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The Free Electricity Allowance and the Engel Curve

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Abstract: In 1994 over 18 per cent of Irish households possessed a free electricity allowance. This creates complications in using the 1994-95 Household Budget Survey to estimate an Engel curve for electricity expenditure. Ignoring the allowances leads to biased estimates of elasticities and distorts comparisons between sectors. Examining the sub-populations with and without allowances results in conclusions leading to a substantial revision of the income elasticity for household electricity expenditure and to deductions about possible current and past welfare losses inherent in the free electricity scheme.

I INTRODUCTION

Estimating an Engel curve for electricity from Irish household budget survey data cannot be considered an innovation. Estimates of the income[1] and household size elasticities of electricity demand from the 1951-52 Household Budget Survey (HBS) were obtained by Leser (1962) and have been replicated by various authors on subsequent rounds of the HBS. But in repeating the estimation on the 1994-95 Household Budget Survey as part of a study of Irish expenditures on household fuels (Conniffe, 2000), the author found very odd results emerging. The curve was surprisingly non-linear in shape, with an initially steep slope quickly becoming flatter as income increased. The income

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1. "Income" being taken as total weekly household expenditure.

elasticity[2] was much larger for rural than for urban households and it seemed that rural households with children used significantly less electricity than equal income households without children. It is reasonable to suppose electricity demand to be income inelastic and that there are economies of household scale, so some tendency to a decreasing slope, to a somewhat higher rural elasticity (assuming lower rural incomes) and to a weak relationship with household size may be plausible. For this reason, authors, in Ireland and elsewhere, have often employed the semi-log functional form for the electricity Engel curve and it will be used here.

However, the magnitudes of the effects, as shown in Table 1, were of an order hardly compatible with that explanation. It is true there are technical problems of estimation using household budget data, but the relevant steps (using IV rather than OLS as described in the Appendix) had been taken.

Table 1: *Income and Household Size Effects on Electricity Expenditure*

	Income Coefficient	*t Value*	*Size Coefficient*	*t Value*	*Income Elasticity*	*Size Elasticity*
Urban	2.19	11.96	.95	3.10	.37	.15
Rural	4.02	22.92	–.52	–2.15	.68	–.10

ns = not statistically significant.

The income elasticity is statistically significantly larger (almost twice) for rural as for urban and the size coefficients are statistically significant for both urban and rural, but of opposite sign. The true explanation is that a sizeable number of survey households possessed a free electricity allowance and this has led to severe bias in estimation. Subsequent sections will examine why this occurs and what can be done to correct it. In doing so, it will be found necessary to consider the possible welfare inefficiencies inherent in the free electricity scheme.

II THE FREE ELECTRICITY ALLOWANCE

Under the free electricity allowance scheme, introduced in 1967, qualifying[3] households do not pay the usual meter rent and obtain 1,500 free units of electricity per annum – 200 per two month period in Summer and 300 in Winter.

2. Calculated at the mean.

3. The eligibility conditions (detailed, for example, in Department of Social, Community and Family Affairs, 1998) imply that most households with the allowance comprise pensioners, aged over 65 and dependants, although there are other qualifying categories too. These households could qualify for an alternative free piped gas allowance, (if gas connected, or vouchers for LPG otherwise), but few make this choice. It should be mentioned here that there are also fuel allowances payable along with weekly assistance to low income households, but being cash payments and spent like any other income, do not distort measures of fuel expenditures.

Units unused within a period can be transferred forward. In 1994 over 18 per cent of Irish households possessed this allowance. Electricity expenditure is measured in the Household Budget Survey on the basis of the Electricity Supply Board's (ESB) bill for the most recent period and so households with the free electricity allowance will show expenditures only for excess consumption beyond the allowance. Zero expenditures can easily arise for households that are interviewed in Summer.

The distribution of the allowance in the 1994/95 Household Budget Survey, by urban and rural areas, is shown in Table 2.

