
The distribution of income and growth in income tax revenue

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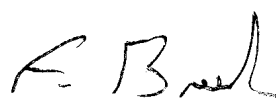
Foreword

In this paper we explore a topic of significance to Scotland – what affects growth in income tax revenues. We look at how the distribution of income, as well as other factors, have contributed to growth in income tax revenues, both in Scotland and the UK. We think this paper provides some helpful and important insights.

We are still in the early days of devolved Scottish income tax, and so we have been constrained to only look in depth at a single year – 2017-18. As more Scottish income tax data become available, we hope to build on the initial findings in this paper.



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5 October 2020

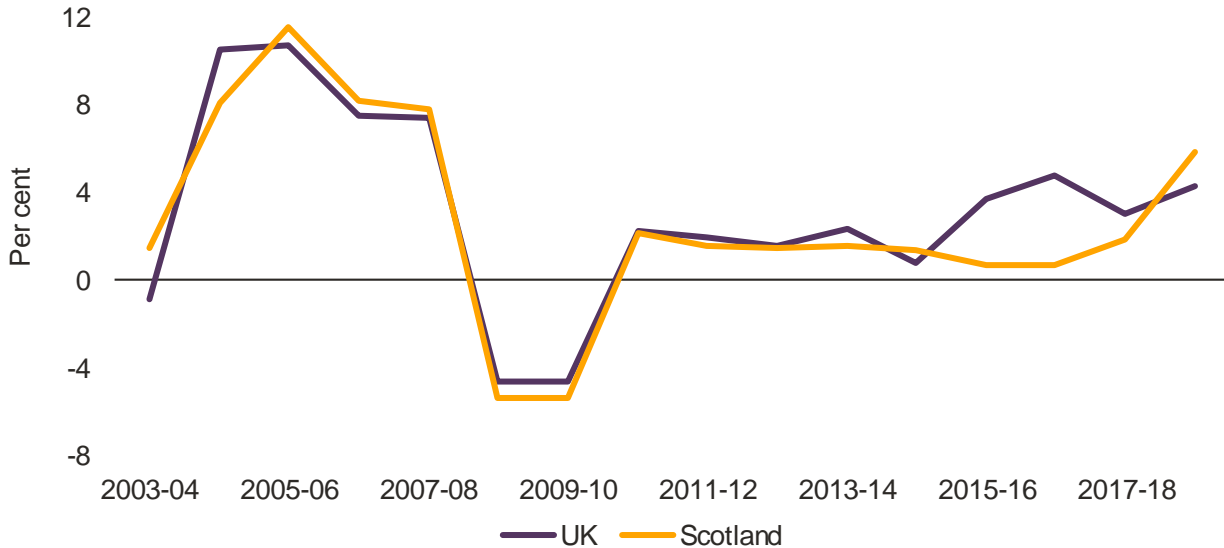
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Summary

- 1 In this paper we look at how the income distribution affects the link between growth in income and growth in income tax revenues. We compare Scotland and the UK to show how distributional issues affect relative growth in income tax revenues between the two.¹ We have identified the different ways in which the distribution of income affects income tax revenues, and we have made some initial estimates to quantify the scale of these effects, focussing particularly on 2017-18 for which we have the most complete data. We are still in the early days of devolved Scottish income tax, with data covering just a couple of years. As more income tax data are developed for Scotland, and more years of outturn data become available, we'll be able to add significantly to our initial findings.
- 2 Figure 1 shows how Scottish and UK non-savings non-dividend (NSND) income tax revenues have changed over time.
- 3 Between 2002-03 and 2014-15, growth in income tax revenue was similar between Scotland and the UK. Between 2014-15 and 2017-18, there was a temporary slow-down in income tax revenue growth in Scotland relative to the UK, coinciding with a period of slower economic growth in Scotland. In 2018-19, the Scottish economy grew faster than the UK economy, and similarly income tax revenues in Scotland grew more quickly than in the UK.

Figure 1: Comparison of growth rates of NSND income tax liabilities in Scotland and UK



Source: Scottish Fiscal Commission

Note: We do not have access to 2008-09, 2011-12 or 2012-13 Public Use Tape (PUT) datasets, so these points on the graph have been interpolated. Values prior to 2016-17 are based on the PUT survey, values from 2016-17 onwards are based on outturn data.

¹ The income tax Block Grant Adjustment is based on income tax growth in England, Wales and North Ireland in 2017-18 and 2018-19, and on growth in England and Northern Ireland from 2019-20 onwards. Generally, for brevity and simplicity, we simply refer to the UK when we mean the parts of the UK relevant for estimating the block grant adjustment in the particular context.

- 4 There are two key findings in our paper.
- 5 First, we sought to answer the question “to what extent did the distribution of income contribute to slower Scottish income tax revenue growth in 2017-18 compared to the UK?”. We conclude that the distribution of income only played a limited role in explaining divergent income tax revenue growth. Most of the slower growth in Scottish income tax revenue compared to the UK can be explained by broad-based slower growth in the Scottish economy and aggregate income. Distributional effects appear to have contributed positively to income tax revenue growth in Scotland relative to the UK in 2017-18, though the effect is small.
- 6 Second, while the role that distributional effects played in 2017-18 was limited, they are important to understand and could have larger effects in other years and over the longer-term. We find that, all else equal, the current distribution of income and Scotland’s tax system favours slightly faster growth in income tax revenues for a given amount of income growth compared to the UK. While only worth around £20 million in any one year, this effect will build over time.

Growth in tax revenues and the distribution of income

- 7 Growth in tax revenue from one year to the next is affected by a number of factors:
1. Growth in total income
 2. Growth in the population and employment
 3. Changes to tax policy
 4. Taxpayer behaviour change, for example use of allowances or how income is received
 5. The current distribution of income and the progressive nature of the tax system – which we call the static distributional effect
 6. The pattern of income growth and whether incomes have grown faster at some parts of the distribution than others – which we call the dynamic distributional effect
- 8 In Chapter 2 we establish some basic facts about the distribution of income in Scotland and the UK. Excluding the highest earners, the income distributions are similar in Scotland and the UK. Over time, growth has been relatively uniform across most of the income distribution in both Scotland and the UK, but differences start to appear for the highest earners. The UK has significantly more individuals with very high levels of income, and these individuals in the UK have typically seen their incomes grow faster since 2002, compared with similar individuals in Scotland.
- 9 In Chapter 3 we discuss the two different kinds of distributional effect. The first distributional effect is the static distributional effect. This is how the current level and distribution of income, combined with tax parameters, affects growth in income tax revenues. We show that lower earners tend to generate a faster growth rate of income tax revenues for a given growth rate of income. To quantify this effect, we calculate what we call the aggregate tax-revenue elasticity which measures the percentage change in aggregate tax revenue brought about by a uniform 1 per cent growth in taxpayer income, all else equal. Under a progressive system of taxation, lower earners tend to have higher elasticities because average tax rates rise with income, and, in both Scotland and UK, average tax rates rise more sharply than the marginal tax rates as incomes rise.

- 10 We show the individual tax band elasticities are broadly similar in Scotland and UK, but the aggregate elasticity for Scotland is 1.79 compared to 1.69 for UK. This reflects the fact that Scotland had a higher share of tax revenue accruing in the lower bands where the elasticities are higher. A higher elasticity for Scotland means that Scotland will tend to generate faster income tax revenue growth rates for a given amount of income growth than the UK. We also show that by switching from the three-band tax system to the more progressive five-band system, the aggregate tax-revenue elasticity rose from 1.79 to 1.84.
- 11 We find that the static distributional effect will contribute positively to faster income tax revenue growth in Scotland compared to the UK. In any one year, we find that the static distributional effect will add around £20 million to Scottish income tax revenue growth compared to the UK. Because this effect is relatively stable, it will build over time.
- 12 The second distributional effect we call the dynamic distributional effect. This primarily captures the effect of a shift in the distribution of taxpayer income on income tax revenues, for example because of higher earning taxpayers seeing faster growth in their incomes than lower earning taxpayers.
- 13 Given the data available, we cannot directly estimate the dynamic distributional effect, nor can we directly estimate changes in taxpayer behaviour. The difference between the factors we are able to estimate income tax revenue growth for, and total growth in income tax revenue, must then be explained by a combination of the dynamic distributional effect and changes in taxpayer behaviour. We expect differential behavioural change between Scotland and the UK in any one year to be limited, and so most of this residual is likely to be dynamic distributional effects. In the future we hope to refine this analysis in order to identify these various effects better.

