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# Economic PERSPECTIVE

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## **PAYING FOR WATER IN SCOTLAND: A DISTRIBUTIONAL ANALYSIS**

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### **1. INTRODUCTION**

During the last decade the water industry throughout Great Britain has undergone its most radical restructuring in over half a century. In England and Wales privatisation of the ten regional water authorities in 1989 removed the industry from the public sector at a stroke. In Scotland the privatisation option was rejected, and responsibility for water and sewerage services was instead transferred from local to central government control through the creation of three public water authorities in 1996. Despite these fundamental differences, however, domestic customers on both sides of the border have faced increases in their charges, year on year, well above the rate of inflation.

In Scotland these increases have been underpinned by the need for additional capital investment, tariff harmonisation across water authority areas and reductions in central government financial support in the form of transitional relief for sewerage services. The statutory body established to protect consumer interests - the Scottish Water and Sewerage Customers Council - has viewed the sharp rise in prices with increasing concern, taking the controversial step of rejecting the 1998/99 water authority charging proposals in January 1998. The final settlement determined by the Secretary of State for Scotland allowed these increases to stand, but arranged a redistribution of

the transitional relief grant of £30 million to limit the effect of the price rises on low-income households. For the 1999/2000 determination transitional relief was phased out completely, leading to rises in average domestic water bills of the order of 20%. Against this background our paper analyses the distributional impact of water and sewerage price rises on domestic households in Scotland.

Following the introduction, section two contains a brief theoretical discussion and an analysis of the recent charging reforms in Scotland. In section three we employ data from the Family Resources Survey, a source not used previously in this context, to examine the relative burden of water and sewerage charges on households classified according to income, property value and geographical location. Section four discusses the policy implications of the analysis and section five concludes.

### **2. THEORY AND REFORM**

Neoclassical economic theory highlights economic efficiency as one of the key evaluatory criteria for commercial tariff structures, with prices reflecting marginal costs of provision. However, for a good such as water, market failure (Cowan 1993) leads policy makers to modify the basic pricing rule.

Below a certain consumption level, water has merit good characteristics for individual households (Herrington 1987, 1996). Not only do the consumers of the good benefit directly, but so does society, through the consequent improvement in public health and reduction in health care expenditure. As consumption increases, marginal social benefits diminish. For public policymakers, therefore, the difficulty is to establish the point at which the consumption of water services ceases to yield additional social benefits, and where a strict cost-reflective tariff structure should be adopted. The task is complicated further as this consumption threshold point may vary from household to household and at different times of the year. In the absence of domestic metering, policymakers are unable to identify this point accurately, and in practice therefore they invariably resort to treating water services in aggregate as a merit good.

In this situation higher priority is given to social equity as a pricing criterion. Water is a classic natural monopoly industry, therefore households unable to purchase from an alternative supplier or to reduce water related expenditure by reducing consumption are, in effect, being taxed for the service. Clearly, there are external costs associated

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with the regressive pricing of merit goods. Hochman and Rodgers' (1969) contention that richer individuals benefit from income redistribution to the poor and Atkinson's (1983) principle of transfers are instructive. They suggest that societies may be characterised by inequality-aversion in such a way that, if two societies with the same average income exhibit different Lorenz curves, then the society with the shallowest curve (less inequality) will have a greater welfare than the other. This hypothesis is, however, highly sensitive to assumptions made regarding the aversion to inequality. If society demonstrates an aversion to equality in income distribution then social welfare will be enhanced by a more unequal distribution. However, in respect to health-care Culyer (1971) argues that there is a preference for equality of access. McMaster and Mackay (1998) contend that the pricing of water services in Scotland is sensitive to regressiveness.<sup>1</sup> Social welfare will decline if poorer sections of society are less capable of consuming water services or any other merit good due to shifts in consumption patterns induced by increased water charges. Consequently policymakers and industry regulators generally support the subsidisation of the service for the socially disadvantaged and low income households, and promote rigorous analysis of the distributional impact of charging reform.

