightly flatter profile and would be a useful sensitivity test in future analysis.

The chart shows that the overall spend on public services and benefits is also progressive as it is higher for lower income deciles. However, those in the lowest income decile do not benefit as highly from benefits and public spend as those in deciles 2, 3 and 4. This may be due to the make-up of this group, which includes people in the pre-retirement age band who may have low income but a reasonable standard of living from savings or other wealth, alongside students, unemployed people, women with children and people who are temporarily sick. Although ten percent of the population appears in each decile, particular lower income groups appear more in the lowest decile (Annex E provides detail of the characteristics of people in each income decile). These are:

- unemployed people (40% of all unemployed people are in the lowest decile)
- people who are temporarily sick/injured (32%)
- people looking after the family/home (22%)
- students (14% of all students are in the lowest decile – these include further education students)
- younger people (aged 18-24) (12% of all people aged 18-24) and people aged over 75+ (12% of all people aged 75+)
- people who are aged 55 to 64 (15%). These people – making up the largest group in this decile excluding the under 18s - may be pre-retirement and living off their savings.

Welfare benefits are typically less generous for younger people and this may explain the lower average spend on benefits. Younger people also tend to have lower income from earnings.

4.1.2 Chart 2: Average Amounts per person by Household Type - Scotland 2019/20



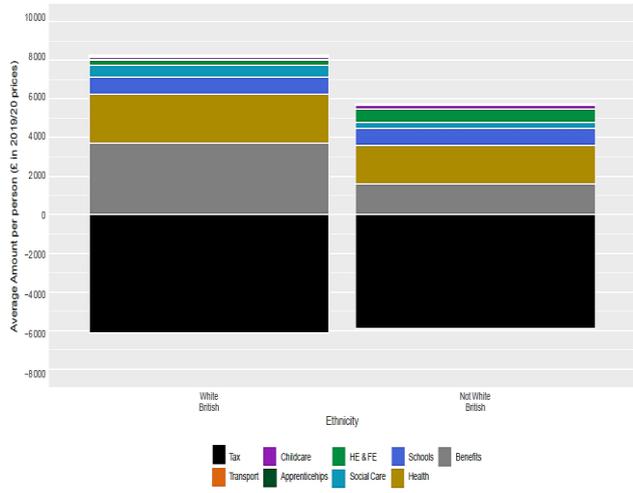
Source: FRS et al.

Chart 2 shows tax and expenditure for individuals by the household type which each person is in. Households with multiple benefit units are typically groups of people living within the same accommodation – for example, students or working people sharing a house.

From this chart we see the critical importance of life stages in the analysis and this is key to interpreting all the remaining analyses. It can be seen that pensioners receive a greater amount of benefit income than other households, which is due to the state pension. Health and social work (which includes social care) spend is also higher for older people, reflecting their greater need for care in later life. Transport expenditure is also higher in pensioner households, compared to other households, although this spend is much lower than other categories of spend.

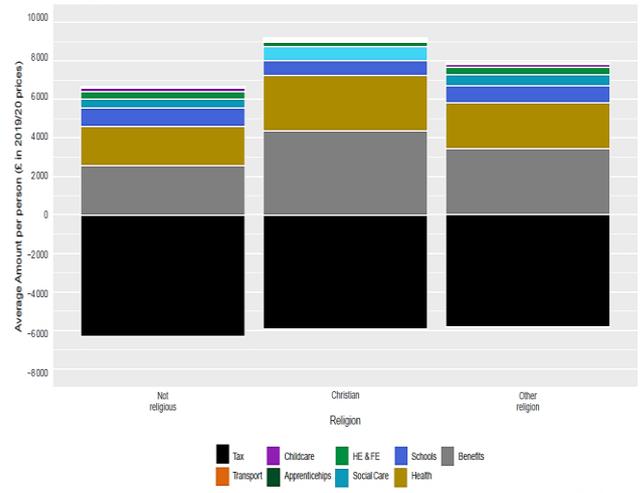
Spending on schools and early learning & childcare (ELC) is concentrated, as would be expected, on households with children, whilst spend on universities and colleges is focussed on single person households, and those living in shared accommodation (multiple benefit units under one address).

Chart 2A: Average Amounts – Ethnicity  
Scotland 2019/20



Source: FRS et al.