Explaining Scottish and UK income tax revenue growth in 2017-18

- 14 We put these six factors together to explain growth in income tax revenues in 2017-18, as shown in Figure 2. Focussing on 2017-18, Scottish income tax revenues grew by 1.8 per cent, compared to 2.9 per cent in the UK. If Scottish income tax revenues had grown at the same rate as in UK, they would have been around £119 million greater.

Figure 2: Contributions to difference in Scottish and UK income tax revenue growth in 2017-18

	Contribution to growth		Difference in growth	Value of difference in growth in Scotland (£ million)
	Scotland	UK		
Total effect of average income growth	3.2	5.5	-2.3	-245
Direct effect of income growth	1.8	3.2	-1.4	-156
Common static distributional effect	1.3	2.3	-1.0	-108
Differential Scottish additional static distributional effect	0.2		0.2	19
Changes in the number of taxpayers	-0.7	0.5	-1.2	-131
Changes in tax policy [1]	-1.0	-2.0	1.0	107
Dynamic distributional effect and changes in behaviour	0.2	-1.1	1.3	139
Total change	1.8	2.9	-1.1	-119

Source: Scottish Fiscal Commission

Figures will not sum to total change as growth rates cannot be summed

[1] Scotland introduced income tax policies in 2017-18 to raise revenues. However, the effect in Scotland of UK and Scottish policies in aggregate was negative. Although the power to change rates and bands is devolved, Scottish income tax revenues are still affected by a number of UK policies such as changes to pensions. In 2017-18, the UK Government introduced a number of UK wide measures that overall were expected to reduce income tax revenues, including in Scotland.

- 15 In 2017-18, UK average incomes grew by 3.2 per cent, compared to 1.8 per cent in Scotland, contributing -£156 million to the overall divergence. The static distributional effect boosts income tax revenue growth relative to income growth in both Scotland and the UK. In absolute terms the effect is greater in the UK because average incomes grew by more. However, differences in the distribution and the tax system in Scotland mean that Scottish income tax revenues received a greater boost in relative terms. To illustrate this we split the static distributional effect in Scotland into a common effect and an additional effect. The common effect is the boost that Scottish income tax revenues would have received if the income distribution and tax system was the same as in the UK, while the additional effect reflects the extra boost that comes as a result of the Scottish income distribution and tax system.
- 16 Overall, faster income growth in the UK contributed -£245 million to the overall tax revenue growth difference of -£119 million. The relatively greater static distributional effect in Scotland played a small offsetting roll adding £19 million to Scottish income tax revenue growth compared to the UK.
- 17 Our analysis suggests that dynamic distributional effects worked in Scotland's favour in 2017-18, adding around £139 million to Scottish income tax relative to UK growth. In 2017-18, UK income growth appears to have been more heavily weighted towards the lower end of the income distribution, whereas Scottish income growth was more heavily weighted towards the top end of the income distribution. Although Scotland had slower growth in income overall, the way this growth was distributed appears to have favoured relatively faster growth in income tax revenues in Scotland than in the UK in 2017-18.
- 18 Overall, we estimate that the differential static distributional effect plus the dynamic distributional effect added around £158 million to Scottish income tax revenue growth relative to the UK. However, this only partially offsets the greater average income growth in the UK.

- 19 Slower Scottish GDP and average income growth in 2017-18 is the main factor behind slower Scottish income tax revenue growth in 2017-18. In 2018-19, Scottish GDP growth was slightly higher than in the UK, and the latest income tax outturn data shows that income tax revenues moved the same way, with Scottish income tax revenues growing by 5.9 per cent, compared to 4.2 per cent in the rest of the UK. However, some of the growth of Scottish income tax revenue in 2018-19 is because of changes to Scottish income tax rates; while part of the growth of income tax revenue in the rest of the UK is associated with particularly rapid growth of income tax revenue both in 2017-18 and 2018-19 from taxpayers on the highest marginal tax rate, who account for about 30 per cent of income tax revenue in the rest of the UK.

The longer term effects of the income distribution

- 20 Despite the limited effect in 2017-18, the distribution of income is still important to consider over the longer-term.
- 21 The dynamic distributional effect can be positive or negative, will vary significantly and is highly uncertain from year to year. Divergent dynamic distributional effects could contribute £100 million or more to divergences in Scottish and UK income tax revenues in any one year. In addition, because dynamic distributional effects are highly uncertain and hard to predict, they may play a significant role in explaining forecast errors and reconciliations. However, historical data show dynamic distributional effects to be approximately even between Scotland and the UK. If this pattern continues, this will limit any longer-term budget implications of the dynamic distributional effect.
- 22 We estimate that after ten years, relatively greater income tax revenue growth from the static distributional effect in Scotland compared to the UK could add £110 million to the Scottish Budget annually. However, many other factors are at play, which will also add to and subtract from how much the Scottish Budget gains from income tax. For example, just 0.1 per cent slower income growth in Scotland each year for the next ten years would detract £100 million from the Scottish Budget.
- 23 We estimate that the income of the top 0.1 per cent of UK taxpayers has grown by 0.6 percentage points faster than the top 0.1 per cent of Scottish taxpayers since 2002. Were this effect to be sustained over the next ten years, this would detract £68 million from the Scottish Budget annually - partially offsetting the relative gain from Scotland's static distributional effect.

Chapter 1

Introduction

- 1.1 In its Pre-Budget Scrutiny 2020-21 Report, the Finance and Constitution Committee recommended that the SFC reflects on distributional issues and writes to the Committee with findings once the 2018-19 Survey of Personal Incomes (SPI) data are available.² In our response to this report we made three commitments.³ These were:
- To reflect on the latest available information, and set out our judgement on distributional effects in our February 2020 forecast report.
 - To write to the Committee with more detailed findings in summer 2020 once further data are available. In particular, we would compare Scotland to the UK and show how distributional issues could affect the Scottish Budget over the long term.
 - To consider distributional issues as part of our ongoing analysis of fiscal risks.
- 1.2 In our February 2020 SEFF we fulfilled the first of these commitments.⁴ We found that earnings growth for all taxpayers between 2003 and 2019 has been roughly even across the income distribution – around 2.5 to 2.6 per cent for most individuals. While the difference between growth at the 90th percentile and the median can vary substantially between years, there does not appear to be a persistent pattern over time, with the average difference close to zero.
- 1.3 This note fulfils the second commitment – to provide more in-depth analysis of the effect of the distribution of income on growth in income tax revenues. Relative growth in Scottish and UK income tax revenues affect Scotland’s Budget, so we look at how the distributions of income in Scotland and the UK affects relative growth in tax revenues and the net effect of this on the Scottish Budget.⁵ Further information on how Scotland’s Budget is determined can be found on our website.⁶
- 1.4 In this paper we also discuss briefly the relationship between the distributional effects we’ve identified and wider Scottish Budget implications and potential risks. We’ll reflect further on this when we discuss fiscal risks in the future.
- 1.5 On 23 September 2020 HMRC published income tax outturn data for Scotland covering 2018-19, including some high level breakdowns of the outturn data. We’ll receive more detailed information about 2018-19 over time, for example we expect to receive the 2018-19 SPI PUT in April 2021. Given the time available, and that only high level information are available so far, we have not been able to produce detailed analysis of income tax revenues in 2018-19. In this paper we focus on 2017-18, for which we have more complete information. Using the analytical framework set out in the following chapters, we will provide more detailed analysis of 2018-19 in the future.

² Finance and Constitution Committee (2019) Pre-Budget Scrutiny 2020-21 Report ([link](#))

³ Correspondence (2019) Scottish Fiscal Commission to Finance and Constitution Committee ([link](#))

⁴ Scottish Fiscal Commission (2020) Scotland’s Economic and Fiscal Forecasts – February 2020 ([link](#))

⁵ The income tax Block Grant Adjustment is based on income tax growth in England, Wales and Northern Ireland in 2017-18 and 2018-19, and on growth in England and Northern Ireland from 2019-20 onwards. Generally, for brevity and simplicity, we simply refer to the UK when we mean the parts of the UK relevant for estimating the block grant adjustment in the particular context.