Table 2: *Prevalence of the Free Electricity Allowance in the 1994/95 Survey Households*

	Urban	*Rural-Non Farm*	*Farm*	*State*
Percentage Electricity Allowance	16.9	26.1	6.8	18.1
Number of Households	5,066	1,953	858	7,877

Of the 7,877 households in the survey, 18.1 per cent possessed allowances, but there was a substantially higher frequency of allowances in rural non-farm households than in urban ones. Table 3 gives a breakdown of households with allowances by gross weekly household income.

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Table 3: *Free Electricity by Gross Weekly Household Income*

Income £/week	*<50*	*51-110*	*111-170*	*171-230*	*231-290*	*290-400*	*>400*
Percentage Electricity Allowance	17	55.8	33.6	12.3	8.9	2.5	.6
Number of Households	75	1,437	1,198	835	666	1,106	2,560

By far the greater number of allowance holding households are in the lower (but not the lowest) income groups, although there is some representation in the higher income categories. Turning to household composition, Table 4 shows the breakdown. The compositions considered are: single adult under 65 years of age (A<65), single adult over 65 (A>65), married couple without children in the household (M2A), married couple with one or more children (2A+C), single adult with one or more children (A+C) and other households (Other).

The free electricity allowance is most common for single adults aged over 65 and quite frequent for married couples without children, which, of course, is to be expected given the eligibility of many pensioners. Very few households with

children have the allowance. However, the numbers with the allowance are still appreciable for single adults under 65 and for the "Other" households.

Table 4: *Free Electricity by Household Composition*

	A<65	*A>65*	*M2A*	*2A+C*	*A+C*	*Other*
Percentage Electricity Allowance	8.1	81.7	31.7	1.1	1.8	7.3
Number of Households	839	992	1,101	2,355	327	2,263

III IMPLICATIONS FOR ENGEL CURVES AND ALLOCATIVE EFFICIENCY

It is now clear what happens in estimating income elasticities. From Table 3, households with the allowance are predominantly of lower income. So there will seem to be a large initial response of electricity expenditure to increasing income, much of which is really due to the reduction in prevalence of allowances, while response to further income increase is modest. So overall income elasticities will be somewhat exaggerated and the semi-log shape of the Engel curve is at least partly spurious. These distortions will be larger for the rural households, where (Table 2) possession of allowances was higher.

The effects on household size elasticities are more complicated. Holding (low) income fixed, an increase from one to two in household size is associated (Table 4) with a reduction in the proportion of allowances. With further increases in size to households with children, the allowance virtually disappears. This suggests standard estimation will exaggerate the size effect and this is what happens for urban households. However, rural households include farms and it is well known that bachelor farmers comprise much of the lower income segment of that profession. Many such farmers will have incomes no higher than many non-farm rural pensioner couples. However, Table 2 showed that few farmers, unlike pensioners, hold free electricity allowances, so the single person farm household could have higher electricity expenditure than the larger household. This would tend to produce a negative size effect. This effect is heightened by the fact that, even without the allowance, rural non-farm households spend less on electricity than farm households of equal income and size.[4]

4. There are possible complexities here. Farmers, unlike other businessmen, are allowed record home and business electricity use on the same metre. So the Central Statistics Office obtain household electricity expenditure by subtracting estimates of use as inputs to farm enterprises. These estimates are supplied from Teagasc's Farm Management Survey. Any estimation errors or biases feed into the household figures.

Appreciating why elasticities are wrong does not in itself solve the problem of how to correct them. There are various possible approaches. Households holding the allowance could be omitted from estimation and the Engel curve based only on those who pay for all their electricity. However, most policy related questions (for example, concerning future electricity demand) will want to take the allowance holding sector into consideration. Another computationally simple method would be to use a dummy variable to identify households with the allowance and to estimate from all data, but it seems inadequate. It makes no use of the known amount of the allowance and it ignores the implicit increment to income. Intuitively, a better approach than either of these would seem to be to impute an additional expenditure, based on the 1,500 free units, to allowance holders' recorded electricity expenditures and to add the same sum to their incomes before fitting the Engel curve. But now it is necessary to consider the possibility that there are substantial welfare inefficiencies inherent in the free electricity scheme. If there are, the validity of the elasticity estimates could be questioned.