In Scotland charging reform, in the guise of annual above-inflation price rises for water services, was precipitated by the 1996 reorganisation of the industry. Under the terms of the Local Government etc (Scotland) Act 1994 responsibility for the supply of water and sewerage services was transferred from the twelve regional<sup>2</sup> and islands councils to three new Public Water Authorities (PWAs) on 1st April 1996. Prior to reorganisation councils were responsible for the levying and collection of domestic charges via council tax demands. Only water charges were separately identified on customer bills, however, with the costs of sewerage being met out of general taxation. The new arrangement required the PWAs

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<sup>1</sup> There is little evidence supporting this argument but McMaster and Mackay draw on the resistance to any form of privatisation encountered by the previous government in Scotland. Maloney and Richardson (1995) document the scale of opposition that culminated in a referendum in the former Strathclyde Region in March 1994. On a 71% turnout, 97% rejected the former government's reform proposals.

<sup>2</sup> Regional Councils were, until 1st April 1996, a second tier of local government in Scotland.

to draw up Charges Schemes for both services and to submit these for approval to the Scottish Water and Sewerage Customers Council (SWSCC). Where this was given, charges were then implemented. Where this was withheld, the Schemes were to be referred to the Secretary of State for Scotland for final adjudication.

As before, domestic (unmeasured) water and sewerage charges were based on council tax property valuations and collected by local authorities on behalf of the PWAs. Properties were assigned to one of eight bands and Band D valuations were used as a base for the calculation of other charges according to an approved weighting scheme, as shown in Table 1.

In common with general council tax payment provisions a discount on domestic (unmeasured) water and sewerage charges was made available on domestic dwellings in which there were fewer than two persons, 18 years of age and over, who had this property as their main or sole place of residence<sup>3</sup>. A rebate in the form of Council Tax Benefit was not granted for domestic (unmeasured) water and sewerage charges.

The fact that sewerage charges were to be identified separately alongside water on council tax demands for the first time, led the Government to grant transitional sewerage relief to domestic consumers connected to the public sewerage system, as shown in Table 2. Relief was first granted in 1996/97 and was phased out for the year 1999/2000. The effect of this was to reduce the overall increase in customer bills for the duration of the concession.

However, the introduction of transitional sewerage relief as such did not lead to an overall reduction in charges. Three other developments ensured increases were well above the rate of inflation for most Scottish consumers. The first was the need for PWAs to undertake a large programme of capital investment to ensure their operations complied with European environmental quality standards. Second was the requirement for all authorities to harmonise their charges. Third was the gradual reduction in central Government financial support in the form of the phased withdrawal of transitional sewerage relief and the limits placed upon borrowing.

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<sup>3</sup> The discount was 25% for a sole occupant, and 50% where there was no such resident.

Table 3 lists the percentage increases (nominal) in domestic water and sewerage charges for Band D households for the North, East and West of Scotland Water Authorities since reorganisation. The first three columns exclude, and the last three columns include the effect of transitional sewerage relief (TR).

Clearly charge increases have comfortably exceeded the rate of inflation for the vast majority of Scottish consumers over this period. Nevertheless, even with these large rises it remains true that, in absolute terms, average charges in Scotland are generally below those in England and Wales<sup>4</sup>.

Despite the favourable relative position of Scottish consumers, the status of water as a merit good demands an analysis of the way in which these charges impact on individual households. Differences in the way in which charges are levied in Scotland compared with England and Wales implies differences in distributional impact across Great Britain. It is to this issue that we now turn.

### 3. DISTRIBUTIONAL ANALYSIS OF SCOTTISH WATER CHARGES

In England and Wales several large empirical studies relating to the distributional impact of charges in the water industry have been conducted in recent years<sup>5</sup>. In Scotland published evidence is much more limited (Sawkins and Mackay 1996, McMaster and Mackay 1998), due primarily to the lack of relevant data. In this paper, therefore, we analyse for the first time the relative burden of water and sewerage charges on Scottish households classified according to income, property value and geographical location.

Data for the analysis were derived, primarily, from the Family Resources Survey (FRS) 1995-96<sup>6</sup>.

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<sup>4</sup> Comparisons with England and Wales are difficult to make and potentially misleading given the differences in charging regimes. However details may be found in Ofwat (1997) 1997-98 Report on tariff structure and charges, Publ: Ofwat, Birmingham, Table 6, 7, 8, 9.

<sup>5</sup> See, for example, Pearson, Rajah and Smith (1993), Department of the Environment and Ofwat (1992), Rajah and Smith (1993) and Cuninghame, Griffin and Laws (1996).

