Institute for Fiscal Studies

The effect of taxes and benefits on UK inequality

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Executive summary

The tax and benefit system is a key tool for a government trying to reduce inequality. In this briefing note, we examine the effects that cash benefits and taxes had on UK inequality in 2016–17. We compare our results with the headline estimates of the effects of taxes and benefits on inequality produced by the Office for National Statistics (ONS) and we explore how methodological choices affect the results.

Key findings

Benefits reduce UK income inequality more than direct taxes do. Before redistribution, the highest-income fifth of individuals, on average, has an income that is 12 times as large as the poorest fifth. Adding all cash benefits and deducting direct taxes (including income and council taxes as well as employer and employee National Insurance contributions) brings this figure down to 5. Benefits account for around 80% of this reduction, while direct taxes account for 20%.

This is because benefits (as a share of income) are more concentrated at the bottom of the income distribution than direct taxes are at the top. The poorest fifth of individuals receives 54% of net (after tax and benefit) household income in benefits, while the highest-income fifth receives only 3% (15.6 times less as a share of net income). By contrast, the highest-income fifth pays just 2.7 times as much direct tax as a share of income as the poorest fifth (though in cash terms they pay 13.7 times as much). The progressivity of direct taxes is limited by council tax. Net of council tax support (which reduces liabilities for low income families), it accounts for 5% of the income of the poorest fifth and only 2% for the richest fifth. Ignoring council tax (so counting just income tax and NICs) the richest fifth pay 4.1 times as much direct tax as a share of their income as the lowest income fifth.

Indirect taxes are broadly distributionally neutral. Overall, 15% of people's expenditure is accounted for by indirect tax (around two-thirds of which is VAT), with little variation across the income distribution. This result contrasts with some analysis (including analysis by the ONS) suggesting that indirect taxes are regressive. The difference lies in the fact that, because they are levied on expenditure, we measure the impact of indirect taxes as a share of expenditure. Indirect tax does look regressive when measured as a share of income, but this is driven by households with high spending relative to their income at a point in time – households who are very likely to be on a low income only temporarily.

Overall, we find that direct and indirect taxes are progressive. This result is in contrast to the headline finding of the ONS, which concludes in its analysis of the effects of taxes and benefits on inequality that 'overall, taxes had a negligible effect on income inequality'. We estimate that direct taxes have over 1.6 times as much effect on inequality as the ONS estimates, but the main difference between our analyses lies in the fact that we find indirect taxes to be distributionally neutral rather than regressive, because we measure their effect as a share of expenditure, not income.

Methodological choices have a significant effect on estimates. Beyond indirect tax, our results differ from the ONS's results because of a number of differences in methodological choices. We take steps to address survey under-reporting of top incomes, include employer National Insurance contributions as a direct tax. We account for the fact that some benefits are taxable and others untaxed. We also measure inequality between individuals, rather than between households. These choices have significant impacts on the estimated redistributive effects of taxes and benefits.

1. Introduction

The tax and benefit system is one of the major tools that the government can use to reduce inequality. In this briefing note, we examine the extent to which taxes and benefits, respectively, achieve this reduction. We also show how these results are dependent upon methodological and data choices.

Before we are able to understand how redistributive the tax and benefit system is, first we need to have a measure of inequality. For our analysis of the impact of direct taxes and benefits on inequality we use a measure of income inequality.[1] There are a wide variety of measures available that, in different ways, attempt to summarise the inequality of an income distribution in a single number. A popular measure, and one that we focus on in this briefing note, is the Gini coefficient, which would be zero if everyone had the same income, and 100% if a single person had all of the country's income. The Gini coefficient in the UK was around 34% in 2016–17.[2]

To help give a sense of scale for some of the numbers that follow, Figure 1 shows the Gini coefficient of UK income over time. After a sharp increase of around 8 percentage points (ppt) in the 1980s, it has been little changed for the past 25 or so years. This partly reflects changes in the tax and benefit system: while there has been a substantial increase in inequality in household earnings over that period, this has been offset by reforms to taxes and benefits (principally the expansion of tax credits in the late 1990s and early 2000s).[3]

In 2016–17, tax revenue from direct taxes and indirect taxes stood at £525 billion, and total benefit spending at £217 billion.[4] We show how these transfers affect inequality. Estimates of inequality, as well as the redistributive capacity of taxes and benefits, depend upon the data and methodology used. To illustrate this point, we compare our estimates with the headline Office for National Statistics (ONS) publication on the effects of taxes and benefits on inequality, and we show how different methods and data affect the results.[5]

We estimate that, in 2016–17, benefits reduced the Gini coefficient of income inequality (making incomes more equal) by around 13 ppt, while direct taxes reduced it by around 5 ppt. Our analysis of indirect taxes suggests that these are more or less distributionally neutral, and we argue that it is very important here to assess who is poor and rich in the most appropriate way (and if one does not, one may conclude that indirect taxes are more regressive than they are). We estimate direct and indirect taxes overall to be more progressive than the ONS does, while our estimates of the impact of benefits on inequality

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1 As we show in Section 3.3, the impact of indirect taxes on inequality is best measured against expenditure rather than income.

2 The Gini coefficient was virtually unchanged for 2017–18. Figure 1 shows the Gini coefficient only up to 2016–17, as this is the year of data that we focus on in this briefing note.

3 C. Belfield, R. Blundell, J. Cribb, A. Hood and R. Joyce, R., 'Two decades of income inequality in Britain: the role of wages, household earnings and redistribution', 2017, *Economica*, 84: 157–79.

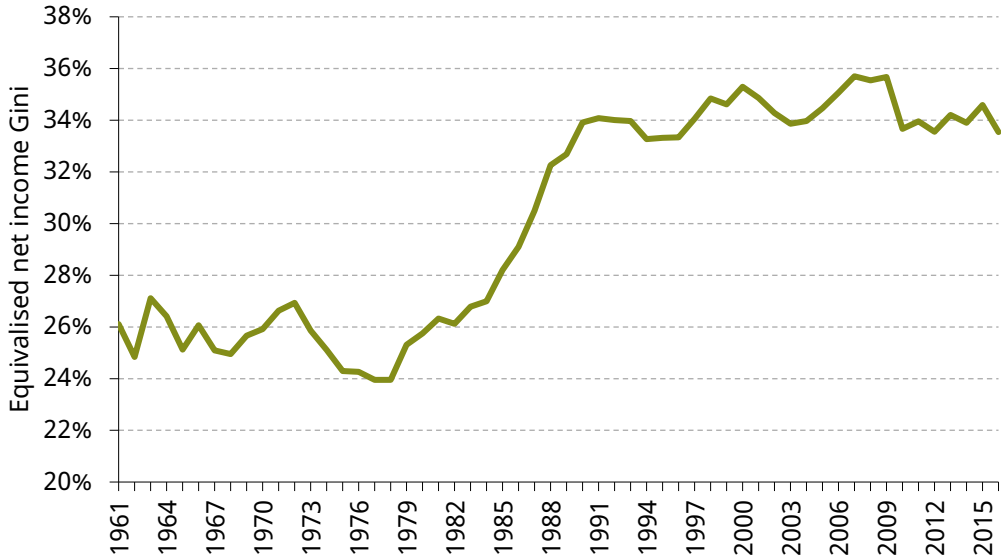
4 Office for Budget Responsibility. 'March 2019 Economic and fiscal outlook – charts and tables: fiscal'. 2019. https://obr.uk/efo/economic-fiscal-outlook-march-2019/

The direct and indirect tax receipts only cover the taxes we include in our analysis, as listed in Appendix 1.

5 ONS, 'Effects of taxes and benefits on UK household income: financial year ending 2017', 2018, https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/bulletins/theeffectsoftaxesandbenefitsonhouseholdincome/financialyearending2017 (hereafter referred to as the ETB).

are similar to the ONS estimates. Compared with the ONS, we therefore attribute a larger redistributive role to the tax and benefit system as a whole.

Figure 1. Gini coefficient of income inequality in the UK, 1961 to 2016–17



Note: Incomes have been measured net of taxes and benefits, but before housing costs have been deducted, and have been equivalised using the modified OECD equivalence scale. Years refer to calendar years up to and including 1992 and to financial years from 1993–94 onwards. Figures relate to UK households from 2002–03 onwards and to GB households for earlier years.

Source: Authors' calculations using the FRS and the HBAI, 2016–17.

It is worth noting that our results for direct taxes and benefits focus on *income* inequality between all *individuals* of the UK, rather than inequality in wealth, earnings or opportunity, and rather than between households or between different groups (e.g. men and women, or the old and young). The redistributive impact of indirect taxes, conversely, is measured against expenditure rather than income.

The briefing note is set out as follows. In Section 2, we define the taxes and benefits analysed and we present our estimates of the effects that they have on inequality in the UK. Then, in Section 3, we show how the results change depending on which data sets and methodologies are used, and we also show how our results differ from those of the ONS. We conclude in Section 4.

2. The effects of taxes and benefits on inequality

In this section, we present our estimates of the effects that taxes and benefits have on UK inequality. Before getting to those results we briefly describe the methodology used, and the taxes, benefits and incomes included in our analysis.

2.1. Methodology and data

We conduct our analysis at the individual level, meaning that we look at inequality between individuals, not inequality between households (see Section 3.2.5). However, the measure of income that we focus on for each individual is 'equivalised household income'. That is, we sum up the income of all individuals within a household and adjust this total to take into account the fact that households of different sizes and compositions have different needs ('equivalisation'). When talking in cash terms, we express all incomes as the equivalent amount for a childless couple.

For this analysis, we use household survey data representative of the UK population. For the effects of direct taxes and benefits, we use the Households Below Average Income (HBAI) 2016–17 data set, produced by the Department for Work and Pensions (DWP).[6] This is a data set, derived from the Family Resources Survey (FRS), of around 19,000 households, which collects detailed measures of income. Because the HBAI does not contain information on expenditure, we measure the effect of indirect taxes using a data set that does – the ONS's Effects of Taxes and Benefits (ETB) 2016–17, which contains around 5,000 households and is derived from the Living Costs and Food Survey (LCF). These data sets are discussed in more detail in Section 3.2.1.

We do not cover the behavioural effects of taxes and benefits, such as people adjusting the amount they work in reaction to higher or lower taxes and benefits, which of course would also affect the income distribution. In other words, we treat peoples' market incomes and expenditures as fixed when considering the effects that the tax and benefit system has on inequality.

2.2. Incomes, taxes and benefits analysed

In order to understand how much redistribution the tax and benefit system achieves, we need first to define what incomes would be in the absence of redistribution. For this, we use 'gross market income'. This is income before any taxes or transfers, and is mainly

[6] Note that the statistics we provide will differ ever so slightly from the official DWP inequality statistics, which uses the HBAI (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691917/households-below-average-income-1994-1995-2016-2017.pdf). This is due to the fact that in order to calculate taxes properly, we drop households with negative net income (e.g., in 2016–17,196 households). Furthermore, our gross market income variable differs from the summary gross income variable supplied in the HBAI. This is because we subtract the following components from gross income, so that we do not double-count income across time or within families: contributions to stakeholder and personal pensions; all maintenance and child-support payments (deducted from the income of the person making the payment); parental contributions to students living away from home.

comprised of income from employment, savings and private pensions, before any tax is deducted, including employer National Insurance contributions (NICs).

We measure the redistributive effect of direct and indirect taxes and cash benefits. The major direct taxes we cover are income tax, council tax and NICs (both employer and employee). Examples of indirect taxes we include are value added tax (VAT) and alcohol and tobacco duties.[7] In total, the taxes included in our analysis account for around 78% of all government tax receipts. However, the total tax revenue recorded in our data is about 6% less than the actual amount the Exchequer receives for the taxes that we include, because the survey data do not successfully capture all of the tax payments that they attempt to capture. Other taxes that we cannot include because our data do not allow us to straightforwardly estimate their distributional effects include corporation tax, capital gains tax and inheritance tax. Taken together, these taxes are highly likely to be progressive with respect to income, and so the redistributive effect of all taxes is probably greater than what we show here.