Chart 2B: Average Amounts – Religion  
Scotland 2019/20

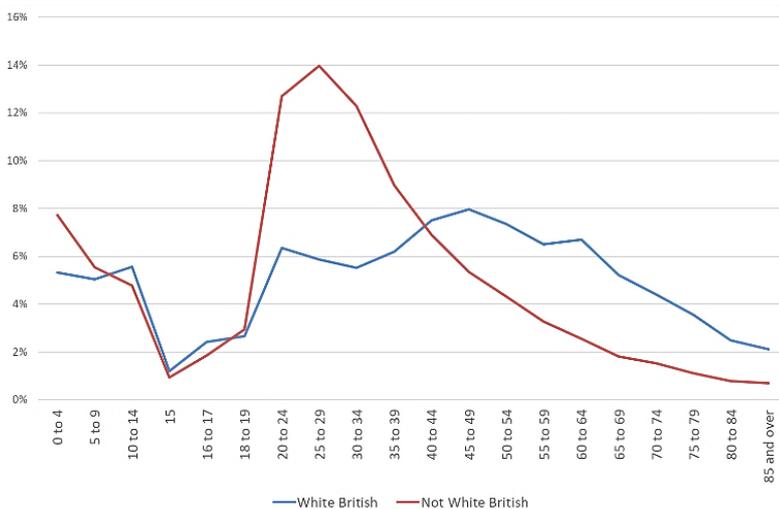


Source: FRS et al.

Charts 2A and 2B show distributional analysis by ethnicity (2A) and religion (2B). Chart 2A shows that “Not-White British” people receive less in benefits, health care and social care per person on average than “White British” people. A similar picture emerges when analysing by Religion (2B) - Christians are shown to receive more in benefits and health care spend on average than other groups. However, in interpreting these charts it is important to take into account the underlying age structures of the different groups, which explain these differences in expenditure.

The age profile for “Not-White British” people (Chart 2C red line) is much younger than for White British people (blue line). This difference in age profile is the key driver for the differences in expenditure seen. As noted above, subgroups with older populations will receive more in benefits (e.g. state pensions) and health service spend. It is important to take these age differences into account when interpreting the results.

Chart 2C: Age Distribution of White-British and Not White British People.<sup>32</sup>



<sup>32</sup> Scotland's Census 2011 - National Records of Scotland Table DC2101SC

## 4.2 Person level charts

For person level charts, for simplicity we have made the assumption that the following taxes and benefits are shared equally across all adults aged 16 or over in the household:

- Taxes: Indirect taxes & Council Tax
- Welfare Benefits: Council Tax Reduction, Scottish Welfare Fund, Housing Benefit, Universal Credit, Discretionary Housing Payments and free TV licenses

The person level charts presented here are all broken down by age and sex as we have seen the important role which these characteristics play in the analysis.

### 4.2.1 Charts 3 & 4 – Individual Amounts by Sex and Age

Chart 3: Individual Average Amounts – Men by Age - Scotland 2019/20

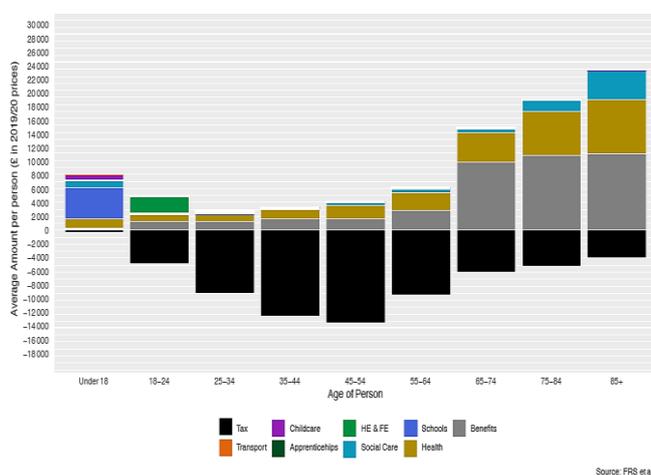
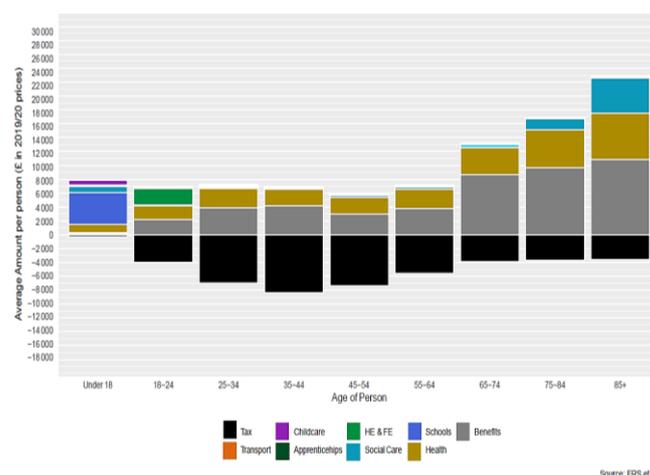


Chart 4: Individual Average Amounts – Women by Age - Scotland 2019/20



Charts 3 and 4 show average spend per person by age group for men and women. The charts again clearly show the impact of life stages. Young people aged under 18 benefit most in terms of spend from early learning & childcare and schooling. Higher and further education is spent mostly on those in the 18 to 24 year age group. The impact of the gender pay gap and unequal sharing of childcare responsibilities results in a clear difference in incomes and this impacts on the amount of taxes paid by males and females. Men earn more and therefore pay greater amounts of tax, peaking in the 45-54 age group. Health and social care spend is most visible in the older age groups.