<sup>6</sup> Supplementary information was obtained from the Scottish Water and Sewerage Customers Council, The Scottish Office and the Analytical

This study, conducted under the auspices of the Department of Social Security from April 1995 to March 1996 was published late in 1997. Using a household interview technique, the FRS sought to establish the main sources of income for the 26,445 households surveyed, and the way in which this was spent. The survey covered the whole of Great Britain, excluding the Scottish Islands and the North West mainland of Scotland. These exclusions were made due to the high fieldwork costs and resulted in approximately 3% of the Scottish population or 0.25% of the population of Great Britain being left out. Households were defined as "a single person or group of people living at the same address who either share one meal a day or share the living accommodation" (Department of Social Security, 1997, p.6).

Although relating to 1995/96 the FRS was chosen in preference to the more widely used Family Expenditure Survey for its relatively large Scottish sample size<sup>7</sup> and its comprehensive coverage of household income and expenditure. Supplementary information from the SWSCC permitted the imputation of sewerage charges which were not separately identified.

Tables 4 and 5 contain figures relating to the relative burden of water and sewerage charges for households classified according to income and property value respectively.

Table 4 reports mean weekly household water and sewerage charges for Scotland in absolute terms and as a percentage of gross weekly household income. For the year 1995/96 (prior to the recent reorganisation and the very large price rises) households in the lowest income bracket (gross weekly household income of less than £100) spent over 3.2% of their gross weekly household income on water and sewerage charges. For households in the next income bracket, £100-199, the figure was still as high as 1.4%. In contrast, the comparable figure for middle income households (in the income brackets between £400 and £699) was in the range 0.4-0.6% while this declined to under 0.3% for those in the highest income bracket (gross weekly household income of £1000 or more).

Table 5 reports the mean percentage of gross weekly household income spent on water and

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Services Division of the Department of Social Security.

<sup>7</sup> The FRS surveyed over 2,300 Scottish households compared with just 555 for the 1996-97 FES.

sewerage charges for Scotland by gross weekly household income and council tax band. As is to be expected under a council tax system of property based charges, low income households spend a greater proportion of their gross weekly household income on water and sewerage the higher is the value of their house. Caution should be exercised when looking at the estimates for bands F, G and H due to the relatively small number of sample cases but, even ignoring these bands, Table 5 indicates the scale of the burden on low income households in the higher property bands. In band E, households in the lowest income bracket spend 25 times the proportion of their gross weekly household income on water and sewerage as households in the highest income bracket. Households in the second and third lowest income brackets in band E spend 7 and 4 times as much respectively as the highest income households. Thus, the current system of charging places a heavy burden on those with low fixed incomes (for example some pensioner groups) living in highly valued properties.

For the SWSCC and The Scottish Office, identification of areas of the country where large increases in water charges would have the greatest collective impact on low income households is an issue of particular concern. Without detailed income distribution data for each local authority area, however, the analysis is problematic. However, given the frequent correlation between house prices - on which council tax bands are based - and average income or other measures of economic prosperity, one proxy of relative social need is the distribution of dwellings across council tax bands. In Table 6, this information is reported for each of the Scottish local authority areas.

Over 90% of recipients of Council Tax Benefit live in houses in Bands A to C<sup>8</sup>. We therefore assume that these are the property bands accounting for most low income households. This implies that households in areas such as East Ayrshire, Dundee and Inverclyde (where nearly 80% of houses are in council tax bands A-C) experience more social need and would encounter more difficulties in paying increased water charges than households in East Dumbartonshire, Edinburgh and East Lothian (where only some 30%, 50% and 60% respectively of houses are in council tax bands A-C). However, clearly there is not a one to one correspondence between social need and property valuation and a more detailed analysis of income distributions

within local authority areas would be necessary to develop this work further.

#### 4. POLICY IMPLICATIONS

Overall, these results are unsurprising since one of the fundamental stylised facts of economic analysis is that the burden of expenditure on food and other staples is proportionately greater for low income households. However, the analysis presented above stands as the first calibration exercise for water and sewerage charges across Scotland. Furthermore, given the above-inflation increases in charges for the majority of Scottish consumers since the date of the survey, there are grounds for concluding that the relative burden of water and sewerage charges on low income households has increased quite markedly since the reorganisation of the industry.