The benefits included in our analysis cover almost all cash benefits. We differentiate between taxable and untaxed benefits. The major taxable benefit is the state pension. Untaxed benefits include housing benefits, tax credits and non-means-tested disability payments. Again, there is under-reporting in the survey data, meaning that total benefit receipt in our data is about 20% less than the actual amount spent by the government. We do not include any public service expenditure, such as spending on education or the NHS. It is likely that this spending is progressive with respect to income, and so also it is redistributive.[8]

2.3. Results

We now present and discuss our estimates of the effects that taxes and benefits have on UK inequality. Then, in Section 3, we show how these results depend on the data and methodologies used and how our results differ from those of the ONS.

Figure 2 groups individuals into quintiles according to their equivalised net household income.[9] It begins with gross market income (defined above), and shows how average equivalised household incomes within quintiles change as benefits are added and direct taxes deducted. The final set of bars shows the average net income within each quintile. The triangles give the 5:1 ratios, defined as the average income of the richest fifth of individuals divided by that of the poorest fifth.

The figure shows that those in the poorest quintile on average receive the (childless couple) equivalent of £7,700 in gross market income and £12,460 in net income. The difference is made up by them receiving £7,150 in benefits and paying £2,400 in direct taxes. Individuals in the richest quintile on average receive the equivalent of £95,560 in gross market income, and £64,050 in net income, with the difference made up of £2,510 in benefits and £34,020 in direct taxes (including employer NICs).

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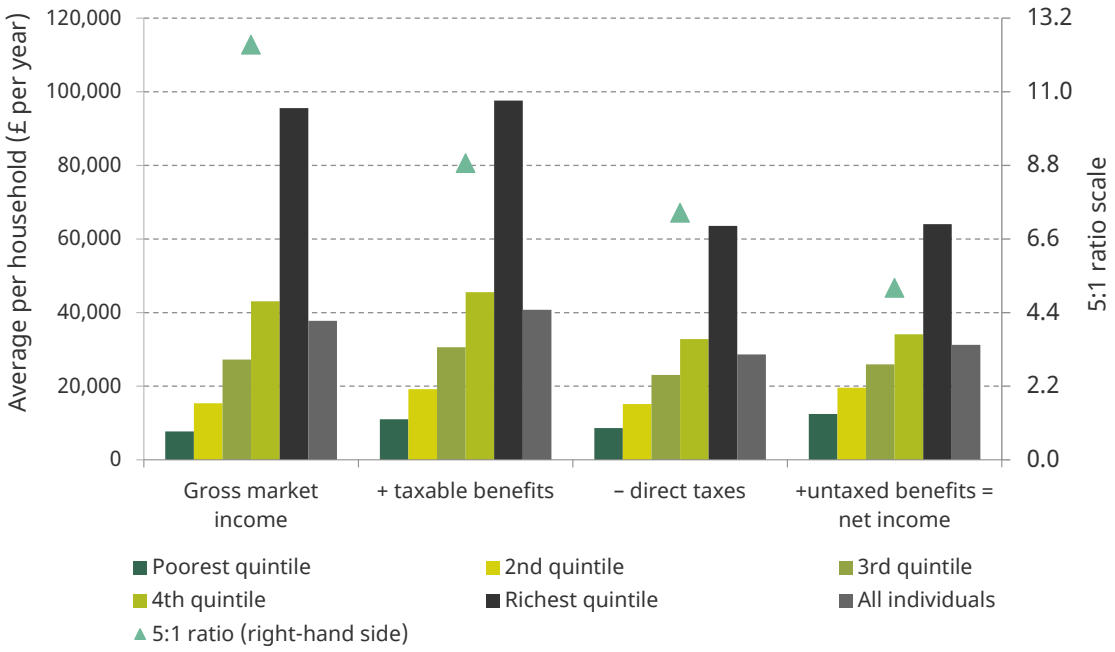
[7] See Appendix 1 for the full list of taxes and benefits included.

[8] See the ONS ETB report.

[9] In order to obtain income quintiles, individuals are grouped into fifths based on their equivalised net household income. The lowest quintile, for example, will cover the poorest (in terms of their equivalised net household income) 20% of individuals while the fifth quintile will cover the richest 20% of individuals.

Figure 2. Income components by income quintiles, 2016–17



Note: Incomes have been equivalised (using the modified OECD equivalence scale). They are measured at the household level and before housing costs have been deducted. The unit of analysis is individuals. Quintiles are based on equivalised net income. The Q5 to Q1 ratios depicted by the triangles are calculated by dividing the average relevant income component of the richest 20% of individuals by that of the poorest 20%.

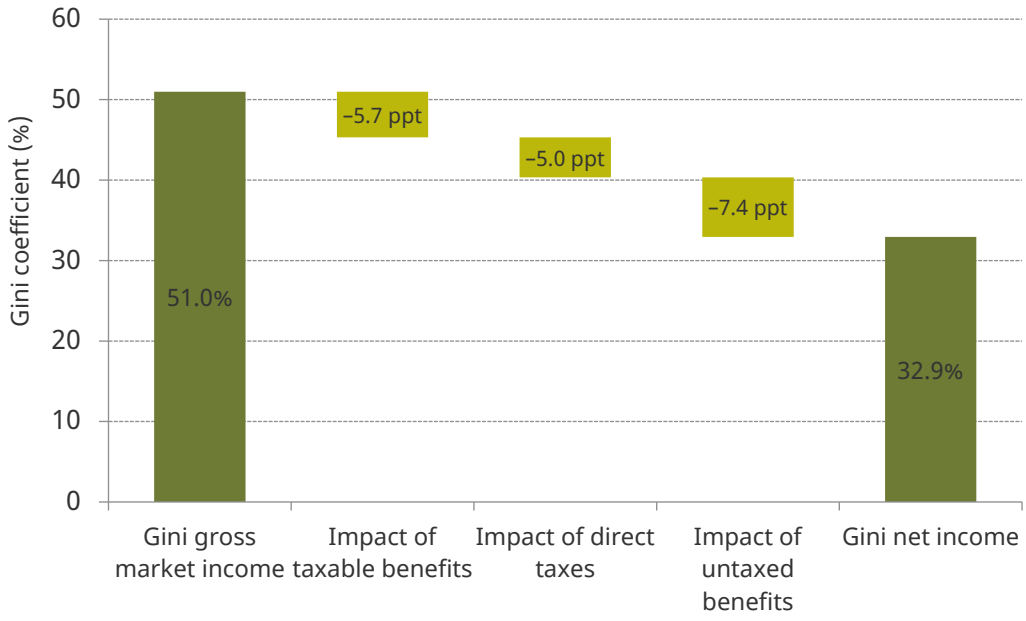
Source: Authors' calculations using the FRS and the HBAI, 2016–17.

The result is that while the 5:1 ratio of gross market income is around 12 (meaning that before redistribution individuals in the richest quintile on average have an equivalised household income 12 times larger than that of the poorest fifth), by the time that all benefits have been added and taxes deducted, the 5:1 ratio is 5. Thus, direct taxes and benefits together more than halve the 5:1 ratio. Benefits play a larger role in redistribution on this measure, decreasing the 5:1 ratio by 5.8 (with taxable and untaxed benefits having approximately equal amounts), while direct taxes reduce it by 1.5.

The 5:1 ratio, however, is only sensitive to changes in relative income between the top and bottom quintiles. Thus, we now look at how direct taxes and benefits affect the Gini coefficient, a summary measure of inequality that looks at the whole distribution.

Figure 3 shows that while the Gini coefficient of gross market household income is 51%, this decreases (meaning less inequality) to 33% once direct taxes are paid and benefits received. Consistent with the 5:1 ratio, this shows that benefits play a larger redistributive role than taxes do: benefits reduce the Gini coefficient by around 13 ppt, while direct taxes reduce it by around 5 ppt. This is largely due to the fact that benefits (as a share of income) are more concentrated at the bottom of the income distribution than taxes are at the top.

Figure 3. Impact of benefits and direct taxes on the Gini coefficient, 2016–17



Note: Incomes have been measured at the household level, but before housing costs have been deducted, and have been equivalised using the OECD equivalence scale. The unit of analysis is individuals.

Source: Authors' calculations using the FRS and the HBAI, 2016–17.

This can be seen in Figure 4, which shows taxable and untaxed benefits as well as direct taxes as a share of net income, by equivalised net income deciles.[10] The bottom five deciles pay between 18% and 27% of net household income in direct taxes, while the top five deciles pay between 32% and 60%.[11] Notably, direct taxes comprise a larger share of net income for the lowest decile than they do for the second to fourth income deciles.

For benefits, the contrast between the top and bottom of the distribution is much larger: the bottom five deciles receive 25%–59% of their net income in benefits, while the top five deciles receive 2%–18%. This is part of the reason why benefits contribute more to redistribution than direct taxes do: as they are more focused on individuals with low household incomes, they can result in very large proportional increases in income for these groups and thus reduce inequality substantially.[12] Another part of the reason is that while means-tested benefits are determined by household incomes, direct tax liability is determined almost entirely on an individual basis. This means that while the benefit system redistributes towards low-income *households*, the direct tax system only redistributes away from high-income *individuals*. Because we measure income at the

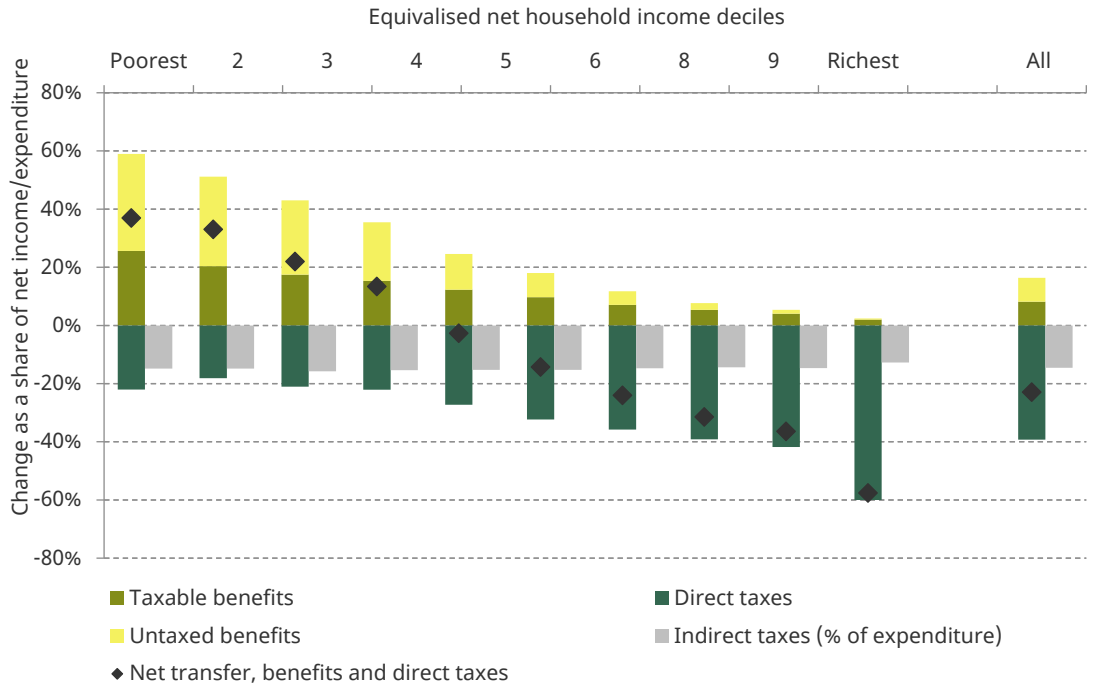
[10] Figure A1 in the Appendix replicates Figure 4 in cash terms: it shows the average (equivalised) cash amount paid in taxes and received in benefits across the ten income deciles.