For women, the key differences are a greater amount of benefit spend, compared to men, which reflects receipt of child benefit and tax credits for these individuals (driven by lower personal incomes and the allocation of child benefit to the mother based on evidence that it is more usually received by the mother rather than father). Health care costs for men aged 65+ are higher and this reflects the profile of average health spend (see annex D). Average social care spend for women is higher than for men as a result of their longer life expectancy. For example women aged 85+ out-number men of the same age in care homes by a ratio of 4:1.<sup>33</sup>

<sup>33</sup> [Care Home Census - Scottish Statistics on Adults Resident in Care Homes, Figures for 2007-2017 as at 31 March](#)

#### 4.2.2 Charts 5 to 8 – Average Spend per person by Age and Sex and Ethnicity<sup>34</sup>

Chart 5: Individual Average Amounts – Men by Age – White British - Scotland 2019/20

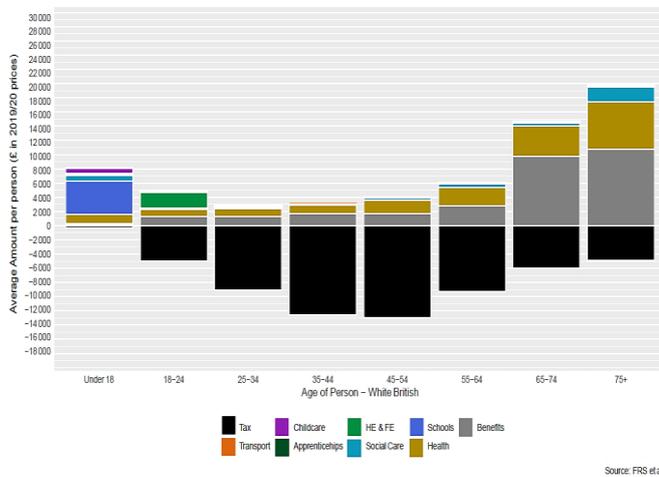


Chart 6: Individual Average Amounts – Men by Age – Non White British - Scotland 2019/20

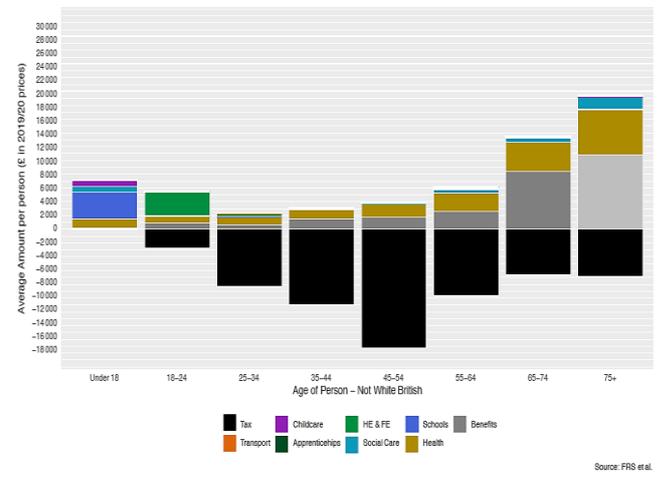


Chart 7: Individual Average Amounts – Women by Age – White British - Scotland 2019/20

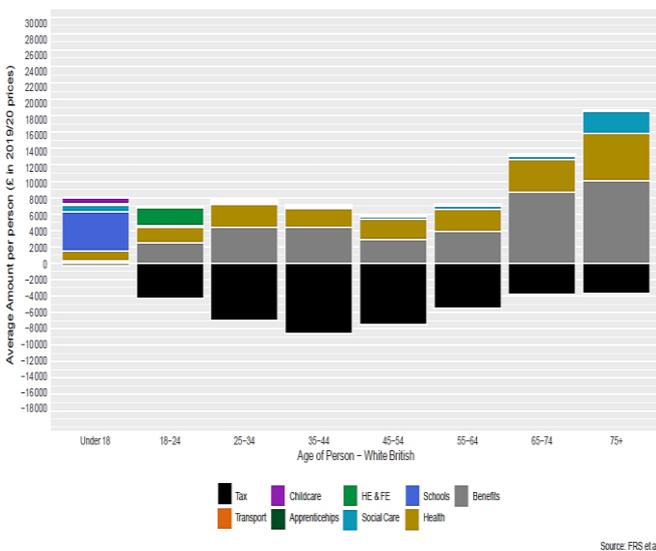
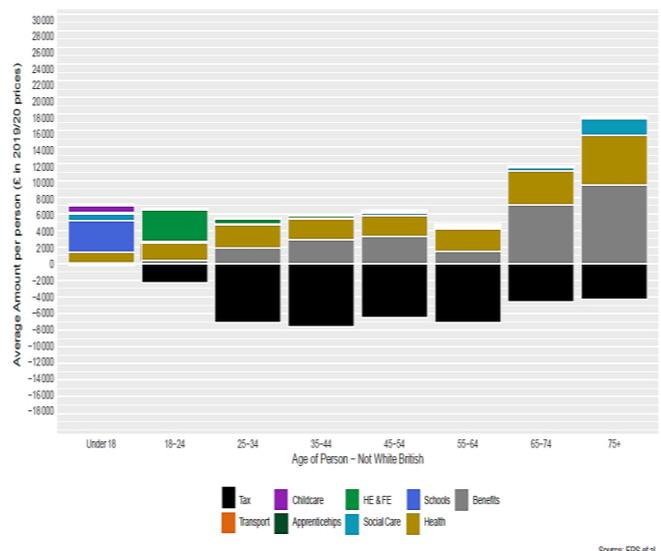