This observation underpinned the SWSCC's case for the referral of the 1998/99 draft water authority charges schemes to the Secretary of State for Scotland in January 1998. In response the Government altered the system of allocating domestic transitional sewerage relief from a property value basis to one in which each household in a water authority area would receive a flat rate grant regardless of Council Tax Band. The effect of this was to give proportionately greater levels of relief to those in Council Tax bands A to C for the year 1998/99. However, with the phasing out of transitional relief in 1999/2000 this modest redistribution comes to an end. Consequently the issue of how to protect the interests of low income households whilst implementing large tariff increases remains one of the most pressing policy issues facing the Scottish water industry and its regulators.

Previous studies have identified the many ways in which economic efficiency and social equity may conflict as pricing criteria<sup>9</sup>. Economic efficiency implies that water services should be allocated over time and between customers to maximise society's net benefits. This implies cost reflective pricing at the margin (Herrington 1987). However, without universal domestic metering this objective is unattainable. The absence of metering also inhibits the targeting of relief to socially disadvantaged households, leading to a charging system which has the potential to create and sustain multiple water "poverty traps". Given the present system of charging in Scotland there are, however, two ways

<sup>8</sup> Scottish Office News Release 0328/98 23rd February 1998.

<sup>9</sup> See, for example Pearson, Rajah and Smith (1993), Sawkins and Mackay (1996) and McMaster and Mackay (1998).

in which the effects of above inflation price rises for water services might be mitigated.

The first is through the introduction of a water related social security benefit - a "Water Benefit". Despite the best efforts of the Ofwat National Customer Council in England and Wales, the Department of Social Security has consistently rejected arguments that water should be singled out for special treatment within the benefits system. At present there are no special "earmarked" social security funds dedicated to the alleviation of social disadvantage caused by rapidly rising water and sewerage charges. The council tax system of charging used in Scotland, although modestly progressive in effect, was not designed as an instrument of social policy. The differing charge application ratios proxy the use of local authority services by households and it is this which underpins the policy of granting disabled people a shift in council tax band by way of charge reduction. The most significant feature of the current social security arrangements pertaining to the Scottish water industry is that Council Tax Benefit does not apply to domestic (unmeasured) water and sewerage charges.

Due to water's merit good and natural monopoly characteristics, there is a strong argument in favour of viewing water charging systems in conjunction with the taxation and social security arrangements. Rajah and Smith (1993) note that in practical terms what matters in designing an equitable tax system is the distribution of the burden of taxation as a whole, not each individual element of the system. They suggest that "the regressive burden of water charges could be compensated by greater progressivity in income tax and in the social security system, through higher income tax allowances and higher levels of social security benefits. Higher benefit levels could, for example, provide poor households with sufficient money to leave a household with average water consumption unaffected by the introduction of metered water charges at the efficient level, whilst ensuring that those households with wasteful water use faced the full marginal cost of their use of water" (Rajah and Smith, 1993, p.105). In similar vein, Dilnot and Helm (1987) have argued for supplements to social security payments to cover utility charges.

Integrating taxation, social security and water charging arrangements may not, however, address the problem of water poverty adequately for two reasons. First, the social security system may not target people's needs adequately. Needs may not be observed correctly. Thus, it may be appropriate to supply water at lower prices to ensure that

households with higher than average needs for water are able to afford adequate quantities. On balance this would probably not be problematic in a developed country like Scotland. Second, there is also the question of providing households in high charge areas with larger amounts of compensation than those in low charge areas. Again it should not be too problematic to devise a charging system to compensate households appropriately. Housing Benefit is an example of an existing social security benefit, the level of which varies according to costs in different parts of the country. Practically, therefore, it should be possible to introduce a system of water charge rebates or "water benefit", the level of which would be related to the average level of water charges levied by each water authority in Scotland.

The second way in which the effects of above inflation rises in water charges might be mitigated for disadvantaged households is through the reformulation of the council tax charging application ratio for water. Once again this solution would be administratively feasible and could be implemented quickly. Given a property-based system of charging it would merely require the alteration of the charge application ratios for water, shown in Table 1, for households in the lower property bands. Thus, the ratio for households in band A properties could be reduced below the current 6/9ths of charges paid by households in band D properties, the ratio for households in band B properties would be reduced below 7/9ths and the ratio for households in band C properties would be reduced below 8/9ths. This is a less well targeted solution since it would benefit all property owners in these bands, but the granting of transitional sewerage relief at a flat rate by the Secretary of State for Scotland was a policy initiative in this mould.

