

# Fraser of Allander Institute

**The affordability of water and  
sewerage charges in Scotland**

**Addendum - equivalised income**

**April 2018**

# Contents

---

**3**

Preface

---

**4**

Chapter 1.

Background and  
context

---

**6**

Chapter 2.

Affordability  
of water and  
sewerage charges  
by household type

---

**16**

Chapter 3.

Addressing  
affordability  
issues: policy  
options

---

**20**

Chapter 4.

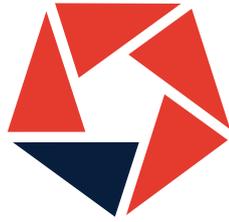
Conclusions

---

**22**

Annex A.

Regression  
analysis



UNIVERSITY of STRATHCLYDE  
**FRASER OF ALLANDER  
INSTITUTE**

## Preface

---

The analysis in this report has been conducted by the Fraser of Allander Institute (FAI) at the University of Strathclyde. The FAI is a leading academic research centre focussed on the Scottish economy.

This addendum to a prior report was commissioned by Citizens Advice Scotland's Consumer Futures Unit, with the technical analysis and writing of the results undertaken independently by the FAI.

The FAI is committed to informing and encouraging public debate through the provision of the highest quality analytical advice and analysis. We are therefore happy to respond to requests for factual advice and analysis. Any technical errors or omissions are those of the FAI.

## Acknowledgements

The Fraser of Allander gratefully acknowledges the support of Citizens Advice Scotland in helping to make this study possible.

We also thank the UK Data Service and the Department for Work and Pensions for the use of data.

# Introduction

## Chapter 1

---

### Background and context

In 2017, FAI were commissioned to produce research on behalf of Citizens Advice Scotland to assess the affordability of water and sewerage charges in Scotland.

The research assessed affordability by considering what proportion of household income was spent on water and sewerage. Households spending above 3% of net After Housing Cost (AHC) income were deemed to be likely to face affordability constraints, whilst households spending above 5% of net AHC income were deemed likely to face more severe affordability constraints. These thresholds are somewhat arbitrary, but mirror thresholds used by OFWAT in assessing the affordability of water and sewerage charges in England and Wales. It is also worth noting that the median percentage spent by Scottish households on water and sewerage bills is 1.5% of income, so the 3% threshold represents twice the median expenditure on water and sewerage.

The main report assessed affordability by considering expenditure on water and sewerage as a percentage of household net AHC income. Importantly, household income was not adjusted for the composition of the household, a process known as equalisation.

The main report assessed affordability based on unequivalised household income for two reasons.

- One was for consistency with OFWAT's work for England and Wales, which uses unequivalised income as the basis for affordability comparisons.
- The other is that there is some correlation between household occupancy and water bills in Scotland. This results from two factors: first, bills increase with council tax band (and there is some correlation between council tax band and occupancy); second, single person households receive a discount on their bill. The fact that bills are correlated with household size mitigates against adjusting income for household size in assessing affordability.

The relationship between occupancy and bill, whilst positive, is relatively weak, with lots of variation around it. There is therefore a case for arguing that unequivalised income will exaggerate the extent to which single-person households face affordability constraints, and underplay the extent to which larger households might face affordability constraints.

Consequently, there is a case for saying that affordability should be based on a measure of equalised income. The process of equalisation adjusts household income for the composition of those households, and reflects that a given income has to 'go further' for larger households than smaller households (Box 1).

In this Addendum to the main report, we assess the affordability of water and sewerage charges based on equalised rather than unequivalised income. The data and methodology adopted are identical to the main report: the data comes from the Family Resources Survey (FRS) in 2013/14, 2014/15 and 2015/16; and the components of household income and housing costs are defined in the same way. The only difference is that, in this Addendum, the income measure is equalised to take account of household composition.

Throughout this Addendum, we present the same analysis as in our main report, with income equalised. We highlight where the results are similar, and where they differ, when equalised income is used instead of unequivalised income. Unless otherwise specified, the source of all tables and charts are calculations by FAI on the Family Resources Survey data.

This Addendum to the main report is structured as follows:

Chapter 2 considers how water and sewerage charges as a percentage of household income vary by household characteristic (equivalent to Chapter 4 in the main report);

Chapter 3 considers the costs and effects of various policy options to alleviate water and sewerage affordability issues (equivalent to Chapter 5 in the main report);

Chapter 4 concludes.

### Box 1. Equivalisation

Equivalisation is used to adjust household income to take into account variations in the size and composition of households. This reflects the common sense notion that for a given household income, a single person living alone will enjoy a different standard of living, compared to a larger household.

The process of adjusting income in this way to ensure comparable standards of living is known as equivalisation and is needed in order to make sensible income comparisons between households.

Equivalence scales conventionally take an adult couple without children as the reference point, with an equivalence value of 1. Relative to this, the equivalisation process then increases the income of single person households (since their incomes are divided by a value of less than 1) and reduces relatively the incomes of households with three or more persons, which have an equivalence value of greater than 1.

In line with international best practice, the main income equivalence scales in the UK are the modified OECD scales, which take the values shown in Table 1.

Different scales are used depending on whether household income is being considered before (BHC) or after housing costs (AHC). The analysis of water and sewerage charges is based on AHC definitions of income so the AHC equivalisation factors are used.

The AHC equivalisation factors give a value of 0.58 to the first adult in the household, 0.42 to subsequent adults (and children aged 14+), and 0.2 to children aged under 14. So a household consisting of two adults and two children, one of whom is aged 12 and the other aged 15, would have an equivalisation factor of 1.62 (0.58 + 0.42 + 0.2 + 0.42).

If this household had an income of £50,000, its equivalised income would be £30,864. This takes into account that an income of £30,864 for this two adult, two children household would be comparable to the income of a couple household with £50,000.

**Table 1:** OECD 'modified' equivalisation scales

	'Before Housing Costs' equivalisation factors	'After Housing Costs' equivalisation factors
First adult	0.67	0.58
Subsequent adults	0.33	0.42
Children aged under 14	0.2	0.2
Children 14+	0.33	0.42

*Source: FRS / HBAI documentation*

# Affordability of water and sewerage

## Chapter 2

In this chapter we consider how various household characteristics influence the likelihood of a household spending more than 3% or 5% of its equivalised AHC income on water and sewerage.

- In section 2.1 we consider the overall proportion of households spending above the 3% and 5% thresholds.
- In section 2.2 we consider how the likelihood of spending above the 3% and 5% thresholds varies by characteristic, highlighting similarities and differences with respect to the unequivalised analysis.
- In section 2.3 we look at a regression analysis on equivalised income
- In section 2.4, we specifically look at the households that do spend more than 3% or 5% of equivalised income on water and sewerage, and examine the composition of that group.