Chart 8: Individual Average Amounts – Women by Age – Non White British - Scotland 2019/20



Charts 7 and 8 are similar to the charts 3 & 4 for age and sex, but are further broken down by whether people are “White British” or not. It should be noted that the breakdown by ethnicity as well as age and sex makes sample sizes very small so this analysis is less reliable and should be treated with caution. Whilst samples would be large enough to do a household ethnicity analysis without any further breakdowns, as age, or life stage, are key drivers of distributional analysis, it is potentially misleading to show spend by ethnicity without also considering age - because the age profile of ethnic minority households is very different to white-British households – they are typically younger.<sup>35</sup>

<sup>34</sup> (Note – we have merged the two older age bands to a single 75+ age band due to limited sample sizes for some groups).

<sup>35</sup> Scotland's Census 2011 - National Records of Scotland Table DC2101SC - Ethnic group by sex by age All people

A key finding from these charts is that average spend on higher and further education is greater for “non-White British” people than for White British.<sup>36</sup> However, looking at spend per student shows that both “White British” and those who are “non-White British” receive similar amounts individually (£3,900 and £4,000 respectively). The proportion of Scottish domiciled BAME students in higher education is higher than in the general population.<sup>37</sup>

Charts 5 – 8 show the need to take great care in interpreting any results. A service may have equal spend on a per user basis. However, differences in take up for a particular service can alter the distributional analysis across the whole population.

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<sup>36</sup> Two points to note here. Firstly, International students self-fund their education and do not benefit from this expenditure. Secondly, people’s self-identified ethnicity does not equate to their country of birth. Many non-white British people have been born in Scotland or Britain but feel an alternative ethnic connection.

<sup>37</sup> <https://www.gov.scot/publications/fair-access-higher-education-progress-challenges/pages/5/>

## 4.2.3 Charts 9 to 12 – Average Spend per person by Age and Sex and Disability

Chart 9: Individual Average Amounts – Men by Age – Not Disabled - Scotland 2019/20

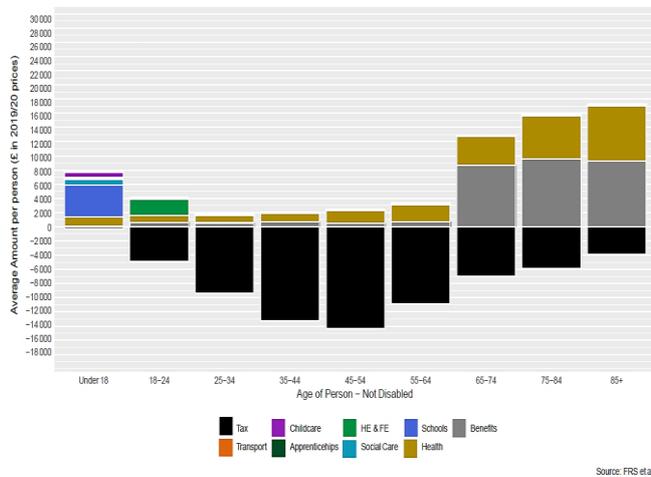


Chart 10: Individual Average Amounts – Men by Age – Disabled - Scotland 2019/20

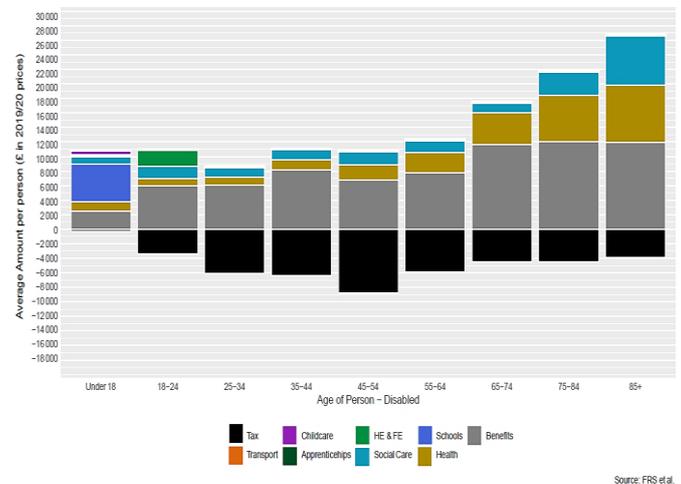


Chart 11: Individual Average Amounts – Women by Age – Not Disabled - Scotland 2019/20