[11] The share of income going to direct taxes among top-income individuals seems particularly large because it is given as a fraction of net (i.e. after tax) income. Tax as a share of gross market income for the top decile is considerably lower, at 40% (instead of 60%).

[12] As a share of net income, the top quintile receives 3% of its net income in benefits, while the bottom quintile receives 54% of its net income in benefits. Thus, the bottom quintile receives 16 times more as a share of net income in benefits than the top quintile does. In contrast, the highest-income fifth pays just 2.7 times as much direct tax as a share of income as the poorest fifth. Ignoring council tax, the highest-income fifth receives 15 times less in benefits as a share of net income and pays 4.1 times as much direct tax as a share of income as the poorest fifth does. In cash terms, the highest-income fifth pays around 20 times as much direct tax (excluding council tax) as the lowest-income fifth does.

household level, and because some high-income individuals are not in high-income households, this limits the redistributive capacity of the direct tax system relative to the benefit system.

Figure 4. Effects of taxes and benefits by income deciles, 2016–17



Note: Incomes have been measured at the household level but before housing costs have been deducted. The unit of analysis is individuals. Quintiles are based on equivalised (using OECD equivalence scale) net household income, but the income components are not equivalised. All benefits and direct taxes are shown as a share of net household income, while indirect taxes are shown as a share of household expenditure.

Source: Authors' calculations using the ETB, the FRS and the HBAI, 2016–17.

The difference in the redistributive effect of direct taxes and benefits is partly also driven by council tax.[13] Those on low incomes may be able to claim council tax support, meaning that they do not have to pay their full council tax liability. We measure council tax net of council tax support. But even net council tax is regressive with respect to income (albeit much less so than gross council tax); the bottom decile pays around 8% of its net income in council tax, while the second to sixth deciles pay 4%–5% and the seventh to top deciles pay around 2%–3%.[14] Previous IFS research has shown that this is partly due to low take-up of council tax support entitlements: if everyone claimed the council tax support that they are eligible for, net council taxes would show an inverse U-shaped distributional pattern, affecting middle-income households more than high- or low-income households.[15] If we ignore council tax and council tax support (in other words, if we only look at those taxes and benefits that are set by central government), we find that direct

[13] In council tax and council tax reduction, we include their Northern Irish equivalents (rates and rate rebates).

[14] The equivalent numbers for quintiles are: Net council tax makes up 5% of net income for the bottom fifth (in terms of equivalised net household income), 4% for the second, 3% for the third and fourth, and 2% for the top fifth.

[15] S. Adam and J. Browne, 'Reforming Council Tax Benefit', IFS Commentary C123, 2012, https://www.ifs.org.uk/comms/comm123.pdf.

taxes reduce the Gini coefficient by 5.8 ppt, which is 0.9 ppt more than in our headline estimates.

The black diamonds in Figure 4 show the net transfer (as a share of net income) from benefits and direct taxes. The average net transfer decreases as we move up the income distribution. While the poorest decile on average receives a net transfer of 37% of their net income (59% of gross market income), the richest decile pays, on net, 58% of their net household income (37% of gross market income) into the direct tax and benefit system. Despite the fact that direct taxes as a share of net income are larger for those in the bottom decile compared with the second to fourth deciles (as explained above), the net transfer that the bottom decile receives is larger, as benefits more than make up for the difference in taxes paid.

The bottom four deciles are net recipients of these transfers on average, while the top six deciles are net contributors. Subtracting indirect taxes in addition to direct taxes leaves the bottom three deciles as net recipients, on average (see Figure A1 of the Appendix). However, these numbers differ when we look at different groups of the population. Across the whole population, 31% of individuals are in households that are net beneficiaries of direct tax, indirect tax and benefit transfers. This compares to 27% of those in working-age households with children, 13% of those in working-age households without children, and 66% of those in households with at least one pensioner.

The grey bars in Figure 4 show indirect taxes as a share of total expenditure by income deciles. To calculate this, we use the ONS's ETB data set. We show indirect taxes as a share of expenditure and not income, as indirect taxes are taxes levied on expenditure. Thus, it is misleading to show them as a share of income, as it will tend to make them look systematically more regressive than they really are. We explain this point further in Section 3.3. Across the population as a whole, individuals' indirect tax payments are a similar share of total household expenditure (at 13%–16%). Indirect taxes are thus roughly distributionally neutral overall: in other words, the redistribution achieved by benefits and direct taxes should be seen as representative of that achieved by the direct and indirect tax and cash benefits system as a whole.

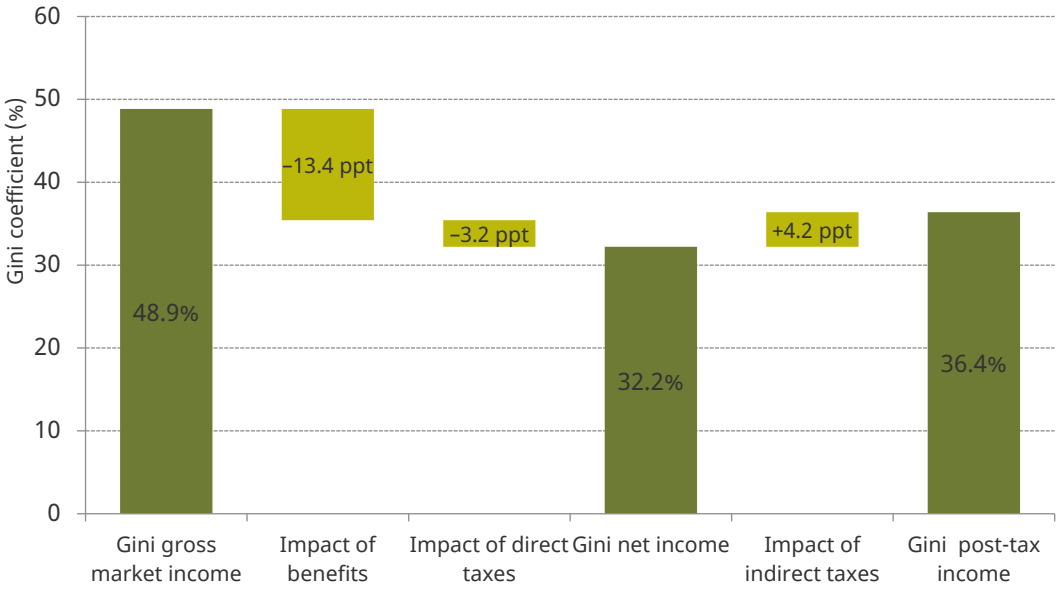
3. Impact of data and methodological choices on results

In this section, we look at how the use of different data and methodological choices affects the measurement of the redistributive effect of taxes and benefits. To highlight the importance of these choices, we compare our results with the ONS's estimates of the effects of taxes and benefits on UK inequality. We first present the ONS's results, and then change data set or methodology, step by step, until the methodology matches that seen in Section 2. We discuss the impact on the results as we go.

3.1. ONS results

Figure 5 replicates one of the charts presented in the ONS's most recent (2016–17) publication on the effects of tax and benefits on the UK income distribution.

Figure 5. ONS calculations of the impact of benefits and taxes on the Gini coefficient, 2016–17



Note: The ONS calls gross market income 'original income' and net income 'disposable income' in its publication. Under indirect taxes, they include taxes on intermediate goods and services. Incomes are equivalised.

Source: Authors' calculations using the ETB, 2016–17.

The ONS calculates an equivalised gross market income Gini coefficient of 48.9% for 2016–17. It estimates that benefits reduce the Gini by 13.4 ppt,[16] direct taxes reduce it by 3.2 ppt and indirect taxes increase it by 4.2 ppt. This analysis implies therefore that that the tax system as a whole (direct plus indirect taxes) actually increases inequality (as measured by the Gini coefficient).

[16] In the ONS ETB report, this figure is 13.5 ppt. This appears to be because the ONS first rounds the income Gini coefficients (gross market and gross market plus benefits) to one decimal place and then calculates the difference, while we calculated the difference on unrounded Gini coefficients.

As discussed in the previous section, we estimate a 13.0 ppt reduction in the Gini coefficient through benefits and a 5.0 ppt reduction in the Gini coefficient through direct taxes. Furthermore, we find that indirect taxes are more or less distributionally neutral. So, while we estimate a similar impact for benefits, we do not find the same effect for taxes. Our results suggest that the direct and indirect tax system as a whole is progressive. This is due to a number of differences in methodological and data choices between the ONS's analysis and ours, which we now investigate. We first show how differences in data and methodology affect estimates of the redistributive effect of direct taxes and benefits on UK income inequality. We then separately discuss indirect taxes in Section 3.3.

3.2. Results: direct taxes and benefits

Table 1 presents our estimates of the impact that taxes and benefits have on the Gini coefficient by data set and methodology. We start from the ONS's results for 2016–17 and we change one thing (i.e. we switch data set or adopt a different methodology) at a time. These changes are listed on the left-hand side of Table 1 ('Switch to HBAI', '+top incomes adjustment', etc.). In the following subsections, we give further detail for each change and we explain what the change does to our estimates.

Panel A of Table 1 shows the equivalised household gross market income (column 1) and equivalised net household income (column 4) Gini coefficients calculated for each incremental change in data set or methodology. Columns 2 and 3 present our estimates of how benefits and taxes, respectively, change the Gini coefficient (by number of ppt). We start off with the ONS's methodology and, row by row, we add a change and give the results. Panel B of Table 1 then shows by how much the relevant statistic of Panel A changes relative to the previous row, when we change method or data set.

For example, switching from the ETB to HBAI ('Switch to HBAI') increases gross market income inequality by 2.7 ppt, from 48.9% to 51.6%. The switch in data set results in an increase in the measured effect that benefits have on reducing inequality, with the impact going from –13.4 to –14.9 ppt. This means that benefits are estimated to be 1.5 ppt more redistributive when using HBAI rather than the ETB. This is shown in the top row of column 2 in Panel B as –1.5; note that a negative number in columns 2 and 3 of Panel B implies an increase in the redistributive effect of benefits or taxes.

The results in Table 1 are for a particular ordering of changes in methodology. That is, we first switch to a different data set, and then we apply a top incomes adjustment, and so on. Alternative orderings could lead to different results. Table A1 of the Appendix presents the average effect of each change in methodology across all possible orderings, and shows that our results are not particularly sensitive to the ordering of changes. Tables A2 and A4 of the Appendix also show that results are similar when we use the 5:1 ratio to measure (changes in) income inequality.

We now discuss each of the changes in data set or methodology in turn.

Table 1. Changes in Gini coefficient due to benefits and direct taxes, by data set and methodology, 2016–17

Panel A: Gini coefficients and effect of benefits and direct taxes on the income Gini by method/data set

	(1) Gross market income Gini	(2) Effect of benefits (in ppt)	(3) Effect of direct taxes (in ppt)	(4) Net income Gini
ONS ETB report	48.9%	–13.4	–3.2	32.2%
Switch to HBAI	51.6%	–14.9	–4.5	32.3%
+ top incomes adjustment	53.4%	–14.6	–5.3	33.6%
+ employer NICs	54.2%	–14.1	–6.5	33.6%
+ split taxable and untaxed benefits	54.2%	–15.5	–5.1	33.6%
+ individual level	51.0%	–13.0	–5.0	32.9%

Panel B: Percentage points change in Gini coefficient and in effect of benefits and direct taxes on the income Gini caused by change in method/data set

	(1) Change in gross market income Gini *(positive = more unequal)*	(2) Change in effect of benefits *(positive = less redistributive)*	(3) Change in effect of direct taxes *(positive = less redistributive)*	(4) Change in net income Gini *(positive = more unequal)*
Switch to HBAI	2.7	–1.5	–1.3	0.1
+ top incomes adjustment	1.8	0.3	–0.8	1.3
+ employer NICs	0.7	0.5	–1.3	0.0
+ split taxable and untaxed benefits	0.0	–1.4	1.4	0.0
+ individual level	–3.2	2.5	0.1	–0.6

Note: The row labelled 'ONS ETB report' presents the ONS's headline estimates of the effects of tax and benefit for 2016–17. The row 'Switch to HBAI' presents results using the HBAI instead of the ETB. The '+ top incomes adjustment' row presents the results when we switch to the HBAI that adjusts for top incomes. The row '+ employer NICs' shows results when, next to using the HBAI with top incomes adjusted, we additionally add employer NICs under gross market income and subtract it again under direct taxes. The row '+ split taxable and untaxed benefits' shows results when we change the order of adding benefits/subtracting taxes to income. Finally, the row '+ individual level' shows results when we additionally conduct our analysis at the individual level instead of at the household level. Figures may not sum as they have been rounded to the nearest decimal point. Incomes have been equivalised.