### 2.1 Overview

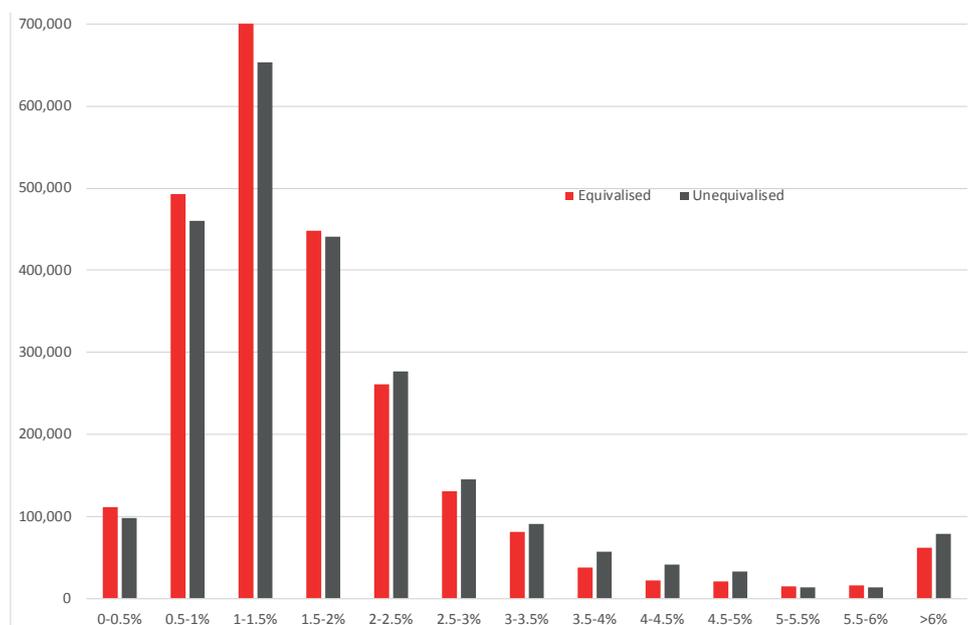
Our November 2017 report found that, on an unequivalised basis, around 15% (just under 370,000 households) spent more than 3% of income on water and sewerage in 2015/16. On an equivalised basis, this figure falls to 12% (around 297,000 households).

Why does equivalisation reduce the prevalence of spending more than 3% on water and sewerage? As can be seen from Table 1, equivalisation effectively increases the incomes of single-person households (and single person households with one or more children aged under 14) which make up a third of all households. Households with two adults (which make up just over one third of all households) see their incomes unchanged. Only households with more than two adult occupants thus see their incomes fall<sup>1</sup>.

Our November 2017 report found that, on an unequivalised basis, 6% of households spent more than 5% of income on water and sewerage in 2015/16. On an equivalised basis the result is not much different – 5.5% of households spent more than 5% of income on water and sewerage.

Chart 2.1 shows the distribution of households by percentage of expenditure on water and sewerage.

**Chart 2.1** Distribution of hhs by % of net (AHC) income spend on water and sewerage



Source: FAI calculations

<sup>1</sup> Note that this result is largely because of the decision to scale the equivalisation scale to equal one for couple households. The unmodified OECD equivalisation scale makes single person households equal to one, with all other household types having higher equivalisation factors (and thus lower equivalised income). If this equivalisation scale were used instead then 900,000 Scottish households, representing 36%, would be deemed to be spending more than 3% of income on water and sewerage. The choice of equivalisation scale is clearly material.

Overall, the distribution of households by percentage of net equivalised income spent on water and sewerage is similar to the distribution for net unequivalised income. Almost three quarters of households spend less than 2% of equivalised income on water and sewerage. In either case, over 2.5% of households are spending more than 6% of income on water and sewerage.

## 2.2 The affordability of water and sewerage charges by household type

This section considers the prevalence of spending more than 3% or 5% of AHC equivalised income on water and sewerage by household type. In other words, for a given characteristic, what proportion of households with that characteristic pay above the 3% or 5% thresholds?

### Income

Table 2.1 divides the 2.4 million Scottish households into ten equally sized groups of households, from the lowest income decile to the highest income decile, this time focusing on those paying more than 3% / 5% of their equivalised income rather than of their unequivalised income alongside equivalised deciles.

Income is very strongly correlated with the likelihood of spending more than 3% or 5% of income in water and sewerage, similar to that found in the previous report. 70% of households in the lowest income decile spend more than 3% of income on water and sewerage, falling to 26% in the second decile. No households in the top half of the income distribution fall within the 3% threshold, and no household above the bottom two deciles falls within the 5% threshold.

**Table 2.1:** Spending more than 3%/5% of income on water / sewerage by decile of net (AHC) income, 2015/16

Equivalised decile	Spend more than 3% of net equivalised income on water and sewerage	Spend more than 5% of net equivalised income on water and sewerage	Income below £...*
Lowest	70%	49%	173
2	26%	7%	248
3	10%	0%	302
4	11%	0%	359
5	4%	0%	420
6	0%	0%	486
7	0%	0%	561
8	0%	0%	666
9	0%	0%	842
Highest	0%	0%	

\* Households in the lowest decile have AHC equivalised income below £173 per week, those in the second decile have equivalised income between £173 and £248 per week, etc. Households in the highest decile have equivalised income above £842.

**Source:** FAI calculations

### Council tax band

Table 2.2 shows that the average share of equivalised income (AHC) spent on water and sewerage is slightly increasing as we progress through bands A-H. The analysis of unequivalised income found that the average share of income spent on water and sewerage was somewhat flatter across the bands. The fact that higher banded households spend slightly more on water and sewerage than average when we equivalise income (but not when we use unequivalised income) reflects the fact that equivalisation decreases the household incomes of larger households, and higher banded properties tend to have higher occupancy on average. But whilst incomes are increasing with band too, the increase in average equivalised incomes by band is not sufficient to offset the increase in bills.