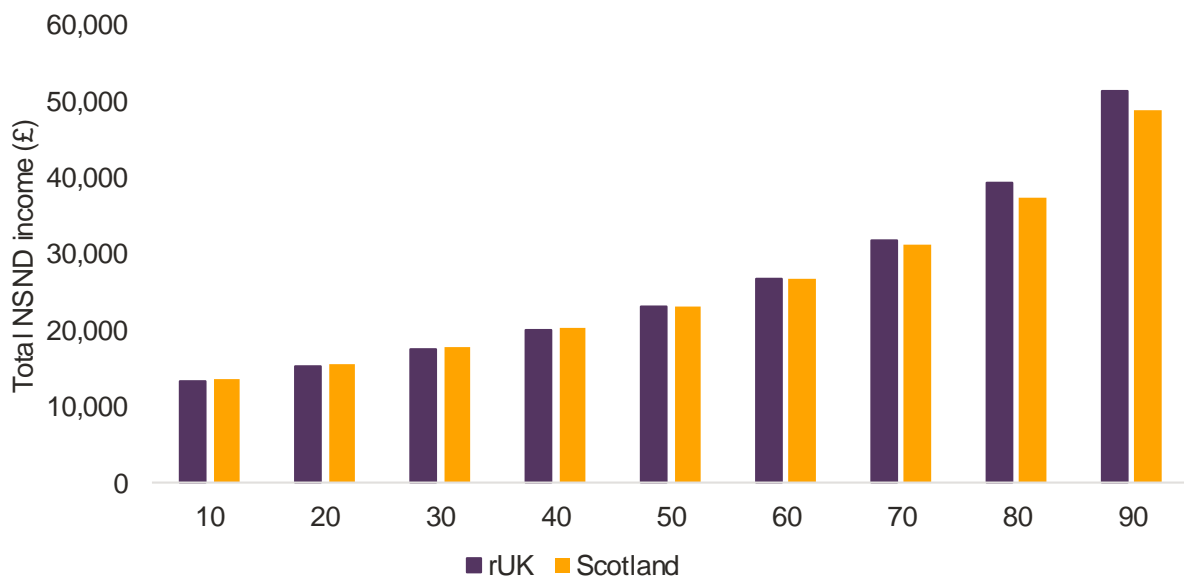
⁶ Scottish Fiscal Commission (2020) Explainers- How is the Scottish Budget set? ([link](#))

Chapter 2

The distribution of income in Scotland and the UK

2.1 In this Chapter we explore the distributions of income in Scotland and the UK and how these have changed over time. Figures 2.1 and 2.2 show the distribution of NSND income in Scotland and the UK in 2017-18, with Figure 2.1 looking at the 10th to 90th deciles, and Figure 2.2 showing the 95th percentile upwards.⁷

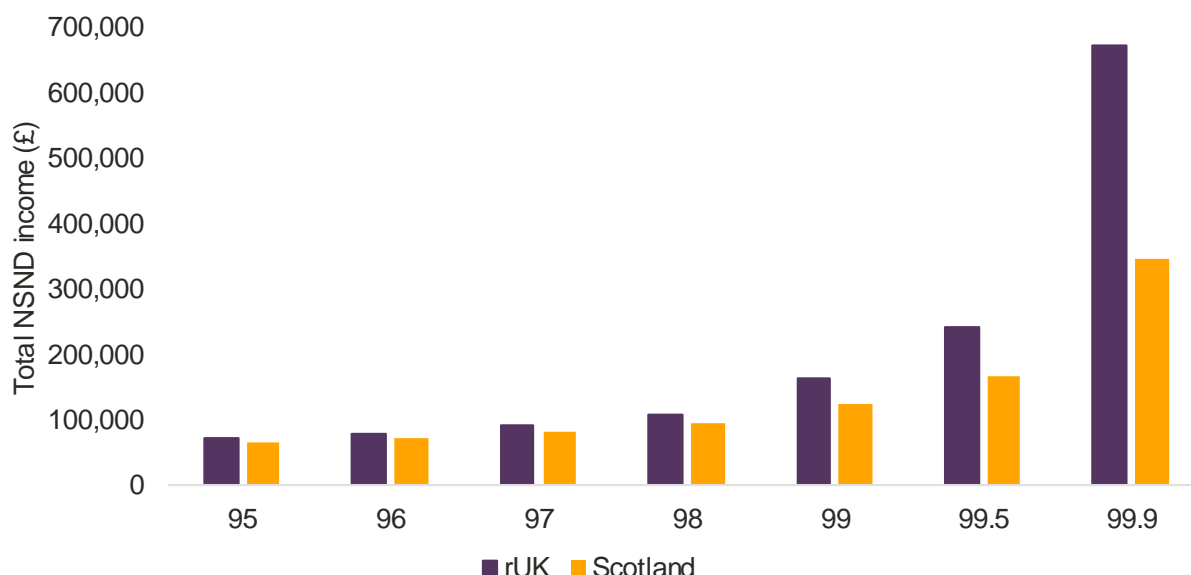
Figure 2.1: Deciles of the income distribution in Scotland and rUK, 2016-17



Source: Scottish Fiscal Commission

⁷ Scottish income tax, and the Block Grant Adjustments based on UK income tax, is based on non-savings non-dividend income only (NSND). Throughout this note, whenever we refer to income or earnings for Scotland or the UK, we mean NSND income, though often drop NSND for brevity.

Figure 2.2: Top five per cent of the income distribution in Scotland and rUK, 2016-17



Source: Scottish Fiscal Commission

2.2 Scotland and the UK have a similar earnings distribution for lower and median incomes up to around the 70th percentile. However, differences start to emerge above this level, with the UK having higher incomes at all points above the 70th percentile and with increasing divergence at higher percentiles. At the very top of the distribution, income at the 99.9th percentile is nearly twice as high in the UK than it is in Scotland.

2.3 As a result of having more higher earners, the UK has relatively more additional rate taxpayers, who each pay relatively more tax, as shown in Figure 2.3. The average top rate taxpayer in the UK has tax liabilities of £149,000 compared to £126,000 in Scotland.

Figure 2.3: Scottish and UK number of taxpayers and average tax liabilities by band in 2017-18

Tax band	Scotland		UK	
	Number of taxpayers	Average liabilities (£)	Number of taxpayers	Average liabilities (£)
Basic	2,191,000	2,186	24,475,000	2,219
Higher	308,000	14,185	3,714,000	14,520
Additional/Top	14,000	125,571	308,000	149,250

Source: Scottish Fiscal Commission

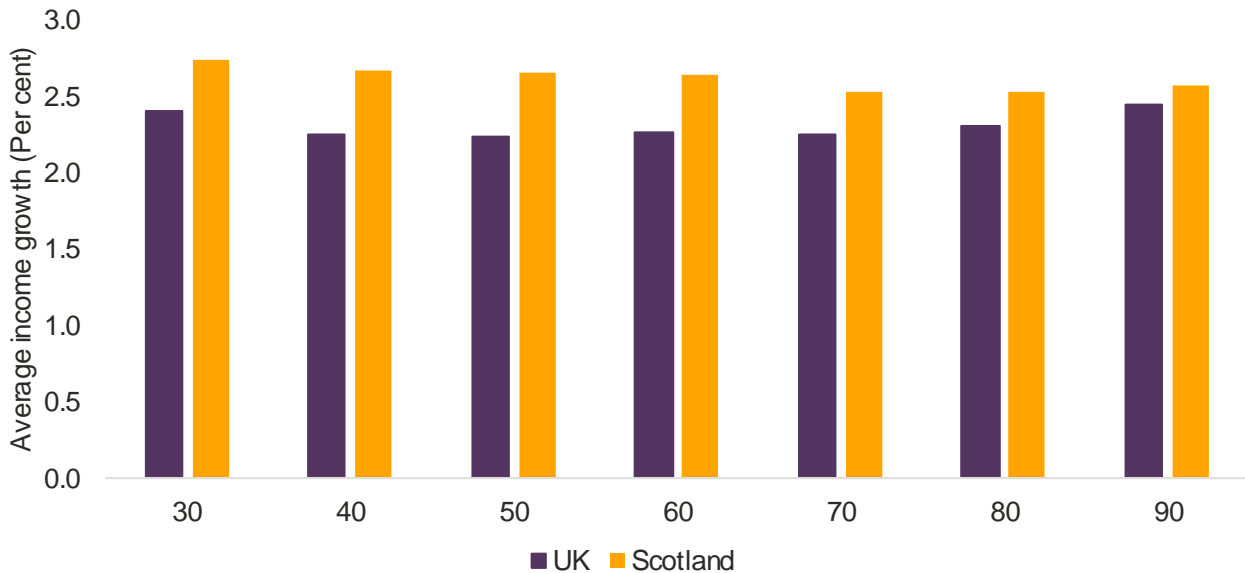
2.4 Individuals earning below £50,000 make up a larger contribution to total tax revenues in Scotland than in the UK, responsible for 74 per cent of liabilities in Scotland compared to 61 per cent in the UK. Additional and Top rate taxpayers account for around 30 per cent of all UK tax liabilities compared to 17 per cent in Scotland and individuals earning over £1 million pay 9 per cent of liabilities in the UK, compared to 4 per cent in Scotland.