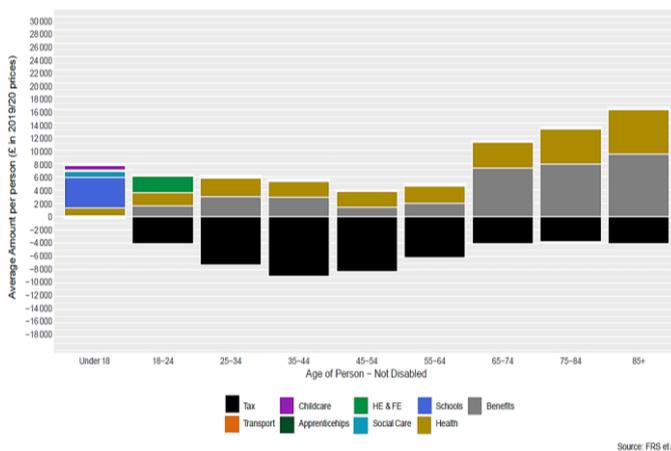
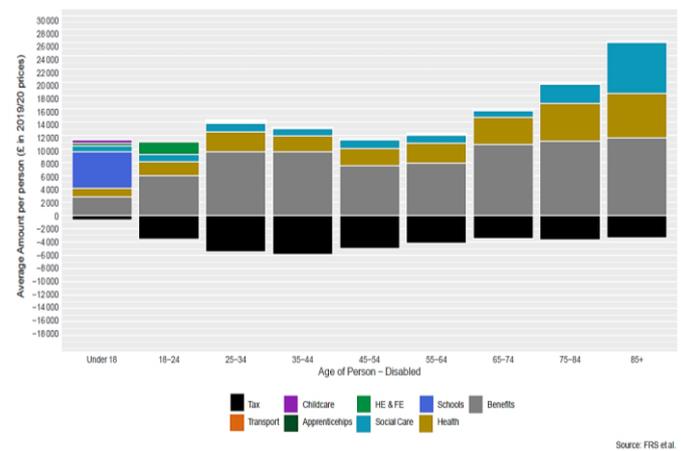


Chart 12: Individual Average Amounts – Women by Age – Disabled - Scotland 2019/20



Charts 11 and 12 are similar to Charts 3 & 4 for age and sex, but are further broken down by whether or not the person is disabled. As much of the social work budget helps towards the care of disabled people, a higher spend on social care can clearly be seen in charts 10 and 12 for disabled men and women, compared to non-disabled people. Disabled people also typically receive more on average in welfare benefits and pay less in taxes than their non-disabled counterparts.<sup>38</sup> From other sources of information we know that on the whole disabled people have lower incomes and are more likely to be in poverty than those without disability<sup>39</sup> – therefore this finding is what we would expect.

<sup>38</sup> Employment rates are significantly lower for disabled people. This is the basis of a Scottish government policy to close the disability employment gap: <https://www.gov.scot/publications/fairer-scotland-disabled-people-employment-action-plan/pages/2/>

<sup>39</sup> [Scotland's Wellbeing: national outcomes for disabled people - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/scotland-wellbeing-national-outcomes-for-disabled-people/pages/2/)

## 4.2.4 Charts 13 to 18 – Average Spend per person by Age and Sex and Religion

Chart 13: Individual Average Amounts – Men by Age – No religion - Scotland 2019/20