**Table 2.2:** Average expenditure\*\* on water and sewerage by council tax band

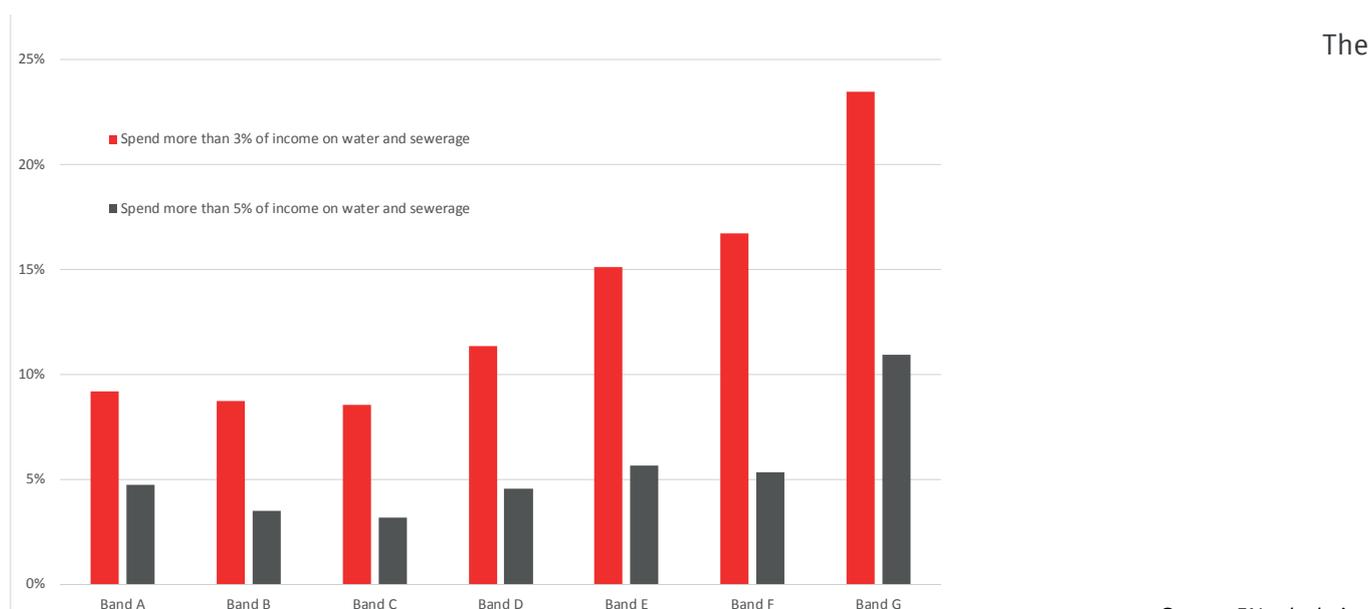
Council tax band	A	B	C	D	E	F	G	H
% of net equivalised income (AHC) spent on water / sewerage*	1.8%	1.8%	1.7%	2.0%	2.1%	2.1%	2.5%	*
% of households in each band	21%	24%	15%	13%	14%	7%	4%	*

\*Insufficient cell sizes \*\* Does not include households with negative or zero incomes

Source: FAI calculations

Chart 2.2 shows that the proportion of households spending above 3% of income on water and sewerage is fairly constant across bands A-C, then monotonically increasing across bands D-G. This reflects the points already alluded to: water and sewerage charges increase by council tax band but whilst income on average increases by band, there is a great deal of variation around this average relationship. Not all households in higher banded properties have high incomes. The incidence of households spending over 5% of income on water and sewerage is somewhat more consistent across council tax bands.

**Chart 2.2 Households spending above 3%/5% of equivalised income on water and sewerage by council tax band**



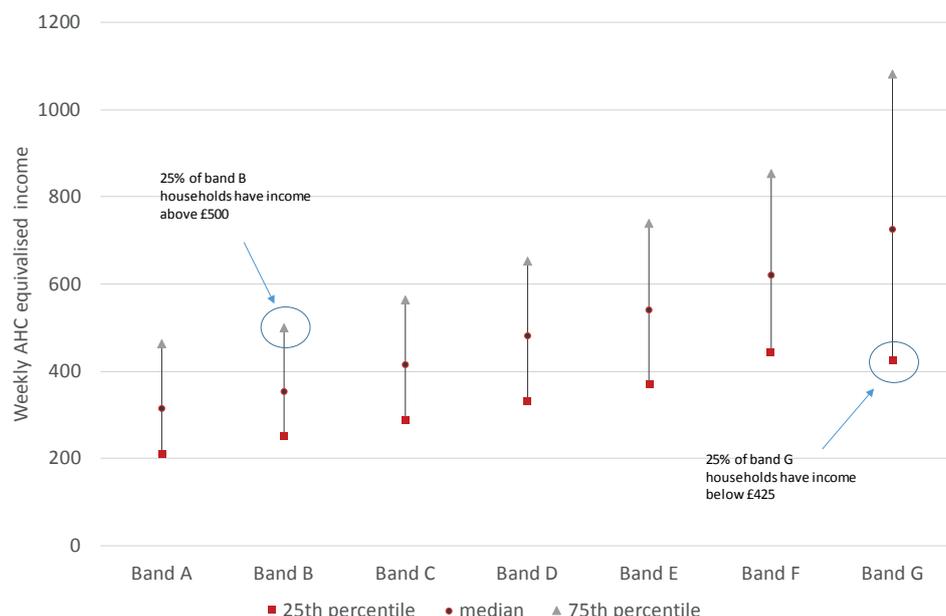
Source: FAI calculations

general pattern described here, of the prevalence of affordability constraints being at least as high (if not higher) in higher banded households, broadly mirrors the findings of the analysis using unequivalised income. If anything however, the analysis using equivalised income accentuates the increase in affordability constraint with increasing council tax band, as the process of equivalisation tends to (on average) increase the incomes of low-banded properties relative to high-banded properties.

Chart 2.3 plots, for each council tax band, the median household income in that band, together with the 25th percentile and 75th percentile of income for each band (25% of households have income below the 25th percentile, whilst the 25% of households have income above the 75th percentile).

Median income increases with band but there is substantial variation within each band. Similar to the unequivalised version, Chart 2.3 shows that 25% of households in Band B have income above £500 per week. At the same time, 25% of households in Band G have income below £425 per week. Despite this, the water and sewerage charge for a Band G property is more than twice as much as the charge for a Band B property.

**Chart 2.3 Distribution of net equivalised income (AHC) by council tax band**



Source: FAI calculations

Table 2.3 provides further analysis of the relationship between income, council tax band and affordability. It shows the average percentage of disposable income spent on water and sewerage by council tax band and income decile. This reiterates the findings of the unequivalised analysis:

- For any given income decile, the higher the council tax band of the household, the greater the proportion of income that household spends on water and sewerage;
- For any given council tax band, the higher the income of the household, the lower the proportion of income spent on water and sewerage

Both these results are of course intuitive, and are observed regardless of whether we consider equivalised or unequivalised income.

**Table 2.3:** Average percentage of equivalised household income spent on water and sewerage by council tax band and decile of equivalised income

	A	B	C	D	E	F	G	H
Lowest	5.0	5.7	5.1	9.5	10.2	*	*	*
2	1.8	2.3	2.4	2.9	4.2	*	*	*
3	1.4	1.8	2.0	2.4	3.3	*	*	*
4	1.2	1.6	1.8	2.0	2.7	*	*	*
5	1.1	1.3	1.6	1.8	2.2	*	*	*
6	0.9	1.2	1.4	1.5	1.9	2.3	*	*
7	0.8	1.0	1.2	1.4	1.7	1.9	*	*
8	0.7	0.9	1.0	1.2	1.5	1.7	*	*
9	0.6	0.8	0.8	1.0	1.2	1.4	1.7	*
Highest	*	0.5	0.6	0.7	0.8	0.9	1.0	*

Source: FAI calculations

## Household composition

Table 2.4 shows the percentage of households spending above 3% and 5% of income on water and sewerage by household composition. As noted in the November 2017 report, equivalisation changes the perspective about how affordability is distributed across household type. As it reduces the incomes of multi-occupancy households relative to single households, equivalisation makes affordability look relatively less of an issue for single households, and relatively more of an issue for family households.