Changes in the income distribution over time

2.5 Figure 2.4 presents average growth in each decile of NSND incomes. We exclude incomes below the 30th percentile from this analysis as incomes in this group tend to be below the personal

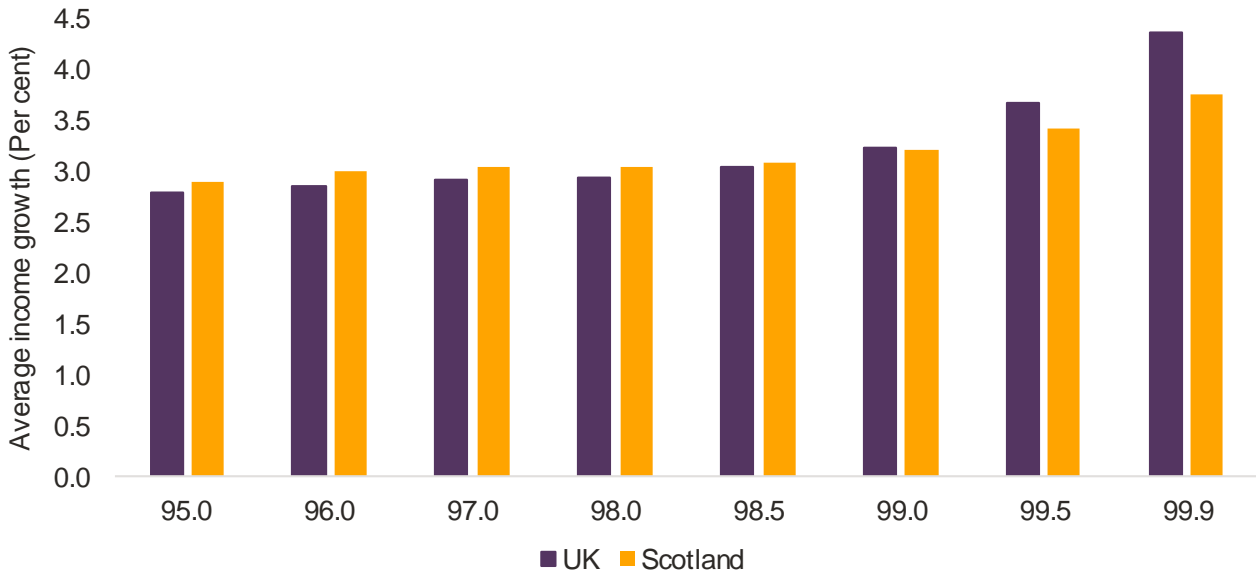
allowance and therefore not subject to income tax. Figure 2.5 shows the same calculation for the top five per cent of the distribution.

Figure 2.4: Average annual income growth by decile, Scotland and UK, 2002 to 2019



Source: Scottish Fiscal Commission

Figure 2.5: Average annual income growth for the top five per cent of incomes, Scotland and UK, 2002-03 to 2016-17



Source: Scottish Fiscal Commission

- 2.6 Since 2002, within Scotland and within the UK, incomes have grown at roughly the same rate for those earning at the 30th to 90th percentiles. In Scotland in particular, earnings have grown slightly faster in the 30th to 60th percentiles than in the 70th to 90th percentiles, but this difference is small.
- 2.7 Comparing Scotland to the UK, Scotland has seen slightly faster growth in earnings for those at the 30th to 90th percentiles. In 2002, Scottish median earnings were around 93 per cent of the UK level, increasing to 99 per cent in 2019, effectively catching up with the UK.

2.8 This picture is different at the top of the income distribution. As shown in Figure 2.5, the UK has seen a bigger increase in earnings at the very top than Scotland has, although growth in earnings of this group has experienced faster growth in both countries since 2002-03, compared to the rest of the distribution.

2.9 In summary:

- Excluding the highest earners, income levels are similar in Scotland and the UK. Since 2002, Scotland has seen slightly faster growth in incomes, effectively catching up with income levels in the UK.
- Significant differences start to appear for the highest earners. The UK has significantly more individuals with very high levels of income, and these individuals in the UK have typically seen their incomes grow faster since 2002, compared with similar individuals in Scotland.

Chapter 3

How the distribution of income affects income tax revenue growth

- 3.1 In this Chapter we look at how distributional factors affect the link between the growth in incomes and the growth in income tax revenues. We have identified two different kinds of distributional effects – static and dynamic. The static distributional effect examines how the current distribution of income and current tax policies affect income tax revenue growth. The dynamic distributional effect captures how changes in the shape of the distribution of taxpayer income affects income tax revenue growth.
- 3.2 In Chapter 4 we apply this analysis to show how the growth of tax revenue over 2017-18 can be decomposed into different effects including these two distributional effects.

The static distributional effect

- 3.3 The static distributional effect is easiest to understand by starting with an example. Consider a simple scenario with just two taxpayers. The personal allowance is £10,000, the first taxpayer has income of £11,000, the second taxpayer has income of £12,000, and the tax rate is 20 per cent. Both taxpayers' incomes grow by 1 per cent between year 1 and year 2. This is summarised in Figure 3.1.

Figure 3.1: Static distributional effect example

		Income	Taxable income	Tax paid	Marginal tax rate (%)	Average tax rate (%)
Taxpayer 1	Year 1	11,000	1,000	200	20	1.8
	Year 2	11,110	1,110	222	20	2.0
	£ change	110	110	22		
	% change	1	11	11		
Taxpayer 2	Year 1	12,000	2,000	400	20	3.3
	Year 2	12,120	2,120	424	20	3.5
	£ change	120	120	24		
	% change	1	6	6		

Source: Scottish Fiscal Commission
 Figures may not sum because of rounding.

- 3.4 Taxpayer 2 has the higher income and pays more tax. A 1 per cent increase in taxpayer 2's income leads to a bigger increase in tax paid in absolute terms than taxpayer 1: £24 compared to £22. However, in relative terms, the 1 per cent increase in incomes leads to a far greater change in taxpayer 1's tax paid – an 11 per cent increase compared to a 6 per cent increase. Taxpayer 1 pays much less tax overall, so even a small increase in their tax bill is a big change in relative terms.