Source: Authors' calculations using the FRS and the HBAI 2016–17.

3.2.1. Switch to HBAI

In a first step, we switch from using the ETB data set, which the ONS uses, to the HBAI,[17] which is derived from the FRS. Both data sets use similar income definitions. Though there

[17] Note that at this stage we do not use the top incomes adjustment that is supplied with the HBAI, but we will do so in the next step.

are a few differences, these are likely to be relatively small and neither data set is obviously superior. However, on balance, the HBAI is less ambitious in terms of the incomes it tries to cover and how it adjusts income to account for intra-year volatility. Because – as we discuss in Appendix 3 – the additional income components and adjustments that the ETB includes are likely to be imprecise, the HBAI may more accurately measure what it intends to measure. For more information, see Appendix 3.

The main advantage that the HBAI has over the ETB is that it has a sample of around 19,000 households while the ETB only has 5,000. The use of a larger data set will allow us to obtain less noisy estimates.[18] Additionally, the HBAI comes with an adjustment for top incomes, which partially corrects for the well-documented under-reporting of high-income earners in surveys (see Section 3.2.2).[19] The major advantage that the ETB has over the HBAI is that it contains expenditure data, so it can be used for analysis of indirect taxes. Both data sets are subject to the usual limitations of survey data, such as the under-reporting of benefit receipt.

Panel A of Table 1 shows that switching from the ETB to the HBAI results in a larger equivalised gross market income Gini (an increase of 2.7 ppt from 48.9% to 51.6%) but a roughly unchanged net income Gini. Given that inequality in market income is increased but net income unchanged, the measured redistributive effect of the tax and benefit system must rise. This is what we see in Table 1, Panel B, which shows that the effects of benefits and direct taxes are measured, respectively, as 1.5 and 1.3 ppt larger in the HBAI than in the ETB.[20]

The change in the gross market income Gini appears to mainly be driven by differences in the measurement of income in the lower deciles. Figure 6 shows that gross market income in the ETB is around twice as high as in the HBAI in the lower-income quintile, while they are quite close from the second quintile on. The larger differences at the bottom are seen across all the major gross income components (gross earnings, investment income and private pensions income).

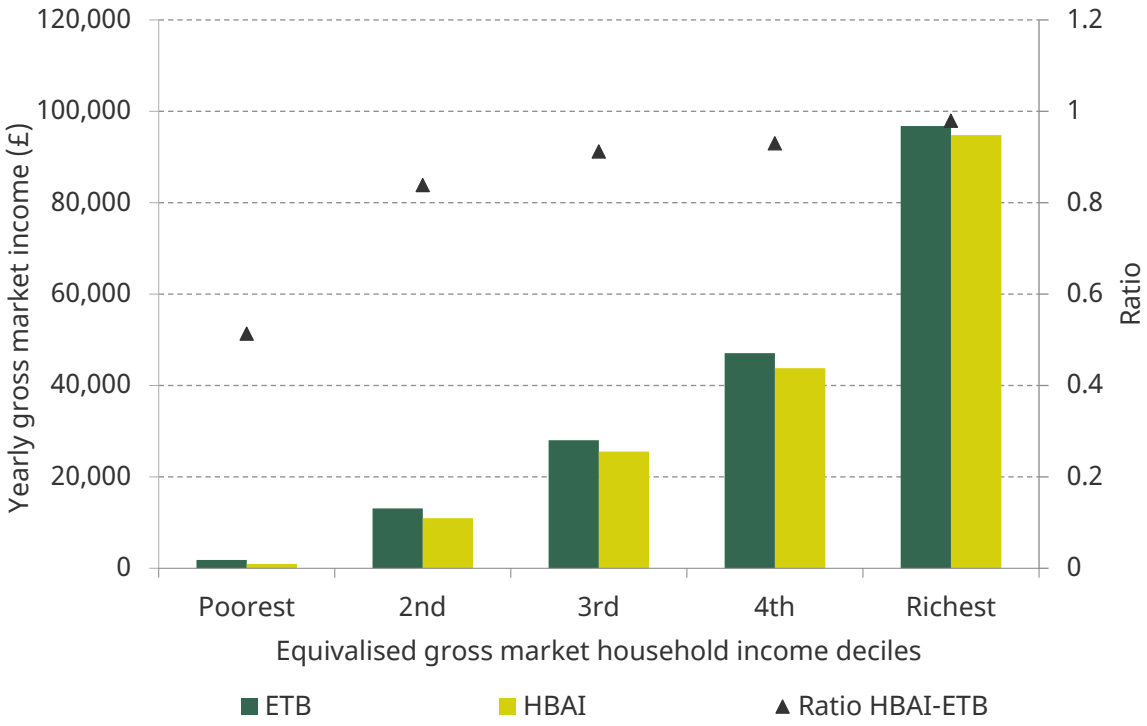
It is not entirely clear why HBAI records lower market incomes than the ETB at the bottom of the income distribution, and future research to better understand this would be useful.

[18] The ONS has stated in email correspondence that in its next but one ETB publication (2018–19) it will use combined data from the Living Costs and Food Survey and the Survey on Living Conditions, which will result in a larger data set of around 17,000 households. However, the combined data set will not include expenditure data.

[19] Note that the ONS is currently developing an adjustment for the income of high earners in the ETB, similar to that of the DWP for the HBAI and plans to implement it in its 2018–19 headline statistics (https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/articles/transformationofhouseholdfinancialstatistics/statisticaloutputsworkplan2018to2019).

[20] The differences in estimated Gini coefficients between the ETB and the HBAI hold across past years.

Figure 6. Average gross market household income by income quintile, 2016–17



Note: Incomes in both the ETB and the HBAI have been measured at the household level and before housing costs have been deducted. The unit of analysis is households. Quintiles are based on equivalised gross market income, but yearly gross market income is not equivalised. The triangle show the average gross market household income of each decile calculated using the HBAI divided by the one calculated using the ETB.

Source: Authors' calculations using the FRS, the HBAI and the ETB, 2016–17.

3.2.2. Top incomes adjustment

In the next step, we use the top incomes adjustment that is supplied with the HBAI. Top incomes are under-reported and under-represented in surveys, and so not correcting for this leads to an understating of income inequality. The DWP uses data from the Survey of Personal Income (SPI) – a sample of income tax records – to adjust the top 0.5% of incomes in the HBAI.[21,22]

Ideally, one would also want an equivalent adjustment for low incomes, as there is also under-reporting of incomes at the poorest end of the distribution, especially with respect to benefits received.[23] Thus, some respondents in the surveys appear to be poorer than they really are. Conversely, household surveys do not even try to capture some of the very poorest (e.g. those living in temporary accommodation or the homeless).

[21] For more details on the top incomes adjustment undertaken in the HBAI, see the DWP's HBAI Quality and Methodology Report, 2016–17 http://doc.ukdataservice.ac.uk/doc/7196/mrdoc/pdf/hbai_16_17_quality_and_methodology.pdf.

[22] The HBAI's top incomes adjustment is relatively simple, and further refinements may be possible. For a discussion of this, see R. Burkhauser, N. Hérault, S. Jenkins and R. Wilkins, 'Survey under-coverage of top incomes and estimation of inequality: what is the role of the UK's SPI adjustment?', 2018, *Fiscal Studies*, 39(2): 213–40.

[23] For empirical evidence on the under-reporting of low incomes, see for example M. Brewer, E. Etheridge and C. O'Dea, 'Why are households that report the lowest incomes so well-off?', 2017, *The Economic Journal*, 127(605): F24–F49.

In the HBAI 2016–17, around 1% of individuals were in households where incomes are adjusted. By making those at the very top of the income distribution appear even richer, applying the HBAI adjustment leads to an increase in both the market income as well as the net income Gini, by 1.8 and 1.3 ppt, respectively. Thus, the direct taxes and benefits system as a whole become slightly more redistributive once we use the top incomes adjusted HBAI.

Applying the top incomes adjustment makes the effect of direct taxes on the Gini 0.8 ppt larger (second row in Table 1, Panel B). This is because the SPI adjustment increases the measured amount of direct tax paid by high-income individuals, thus enhancing the redistributive role of taxes. The effect of benefits on the Gini becomes slightly smaller. This is because the SPI adjustment increases the total amount of measured income in the country, while leaving the recorded amount of benefits essentially unchanged (as the top 1% generally do not receive benefits). As a result, the adjustment makes benefits a smaller share of total income, thus reducing their redistributive capacity.

3.2.3. Adding employer NICs

In our analysis, we measure gross market income as gross of employee NICs, and then subtract employee NICs as part of direct taxes to derive net income – but we have ignored employer NICs. This is similar to the ONS's method, though they include employer NICs in indirect taxes, an approach that we discuss shortly.

Measuring market income gross of employee but not employer NICs is equivalent to assuming that the burden of the former is felt by the employee and the latter by the employer. Basic economic theory suggests that, in the long run, earnings should adjust so that the burden of NICs is paid by the same individual (employee or employer), regardless of who is formally liable to pay the tax.[24] In practice, the burden of both employer and employee NICs (and indeed income tax) is probably shared. However, as we assume that income tax and employee NICs are ultimately incident on the worker, it is reasonable to assume the same about employer NICs too, rather than to allow the ultimate incidence to depend simply on the legal incidence.[25]

Under this assumption, an employee's gross market income – the income they would receive in the absence of any taxes – includes the amount of employer NICs their employer is formally liable for. The inclusion of this as gross market income leads to a greater gross market income Gini. This is because the employer NICs of higher-income households make up a larger share of their net income, as shown in Figure 7. This occurs for two reasons. First, the share of households with employees is higher in higher-income deciles. Second, higher-income deciles have higher average earnings, and the system of employer NICs is progressive with respect to earnings: no employer NICs are paid up to the secondary threshold (£156 per week in 2016–17), and a fixed proportion are paid on earnings above that.