**Table 2.4:** Spending above income thresholds on water and sewerage by household type

	Unequalised		Equalised		
	% spending more than 3% on water / sewerage	% spending more than 5% on water / sewerage	% spending more than 3% on water / sewerage	% spending more than 5% on water / sewerage	
Working age					
one adult	-	31%	14%	13%	8%
1 child		13%	6%	9%	5%
> 1 child		5%	2%	8%	3%
one couple	-	9%	4%	9%	4%
1 child		10%	6%	15%	7%
> 1 child		6%	3%	16%	5%
Pension age					
one adult		24%	6%	6%	2%
one couple		10%	2%	10%	2%
Multi family households		7%	3%	13%	5%

Notes: Pension age households include a small number of pensioner households with dependent children

Source: FAI calculations

For example, 31% of single adult households spend more than 3% of income on water and sewerage on an unequalised basis, but this falls to 13% on an equalised basis. For couples with no children, equalisation makes no difference (by definition, these households equalisation factor is one). But for couples with more than one child, equalisation has the effect of increasing the prevalence of spending more than 3% of income on water and sewerage from 6% to 16%.

Equalisation therefore can change drastically the perspective about which type of households are most likely to face affordability constraints. We discuss this further in the concluding section.

## Household tenure

Table 2.5 shows the proportion of households spending above 3% and 5% of income by tenure type.

The pattern of housing affordability by tenure is broadly similar for equalised income as for unequalised income. Owner occupiers are least likely to spend more than 3% of income on water and sewerage, and those renting privately are most likely to spend more than 3% of income on water and sewerage. This reflects the fact that renters tend to have lower after housing costs income than owner occupiers.

**Table 2.5:** Spending more than 3% / 5% of income on water and sewerage by tenure

	Unequalised		Equalised	
	% spending more than 3% on water / sewerage	% spending more than 5% on water / sewerage	% spending more than 3% on water / sewerage	% spending more than 5% on water / sewerage
Rented from council	18%	7%	11%	4%
Rented from HA	23%	9%	15%	5%
Rented privately unfurnished	20%	9%	16%	7%
Rented privately furnished	23%	12%	17%	10%
Owned outright	15%	5%	10%	4%
Owned with mortgage	7%	3%	9%	4%

*Source: FAI calculations*

### Benefits

Table 2.6 shows the percentage of households in receipt of particular benefits which spend more than 3% of income on water and sewerage, contrasting unequalised and equalised measures. As would be expected, equalisation has the effect of increasing the prevalence of affordability issues where the benefit tends to be one claimed by families (such as tax credits), but reducing the prevalence of affordability challenges where the benefits tends to be claimed by single people more often than by families (such as the State Pension).

In general, whether we consider equalised or unequalised income, what might be seen as surprising is that (with the exception of Jobseekers Allowance) the prevalence of spending more than 3% of income on water and sewerage for those in receipt of particular benefits is often not drastically higher than the proportion for the population as a whole. For example, 12% of all households in Scotland spend more than 3% of equalised income on water and sewerage. Among those in receipt of DLA, Pension Credit, and Attendance Allowance this percentage is smaller, and among those claiming Housing Benefit, ESA, Income Support and Council Tax Reduction, the proportion is only slightly higher than 12%.

**Table 4.6:** Percentage of households spending > 3% of income on water and sewerage by benefit

Benefit*	Unequalised	Equalised
State Pension	16%	8%
Housing Benefit	25%	14%
Working Tax Credits	12%	17%
Employment and Support Allowance	28%	14%
Disability Living Allowance	9%	6%
Pension Credit	13%	4%
Attendance Allowance	7%	4%
PIP	*	*
Child Tax Credits	9%	16%
Jobseeker's Allowance	48%	35%
Carer's Allowance	9%	12%
Income Support	15%	13%
Council Tax Reduction	23%	13%
Universal Credit	21%	17%

\* Cells suppressed where based on less than 50 households in line with FRS guidance

*Source: FAI calculations*

Notes: Universal Credit estimates are based on whether households are receiving one or more of Income Support, Income based JSA, Income related ESA, Housing Benefit, Working Tax Credit, Child Tax Credit

This reflects two factors. One is that receipt of some of these benefits by definition raises income, whilst in some cases at the same time can act as a passport to Council Tax Reduction and thus a lower water and sewerage bill. The other is that, as we have seen, water and sewerage affordability as defined extends to households with a variety of characteristics, and is not concentrated solely on households that might be considered ‘poor’ in the usual sense.

### Work status

As was the case with unequivalised income, when we measure affordability with equivalised income we find that households where nobody is in work and a household member is unemployed are most likely to spend more than 3% of income on water and sewerage (Table 2.7). Specifically, 46% of these households are spending more than 3% of income on water and sewerage - almost four times the national average rate.

In contrast, among households where everyone is working, only 3% of households spend more than 3% of income on water and sewerage. Work status is thus an important determinant of what proportion of income a household spends on water and sewerage.

**Table 2.7:** Percentage of households spending >3% / 5% of income on water and sewerage by work status

	Unequivalised		Equivalised	
	% spending more than 3%	% spending more than 5%	% spending more than 3%	% spending more than 5%
One or more self employed	20%	10%	21%	11%
All in full time work	7%	2%	3%	2%
One (or more) in full-time work, one (or more) part-time	3%	1%	6%	2%
One (or more) in full-time work, one (or more) not working	10%	3%	16%	4%
No full-time work, one or more in part-time work	21%	10%	16%	8%
Workless head or spouse aged 60 or over	20%	6%	9%	3%
Workless, head or spouse unemployed	68%	40%	46%	24%
Workless, other economically inactive	32%	15%	18%	9%
Multi mixed family units	7%	3%	13%	5%

*Source: FAI calculations*

## 2.3 The role of various factors in influencing the probability of spending more than 3% of income on water and sewerage: regression analysis

In our November 2017 report, we used regression analysis to assess the relative importance of different household characteristics in influencing the likelihood of a household spending more than 3% of unequivalised income on water and sewerage. In Annex A, we have updated this regression analysis using equivalised income as the basis on which the 3% threshold is calculated.

The main difference between the equivalised and unequivalised results is that, when income is equivalised, single person households are slightly less likely to spend more than 3% of income on water and sewerage than non-single households. When income was unequivalised, single person households were found to be much more likely to spend more than 3% of income on water and sewerage. This of course reiterates the findings presented in section 2.2.