- 3.5 The static distributional effect captures the way that the progressive nature of the tax system converts a given percentage increase in income into a potentially higher percentage increase in tax revenue. It is the fact that the percentage change in tax paid is higher for taxpayer 1 than for taxpayer 2 that is relevant for understanding this static distributional effect.
- 3.6 This rate of conversion is summarised by what economists call an elasticity. In this case the tax revenue elasticity measures the percentage change in tax revenue brought about by a 1 per cent increase in income. This elasticity is 11 for taxpayer 1 and 6 for taxpayer 2.
- 3.7 An alternative way of understanding and measuring this tax revenue elasticity is to look at marginal and average tax rates. The marginal tax rate is the tax paid on £1 extra income, which in this case is 20 per cent for both taxpayers. The average tax rate is the amount of tax paid expressed as a fraction of the taxpayers total income. Taxpayer 1 has the same marginal tax rate as taxpayer 2, but an average tax rate of 1.8 per cent in year 1 compared to 3.3 per cent for taxpayer 2.
- 3.8 The ratio of marginal and average tax rates describes exactly how much the tax paid by each taxpayer will grow following a 1 per cent increase in income – the tax revenue elasticity. Taxpayer 1’s marginal tax rate is 11 times their average tax rate, and their tax paid grows by 11 per cent in response to a 1 per cent increase in incomes. Similarly, taxpayer 2’s marginal tax rate is exactly 6 times their average tax rate, and their tax paid grows by 6 per cent in response to a 1 per cent increase in incomes.
- 3.9 Since, under a progressive tax system, each individual’s marginal tax rate is higher than their average tax rate, each individual’s tax revenue elasticity is greater than 1. A given percentage increase in income will always lead to a relatively greater percentage increase in income tax revenue paid by the individual.
- 3.10 Turning to the tax system as a whole, we are interested in what we call the aggregate tax revenue elasticity – the percentage increase in aggregate tax revenue brought about by a uniform 1 per cent increase in everyone’s income.
- 3.11 For each tax band, we calculate the tax revenue elasticity for that tax band. This is the percentage increase in tax revenue paid by people in that tax band brought about by a 1 per cent increase in their income. Since everyone in a given tax band faces the same marginal rate of tax, this elasticity is equal to this common marginal tax rate divided by the average tax rate paid in the band.
- 3.12 We also calculate an aggregate tax revenue elasticity for all taxpayers. This is the weighted sum of the tax revenue elasticities of each tax band, where the weights are the shares of total tax revenue raised by each tax band.
- 3.13 These are shown in Figure 3.2 for the UK three-band tax system, which was still in place in Scotland in 2017-18, and in Figure 3.3 under the new Scottish five-band system.
- 3.14 For each region the first column in the table shows the tax revenue elasticities for each tax band, with the bottom row giving the aggregate tax revenue elasticity. The second column gives the shares of total tax revenue raised by each tax band. The third column gives the weighted elasticities – the elasticities in column 1 multiplied by the shares in column 2. These sum to the aggregate elasticity.

Figure 3.2: Aggregate elasticities for Scotland and UK, three-band tax system

	Scotland			UK		
	Elasticity	Tax share (%)	Weighted elasticity	Elasticity	Tax share (%)	Weighted elasticity
Basic	1.99	45.3	0.90	2.03	34.9	0.71
Higher	1.81	39.0	0.71	1.82	36.6	0.67
Additional	1.11	15.7	0.17	1.10	28.4	0.31
Aggregate	1.79			1.69		

Source: Scottish Fiscal Commission

Figures may not sum because of rounding.

Figure 3.3: Aggregate elasticity for Scotland, five-band system

	Scotland		
	Elasticity	Tax share	Weighted elasticity
Starter	13.24	0.5	0.06
Basic	2.85	12.5	0.36
Intermediate	1.67	31.2	0.52
Higher	1.82	39.5	0.72
Additional	1.11	16.5	0.18
Aggregate	1.84		

Source: Scottish Fiscal Commission

Figures may not sum because of rounding.

- 3.15 The tax revenue elasticity for each tax band generally falls as we move to successively higher tax bands. This reflects the fact that although the marginal rate of tax is increasing as we move to successively higher tax bands, the average tax rate rises even more rapidly causing the elasticity to fall.
- 3.16 The tax band elasticities are similar in Scotland and the UK. However the aggregate tax revenue elasticity in Scotland is quite a bit higher than that of the UK, 1.79 compared to 1.69. The distribution of income in the UK is more heavily weighted towards higher incomes with lower elasticities, lowering the aggregate elasticity.
- 3.17 Figure 3.3 shows the values for Scotland following the introduction of the five-band tax system. This shows that by moving to a more progressive tax system the aggregate tax revenue elasticity has increased from 1.79 to 1.84.
- 3.18 Taken together these figures show the important role that the distribution of income and the progressivity of the income tax structure plays in how income growth generates income tax revenue growth.
- 3.19 Overall, we can see that because of the distribution of income in Scotland and the structure of its income tax rates, we can expect Scotland to generate a higher rate of income tax revenue growth for a given and evenly distributed amount of income growth.

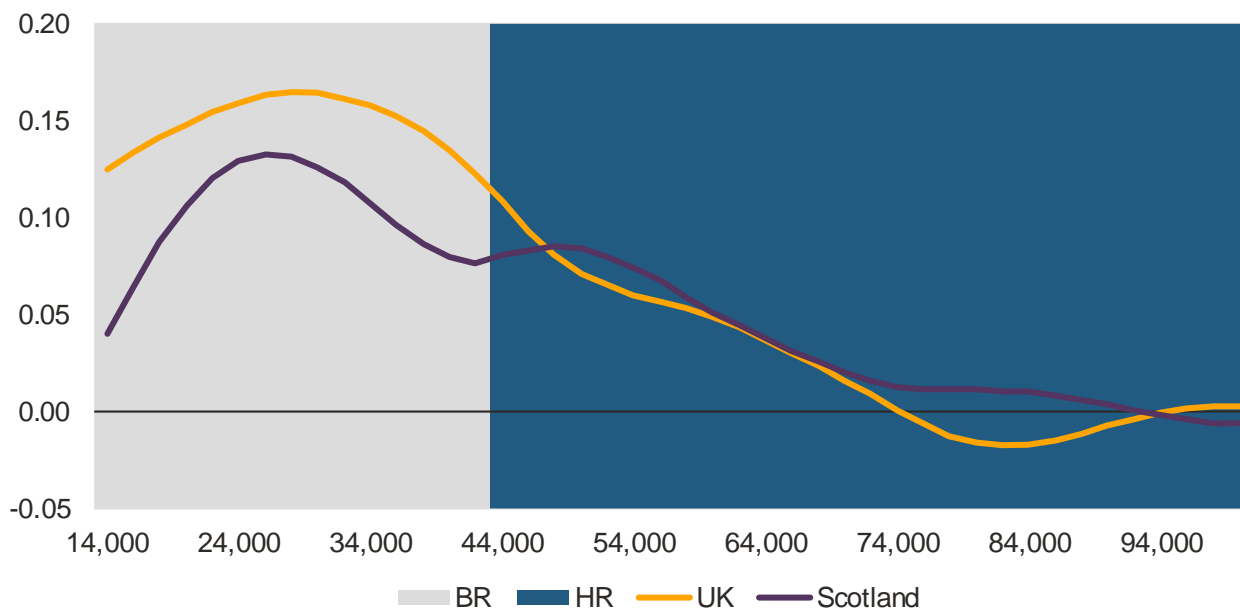
- 3.20 Put another way, if incomes grow at exactly the same rate in Scotland and the UK, and this growth is distributed evenly across all taxpayers, we would expect faster growth of income tax revenues in Scotland than in the rest of the UK. All else equal, this effect could be expected to add around 0.2 percentage points to growth in Scottish income tax revenues, worth around £20 million.
- 3.21 This effect is small, and from year to year could be dominated by differences in income growth between Scotland and the UK. However, over time, if Scotland matches the UK for income growth, it should lead to faster growth in income tax revenues. We quantify the potential scale of this effect in the final chapter.
- 3.22 These aggregate tax revenue elasticities may gradually vary over time, in part because of the growth of income, since, other things being equal, higher incomes lead to higher average tax rates and hence lower tax revenue elasticities. It will be important to monitor these elasticities to see how future changes in the income distribution may affect the link between the income distribution and growth in income tax revenues.