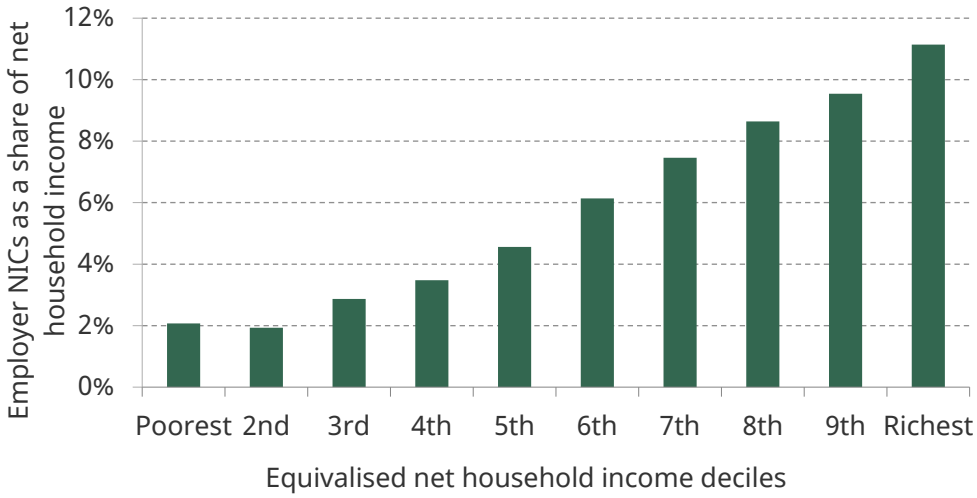
Not surprisingly, the effect of taxes on reducing the Gini coefficient becomes larger (by 1.3 ppt), because, as Figure 7 shows, employer NICs are a progressive tax. The effect of

[24] However, some empirical evidence suggests otherwise (at least in the short run); see, for example, F. Alvaredo, T. Breda, B. Roantree and E. Saez, 'Contribution ceilings and the incidence of payroll taxes, 2017, *De Economist*, 165: 129 (doi: 10.1007/s10645-017-9294-7).

[25] We estimate employer NICs using the IFS tax and benefit microsimulation model, TAXBEN (see https://www.ifs.org.uk/publications/12858).

benefits decreases slightly for the same reason as when we applied the top incomes adjustment.

Figure 7. Employer NICs as a share of income by income deciles, 2016–17



Note: Incomes have been measured at the household level and before housing costs have been deducted. The unit of analysis is households. Deciles are based on equivalised net income.

Source: Authors' calculations using the FRS and the HBAI, 2016–17. Employer NICs are estimated using the IFS tax and benefit microsimulation model, TAXBEN (see https://www.ifs.org.uk/publications/12858).

incomes: the inclusion of employer NICs in gross market income increases the total measured market income of the population, making benefits a smaller fraction of income, and so reducing its redistributive power.

As noted above, our treatment of employer NICs differs from the ONS's. The ONS try to estimate the share of the costs of all goods and services that are accounted for by employer NICs. They then multiply this fraction by each household's total expenditure to calculate how much they indirectly spend on employer NICs. This essentially assumes that the employer NICs are passed on (at least somewhat) to consumers via higher prices, but that they do not have any impact on employee earnings. For employee NICs, however, they assume that the cost is fully incident on the employee.

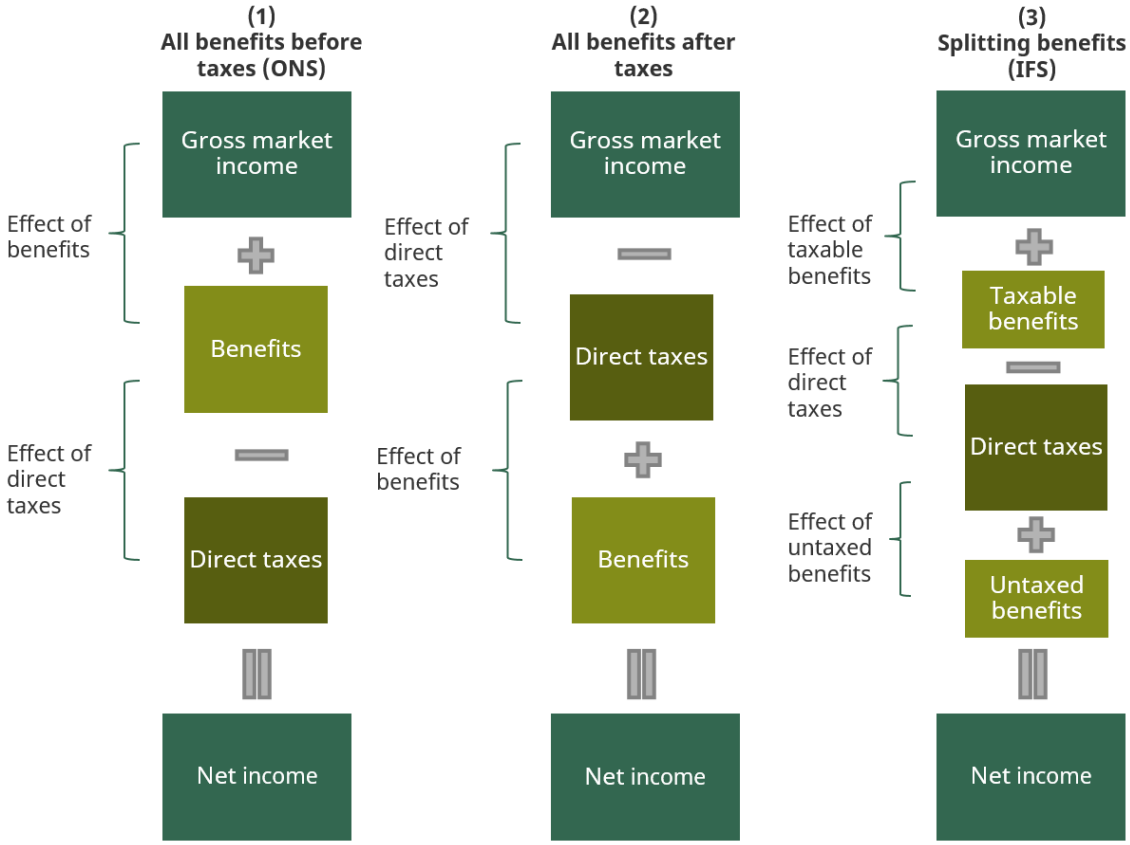
Less importantly, even if one accepts the ONS's assumptions on where the burden of employer NICs falls, the approach used is somewhat coarse. The share of total cost that employer NICs make up varies across goods and services. This means that, in broad terms, the more a household spends on UK labour-intensive goods and services, the more they implicitly spend on employer NICs. It is plausible that higher- and lower-income households spend different fractions of their budgets on labour-intensive goods and services, but this would not be captured by the ONS's approach, which assumes that a fixed share of expenditure goes on employer NICs for every household.

3.2.4. Splitting taxable and untaxed benefits

So far, in calculating the effect of benefits, we have compared the gross market income distribution with the gross market income plus benefits distribution. To calculate the impact of taxes, we have compared the distribution of gross market income plus benefits with the distribution of net income (gross market income plus benefits minus direct

taxes), as shown by flowchart 1 of Figure 8. This is the same as the ONS does in its analysis.

Figure 8. Ordering of taxes and benefits



In other words, what the ONS approach does – as does ours up to this point – is to add on all benefits to income first, and subtract taxes second. This ordering matters. It means that the distributional impact of benefits is assessed by looking at what it does to the *pre*-tax distribution of income, whereas the distributional impact of taxes is assessed by looking at what it does to the *post*-benefit distribution of income. This means for example, that if someone with an average market income receives a significant amount of benefits and pays a significant amount of tax, it looks like benefits are going to someone with average living standards and tax is being paid by a somewhat better-off person (since the tax is being examined after including the benefit income this person gets). But one could instead describe this as tax being paid by a middle-income person and then benefits being paid to a below-average income person (since that income is measured after tax). Dealing with taxes and benefits in a different order would give a different result, and it is not clear which we should prefer. The choice is arbitrary. At the very least we should want to know what difference the choice of ordering makes.

Although any ordering choice would be arbitrary, there is a particular oddity in the interpretation of the ONS approach. If we add on all benefits and then deduct taxes, the measured impact of taxes is calculated by holding constant the set of benefit receipts. But this is a thought experiment that is at odds with how the tax and benefit system works, since some means-tested benefit entitlements depend on post-tax income – in other words, if you change taxes, you would in reality also change some benefit entitlements. Equivalently, it seems odd to show the impact of benefits which arise merely because of taxes as a share of income which is gross of those taxes. As we explain shortly, the

consequence of this is that the ONS approach will overstate the redistributive impact of taxes. One would have a similar problem if one first subtracted all taxes from market income and then added on all benefits, since some benefits are taxable, so in fact changing benefits also has feedback effects on tax payments.

An alternative, which does have the merit of mirroring more closely how the tax and benefit systems work in practice, is to split benefits into two groups: taxable and untaxed benefits, as described in Section 2.2. First, we add on taxable benefits to gross market income, then we subtract direct taxes and finally we add on untaxed benefits to obtain net income. This is shown in the third flowchart of Figure 8. At each stage, we compare the income distribution before and after the transfer in order to calculate its effect. This means that, for example, we calculate the effect of direct taxes on income inequality by looking at the distribution of 'gross market income + taxable benefits' and seeing how it changes when we subtract direct taxes. When we show the effect of benefits, it is the sum of the effects of taxable and untaxed benefits.

This method approximately mimics the mechanics of the way that the tax and benefit system actually works: an individual's tax liability is dependent upon the sum of their market income and the taxable benefits they receive, and their entitlements to some untaxed benefits are dependent upon their income after direct tax.[26] It does therefore have the merit of a somewhat clearer interpretation: the effect of taxes or group of benefits is their impact on the distribution of the income base to which they are in fact applied, and it does not ignore the interaction between taxes and benefits.

To illustrate the importance of these issues, Table 2 shows how the ordering of taxes and benefits affects their estimated effects on income inequality.

Table 2. The effects of benefits and direct taxes on the Gini coefficient by ordering of taxes and benefits

	Effect of benefits on Gini *(ppt; more negative = more redistributive)*	**Effect of taxes on Gini** *(ppt; more negative = more redistributive)*
All benefits before taxes (ONS)	–14.1	–6.5
All benefits after taxes	–17.9	–2.7
Splitting taxable and untaxed benefits (IFS)	–15.5	–5.1

Source: Authors' calculations using the FRS and the HBAI 2016–17.

If we calculate the effects of benefits and taxes by first adding on all benefits to gross market income and then subtracting direct taxes, as the ONS does, benefits reduce the

[26] Some benefits – such as some disability payments – are neither taxable nor means-tested. There is no strong argument either way for whether the effect of these benefits should be measured before or after tax. In this analysis, we demarcate the benefit groupings by which benefits are taxed and untaxed, and so these types of benefits go in the untaxed group. It might be thought that tax credits could also be ordered either before or after tax, as they are not taxable and are based on gross, not net, earnings. However, because we are assuming that employer NICs are incident on employees, direct taxes in fact do reduce the measure of earnings relevant for tax credit entitlements, and so it is appropriate that they are ordered after taxes.

income Gini by around 14 ppt while taxes reduce it by around 7 ppt. If one does the reverse – first subtracting taxes from gross market income and then adding on all benefits – benefits are estimated to reduce the income Gini by around 18 ppt and taxes to reduce it by 3 ppt. We see a smaller impact of taxes if they are applied directly to gross market income (before adding on benefits). This is because individuals who have a low income or no market income still usually pay some tax (e.g. council tax), and these taxes make up a very large share of their market income, limiting the progressivity of tax when measured in this way. The addition of benefits after deducting taxes results in a larger measured redistributive role of benefits because taxes reduce the total amount of household income, which means that benefits make up a larger share of total income, increasing their redistributive power.

Not surprisingly, applying some (taxable) benefits before taxes are deducted and others (untaxed) after tax gives estimates of the effects of taxes and benefits in between the other two options.

These results show that the order in which benefits and taxes are applied has a substantial impact on their measured effects on inequality. We have argued that, if one wants to split the distributional impacts of taxes and benefits, there is one approach that at least has a more coherent interpretation than the others, because it does not ignore direct interdependencies between taxes paid and benefit received. But fundamentally this section highlights that taxes and benefits operate jointly to affect how market incomes are translated into net incomes. Really this is another point in favour of looking at the progressivity of the tax and benefit system as a whole, rather than fixating on specific parts of it.

3.2.5. Individual-level analysis

Finally, we switch from household-level analysis to individual-level analysis. Though we still measure income at the household level, instead of counting households, we count individuals. This gives larger households more weight, and means that we are measuring inequality between individuals rather than inequality between households.