Beyond this, there are no major differences between the two sets of results. With equivalised income, as was the case with unequivalised income, the probability of spending more than 3% of income on water and sewerage actually increases slightly as we move through council tax bands A-H.

Regardless of whether income is measured on an equivalised or unequivalised basis, being in receipt of a working age benefit is associated with a higher probability of spending more than 3% of income on water and sewerage, whilst being in receipt of a pension age or disability related benefit is associated with a slightly smaller probability of spending more than 3% of income on water and sewerage.

But beyond any of these characteristics, the factor that influences the likelihood of spending more than 3% of income on water and sewerage more than anything else is income itself.

## 2.4 What are the characteristics of those spending more than 3% or 5% of income on water and sewerage?

As well as understanding the likelihood of households with particular characteristics spending more than 3% or 5% of income on water and sewerage, it is also important to look at a slightly separate question which is: what proportion of households which do spend over 3% / 5% of income on water and sewerage have particular characteristics?

For example, the previous analysis shows that a high proportion of households in council tax band G spend more than 3% of income on water and sewerage.

But because there are relatively few band G households, these households are unlikely to make up a large proportion of all those households who spend more than 3% of income on water and sewerage throughout Scotland.

In this section therefore, we turn the focus of the analysis to look at the characteristics of those who spend more than 3% or 5% of income on water and sewerage as a group.

### Council Tax Band

Our previous analysis based on unequivalised income found that, although the prevalence of water and sewerage affordability was fairly consistent across bands, almost half of those households spending more than 3% or 5% of their income on water and sewerage were found in council tax bands A and B. This simply reflected the fact that there are proportionately more households in these bands.

This finding is broadly reiterated when looking at equivalised income (Table 2.8). However, when considering equivalised income, the proportion of households spending more than 3% of income on water and sewerage is slightly less concentrated across bands A and B.

This reflects the points made previously: equivalisation tends to reduce the incomes of those in higher banded properties relative to those in lower banded properties, on average.

**Table 2.8:** Composition of households with water and sewerage affordability issues by council tax band

	A	B	C	D	E	F	G
>3%	17%	18%	11%	13%	19%	11%	9%
>5%	22%	18%	10%	13%	17%	9%	10%
% of CT bands	21%	24%	15%	13%	14%	7%	4%

\* Band H suppressed due to low cell sizes

**Source:** FAI calculations

## Household composition

Our previous analysis using unequivalised income found that, of households spending more than 3% of income on water and sewerage, just over 60% were single person households. Working age couple households (with or without children) accounted for 18% of households spending more than 3% on water and sewerage.

As would be expected, equivalisation changes this conclusion significantly (Table 2.9). On an equivalised basis, 29% of households spending more than 3% of income on water and sewerage are single person households (rather than 60%). And 36% are working age couple households with or without children (compared to 18% on an unequivalised basis).

**Table 2.9:** Households spending above 3%/5% of equivalised income on water and sewerage by household composition

	Working Age						Pension age		Multi family households
	One adult	+1 child	+ >1 child	One couple	+1 child	+ >1 child	One adult	One couple	
Spending >3% on water / sewerage	21%	3%	2%	14%	10%	12%	8%	11%	19%
Spending >5% on water / sewerage	30%	4%	1%	15%	11%	9%	8%	6%	17%
% of household type in population	18%	3%	2%	17%	7%	8%	15%	13%	16%

*Source: FAI calculations*

## Tenure

The November 2017 report identified what might have been at first glance a counter-intuitive finding: a large proportion of households which spend more than 3% of income on water and sewerage are owner occupier households, whilst a relatively low proportion are in the private rented sector. This is despite the prevalence of spending more than 3% of income on water and sewerage being lower among owner occupiers and higher among private renters. The result is explained by the distribution of households in the total population – there are relatively far fewer households who rent than who own. This finding is broadly mirrored when we consider equivalised income (Table 2.10).

**Table 2.10:** Composition of households spending above 3%/5% of income on water and sewerage by tenure

	Rented from council	Rented from Housing Association	Rented privately (un-furnished)	Rented privately (furnished)	Owned outright	Owned with mortgage
Spending >3% on water / sewerage	14%	12%	16%	8%	28%	23%
Spending >5% on water / sewerage	13%	10%	18%	11%	25%	24%
% of household type in population	14%	9%	11%	5%	32%	29%

*Source: FAI calculations*

Of all households who spend more than 3% of income on water and sewerage, half are owner occupiers, whilst one quarter are in the private rented sector and one quarter are in the social rented sector. However, the proportion of households spending more than 3% of income on water and sewerage who are owner occupiers is somewhat higher when we use the equivalised measure of income. This is because equivalisation tends to reduce the incomes of owners by slightly more on average than of renters, given the slightly different composition of these two groups on average (i.e. renters are more likely to be single households, and owners are more likely to be couples with children, on average).

## Benefits

When looking at equivalised income, less households spending more than 3%/5% of income are in receipt of the State Pension (Table 2.11) compared to on an unequivalised basis. While around a third of those paying more than 3% of unequivalised income were in receipt of the State Pension, this drops to around a fifth of those paying more than 3% of equivalised income. The reason for this could be that equivalisation boosts the income of single households relative to larger families, and those in receipt of the state pension are less likely to be in a large family household type.

Households paying more than 3% of their equivalised household income on water and sewerage are just as likely as the population as a whole to be in receipt of Council Tax Reduction. Overall, the largest difference between using equivalised and unequivalised income is seen for those households in receipt of Child Tax Credits. This is likely to be due to equivalisation reducing household income with increasing family size, and large families being more likely to be in receipt of Child Tax Credits.

**Table 2.11:** Households spending above 3%/5% of income on water and sewerage by benefit type

	State Pen.	Hous. Ben.	WTC	ESA	DLA	Pen. Cred.	Attend. Allow.	CTC	JSA	Carer's Allow.	Inc. Supp.	CTR	UC*
Spending > 3% on water / sewerage	22%	20%	8%	6%	5%	2%	1%	15%	11%	2%	4%	21%	36%
Spending > 5% on water / sewerage	15%	16%	9%	4%	5%	2%	1%	14%	10%	1%	2%	17%	33%
% of household type in receipt	31%	16%	6%	5%	10%	6%	3%	10%	3%	2%	3%	19%	25%

\* in receipt of one or more of the benefits being replaced by Universal Credit

**Source:** FAI calculations

## Work status

Similarly to the report based on unequivalised income, households with all adults in full time work make up 7% of all those facing water and sewerage affordability issues, despite accounting for 23% of all households (Table 2.12).