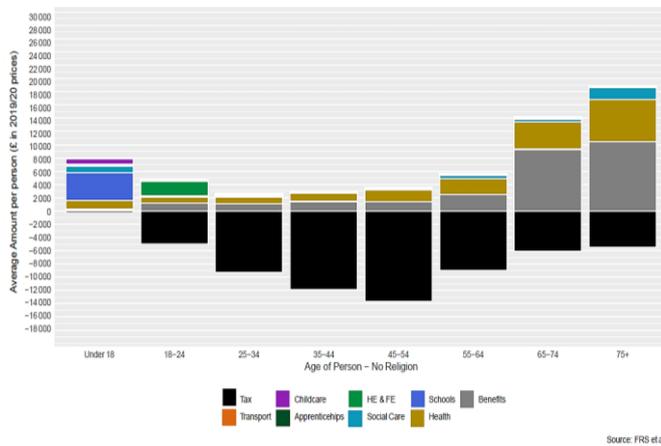


Chart 14: Individual Average Amounts – Men by Age – Christian - Scotland 2019/20

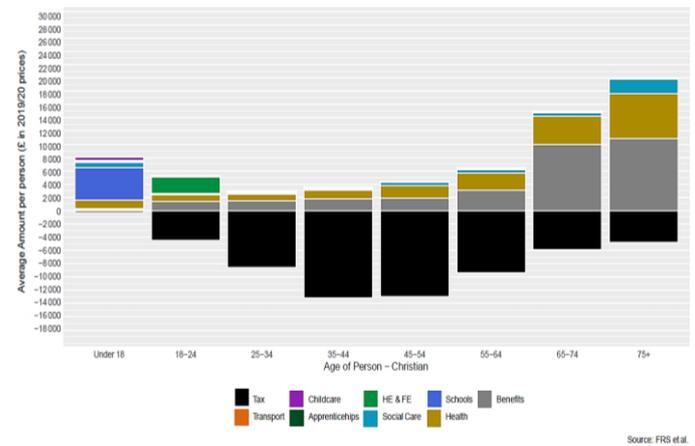


Chart 15: Individual Average Amounts – Men by Age – Other religion - Scotland 2019/20

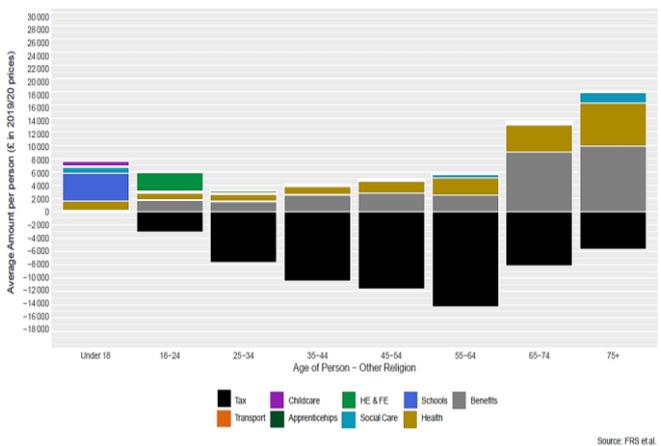


Chart 16: Individual Average Amounts – Women by Age – No religion - Scotland 2019/20

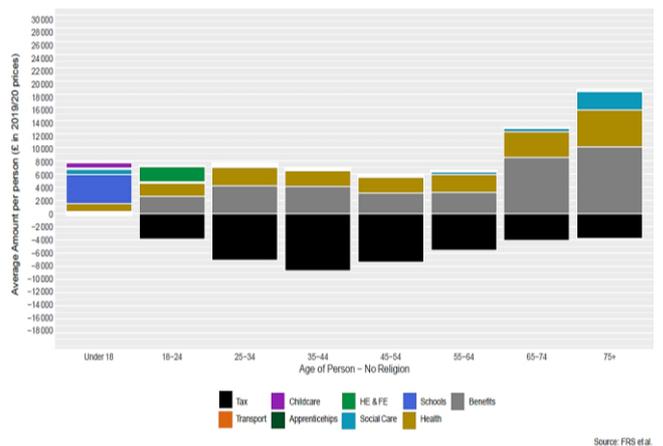


Chart 17: Individual Average Amounts – Women by Age – Christian - Scotland 2019/20

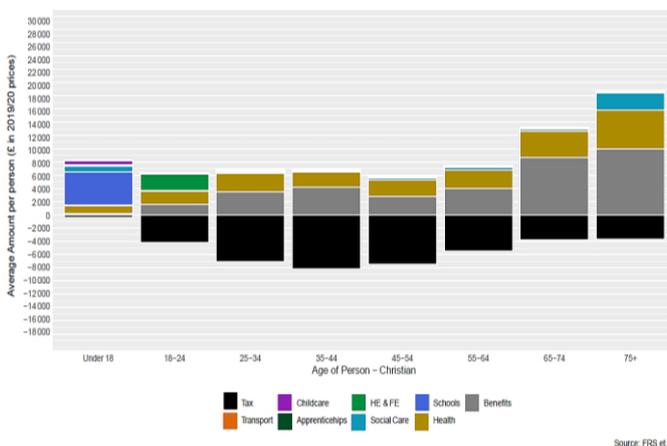
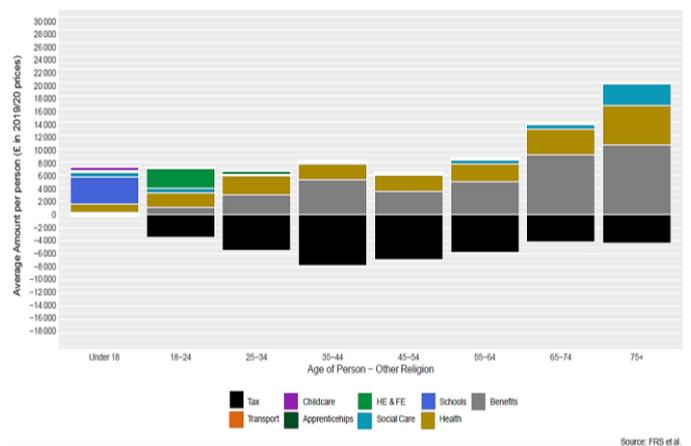


Chart 18: Individual Average Amounts – Women by Age – Other religion - Scotland 2019/20



Charts 13 to 18 are similar to Charts 3 & 4 for age and sex, but are further broken down by whether the person identifies as Christian, another religion or of no religion.