There are arguments in favour of individual- as well as household-level analysis. In favour of the former is the fact that we are generally concerned about the living standards of individuals, rather than households, meaning that a large household containing many people with low living standards should have more weight than a small household containing fewer people with equally low living standards. Analysis at the individual level rather than at the household level also accounts for any changes over the years in composition of households, which may affect individual-level inequality. An argument in favour of doing analysis at the household level is that one can avoid making an assumption about the difficult issue of within-household income sharing; that is, whether households, for example, divide income equally amongst themselves, or whether some members receive more than others.

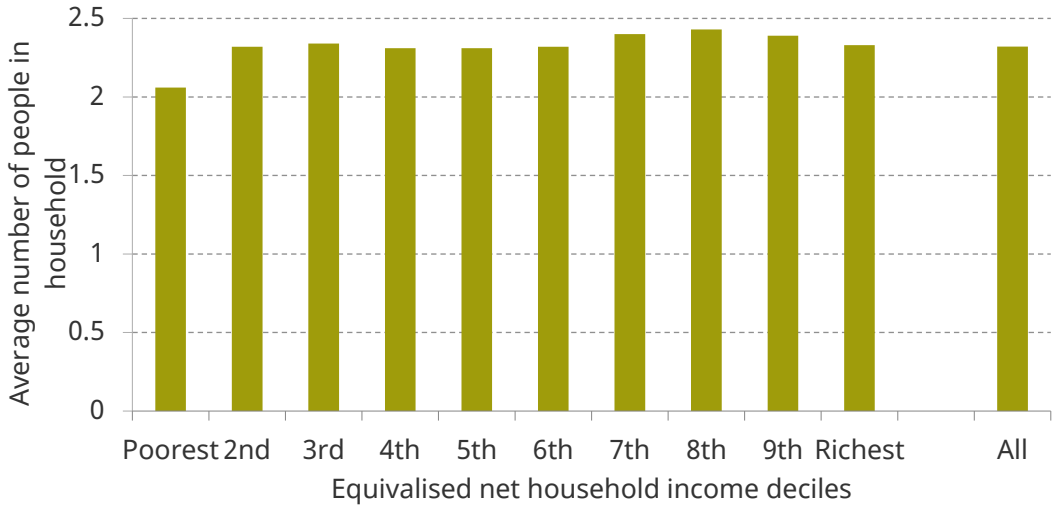
There are no decisive arguments in favour of one level of analysis over the other, and it is probably worth having both. However, it is important to know how switching to individual-level analysis changes results, so that we can interpret estimates of the impact of taxes

and benefits on the income distribution with this in mind.[27] It is also worth noting that as of this year the ONS also plans to do its analysis at the individual level.[28]

As the fifth row of Table 1, Panel B shows, switching from household-level to individual-level analysis decreases both the gross market income and the net income Gini (by 3.2 and 0.6 ppt, respectively) and decreases the effect of benefits on the Gini (by 2.5 ppt in absolute terms), while leaving the effect of taxes virtually unchanged.

To understand the impact that switching to individual-level analysis has, Figure 9 shows the average size of households across the income distribution. Average household size is relatively constant between deciles 2 and 10 (with an average of 2.35 people per household), but in the poorest decile it is smaller, at 2.06. As switching to individual-level analysis entails putting more weight on bigger (and less weight on smaller) households, this approach essentially reduces the weight on the poorest households. As a result, this approach decreases inequality in both gross market income and net income Gini (because it reduces the share of units with incomes at one extreme). It also decreases the effect of benefits, as poorer households are the major recipients of benefits. The effect of taxes is virtually unchanged, a consequence of two offsetting effects: the poorest households (who are, on average, the smallest households) pay, as a share of net income, somewhat less tax than average, and households in deciles 7–9 (who are, on average, the biggest households) pay somewhat more (see Figure 4). In other words, some tax redistribution happens through those in the bottom decile, who get less weight when we switch to the individual level, and some through deciles 7–9, who get more, and these effects roughly balance out.

Figure 9. Number of people in household by income decile, 2016–17



Note: Incomes have been measured at the household level and before housing costs have been deducted. The unit of analysis is households. Deciles are based on equivalised net household income.

Source: Authors' calculations using the FRS and the HBAI, 2016–17.

[27] For a presentation of how results may differ depending on the level of analysis over time, see A. Corlett, 'Unequal results. Improving and reconciling the UK's household income statistics', 2017, https://www.resolutionfoundation.org/app/uploads/2017/12/Unequal-results.pdf.

[28] ONS statistical outputs workplan (https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/articles/transformationofhouseholdfinancialstatistics/statisticaloutputsworkplan2018to2019).

3.2.6. Summary of results on benefits and direct taxes

The previous subsections have demonstrated how each change in data set or methodology changes our estimates. If we look at the combined changes, by comparing the estimates in the first and sixth rows of Panel A, Table 1, we see that many of the changes in results are offsetting. Overall, we estimate a gross market income Gini that is 2.1 ppt higher than the ONS's estimate, and a net income Gini that is 0.7 ppt higher. Our estimate of the redistributive effect of benefits is similar to that of the ONS, while that of direct taxes is 1.8 ppt – or 56% – higher. We obtain similar results using the 5:1 ratio as the measure of inequality.[29]

Our final estimates differ from the ONS's in several ways. Some of these – such as choice of data set and unit of analysis – are not clear analytical improvements, and to some extent are judgements on which reasonable people can differ. With others – particularly the SPI adjustment and, to a lesser extent, adding employer NICs to direct taxes and splitting benefits into taxable and untaxed – one can make a strong case that they are analytical improvements, making the results more accurate or more internally consistent. The ONS is currently in the process of combining data sets to obtain a larger sample size,[30] and it has released an additional experimental series with top incomes adjustment (though – so far at least – this is only used for their measure of net income inequality, not their estimates of the effects of taxes and benefits).[31] This analysis complements these changes by helping us to understand their effects.

We now move on to look at the redistributive effect of indirect taxes.

3.3. Results: Indirect taxes

Here, we discuss alternative ways to analyse the distributional impact of indirect taxes. As with direct taxes and benefits, we illustrate these alternatives by highlighting differences between the ONS's method and the approach adopted in Section 2.

In order to work out the effect that indirect taxes have on inequality, we cannot use the HBAI, as it does not contain any expenditure data. Thus, we use the ETB, as the ONS does.

There are three key issues that need to be addressed to estimate the distributional consequences of indirect taxes. First, we need an assumption about who bears the burden of the tax. Second, we need to decide 'coverage' (i.e. which taxes will be included). Third, we need to divide indirect tax liability by some measure of living standards.

First, we assume (with the ONS) full incidence on the consumer for indirect taxes. This means we assume that companies pass on the full costs of indirect taxes to consumers in the form of higher prices (rather than to shareholders via lower profits or to employees via lower wages). As with employer and employee NICs, this is an extreme assumption,

[29] See Table A2 of the Appendix.

[30] The ONS has stated in email correspondence that it intends to use the combined larger sample for its 2018–19 statistical outputs.

[31] See ONS, 'Using tax data to better capture top earners in household income inequality statistics', 2019. https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/articles/usingtaxdatatobettercapturetopearnersinhouseholdincomeinequalitystatistics/2019-02-26

with the burden likely split between all three parties in reality; but because that split is unknown, we adopt this straightforward and transparent approach.

Second, we include as indirect taxes only taxes on final goods and services (goods and services that are bought by consumers), the most important of which are VAT and fuel and vehicle excise duties.[32] The ONS analysis also includes taxes on intermediate goods and services (goods and services that are used as inputs to create other goods and services), such as rates on commercial and industry properties. It is likely that intermediate taxes are at least partially passed on to consumers in the form of higher prices. However, even if they are fully passed on, it is much harder to work out which consumers bear the burden than it is in the case of taxes on final goods and services. For example, if someone buys petrol (a final good), we know the relevant fuel duty that they pay. In contrast, if they buy bread, which was delivered to the supermarket by a truck that used fuel (and paid fuel duty), it is much harder to calculate, even on the assumption of full pass-through to consumers, how much more expensive the bread is as a result, as we do not observe the quantity of fuel used in the delivery of the bread. So, although the inclusion of intermediate taxes is theoretically appealing, it is difficult to do this accurately, and it is also hard to know how well it has been done. Therefore, we do not include taxes on intermediate goods and services in our analysis.

Third, we present indirect taxes as a share of expenditure (see Figure 4) rather than as a share of net income (as the ONS does in their headline results).[33] Ultimately, we choose this approach because indirect taxes are levied on expenditure, not income. This matters because expenditure and income can diverge: low (or high) income can be temporary, and households can 'smooth' their expenditure over time by borrowing and saving, allowing them to maintain a similar standard of living even when their income fluctuates. This makes indirect taxes look large as a share of income for people who have temporarily low incomes but somewhat higher living standards (i.e. higher expenditures). But because they cannot permanently spend more than their income, these people will have, in other periods, either lower expenditure (and hence pay less indirect tax) or higher income (and hence appear to be less poor). Looking at this differently, people with high incomes tend to save a larger proportion of their income, and because saving is not subject to indirect tax, their indirect tax liability as a share of net income is low. However, this indirect tax is merely delayed, not avoided: when those savings are eventually spent, they will attract indirect taxes.[34]

Figure 10 demonstrates the redistributive effect of indirect taxes using several methods. The dark green bars show indirect taxes as a share of net income by net household

[32] Note that, additionally, we do not cover all the taxes on final goods and services that the ONS does. We do not include stamp duty, driving licences and television licences. For stamp duty, this is because there is no robust way to spread its cost through the time that someone lives in the purchased house (as would be ideal); in the latter two cases, it is because these are arguably not taxes.

[33] Note that the ONS has in fact presented indirect taxes as a share of expenditure in addition to as a share of income in previous ETB releases (and very briefly in its technical report to the ETB for 2016–17). However, these findings were never presented as the ONS's main results on the effect of indirect taxes on inequality. (See for example ONS, 'Effects of taxes and benefits on UK household income: financial year ending 2016', 2017, https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/bulletins/theeffectsoftaxesandbenefitsonhouseholdincome/financialyearending2016)

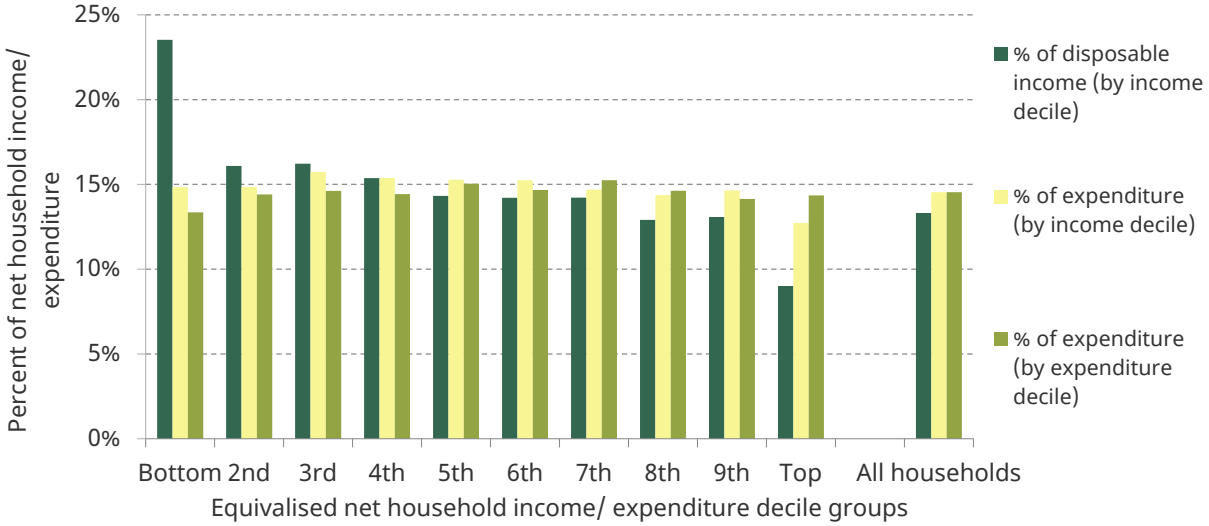
[34] For a further discussion of this point, see 'The distributional impact of VAT', Section 9.2 of 'A retrospective evaluation of elements of the EU VAT system', TAXUD/2010/DE/328, 2011 (https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/common/publications/studies/report_evaluation_vat.pdf)

income deciles. These bars suggest that indirect taxes are quite regressive as those on the lowest current incomes spend a lot on goods that are taxed relative to their income. The yellow bars in Figure 10 conversely show indirect taxes as a share of expenditure.[35] Using this method, indirect taxes appear approximately distributionally neutral, with households across the income distribution paying a similar proportion (13%–16%) of their expenditure in indirect taxes.