Compared to the unequivalised results, workless households with a head or spouse aged 60 or over are less likely to feature in those paying more than 3% on water and sewerage. Again, this is likely to be due to equivalisation boosting the incomes of single person households. Like the unequivalised findings, workless households (where the head or spouse is unemployed or economically inactive) are slightly more likely to feature in those paying more than 3% of their equivalised income on water and sewerage than in the population as a whole.

**Table 2.12:** Households spending above 3%/5% of income on water and sewerage by economic status

	One or more self-employed	All in full-time work	One (or more) in full-time work, one (or more) part-time	One (or more) in full-time work, one (or more) not working	No full-time work, one or more in part-time work	Workless, head or spouse aged 60 or over	Workless, head or spouse unemployed	Workless, other economically inactive	Multi mixed family units*
Spending > 3% on water / sewerage	12%	7%	4%	8%	9%	21%	9%	11%	19%
Spending > 5% on water / sewerage	16%	8%	2%	5%	11%	17%	11%	13%	17%
% of household type in population	6%	23%	7%	6%	7%	26%	2%	7%	16%

\* consists of households made up of different combinations of economic status (ECOBU)

**Source:** FAI calculations

# Policy options

## Chapter 3

---

Chapter 5 of our November 2017 report considered a number of policy options for alleviating affordability issues among those households spending more than 3% or 5% of unequivalised income on water and sewerage charges. This included the costing of various policy options, as well as describing the advantages and disadvantages of different policy options, from the perspectives of efficiency, cost-effectiveness, and administrative complexity.

In this chapter, we outline where a focus on water and sewerage costs as a percentage of equivalised income (as opposed to unequivalised income) might make a difference to either the costs of a particular policy, or the number of households that the policy affects.

We do not revisit the general arguments about administrative costs, transparency for individual households, and other policy design issues, and these issues are no different when policy is determined as a function of equivalised income rather than unequivalised income.

### **The full cost of reducing water and sewerage bills to less than 3% of income**

If all households currently spending more than 3% of their net AHC income on water and sewerage were offered a discount on their bill that would bring their expenditure on water and sewerage to exactly 3% of income, what would the total cost of this be?

Our November 2017 report calculated the cost of ensuring that no household spent more than 3% of its net unequivalised AHC income on water and sewerage would be around £34 million in 2015/16, whilst the costs of ensuring that no household spends more than 5% of its unequivalised income on water and sewerage would be around £12 million.

We can perform similar calculations for equivalised income, i.e., what is the cost of ensuring that no household spends less than 3%/ 5% of its equivalised income on water and sewerage?

The results are shown in Table 3.1. The costs of ensuring that no household spends more than 3% of its equivalised income on water and sewerage are slightly lower than the costs of ensuring that no household spends more than 3% of its unequivalised income on water and sewerage. This is because, after adjusting income for equivalisation, fewer households pay more than 3% of income on water and sewerage bills<sup>1</sup>.

Note however that the costs of ensuring no household spends more than 3% of equivalised income on water and sewerage are only slightly less than the costs of ensuring that no household spends more than 3% of unequivalised income on water and sewerage, despite markedly fewer households falling into the unequivalised threshold. This implies that those households paying more than the 3% equivalised threshold tend to be further from the threshold than is the case for the unequivalised threshold.

As noted in our November 2017 report, whilst these estimates of the total cost are useful, any policy to reduce household expenditure on water and sewerage is likely to end up costing substantially more than identified here. This is because it will be impossible in practice for policy makers to identify exactly which households spend more than 3% on water and sewerage, and compensate those households in such a way that their expenditure on water and sewerage falls to exactly 3% of income.

---

<sup>1</sup> Table 3.1 excludes households which have negative AHC incomes. This is why it shows apparently fewer affected households than the total number of households who have been identified as spending more than 3% of income on water and sewerage. For this reason, the cost estimates in Table 3.1 are underestimates of the true cost of reducing all households' expenditure on water and sewerage to less than 3%.

**Table 3.1:** Costs of ensuring that no household spends more than a given threshold of income on water and sewerage charges

Panel A: Unequalised income				
3% threshold			5% threshold	
	Annual cost (£million)	No. of affected households	Annual cost (£million)	No. of affected households
2013/14	£32	315,619	£12	105,793
2014/15	£31	316,511	£10	102,775
2015/16	£34	325,556	£12	104,285
Panel B: Equalised income				
3% threshold			5% threshold	
	Annual cost (£million)	No. of affected households	Annual cost (£million)	No. of affected households
2013/14	£27	228,191	£10	69,796
2014/15	£24	224,759	£8	65,736
2015/16	£32	254,729	£12	92,645

\* Does not include households with negative or zero incomes

Source: FAI calculations

## Options within the existing council tax based system

### *Changing the ratios between bands*

As noted in our original report, there seems relatively little case for changing the ratios between council tax bands. There is no evidence that the likelihood of having water and sewerage affordability issues is lower in higher banded properties. Indeed, there is some evidence that the prevalence of spending more than 3%/5% of income on water and sewerage increases within higher banded properties. This reflects the well-established fact that the relationship between council tax band and income is weak.

### *Extending the single person status discount*

Our previous analysis showed that extending the single person discount to 50% would cost around £78 million while extending it to 100% would cost an estimated £235m.

Looking at equalised income, extending the single person discount to 50% would result in the percentage of households paying more than 3% of equalised income on water and sewerage costs falling from 12% to 10%. Extending to 100% would bring the percentage of households paying more than 3% of their equalised income from 12% to 8%.

On the other hand, removing the 25% single person discount would increase the percentage of households paying more than 3% from 12% to 14%. Equalisation effectively boosts the incomes of single households relative to larger household types. As such, there are fewer single households experiencing water and sewerage affordability issues when looking at equalised income, and extending the single person discount has a smaller effect on the number of households facing water and sewerage affordability issues than compared to the unequalised results. Given that a relatively large proportion of single person households do not spend more than 3% of income on water and sewerage, any scheme to increase the Single Person discount involves significant ‘deadweight’. This is much more the case when measuring affordability on an equalised relative to an unequalised income basis.

### *Extending Council Tax Reduction discounts*

It might be expected that extending reliefs for water and sewerage charges to be more consistent with those available for Council Tax Reduction would be a relatively efficient policy, as Council Tax Reduction is targeted specifically at relatively low-income households and it is primarily low-income households who face water and sewerage affordability issues.

We have already costed three such policies in our previous report. On an equivalised income basis, extending WCRS relief to 25% for all those who currently receive a CTR based discount of less than 25% would cost an estimated £2.5 million. Increasing the relief to 50% for all those currently in receipt of CTR (including those additionally in receipt of status discounts) would cost around £32 million. And increasing the relief to 100% for all those currently in receipt of CTR (including those additionally in receipt of status discounts) would cost around £90 million.

In our first report, we looked at how these would affect those paying more than 3%/5% of their unequivalised household income. Looking at equivalised income, what would the effects be on the rates of paying more than 3%/5% on water and sewerage?