Chart 15 shows that men in the 55-64 age group in the “Other Religion” category pay more in tax on average than men who are identified as no religion (Chart 13) or Christian (Chart 14). Other data shows that only 8% of those in this group were retired, whilst the figure was 14% for those of this age group with no-religion or Christian. The median age of the “other religion” group was also two years older in the sample than the no-religion or Christian men. This suggests that the “other religion” males in this age group could be paying more tax as they are working longer.

Looking more closely at the underlying survey data, we also find that Chart 15 has only 60 records for men in the “Other Religion”, 55 to 64 age group, much smaller than the same groups in Chart 13 (957 records) and Chart 14 (1,414 records). This means the result should be treated with caution.

Overall, it is hard to determine whether this difference is real or is a consequence of the small sample size, or of underlying assumptions in our modelling.<sup>40</sup>

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<sup>40</sup> Any future development of equality data collection for key UK Government administrative tax and benefit data collections would help in conducting and interpreting distributional analysis.

## 5. Conclusions

The purpose of this project was to investigate the feasibility of undertaking a distributional analysis of the Scottish Government Budget. Data from the 2019/20 Scottish Budget was used to test the feasibility.

### 5.1 What is feasible

Our results suggests that distributional analysis is feasible by:

- Household net income decile; and
- Household type

For person level analyses, we have needed to first make an assumption around how certain taxes and benefits - paid to households - are shared amongst household members. By assuming these are shared equally amongst all adults aged 16 or over in the household, we are also able to produce distributional analysis by

- Age and Sex; and
- Age, Sex and Disability

### 5.2 What might not be feasible

It is technically possible to produce the following charts, however, due to small sample sizes and differences in service usage by groups, there is a risk that they may produce results that are unreliable or could be misinterpreted:

- Religion
- Ethnicity

There would be potential for misinterpretation of these charts without further breakdown, because the age profiles of these groups is very different and age (and life stage) is a key underlying driver of differences in spend.

For

- Age, Sex and Religion
- Age, Sex and Ethnicity

these analyses would need to be treated with care due to very small sample sizes.

### 5.3 Key caveats and limitations

The project has demonstrated that even when analysis is technically feasible, there are other issues that must be considered in deploying the analysis. These are outlined below.

#### Comparability

Comparability of the results with other outputs, such as that of HM Treasury, will be limited as different data sources and methods will have been used in aspects of the model development. For example, we have corrected for under-reporting of benefit income in our

model and therefore the analysis is not directly comparable with distributional analyses that have not done this. The choices about which benefits and public services to include in our model will also be different from other models. The choices and assumptions made in this study were driven primarily by the purpose of this analysis rather than by comparability with other models.

## **Uprating**

As the modelling is based on historical data it has been necessary to uprate incomes. Assumptions regarding uprating may be sensible for the population as a whole, but may be unrealistic for sub-groups of the population.

## **Complex relationships between characteristics**

Life stage has been shown to be a critical consideration in analysis and interpretation, with the pattern of spending varying across the life course. For example, young people receive more higher education spend; in middle age we see higher tax paid due to higher incomes; and in old age there is higher receipt of benefits from pensions and higher health and care expenditure. This means that when considering distributional analysis by ethnicity, for example, results would ideally need to be age standardised to be able to compare ethnic differences within similar life stages. However samples are so small that the data at this level becomes unstable and unreliable. Gender will also have a strong intersecting impact but it is difficult to fully understand this because of the lack of understanding of how income from earnings and benefits are distributed between different genders within the household.<sup>41</sup>

## **Missing groups**

The survey upon which the modelling is based is a survey of private households. As a result, many student households and care home residents will be missing from the survey. As a consequence, either the survey population must be modified to include these people, through adjusting the weighting, or a decision needs to be made to exclude the public services which relate to these people. As expenditure on students and care homes is relatively sizeable, we have opted to adjust the underlying survey population rather than omit these public services.

## **Assumptions made**

We have presented our assumptions and decisions about the taxes, benefits and services included in the different annexes. For any distributional analysis the assumptions used will determine the outputs that follow. This includes technical ways to address issues about income or which people to include in the analysis, as well as the overall approach and decisions about inclusion/exclusion. For example in health we decided to take an insurance based approach rather than an individual usage approach – and used population level usage information. There may be value in undertaking analysis using different assumptions to see what different approaches and resulting outputs tell us.

There will always be some debate about whether the assumptions used are the best ones for the analysis. However, whilst agreement on assumptions may be difficult if not impossible to achieve, it is important that if changes over time are to be understood, then the same assumptions must be used over time wherever possible. Similarly if comparison with other distributional analyses is required – for example ‘what-if’ analyses for specific policy areas - then this will require the same assumptions to be used.