Another method is to continue to show indirect taxes as a share of expenditure, but to group households by their equivalised expenditure, rather than equivalised net household income. Expenditure may be a better measure of a household's lifetime available resources, precisely because of the 'smoothing' described above. As it turns out, this approach (shown in Figure 10 by the light green bars) gives very similar (though slightly more progressive) results to ranking by income.[36]

It is arguable whether ranking by expenditure or net income is better. Given that the two approaches give similar results and the HBAI does not have an expenditure measure, we use net income.[37]

Figure 10. Indirect taxes as a share of net income/expenditure by income/expenditure deciles, 2016–17



Note: Incomes have been measured at the household level and before housing costs have been deducted. Expenditure is also measured at the household level. The unit of analysis is individuals. Deciles are based on equivalised income/expenditure.

Source: Authors' calculations using the ETB, 2016–17.

Figure 11 shows indirect taxes as a share of total expenditure, by net income deciles, splitting out the different components of indirect taxes. This shows that VAT and fuel

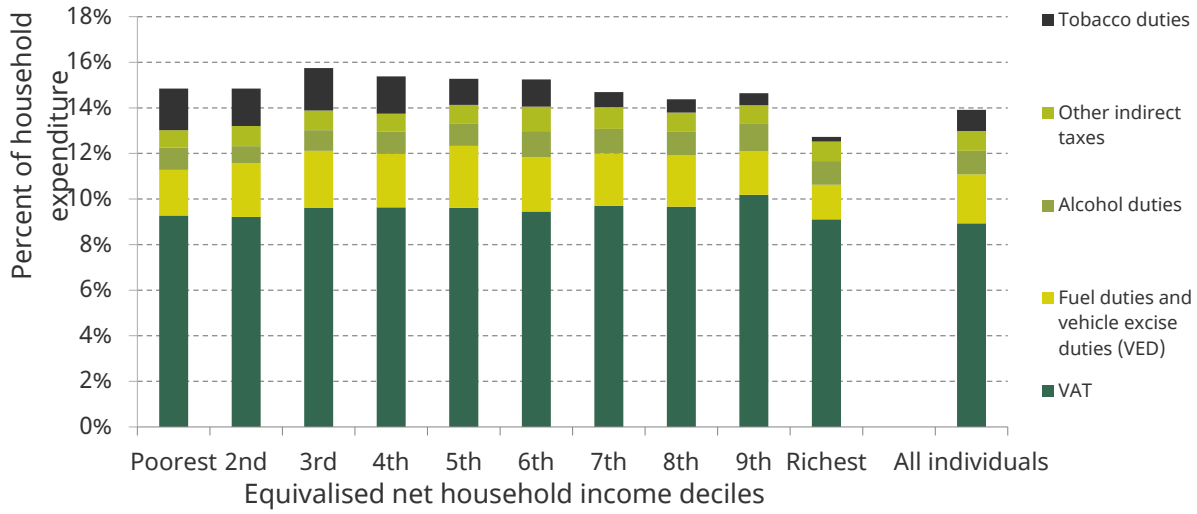
[35] In calculating indirect taxes as a share of expenditure, we have subtracted from the ETB expenditure measure income from benefits in kind (e.g. stamp duty, TV licences and intermediate taxes) in order to get an expenditure variable that is consistent with the rest of our analysis.

[36] Of course, there is a fourth way of presenting indirect taxes; that is, measuring indirect taxes as a share of income and presenting them by expenditure deciles. With this method, which is as misleading as showing indirect taxes as a share of disposable income by income deciles, indirect taxes look very progressive.

[37] For a discussion of using net income versus expenditure to rank people, see S. Carrera, 'An expenditure-based analysis of the redistribution of household income', 2010, *Economic and Labour Market Review*, 4 (3):18–27 (https://link.springer.com/content/pdf/10.1057%2Felmr.2010.33.pdf).

duties are approximately distributionally neutral, while alcohol duties are slightly progressive. Only tobacco duties are clearly regressive. This underscores an important thing to keep in mind in discussions of taxes and benefits: it is always possible to find some part of the tax and benefit system that is regressive. But even governments that are strongly inequality-averse should not be especially concerned about that. There might be a good reason for the tax – for example, tobacco duties, which are levied to influence smoking behaviour. Instead, when assessing the progressivity of taxes and benefits, we ought to consider the system as a whole; there is no particular need for every component of the tax and benefit system to be neutral or progressive. A tax that is regressive can achieve a specific aim (e.g. tobacco duties) and its distributional consequences can be offset by other parts of the system (such as benefits).

Figure 11. Indirect tax components as a share of expenditure by income deciles, 2016–17



Note: Incomes have been measured at the household level and before housing costs have been deducted. Expenditure is also measured at the household level. The unit of analysis is individuals. Deciles are based on equivalised net household income. Other indirect taxes include betting taxes, Insurance Premium Tax, Air Passenger Duty and customs (import) duties.

Source: Authors' calculations using the ETB, 2016–17.

4. Conclusion

The tax and benefit system is an important tool for a government that wants to reduce inequality. In this briefing note, we have examined the effect that benefits and direct taxes have on UK inequality using the income Gini coefficient as the main measure of income inequality. We find that benefits and direct taxes reduce the income Gini (making incomes more equal) by 13 and 5 ppt, respectively. Our analysis of indirect taxes shows that they are more or less distributionally neutral: therefore, the redistribution achieved by benefits and direct taxes should be seen as representative of that achieved by the direct and indirect tax and cash benefits system as a whole.

These results differ somewhat from those of the ONS, which finds a smaller role for direct taxes and finds indirect taxes to be regressive. In the case of direct taxes, this divergence is due to a number of methodological differences between the ONS's analysis and ours. We would argue that the application of a top incomes adjustment, the inclusion of employer NICs as a direct tax, and the assessment of direct taxes after adding on taxable benefits but before adding on untaxed benefits, are all analytical improvements. Together, they have significant impacts on the measured progressivity of direct taxes. In the case of indirect taxes, the difference in our results is driven by the fact that we show their effect as a share of expenditure, rather than income, which is a more accurate way of displaying their impacts on those with different standards of living. Overall, the surprising ONS conclusion that 'overall, taxes had a negligible effect on income inequality' is due to some less than ideal analytical choices, and under more appropriate choices one obtains the result that indirect and direct taxes are in fact progressive.

But it is worth noting that what matters for inequality is the progressivity of the tax and benefit system as a whole, and not that of a specific tax or benefit, or group thereof. As we have shown, the interdependency of taxes and benefits makes it difficult to unpick the contribution of each. Also, individual taxes – such as tobacco duties – can be regressive, even while the system as a whole is progressive. Rather than focusing on whether an individual aspect of the system is progressive or regressive, we should ask whether the government is using the best instruments available to achieve its goal – be that redistribution, changing work incentives, or influencing consumption behaviour.

Finally, in order to conduct this sort of analysis that we have done here, researchers have to make assumptions, such as who bears the burden of a tax. These assumptions drive methodological choices, and – as we have shown in this briefing note – these methodological choices can markedly affect the measured impact of taxes and benefits. This underlines the importance of making explicit and interrogating those underlying assumptions.

Appendix

Appendix 1: Tax and benefits included

Here, we present a list of all benefits and direct and indirect taxes that are covered in our analysis. We split the benefits that we analyse into two groups: taxable and untaxed benefits. We only list the taxable benefits because the untaxed benefits include all other cash benefits and tax credits.

Included under direct tax:[38]

- income tax
- employer and employee NICs
- council tax

Included under indirect taxes:

- value added tax (VAT)
- tobacco duties
- alcohol duties, including duties on spirits, beer, cider and wines
- motor duties, which include both vehicle excise duties (VED) and duty on hydrocarbon oils
- other duties, which include betting taxes, Insurance Premium Tax, Air Passenger Duty and customs (import) duties

Included under taxable benefits:[39]

- the State Pension
- Jobseeker's Allowance (JSA)
- Carer's Allowance
- contribution-based element of Employment Support Allowance (ESA)
- Incapacity Benefit
- Child Benefit (Child Benefit is only taxed for people whose income is above a certain level)

[38] We also follow the DWP in counting student loan repayments as a tax. These make up less than 1% of the total direct tax liabilities we consider.

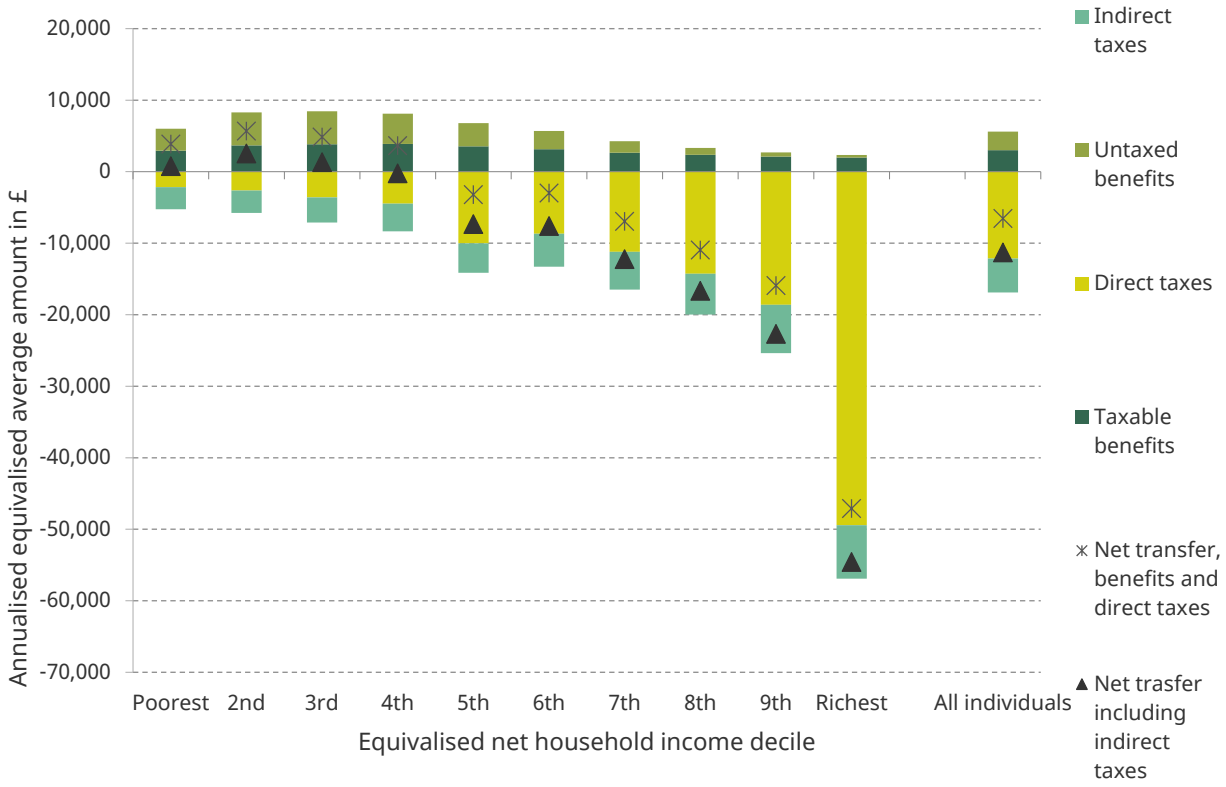
[39] To see a full list of benefits that are taxable, see https://www.gov.uk/income-tax/taxfree-and-taxable-state-benefits.