Extending WCRS relief to 50% would result in the proportion of households spending more than 3% of their equivalised income on water and sewerage falling from 12% to 11%. The proportion spending more than 5% of income on water and sewerage would fall from 6% to 5%. Even if full relief on water and sewerage bills is provided to all households receiving Council Tax Reduction, a more significant increase in water and sewerage affordability is not observed. Extending WCRS relief to 100% results in the proportion spending more than 3% of their equivalised income dropping to 10%, and those spending more than 5% of their equivalised income remaining at around 5%.

The reason why full relief on water and sewerage charges for those houses in receipt of CTR does not result in a larger fall in the proportion of households spending over 3%/5% of income on water and sewerage is simply that many of the households who spend above those thresholds are not eligible for CTR. In turn, this is because many of the households which do spend over 3% of income on water and sewerage are not necessarily low income households per se; it is simply that their incomes are low relative to the council tax band (and therefore the water charge that they face).

### *A relief scheme on application*

Our November 2017 report discussed issues around the design of a relief scheme on application. It argued that the most effective criteria on which to base relief would be household income, given that household income is the single most important determinant of whether a household is likely to spend more than 3% or 5% of income on water and sewerage.

Table 5.3 of our November 2017 report showed the annual net unequivalised income that would be required for a household to spend less than 3% or 5% of its income on water and sewerage, by council tax band. Table 3.2 below shows what level of unequivalised income a household requires in order to spend less than 3% or 5% of its equivalised income on water and sewerage. It does this to make the income thresholds more meaningful. It shows the income thresholds for three example household types: a single person household, a couple without children, and a couple with two children under 14.

The single person household faces a reduced bill relative to other household types with equalisation increasing its income. As a result, the unequivalised income required to avoid spending more than 3% of income on water and sewerage is relatively lower than it was in the November 2017 report. Equalisation adjusts the income of the household with children downwards. Therefore this household

needs higher unequivalised income to avoid spending more than 3% of equivalised income on water and sewerage. The income thresholds for the couple without children are the same in for equivalised as unequivalised income, as the equalisation factor is 1 for these households.

The cost of the scheme, if it was fully taken up, would be in the region of £32 million, given that this is the cost of reducing all household bills to within 3% of equivalised income threshold, as identified in the section above. This is similar to the costs that would be incurred for a similar scheme based on unequivalised income (£34 million). The issues around implementing such a scheme remain the same as identified in our November report.

**Table 3.2:** Net unequivalised household income required to spend < 3%/5% of equivalised income on water and sewerage (2017/18)

		Annual household net income required in order to spend ...					
Band	Combined services charge	... less than 3% on water and sewerage			... less than 5% on water and sewerage		
		Single person	Couple - no children	Couple - two children	Single person	Couple - no children	Couple - two children
A	£287.04	£4,162	£9,568	£13,395	£2,497	£5,741	£8,037
B	£334.88	£4,856	£11,163	£15,628	£2,913	£6,698	£9,377
C	£382.72	£5,549	£12,757	£17,860	£3,330	£7,654	£10,716
D	£430.56	£6,243	£14,352	£20,093	£3,746	£8,611	£12,055
E	£526.24	£7,630	£17,541	£24,557	£4,579	£10,525	£14,735
F	£621.92	£9,018	£20,731	£29,023	£5,411	£12,438	£17,413
G	£717.60	£10,405	£23,920	£33,488	£6,243	£14,352	£20,093
H	£861.12	£12,486	£28,704	£40,186	£7,492	£17,222	£24,111
Equalisation factor		0.58	1	1.4	0.58	1	1.4

*Source: FAI calculations*

### *Topping up existing benefits*

The November 2017 report estimated that, if all claimants of Universal Credit (or the benefits due to be replaced by UC) could be offered a top-up that was just sufficient to ensure that they spent no more than 3% of unequivalised income on water and sewerage, this would cost £10m and affect 125,000 households (equivalent to £84 per household per year). On an equivalised basis, the total cost would amount to £9m and affect 95,000 households (equivalent to £95 per household per year).

The more general points about the advantages and disadvantages of using top-up powers remain as discussed in the November 2017 report. A UC top-up policy would incur administrative costs, and a significant degree of inefficiency in the sense that it would be paid to all UC claimants, but only around one fifth of these spend more than 3% of income on water and sewerage according to the FRS data.

### *Creating a new benefit*

The issues identified in our previous report are no different when defining affordability on an equivalised basis relative to an unequivalised basis. The difficulty is that the main variable of interest – household net AHC income – is not easily observable for all households. Whilst the new Scottish Social Security Agency may in due course hold reasonably comprehensive data for households in receipt of devolved Scottish benefits, there is little relationship between benefit receipt and water and sewerage affordability issues.

# Conclusions

## Chapter 4

---

As we noted in our November 2017 report, the decision as to whether to use equivalised or unequivalised income is not straightforward nor clear cut.

In its study in England, OFWAT used unequivalised income on the grounds that water bills in England are likely to be correlated with household size, and argued therefore that there is little point in adjusting income for occupancy when bills already in effect reflect occupancy.

In Scotland there is also a correlation between occupancy and water bill. This results from two factors: first, bills increase with Council Tax band (and as we have seen, there is some correlation between council tax band and occupancy); second, single person households receive a discount on their bill.

Nonetheless, the relationship between occupancy and bill, whilst positive, is relatively weak, with lots of variation around it. Therefore the case for using equivalised versus unequivalised income is somewhat ambiguous.

The main effect of assessing affordability of water and sewerage charges based on equivalised rather than unequivalised income is to shift the burden of affordability away from single person households and towards multiple occupancy households.

Assessed relative to unequivalised income, 60% of the households which spend more than 3% of income on water and sewerage are single person households, and 18% are working age couple households. On an equivalised basis, these percentages change to 29% and 36% respectively.

Equivalisation also makes affordability challenges somewhat more prevalent in higher banded council properties, and among benefits that are claimed largely by families rather than single people.

But although equivalisation does change significantly the conclusions about which types of household composition are most likely to spend more than 3% (or 5%) of income on water and sewerage, there are many conclusions that equivalisation does not change. Regardless of whether one looks at affordability measured on an equivalised or unequivalised basis, the households that face 'affordability' issues are not easily identifiable by one or two specific characteristics, such as council tax band, benefit status, or age.

Affordability is fairly ubiquitous across a variety of different characteristics. One of the reasons for this finding is that water charges are determined by council tax band, but within each band there are a multiplicity of different types of household who vary in terms of income, tenure, age, and so on.

Within any given council tax band, the major factor influencing whether a household faces affordability challenges is income – regardless of whether income is defined on an equivalised or unequivalised basis.

There are a number of legitimate (and not necessarily mutually exclusive) responses. One is to question the rationale for basing charging on council tax band. Another is to question whether the chosen measure of affordability is the 'right' one (an alternative might be to look only households who fall within the government's measure of income poverty, and look at affordability within this subset of households).