The dynamic distributional effects

- 3.23 The static distributional effect captures the effect of the current distribution of income on income tax revenue growth. The dynamic distributional effect is about how changes in the shape of the income distribution affects income tax revenue growth.
- 3.24 A complete account of how distributional factors affect the growth in tax revenue needs to recognise that the growth in incomes might be faster for some groups of the population than for others. To capture the effect of non-uniform growth in income across the distribution one would need to take the weighted elasticities in Figures 3.2 and 3.3 and multiply them by the extent to which income growth in a given tax band was above or below the rate of growth of aggregate income.
- 3.25 We can observe the distribution of income and tax in any one year and how the shape of this distribution changes from year to year. The distribution of taxpayer income and tax paid can change for a number of reasons, including:
- Unevenly distributed income growth of existing taxpayers
 - Taxpayers entering or exiting income tax unevenly across the income distribution
 - Changes in taxpayer behaviour including their use of: allowances; deductions; shifting income to a different tax base; tax avoidance; or tax evasion, in a way that is unevenly distributed across the income distribution
 - Changes in tax policy that affect different parts of the income distribution in different ways
- 3.26 Of particular importance for Scotland is how dynamic distributional effects affect income tax revenue growth relative to the UK. Income growth could be weighted towards the top end of the income distribution in Scotland, but if the UK experiences a similar effect, the net effect on Scotland's Budget is limited. If however Scotland experiences divergent dynamic distributional effects to the rest of the UK, this could have a greater effect on Scotland's Budget.
- 3.27 As Figures 2.4 and 2.5 in Chapter 2 show, income growth has generally been spread fairly evenly across most of the income distribution over longer periods of time in both Scotland and the UK.

3.28 However, in any one year, income growth can vary considerably across the income distribution, therefore in any single year the dynamic distributional effect could have a bigger role to play. Figure 3.4 shows how the percentage of taxpayers at different points of the income distribution changed in Scotland between 2016-17 and 2017-18 using PUT data for incomes up to £100,000. The regions of the income distribution for basic rate (BR) and higher rate (HR) taxpayers are shaded.

Figure 3.4: Change in density of income distribution between 2016-17 and 2017-18, Scotland and UK (percentage point)



Source: Scottish Fiscal Commission, PUT

The figure does not show percentage change in the number of taxpayers at each point in the income range. The figure shows the percentage point change in the percentage of taxpayers at each point in the income range in Scotland and the UK.

3.29 Figure 3.4 clearly shows the UK had a greater relative increase in the number of lower earning basic rate taxpayers than in Scotland, while Scotland had a somewhat greater relative increase in the number of higher rate taxpayers. For higher income levels, there is no consistent distinction between Scotland and the UK.

3.30 Weighting together the percentage point changes in each part of the income distribution with the respective marginal tax rates, PUT data suggest that for income growth at least, the dynamic distribution effect in 2017-18 was more positive in Scotland than in the UK. The density weighted change in marginal tax rate in Scotland was 34.3 per cent, compared to 24.9 per cent in the UK.

3.31 Changes in the shape of the income distribution is only one factor behind dynamic distributional effects. Chapter 4 estimates the aggregate effect of dynamic distributional effects in 2017-18 in total.

3.32 We do not currently have the data on income distribution in Scotland that would allow us to extend this analysis fully to 2018-19. However, the HMRC outturn data for 2018-19 shows changes in the shape of the tax distribution. In the rest of the UK, approximately 30 per cent of revenue in each of the three tax years comes from the taxpayers on the highest marginal rate and revenue from this group of taxpayers has grown particularly strongly during the three-year period, at over 7 per cent annually compared with the overall growth rates of 3 per cent and 4.25 per cent. This is evidence of a strong dynamic distributional effect in the rest of the UK.

- 3.33 By contrast the highest-rate taxpayers in Scotland contribute only 15 per cent to 17 per cent of revenue, and although tax revenue growth from this group has been even higher in Scotland than in the rest of the UK, some of this growth is likely to be the result of increased tax rates on higher earners rather than a dynamic distribution effect.

Comparing dynamic and static distributional effects

- 3.34 At first glance, the dynamic and static distributional effects appear somewhat contradictory. The static distributional effect tells us that lower earners have higher income tax growth rates, while the dynamic distributional effect shows that higher earners having more income growth leads to higher tax revenue growth.
- 3.35 The static distributional effect is about the relationship between the current distribution of income and total income tax revenues in a tax system with a personal allowance and a progressive structure of tax rates. Because Scotland currently has more lower earning taxpayers it currently has lower total tax revenues per capita, but with a progressive tax structure this also means faster income tax revenue growth rates at the aggregate level for a given income growth rate.
- 3.36 At the same time, more income growth going to taxpayers with higher marginal tax rates will generate greater growth in tax revenues in absolute terms, which is the dynamic distributional effect.

Chapter 4

Distributional effects and 2017-18 income tax revenue growth

4.1 Chapter 3 discussed the two different ways that the distribution of income affects growth in income tax revenues, the static and dynamic distributional effects. In this chapter we look at income tax revenue growth in 2017-18 in detail, and show how each of these distributional effects contributed to growth in tax revenues. We also estimate how other factors have contributed to growth in income tax revenues. This is summarised in Figure 4.1.

Growth in average incomes

4.2 Growth in average incomes will have the most direct and easily understood effect on income tax revenues. All else equal, faster income growth will mean faster income tax revenue growth. As shown in Chapter 2, since 2002 income growth in Scotland has been slightly faster than in the UK. Scottish average incomes have in effect been catching up with average UK incomes.

4.3 However, PUT data shows that in 2017-18 Scottish average taxpayer incomes grew by only 1.8 per cent, significantly less than the 3.2 per cent income growth in the UK. We explore the potential explanations for this difference in income growth in the final part of this chapter.

4.4 We estimate that, all else equal, slower growth in average incomes in Scotland relative to the UK meant income tax revenues in Scotland grew by 1.8 percentage points less than in the UK, equivalent to around £156 million. This excludes the effect of the static distributional effect.

The static distributional effect

4.5 We estimate that in 2017-18 the static distributional effect added a total of 1.4 percentage points to income tax revenue growth in Scotland, on top of the 1.8 percentage points of growth from increases in average incomes. This is less than the 2.3 percentage points of growth the static distributional effect added to income tax revenue growth in the UK. However, this was on a much greater average income growth base of 3.2 per cent.

4.6 In relative terms, Scotland got a greater boost from the static distributional effect on its income growth of 1.8 per cent than the UK did from its income growth of 3.2 per cent. The static distributional effect boosted income tax revenue growth by around 80 per cent in Scotland, compared to 70 per cent in the UK – in line with our estimated elasticities – adding around £20 million to Scottish income tax revenue growth. Figure 4.1 shows the common static distributional effect separately to this additional £20 million Scottish static distributional effect.

Changes in the number of taxpayers

4.7 The UK tends to have faster population growth than Scotland, and therefore faster growth in employment and the number of taxpayers. We estimate that differences in the growth of the number of taxpayers reduced Scottish income tax growth by 1.2 percentage points relative to the UK, equivalent to around £131 million.

Changes in income tax policy

- 4.8 Income tax in Scotland is affected by both Scottish and UK income tax policies. The Scottish Government has power over the non-savings non-dividend (NSND) rates and bands applied in Scotland. However, changes by the UK Government in reserved areas such as pension tax relief also affect Scottish income tax revenues. In 2017-18 the Scottish Government froze the higher rate threshold in Scotland, which we estimate increased income tax revenues by £106 million. The combined effect of all tax policy changes in Scotland was to reduce income tax revenues by 1.0 per cent. Because of the Scottish Government's policy changes, this was less than the 2.0 per cent reduction in income tax revenues as a result of all policy changes in the UK.
- 4.9 To estimate the total size of the policy effect in both Scotland and the UK we use the OBR's policy costing database. This element of the analysis is uncertain as policy costings can carry a significant degree of error. However, policies introduced across the UK should have a broadly similar effect in both Scotland and the rest of the UK, and so the error in any policy estimates should be symmetric – lessening the effect of policy costing error on this analysis.

The dynamic distributional effect

- 4.10 Given the limitations of the data available, we estimate the dynamic distributional effect indirectly. By controlling for all other factors that affect growth in income tax revenues, the remaining growth must be explained by the dynamic distributional effects discussed in Chapter 3. In line with the evidence presented in Chapter 3, we estimate that dynamic distributional effects contributed positively to Scottish income tax revenue growth relative to the UK.

How have these factors contributed to growth in income tax revenues?

- 4.11 Figure 4.1 summarises our above estimates of how the different factors have contributed to growth in income tax revenues in 2017-18.