Both proposals might be debated, quite properly, by Members of the Scottish Parliament, to whom the public water authorities will become responsible this summer. At present only the second proposal is within the competence of the Parliament, although Members will be at liberty to press government agencies - specifically the DSS - to change their policy. In the medium term the appointment of a new Water Industry Commissioner for Scotland<sup>10</sup> may prompt a re-examination of the position of socially disadvantaged groups in society with respect to water and sewerage services.

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<sup>10</sup> A proposal in the Water Industry Bill currently being debated in the House of Lords.

## 5. CONCLUSION

Faced with the requirement to finance a growing proportion of their activities from customer charges without discriminating against any group of consumers<sup>11</sup> the Scottish public water authorities find themselves pulled in two directions. On the one hand they must endeavour to operate efficiently as trading corporations, on the other they must satisfy the industry regulators that the public interest is being promoted and protected at the same time. This dynamic may be observed in the charging debate discussed in this paper.

No one charging scheme is ever likely to command universal approval from all stakeholders in the industry. Consequently political judgement will remain an integral part of the bargaining process. In this paper we argue that relatively minor changes to the social security or council tax systems would enable policymakers concerned over the effects of rapidly rising water charges on low income households to partially protect the interests of this group of consumers. However these are rather blunt instruments, which would not, by themselves, promote the efficient allocation of resources in the water industry.

Nevertheless, the means of correcting this deficiency, and ensuring social objectives are met lies within the industry's grasp. A volumetric charging system underpinned by universal domestic metering would achieve this end. However, until universal metering is introduced, it is essential that better protection be given to low income groups through one of the devices discussed in this paper or in some other way. This is the primary challenge facing the Scottish water industry in the closing years of the century.

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<sup>11</sup> An important legislative requirement is that in the Charges Scheme the water authority must "endeavour to ensure that no undue preference is shown, and that there is no undue discrimination in the fixing of charges" (Section 76(7) of the Local Government (Scotland) Act 1994).

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**TABLE 1 PROPERTY BANDS AND CHARGE APPLICATION RATIOS IN SCOTLAND**

Property band	Valuation band (£)	Charge application ratio
A	up to 27,000	6/9ths
B	27,001-35,000	7/9ths
C	35,001-45,000	8/9ths
D	45,001-58,000	9/9ths
E	58,001-80,000	11/9ths
F	80,001-106,000	13/9ths
G	106,001-212,000	15/9ths
H	more than 212,000	18/9ths

Source: Local Government Finance Act 1992, Section 74.

**TABLE 2 TRANSITIONAL SEWERAGE RELIEF, £ MILLION**

Water Authority	1996/97	1997/98	1998/99
North	22.4	14.9	7.4
East	27.3	18.2	9.0
West	40.0	26.6	13.2
Total	89.7	59.7	29.7

Sources: 1996/97 - Table 2.13 Departments of the Secretary of State for Scotland and the Forestry Commission (1996) The Government's Expenditure Plans 1996/97 to 1998/99, Cm 3214, HMSO Edinburgh; 1997/98 - The Scottish Office; 1998/99 - Scottish Water and Sewerage Customers Council; 1998/99 total does not sum due to rounding.

**TABLE 3 PERCENTAGE INCREASES IN DOMESTIC (UNMEASURED) WATER AND SEWERAGE CHARGES FOR BAND D HOUSEHOLDS**

WATER AUTHORITY AREA	% Increase 1996/97 - 1997/98, excl. TR		% Increase 1997/98 - 1998/99, excl. TR		% Increase 1998/99- 1999/00, excl. TR		% Increase 1996/97 - 1997/98, incl. TR		% Increase 1997/98 - 1998/99, incl. TR		% Increase 1998/99- 1999/00, incl. TR	
	<b>NORTH</b>											
Tayside	8.42	15.21	15.17	39.58	39.35	29.32						
Grampian	6.96	12.43	10.53	32.23	32.95	23.15						
Highland	6.96	12.43	10.53	32.23	32.95	23.15						
Western Isles	-0.28	4.97	10.53	16.40	21.57	23.15						
Orkney	-0.28	4.97	10.53	16.40	21.57	23.15						
Shetland	-0.28	4.97	10.53	16.40	21.57	23.15						
<b>EAST</b>												
Borders	6.46	9.87	7.08	28.58	28.05	18.30						
Forth Valley	10.05	25.06	19.15	53.89	59.33	34.39						
Fife	10.12	19.04	8.76	42.36	44.15	20.97						
Edinburgh and Lothians	6.46	9.87	7.08	28.58	28.05	18.30						
North Lanarkshire and East Dunbartonshire	6.00	11.36	10.48	28.73	31.16	21.74						
Kinross	8.99	14.39	8.76	36.55	31.84	20.97						
<b>WEST</b>												
Dumfries and Galloway	6.00	11.36	10.48	28.73	31.16	21.74						
Strathclyde	6.00	11.36	10.48	28.73	31.16	21.74						