From a wider policy perspective, it is also legitimate to ask whether government should attempt to address water and sewerage affordability issues within the water charging system, or whether it should include water and sewerage charges as part of a more holistic attempt to ease the spending pressure on poorer households.

In this report, we have looked more narrowly at policy responses that could be enacted to reduce the proportion of all households which spend more than 3% of income on water and sewerage. Given the diversity of household types that face affordability challenges, there are no obvious outstanding policies.

Any policy aimed at those claiming a particular benefit, or in a particular council tax band, will necessarily generate significant 'deadweight', i.e. they will help large numbers of households who don't particularly need help, as well as those that do. This may be inequitable as well as inefficient.

This conclusion is perhaps strengthened further when looking at equivalised income, as with equivalised income, affordability ceases to appear so clearly as an issue for single person households.

Further consideration of appropriate policy responses, in the context of broader policy objectives, are called for.

# Regression results

## Annex A

---

### Background

Table A1 shows the results of two probit regressions. These regressions assess the probability of spending more than 3% of equivalised AHC income on water and sewerage, given various household characteristics. The household characteristics are: whether or not the household is a single person household; whether there are dependent children in the household; which council tax band the household is in; and whether the household is in receipt of various benefits.

The interpretation of a coefficient of say 0.02 for a particular characteristic implies that that characteristic is associated with a 2% higher probability of spending more than 3% of income on water and sewerage compared to a household that does not have that characteristic.

The regressions in Table A1 are identical to those in Table A1 of the main November 2017 report, apart from the dependent variable. The regressions in Table A.1 of the main report assess the probability of spending more than 3% of income on water and sewerage where income is defined on an unequivalised basis. Table A1 shows the results of re-running the regressions but using equivalised income as the dependent variable. In other words, in Table A1 we are assessing the probability of a household spending more than 3% of equivalised income on water and sewerage.

We now discuss the implications of the results, focussing on the differences between the results using equivalised compared to unequivalised income as the dependent variable.

### Results

Looking at Regression 1 first, we see that single households are 1.5 percentage points less likely to spend more than 3% of income on water and sewerage than other households. This reflects the fact that single people are more likely to occupy lower banded properties, and benefit from a 25% discount on their bills.

But note that this result is in stark contrast to the result with unequivalised income as the dependent variable, which found that single person households are almost 15 percentage points more likely to spend more than 3% of income on water and sewerage.

The results are so markedly different because the process of equivalisation effectively raises the incomes of single person households relative to all other households. In summary, if we do not adjust incomes for household size (i.e. we use unequivalised income), single person households are much more likely to spend more than 3% of the income on water and sewerage, as their incomes tend to be smaller, and whilst their bills are also smaller, their lower bills are not sufficient to offset lower income. But when we equalise, i.e. we take into account the fact that the incomes of larger households effectively have to 'go further' because there are more people in the household, then those households' water and sewerage bills take up a relatively larger proportion of equivalised income.

Households with dependent children are 2.4 percentage points less likely to spend more than 3% of equivalised income on water and sewerage than households without dependent children. This is because households with children tend to have larger incomes than those who do not have children (these households tend to be of prime working age). But again, equalisation makes a difference – the unequivalised version found that households with dependent children are 12 percentage points less likely to spend more than 3% on water and sewerage, but after adjusting for household size, these households are only 2 percentage points less likely to spend more than 3% on water and sewerage.

The results for council tax band are in line with those for unequivalised income. Compared to a Band D property, households in Bands A, B and C are less likely to spend more than 3% of income on water and sewerage, whilst households in Bands E and higher are more likely to spend more than 3% of income on water and sewerage. This reflects the fact that bills are higher for higher banded properties, but there are large numbers of households with relatively low incomes even in the higher bands.

The results on benefit receipt are also not too dissimilar using equivalised income compared to unequivalised income. Households in receipt of working age benefits are more likely to spend more than 3% of income on water and sewerage than households who are not, as they tend to have lower incomes.

But households in receipt of disability benefits, the State Pension, and Pension Credit are also slightly less likely to spend more than 3% of income on water and sewerage. This reflects the fact that these households have slightly higher incomes conditional on council tax band than households who are not in receipt of these benefits.

Regression 2 is the same as Regression 1 apart from the addition of one further variable: household net income. As was the case when looking at unequivalised income, the inclusion of income as an explanatory variable dominates. Its effect is to dramatically reduce the size of all the other explanatory variables (although most of them retain their statistical significance).

This result is intuitive. It simply says that income is the biggest determinant of whether a household spends more than 3% of its income on water and sewerage. And it says that, once we have controlled for household income, then other factors such as whether a household is in receipt of a particular benefit make little further difference to the probability of spending more than 3% of income on water and sewerage.

**Table A.1: Regression results**

variable	Regression 1			Regression 2		
	Coefficient	Standard error	Signif. level	Coefficient	Standard Error	Signif. level
Single	-0.015	0.007	0.05	-1.09E-09	1.36E-09	0.01
Dependent children	-0.024	0.008	0.01	1.68E-10	2.28E-10	0.01
Band A	-0.049	0.009	0.01	-5.06E-10	6.54E-10	0.01
Band B	-0.042	0.009	0.01	-2.97E-10	3.96E-10	0.01
Band C	-0.030	0.010	0.01	-9.69E-11	1.34E-10	0.01
Band E	0.050	0.014	0.01	1.41E-07	1.58E-07	0.01
Band FGH	0.088	0.016	0.01	0.00025	0.0001682	0.01
In receipt: working age benefits	0.128	0.012	0.01	-2.69E-11	4.54E-11	*
In receipt: DLA/ PIP	-0.085	0.013	0.01	-3.22E-11	6.37E-11	*
In receipt: State Pension	-0.037	0.007	0.01	1.25E-10	1.67E-10	0.01
In receipt: Pension Credit	-0.054	0.011	0.01	-6.10E-11	8.56E-11	0.05
AHC income				-7.07E-12	9.58E-12	0.01
Observations	8543			8543		
R2	0.06			0.774		

\* Not statistically significant

Source: FAI calculations

## Fraser of Allander Institute

University of Strathclyde  
199 Cathedral Street  
Glasgow G4 0QU  
Scotland, UK

Telephone: 0141 548 3958

Email: [fraser@strath.ac.uk](mailto:fraser@strath.ac.uk)

Website: [www.strath.ac.uk/fraser](http://www.strath.ac.uk/fraser)

Follow us on Twitter via [@Strath\\_FAI](https://twitter.com/Strath_FAI)

---

the place of useful learning

[www.strath.ac.uk](http://www.strath.ac.uk)

University of Strathclyde Glasgow

The University of Strathclyde is a charitable body,  
registered in Scotland, with registration number SC015263