Figure 4.1: Decomposing growth in Scottish and UK income tax revenue in 2017-18

	Contribution to growth		Difference in growth	Value of difference in growth in Scotland (£ million)
	Scotland	UK		
Total effect of average earnings growth	3.2	5.5	-2.3	-245
Direct effect of earnings growth	1.8	3.2	-1.4	-156
Common static distributional effect	1.3	2.3	-1.0	-108
Scottish additional static distributional effect	0.2		0.2	19
Changes in the number of taxpayers	-0.7	0.5	-1.2	-131
Changes in tax policy [1]	-1.0	-2.0	1.0	107
Dynamic distributional effect	0.2	-1.1	1.3	139
Total change	1.8	2.9	-1.1	-119

Source: Scottish Fiscal Commission

Figures will not sum to total change as growth rates cannot be summed

[1] Scotland introduced income tax policies in 2017-18 to raise revenues. However, the effect in Scotland of UK and Scottish policies in aggregate was negative. Although the power to change rates and bands is devolved, Scottish income tax revenues are still affected by a number of UK policies such as changes to pensions. In 2017-18, the UK Government introduced a number of UK wide measures that overall were expected to reduce income tax revenues, including in Scotland.

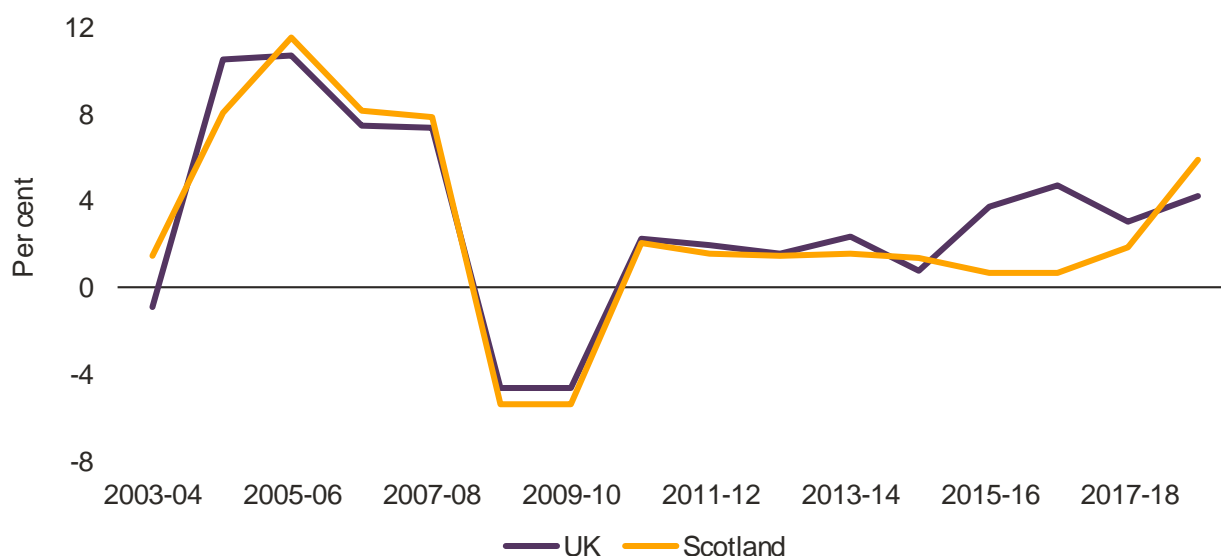
- 4.12 In 2017-18, Scottish average earnings grew by 1.8 per cent, compared to 3.2 per cent in the UK. Taking account of the static distributional effect, growth in average earnings generated growth in income tax revenues of 3.2 per cent in Scotland, compared to 5.5 per cent in the UK.
- 4.13 The static distributional effect is greater in the UK than in Scotland in absolute terms. This is because the UK had greater growth in average earnings. As we would expect given our elasticities in the previous section, the static distributional effect did more to boost tax revenue growth in Scotland in proportionate terms, but applied to a lower earnings growth base. The static distributional effect boosted tax revenues from earnings growth by 79.1 per cent in Scotland, compared to 69.5 per cent in the UK – in line with our estimated elasticities.
- 4.14 Taking account of earnings growth, changes in the number of taxpayers, the static distributional effect and changes in tax policy, we might have expected income tax revenues to have grown by 1.6 per cent in Scotland. Income tax revenues actually grew by 1.8 per cent, implying that dynamic distributional effects boosted income tax revenue growth in Scotland by 0.2 percentage points.
- 4.15 The UK had higher earnings growth at 3.2 per cent, which would have resulted in income tax revenue growth of 5.5 per cent including the static distributional effect. Including taxpayer numbers growth and policy changes we might have expected growth in income tax revenues of 4.1 per cent in the UK. However, income tax revenues in the UK only grew by 2.9 per cent in 2017-18. This means that other factors, captured in dynamic distributional effects, must have reduced UK tax revenue growth by around 1.1 percentage points.
- 4.16 We expect dynamic distributional effects to be highly variable from one year to the next. In 2017-18, dynamic distributional effects appear to have added a small amount to growth in Scotland, and detracted from growth in the UK. Overall, we believe that dynamic distributional effects played a limited role in explaining differences in income tax revenue growth, and worked slightly in Scotland's favour.

- 4.17 In 2017-18 the UK had significantly faster growth in average earnings than Scotland, and we believe this accounts for most of the difference in tax revenue growth between Scotland and the UK. Scottish income tax policies boosted growth in income tax revenues relative to the UK, but this was not sufficient to offset slower growth in average earnings.
- 4.18 Given 2018-19 outturn data was only published on 23 September, we have not yet been able to update this analysis for the latest available data. We can provide equivalent analysis for other years as data allows.

Growth in Scottish income tax revenues over time

- 4.19 Figure 4.1 showed that slower earnings growth in Scotland was the main contributing factor to slower income tax revenue growth in 2017-18. Here, we look at the relationship between income tax revenue growth and growth in earnings and the broader economy. Figure 4.2 shows how Scottish and UK NSND income tax revenues have changed over time.

Figure 4.2: Comparison of growth rates of NSND income tax liabilities in Scotland and UK



Source: Scottish Fiscal Commission

Note: We do not have access to 2008-09, 2011-12 or 2012-13 Public Use Tape (PUT) datasets, so these points on the graph have been interpolated. Values prior to 2016-17 are based on the PUT survey, values from 2016-17 onwards are based on outturn data.

- 4.20 Figure 4.2 uses a mixture of data sources. We only have official HMRC outturn data on Scottish NSND income tax revenues for 2016-17 and 2017-18. For earlier years, we use the Survey of Personal Incomes (SPI) to estimate Scottish NSND income tax revenues.
- 4.21 Between 2002-03 and 2014-15, growth in income tax revenue was similar between Scotland and the UK. Following the 2008 global financial crisis, growth in income tax revenues was slow in both Scotland and UK. Around 2015-16, growth in UK income tax revenues increased, while growth in Scottish income tax revenues slowed. Between 2015-16 and 2017-18 Scotland had notably slower growth in income tax revenues. With the latest 2018-19 outturn data, the position reversed. Recent growth in Scottish and UK income tax and GDP is summarised in Figure 4.3.

Figure 4.3: Scottish and UK GDP and NSND income tax revenue growth

Per cent	GDP		Income tax	
	Scotland	UK	Scotland	UK
2015-16	0.1	2.3	0.6	3.7
2016-17	1.3	2.0	0.6	4.7
2017-18	1.1	1.6	1.8	3.0
2018-19	1.7	1.6	5.9	4.2

Source: Scottish Fiscal Commission

- 4.22 Scottish GDP grew by 0.1 per cent in 2015-16 compared to 2.3 per cent in the UK. The slower GDP growth in this year is primarily attributed to low oil prices affecting North Sea oil producers and the Scottish onshore supply chain. Not only did this have a significant effect on GDP, but individuals working in these industries tend to have higher incomes and therefore pay relatively larger amounts of income tax. This led to income tax revenues growing at a far slower rate in Scotland than in the UK.
- 4.23 In 2016-17 as the oil and gas supply chain continued to adapt to lower prices, Scotland continued to have considerably slower growth in income tax revenues than the UK. This was despite a narrowing of the difference in growth in GDP.
- 4.24 In 2017-18 the oil price started to rise and the difference in GDP growth between Scotland and the UK narrowed. At the same time, the Scottish Government made its first change to income tax policy to raise additional income tax revenues in Scotland. The income tax revenue growth gap between Scotland and the UK lessened but income tax revenues in the UK continued to grow faster than in Scotland.
- 4.25 In 2018-19, with the Scottish economy growing slightly faster than the UK, Scottish income tax revenues grew faster than in the UK. This faster growth rate will be a result in part of faster growth in the Scottish economy in 2018-19, and also policy changes in Scotland to raise additional income tax revenues. As 2018-19 NSND income tax outturn data was only published on 23 September, we have not had the time to do an in-depth analysis, and we will provide further analysis of the 2018-19 data in future publications.
- 4.26 Overall, we think differences in growth in income tax revenue between Scotland and the UK between 2015-16 and 2017-18 are primarily explained by differences in aggregate economic performance. Slower growth in GDP in Scotland led to slower growth in income tax revenues between 2015-16 and 2017-18 – further exacerbated by a loss of some high paying jobs in the oil and gas supply chain. 2018-19 appears to mark a realignment of Scottish and UK income tax revenue growth.