- Bereavement Allowance
- Widowed Parent's Allowance
- Widow's pension

Appendix 2: Further results and robustness checks

Figure A1 is the equivalent of Figure 4 of the main text in cash terms. It shows the average cash amount that each income decile receives in benefits, as well as how much they pay in direct and indirect taxes in annualised cash terms.

Figure A1. Effects of taxes and benefits in yearly GBP by income deciles, 2016–17



Note: Incomes have been equivalised and measured at the household level and before housing costs have been deducted. The unit of analysis is individuals. Deciles are based on equivalised net household income. All benefits and taxes are shown in yearly GBP.

Source: Authors' calculations using the FRS and the HBAI, 2016–17.

Table A1 shows the average effect of changing a method of analysis on the Gini coefficients (columns 1 and 4) and on the impacts that benefits and taxes have on the income distribution (columns 2 and 3). The estimates of Table 1 of the main text rely on a particular ordering of the changes in methodology applied (i.e. first switching to the HBAI, then applying the top incomes adjustment, then including employer NICs under gross market income, then differentiating between taxable and untaxed benefits and, lastly, changing the unit of analysis). The estimates of Table A1, unlike those of Table 1, are the average effect of changing a specific methodology across all possible orderings of

changes and thus are independent of any particular ordering.[40] Estimates are nearly the same as those displayed in Table 1, showing that the ordering we give in the main text is not unrepresentative.

Table A1. Average change in the Gini coefficient (in ppt) due to benefits and direct taxes, by data set and methodology

	(1) **Effect on gross market income Gini** *(positive = more unequal)*	(2) **Change in impact of benefits** *(positive = less redistributive)*	(3) **Change in impact of direct taxes** *(positive = less redistributive)*	(4) **Effect on net income Gini** *(positive = more unequal)*
Top incomes adjustment	1.9	0.2	–0.7	1.4
Employer NICs	0.8	0.4	–1.1	0.0
Splitting taxable and untaxed benefits	0.0	–1.3	1.3	0.0
Individual level	–3.3	2.5	0.0	–0.7

Note: The estimates given here are the average effects (in ppt) that a change in a methodology has on the Gini coefficients (columns 1 and 4) and on the effects that taxes and benefits have on the UK income distribution (columns 2 and 3). They are calculated by first estimating the numbers for each possible ordering of switches and then averaging these estimates. Note that figures may not add up as they have been rounded to the nearest decimal point.

Source: Authors' calculations using FRS and HBAI 2016–17.

Table A2 shows the same estimates as Table 1 of the main text, but with the measure of inequality being the 5:1 ratio instead of the Gini coefficient.

We find that changing the measure of inequality does not significantly change results, except for in two cases: when we use the 5:1 ratio instead of the Gini coefficient, applying the top incomes adjustment increases (instead of decreases) the redistributive impact of benefits. The same is true when we in a next step include employer NICs under gross market income.

This is as, what matters for calculating the impact that benefits have on the 5:1 ratio, is the size of incomes in the top quintile relative to that of benefits. Both when switching to the top incomes adjusted HBAI as well as when we switch to including employer NICs under gross market income, the market income of the top quintile becomes larger, making the 5:1 ratio bigger. This means that any increase in income for the bottom quintile (such as benefits) has, in absolute terms, a larger impact on the ratio, even though the *proportional* change in the ratio will be unchanged.

Table A4 is the equivalent Table A1 for the Gini coefficient, just for when we use the 5:1 ratio as the measure of inequality. It shows us the effect of each change in methodology

[40] Note that we do not include the switch from ETB to HBAI here, as we are not able to do the top incomes adjustment and split of benefits with the ETB due to data constraints.

independent of ordering. Again, we see that the ordering used in Table A2 is not unrepresentative.

Table A2. Changes in 5:1 ratio due to benefits and direct taxes, by data set and methodology

Panel A: 5:1 ratio by method and effects of benefits and direct taxes on reducing 5:1 ratio

	(1) Gross market income 5:1 ratio	(2) Effect of benefits	(3) Effect of direct taxes	(4) Net income 5:1 ratio
ONS ETB report	12.0	–6.0	–0.7	5.3
Switch to HBAI	12.8	–6.5	–1.0	5.4
+ top incomes adjustment	13.9	–7.0	–1.2	5.7
+ employer NICs	14.5	–7.2	–1.6	5.7
+ split taxable and untaxed benefits	14.5	–7.2	–1.6	5.7
+ individual level	11.5	–5.0	–1.4	5.0

Panel B: Changes in 5:1 ratio and effects of benefits and taxes on reducing 5:1 ratio caused by change in method

	(1) Change in gross market income 5:1 ratio *(positive = more unequal)*	(2) Change in effect of benefits *(positive = less redistributive)*	(3) Change in effect of direct taxes *(positive = less redistributive)*	(4) Change in net income 5:1 ratio *(positive = more unequal)*
Switch to HBAI	0.8	–0.5	–0.3	0.1
+ top incomes adjustment	1.1	–0.6	–0.2	0.3
+ employer NICs	0.5	–0.1	–0.4	0.0
+ split taxable and untaxed benefits	0.0	0.0	0.0	0.0
+ individual level	–3.0	2.1	0.2	–0.7

Note: The row labelled 'ONS ETB report' presents the ONS's headline estimates of the effects of tax and benefit for 2016–17. The row 'Switch to HBAI' presents results using the HBAI instead of the ETB. The '+ top incomes adjustment' row presents the results when we switch to the HBAI data set that adjusts for top incomes. The row '+ employer NICs' shows results when, next to using the HBAI with top incomes adjusted, we additionally add employer NICs under gross market income and subtract it again under direct taxes. The row '+ split taxable and untaxed benefits' shows results when we change the order of adding benefits/subtracting taxes to income. Finally, the row '+ individual level' shows results when we additionally conduct our analysis at the individual level instead of at the household level. Figures may not sum as they have been rounded to the nearest decimal point. Incomes have been equivalised.

Source: Authors' calculations using the FRS and the HBAI, 2016–17.

Table A4. Average changes in the 5:1 ratio due to benefits and direct taxes, by data set and methodology

	(1) **Effect on market income 5:1 ratio** *(positive = more unequal)*	(2) **Change in impact of benefits** *(positive = less redistributive)*	(3) **Change in impact of direct taxes** *(positive = less redistributive)*	(4) **Effect on net income 5:1 ratio** *(positive = more unequal)*
Top incomes adjustment	1.1	–0.5	–0.3	0.3
Employer NICs	0.5	–0.1	–0.4	0.0
Splitting taxable and untaxed benefits	0.0	0.0	0.0	0.0
Individual level	–2.9	2.0	0.1	–0.7

Note: The estimates given here are the average effect (in ppt) switching a methodology has on the 5:1 ratio coefficients (columns 1 and 4) and on the effect that taxes and benefits have on the UK income distribution (columns 2 and 3). They are calculated by first estimating the numbers for each possible ordering of switches and then averaging these estimates. Note that figures may not add up as they have been rounded to the nearest decimal point.

Source: Authors' calculations using the FRS and the HBAI, 2016–17.

Appendix 3: Differences between the income measures in the HBAI and the ETB

Both the ETB and the HBAI use similar income definitions, though there are a small number of differences. We highlight some of these here.[41]

First, the ETB includes benefits-in-kind provided by employers (rent-free accommodation, company cars and car fuel benefit[42]) whereas the HBAI does not. If done correctly, it is probably better to include benefits-in-kind provided by employers as income, as these affect how well off people are. The key difficulty with doing this is working out what value to apply to the benefit-in-kind. Ideally, one would use the cash value that the employee places on the benefit; in other words, how much they would be prepared to pay for it? However, this is very difficult to estimate, and it is not a figure available in the ETB. The second-best option is to use the cost to the employer. This is not as good as using the value to the employee, because in some cases a benefit may be costly for the employer to provide but be of relatively little value for the employee. For example, the income from rent-free accommodation provided by an employer is calculated as the rental value of the accommodation. However, this may not be the value the employee places on it. Furthermore, calculating the cost of the benefit to the employer may also not be

[41] For a list of differences between the HBAI and the ETB, see https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/methodologies/theeffectsoftaxesandbenefitsonukhouseholdincome.

[43] For a list of the rates, see https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/684687/tc2b.pdf.

straightforward: in the ETB, the income derived from company cars, for example, is calculated as the taxable value of the company car. In order to calculate this, the ONS uses survey responses to obtain the list price and fuel type of company cars. It then uses the fuel type to estimate CO_2 emissions of the car, as company cars are taxed at a rate which depends on car fuel type and CO_2 emissions. This rate is applied to the list price of the car.[43]

There are some things to say about this approach. First, it implies that that individuals derive less value from an ecologically more efficient car (as its taxable value is lower). It also does not measure the full cost to the company – only the tax paid – and thus understates the full cost of the company car to the employer. Secondly, even if it were the taxable value one would want to use as the value of the benefit-in-kind, it is difficult to say how accurate this approach is. The list prices of company cars are obtained from survey responses and it is unlikely that individuals would know with much accuracy what this price is. Additionally, fuel type is not a very good proxy of CO_2 omissions, as this is likely to depend on a variety of other factors, such as car size and fuel efficiency.

Lastly, the inclusion of some benefits-in-kind but not others (even if done accurately) is not an unambiguous improvement. Suppose that individuals who receive the benefits-in-kind that are included are disproportionately of higher or lower incomes than those who receive benefits-in-kind that are not included. It would then be possible that the resulting estimate of inequality could be further from the true inequality than an estimate that ignored benefits-in-kind altogether.

A second difference between income measured in the ETB and income measured in the HBAI is that income in the ETB is adjusted for individuals who are unemployed, but have done work as a paid employee over the last 12 months. This is done by taking their earnings for their last job and adjusting these for the number of weeks they were unemployed. This is not the case in the HBAI. This approach goes some way towards measuring incomes over the year, rather than in the week that the household is sampled. Were it possible to obtain estimates of annual income, this might well give a better estimate of living standards than weekly incomes. However, the ETB only accounts for a very specific form of intra-year volatility in income. This will disproportionately affect certain parts of the income distribution. Other forms of intra-year income volatility are not adjusted for. Someone who is employed but has been unemployed at some point over the past 12 months, for example, does not have their income adjusted in the ETB and will be recorded as high income even though an equivalent adjustment would make them less so.[44] Adjusting income only in very specific cases risks biasing the results, and so this is possibly worse than not adjusting income at all.

A further difference between the two data sets is that the HBAI includes some benefits such as free school meals or Healthy Start vouchers under cash benefits, whereas the ETB treats these as a benefit-in-kind together with public services, such as education or the

[43] For a list of the rates, see https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/684687/tc2b.pdf.

[44] In the ONS technical report to the ETB, it says that they also adjust for this. However, in email correspondence, the ONS confirmed that this is not the method they actually apply.

National Health Service (NHS).[45] Additionally, in the ETB, student loans and repayments thereof are not added or deducted from income, whereas in the HBAI they are (though the ONS does plan to change its practice regarding student loans in the future).[46] Both approaches are consistent in the way they treat both loans and their repayments, and it is not clear which way is better.

[45] These benefits are not insignificant. According to the ETB, around 8% of households receive such a benefit (which they do not include as a cash benefit) and, on average, it was around £579 yearly.

[46] This information was obtained via email correspondence with the ONS.