Source: Data supplied by Scottish Water and Sewerage Customers Council.



**TABLE 4 SCOTTISH WATER AND SEWERAGE CHARGES AS A MEAN PERCENTAGE OF GROSS WEEKLY HOUSEHOLD INCOME, BY HOUSEHOLD INCOME**

Gross weekly household income	Mean weekly household water charge (£)	Mean weekly household sewerage charge (£)	Mean weekly household water and sewerage charge (£)	Mean % gross weekly household income spent on water and sewerage (%)
Less than £100	1.04	0.86	1.90	3.21
£100-199	1.10	0.87	1.97	1.40
£200-299	1.25	0.92	2.17	0.89
£300-399	1.41	0.98	2.39	0.70
£400-499	1.46	1.02	2.48	0.56
£500-599	1.54	1.06	2.60	0.47
£600-699	1.68	1.13	2.81	0.43
£700-799	1.72	1.20	2.92	0.39
£800-899	1.90	1.28	3.18	0.38
£900-999	1.88	1.28	3.16	0.33
£,1000 or more	2.11	1.41	3.52	0.28

Source: Family Resources Survey 1995/96

**TABLE 5 SCOTTISH WATER AND SEWERAGE CHARGES AS A MEAN PERCENTAGE OF GROSS WEEKLY HOUSEHOLD INCOME, BY HOUSEHOLD INCOME AND COUNCIL TAX BAND**

Gross weekly household income	Band A (%)	Band B (%)	Band C (%)	Band D (%)	Band E (%)	Band F (%)	Band G (%)	Band H (%)
Less than £100	1.98 (107)	4.03 (80)	3.05 (39)	3.79 (20)	7.41 (8)	5.10 (5)	14.69 (1)	.
£100-199	1.18 (269)	1.35 (230)	1.52 (112)	1.72 (61)	2.11 (31)	2.59 (16)	2.29 (2)	.
£200-299	0.66 (82)	0.83 (121)	0.92 (70)	1.03 (46)	1.27 (20)	1.53 (12)	1.83 (3)	.
£300-399	0.49 (44)	0.58 (87)	0.68 (65)	0.76 (46)	0.95 (36)	1.16 (8)	1.30 (7)	.
£400-499	0.42 (16)	0.46 (62)	0.52 (50)	0.57 (50)	0.73 (26)	0.76 (7)	0.98 (8)	.
£500-599	0.33 (11)	0.37 (37)	0.42 (32)	0.47 (40)	0.58 (30)	0.68 (9)	0.81 (5)	.
£600-699	0.30 (7)	0.32 (15)	0.38 (18)	0.42 (27)	0.51 (23)	0.61 (10)	0.60 (5)	.
£700-799	0.25 (6)	0.26 (10)	0.31 (12)	0.34 (10)	0.45 (20)	0.48 (8)	0.57 (8)	0.76 (1)
£800-899	0.23 (2)	0.25 (3)	0.28 (4)	0.32 (10)	0.39 (14)	0.47 (11)	0.56 (4)	.
£900-999	. (0)	0.22 (2)	0.26 (2)	0.30 (5)	0.33 (11)	0.43 (6)	0.46 (1)	.
£,1000 or more	0.13 (1)	0.16 (7)	0.18 (2)	0.25 (9)	0.29 (21)	0.35 (13)	0.29 (17)	0.53 (3)

Source: Family Resources Survey 1995/96.

Notes: i) a constant mean sewerage charge within council tax bands across income groups is assumed; ii) some of the estimates are based on a small number of sample cases and are therefore subject to relatively high sampling error.