Chapter 5

Long-run outlook and effect on Scottish Budget

- 5.1 Scotland has a similar income distribution to the UK, though with a slightly greater density of lower earners, and in general we expect incomes to grow at a similar rate in Scotland to the UK. As Chapter 2 shows, given the income tax system in Scotland and Scotland's current distribution of income, we might expect, all else equal, a slightly faster growth rate of income tax revenues in Scotland than in the UK. In this section we look at the potential scale of this effect in the longer term, though it is important to keep in mind that these are not forecasts and there are many other factors that will affect growth in income tax revenues.
- 5.2 We look at two illustrative scenarios in turn. In both scenarios, we assume the income distributions and therefore elasticities remain roughly constant, adjusting only as a result of the growth rates we are applying, which may not be the case in reality. In the first, we give all taxpayers in Scotland and the UK the same nominal earnings growth of 3 per cent. This is based on our finding that over longer periods of time growth in earnings is evenly distributed across most of the income distribution – though clearly in any one year the growth in earnings across the distribution can be more variable. This scenario shows the cumulative effect of the more positive static distributional effect in Scotland over the longer term.
- 5.3 The second scenario is similar to the first, except we give the highest earning 0.1 per cent of UK taxpayers' slightly faster earnings growth than other taxpayers. This is based on our finding that there does appear to be a small cohort of the very highest earners in the UK who have had consistently higher earnings growth over the last 20 years than others on lower incomes. Based on the available historic data in Figure 2.5, we give the top 0.1 per cent of UK taxpayers 0.6 percentage points faster income growth. Growth among the highest earners may of course be different in the future to the past. All other UK and Scottish taxpayers receive 3.0 per cent income growth as in Scenario 1. Scenario 2 shows how the dynamic distributional effect could counteract the static distributional effect.
- 5.4 Otherwise, we assume that the Scottish and UK tax systems remain unchanged, applying only inflationary uprating to tax thresholds, except the additional rate threshold which remains fixed. We also fix population growth to zero, removing the effect of any divergent trends in population growth.
- 5.5 Figure 5.1 shows the effect of these two scenarios on Scottish and UK income tax revenues over a period of 1 year, 10 years and 20 years. The "value of difference in Scotland" column shows the difference between revenues in the scenario for Scotland compared to what revenues in Scotland would have been if they had grown at UK growth rates instead. For example, in Scenario 1 after ten years total revenues in Scotland have grown by 38.6 per cent. If instead they had grown by only 37.1 per cent as in the UK scenario, total income tax revenues would be £110 million less.

Figure 5.1: Long-run effect of distribution and tax systems

		% growth in tax revenues		Value of difference in Scotland (£ million)
		Scotland	UK	
Scenario 1 – equal income growth	1 year	3.9	3.7	9
	10 years	38.6	37.1	110
	20 years	80.9	77.9	329
Scenario 2 – faster income growth UK top-end	1 year	3.9	3.8	4
	10 years	38.6	38.0	42
	20 years	80.9	79.7	124

Source: Scottish Fiscal Commission

Figures may not sum because of rounding.

- 5.6 In Scenario 1, as would be expected given our estimated elasticities in Chapter 2, applying exactly equal income growth rates to all taxpayers in Scotland and the UK leads to faster income tax revenue growth in Scotland. In a single year, this effect is small, equating to around an additional 0.2 percentage points of additional income tax revenue growth for Scotland. Over a period of ten years, this effect could add around £110 million to Scottish income tax revenues relative to the UK, benefitting the Scottish Budget.
- 5.7 In Scenario 2 the higher income growth of the highest earning 0.1 per cent of UK taxpayers does a lot to offset the gains to Scotland in Scenario 1. This reduces the relative gain in Scotland by more than half. After ten years, the relative gain to Scotland is now just £42 million.
- 5.8 These scenarios show that Scotland will gain more from fiscal drag over the coming decades than the UK, and in isolation this could add a sizeable amount of money to the Scottish Budget. However, with both of these illustrative scenarios, it is important to keep in mind that they assume equal average income growth in Scotland and the UK. Income growth is highly variable, and differing income growth between Scotland and the UK because of broader economic effects is likely to be a far greater component in determining total tax revenue growth than the effect of the static distributional effect. For example, if Scottish incomes grow at just 0.1 percentage points less than UK incomes over the next ten years, this will take around £100 million off the Scottish Budget after 10 years, largely offsetting the positive effects of the static distributional effect.

Distributional effects and the Scottish Budget

- 5.9 The dynamic distributional effect can be positive or negative and can vary a lot from year to year, making it hard to predict. In any one year, the dynamic distributional effect could be quite large, contributing significantly to divergences in Scottish and UK income tax revenue growth. This means dynamic distributional effects could contribute large amounts to forecast errors and income tax reconciliations. However, over the longer-term we expect the effect on the budget to be more limited. While income growth can vary across the income distribution in any one year, this effect appears to even out over time. As Figures 2.4 and 2.5 in Chapter 2 show, income growth is fairly evenly distributed across different income levels when looking across several years data.
- 5.10 The static distributional effect will generally have a smaller impact on the budget in any one year than the dynamic distributional effect. However, we expect the effect to be more persistent over time. As shown in the longer-term analysis, the positive effect of the static distributional effect in

Scotland should build over time, producing longer-term more positive outcomes for the Scottish Budget.

- 5.11 For most Governments, growth in tax revenues in absolute terms will be what matters. Scotland is in the unique situation where the most important factor relating to income tax in the Scottish Budget is how the growth rate of Scottish income tax revenues compares to the growth rate of UK income tax revenues. Scotland has a lower level of income tax revenues per capita than the UK. When calculating growth rates, changes in Scottish tax revenues each year are compared to a relatively lower tax revenue base than in the UK, and this is effectively what drives the more positive static distributional effect in Scotland. Since the growth rate of Scottish income tax revenues relative to the UK is what matters, the static distributional effect is an important concept in the context of the Scottish Budget.

Additional information

Abbreviations

ASHE	Annual Survey of Hours and Earnings
BGA	Block Grant Adjustment
COE	Compensation of Employees
CPI	Consumer Price Index
GDP	Gross Domestic Product
HMRC	Her Majesty's Revenue and Customs
HMT	Her Majesty's Treasury
LFS	Labour Force Survey
MTFS	Medium Term Financial Strategy
NRS	National Records of Scotland
NSND	Non-Savings and Non-Dividends
OBR	Office for Budget Responsibility
ONS	Office for National Statistics
PAYE	Pay As You Earn
PUT	Public Use Tape
RTI	Real Time Information
SEFF	Scotland's Economic and Fiscal Forecasts
SFC	Scottish Fiscal Commission
SG	The Scottish Government
SPI	Survey of Personal Incomes
TMI	Tax Motivated Incorporations

A full glossary of terms is available on our website:

<https://www.fiscalcommission.scot/explainers/glossary/>

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⁸ OECD (2014) Recommendation on Principles for Independent Fiscal Institutions ([link](#))

⁹ Scottish Fiscal Commission (2018) Compliance with the Code of Practice for Official Statistics ([link](#))

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All charts and tables in this publication have also been made available in spreadsheet form on our website. For technical enquiries about the analysis and data presented in this paper please contact the responsible analyst:

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