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<sup>41</sup> Although this report by Scottish Social Attitudes Survey starts to build evidence on this issue: <https://www.gov.scot/publications/scottish-social-attitudes-survey-2019-intra-household-distribution-resources/>

## Further development of the model

If this work is to be repeated for the 2021/22 Scottish Budget or future budgets, the model will need to be further developed to take into account the structural changes in the Scottish economy resulting from the Covid-19 pandemic (for example increases in benefits uptake due to increased unemployment). Modelling of mitigation activity in response to Covid-19 undertaken by the UK and Scottish Governments would also be needed. This is complicated by uncertainty regarding how long these measures will need to be in place and for which sectors. This modelling would need to be informed by Scottish Fiscal Commission forecast assumptions released for the 2021/22 budget documents.

## 5.4 Distributional findings

In testing the feasibility of our approach, data from the 2019/20 Scottish Budget was used. Therefore the project was also able to produce findings in relation to the distributional impact at the time of that budget. The key findings are:

- The progressive nature of tax by income decile is shown in the analysis.
- Spend and benefits is also progressive in that it is highest for income deciles 2, 3 and 4 and then reduces. However, those in the lowest income decile do not appear to receive as much in benefits and public spend as deciles 2, 3 and 4. This may relate to the composition of the group, which is complex containing people aged 55-64 in the pre-retirement phase who may have low income but a reasonable standard of living from savings or other wealth. The group also includes students, unemployed people, women with children and people who are temporarily sick.
- Life stage plays a critical role in understanding distributional analysis – and this is the case in looking at the Scottish offer. Our household analysis shows that households containing older people tend to receive more in benefits (from the state pension) and see a higher spend on health and social care. Households containing middle aged people tend to be paying the most tax (due to those age-groups tending to earn the most) and households with children and young people see the highest spend on schooling, Early Learning and Childcare and higher and further education.
- Analysis by ethnicity and religion shows that households with a head of household who identifies as non-British or a head of household who has a religion other than Christian, receive lower benefits and lower health and social care spend but higher further and higher education spend. This is primarily driven by the fact that the age profile is very different for these groups. The age structure is younger and we have seen that benefits and health and social care spend increases with age. There are also other differences such as the fact that a higher proportion of non-White British young people attend higher or further education than white British young people.
- Analysis at the individual level shows the impact of the gender pay gap and unequal childcare responsibilities in the differential amount of tax paid by men and women – being higher for men due to higher earnings. Conversely, women tend to receive more benefits, but some of this is due to child benefit – all of which is allocated to women in our model. Men aged over 65 had higher health costs while women aged over 65 tended to have higher social care costs, due to having longer life expectancy.
- The same structural issues can be identified amongst disabled men and women, with disabled men paying more tax than disabled women while benefit receipt looks relatively even between disabled men and women. Health care costs look similar

across disabled and non-disabled groups, but that may be linked to the methodology used which allocated health care expenditure by age, sex and deprivation only. Social care spend is much higher for disabled men and women when compared with non-disabled men and women.

## **5.5 Potential role and value of analyses that are feasible**

The project has demonstrated that it is possible to produce reliable outputs of distributional analysis for households by income level and for some if not all equality characteristics. It is also possible, however, for the outputs to be misinterpreted. Therefore a key finding of the project is that distributional analysis should be accompanied by robust explanation. This interpretation should explain apparent anomalies or unexpected results and provide details of what might be the underlying reasons for these. In some instances additional data and information will be helpful in explaining findings.

The analysis presented here provides a baseline understanding of budget impacts. It shows how big blocks of spend are distributed across households depending on income, age, gender, ethnicity and religion. It also shows the progressive nature of tax and spend. It shows which groups might see positive or negative impacts if changes were made to particular budget lines. However, it cannot look at the impact of any such changes in detail, since even relatively large changes in spend on individual budget lines would be very difficult to see when looking at all expenditure. There are benefits to the analysis here which aids understanding of how tax, benefits and spend add up for individuals, but this also needs to be supplemented by detailed intersectional analysis of particular items of spend across groups.

The project has shown that cumulative distributional analysis is feasible and can be a valuable tool for understanding the impacts of the Scottish Budget for different households and individuals. It is most useful in providing a baseline – which could be updated every few years (perhaps at the start and end of a Parliamentary term) – and which can help identify areas where more detailed analysis at individual policy level might be useful.

## **6. List of Annexes**

The report and annexes present key information about the development of the model and assessment of feasibility of distributional analysis of the 2019/20 budget. Additional papers were produced throughout the project with additional technical details and considerations.

Annex A: Budget details and where each line of expenditure comes from

Annex B: Modelling taxes

Annex C: Modelling welfare benefits

Annex D: Modelling public services

Annex E: Characteristics of people in each income decile

Annex F: Charts

Annex G: Chart Data



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