Households with the free electricity allowance actually divide into two types with quite distinct economic behaviour. If a household's income was sufficiently high, even if it had not been eligible for the allowance, it would use well more than the 1,500 units. For such a household, the allowance is exactly equivalent to an increase in disposable income of the standing charge plus the cost of 1,500 units. The household would allocate its augmented income over commodities in just the same way as a household without the allowance would. Income is allocated across all commodities to maximise utility. For households of this type, the imputation and estimation approach seeks the same underlying relationship as holds for households without the allowance. However, if a household would have used less than 1,500 units without the allowance, behaviour is different. Electricity will be consumed to 1,500 units and the original income will be allocated to maximise utility over the remaining commodities. Elasticities derived from imputation in this group could be meaningless. If there are a substantial number of households with the allowance that are of this second type, they would require separate study and issues such as demographic impacts on frequencies and the likely evolution of eligibility conditions could matter greatly. But if there are very few households of this type, elasticities derived from estimation including imputation will be adequate for policy relevant analysis. So the relative frequencies of the household types are clearly important.

A related matter, to do with the possibility of allocative inefficiency, deserves mention. A household, that would have consumed below 1,500 units if without free electricity, would clearly prefer a direct income transfer to the value of the electricity allowance, because some could be spent on preferred commodities. The implication is that a smaller transfer from taxes to these households could

give as much benefit as a larger transfer from taxes to the ESB to provide free electricity. Of course, there could not be much wastage if there are few such households, so again the frequency of household types is the key parameter.

IV FREQUENCIES OF HOUSEHOLD TYPES

To progress, the critical incomes, below which 1,500 units would not be consumed, are required. Table 4 showed that free allowance households were almost all in the four childless categories and then largely concentrated in the single adult over 65 and the married couple groups. In case the electricity expenditure to income relationship differs between categories, it is best to estimate it within each composition category. Obviously, the Engel curve must be estimated from households without the free electricity allowance[5] and the assumption (which will be returned to) made that the curves would have applied to the free electricity households had they not possessed the allowance.

In 1994 the ESB's standing charge to households was £3.35 per two month period or £20.10 per annum. The charge per unit was 7.14 pence, so allowing for VAT, the free electricity allowance was worth £127.20 per annum, or £2.752 per week. If the equation for a particular household composition is

$$x = a + b \log(y) ,$$

the critical income is then

$$e^{(2.752-a)/b}.$$

The equations and critical incomes are given in Table 5.

Table 5: *Equations and Critical Incomes for Households with the Free Allowance*

Household Types	*Equations*		*Critical Incomes*
A<65	$x = -1.52 + 1.09 \log(y)$	t=2.34	£50.4
A>65	$x = -11.03 + 3.17 \log(y)$	t=6.14	£77.3
M2A	$x = -7.74 + 2.41 \log(y)$	t=5.10	£77.8
Other	$x = -15.28 + 3.84 \log(y)$	t=4.79	£109.5
Test	χ^2 with 3 df for testing for unequal coefficients =		18.6

5. There may be some households without the allowance that are not paying an ESB bill, because they rent accommodation with electricity charges included in the rent. However, there can be very few such households.

The last line of the Table shows a test[6] for inequality of the coefficients, giving a value which is highly statistically significant. This shows it was more precise to model household types separately, rather than assume a single equation or even a common coefficient and different constants (parallelism). However, the two really important categories, A>65 and M2A, have similar equations and critical values and these could have been replaced by a single equation. It may be worth mentioning that there was little statistical reason to prefer semi-log to linear models in these analyses; the semi-log fitted slightly better for A>65, while the linear was a little better for M2A.

In identifying households (with the free electricity allowance) falling below the "critical" incomes, it is necessary to temporarily abandon the interpretation of total expenditure as income and revert to the Gross Household Income recorded in the Household Budget Survey. The problem with expenditure here is that the Central Statistics Office's recording period of a fortnight makes individual household expenditures exhibit seasonal highs and lows (the problem and the solution via grouping are described in the Appendix). The cumulative income distributions, as recorded in the Household Budget Survey, for the four types of household are given over the relevant income range in Table 6.

Table 6: *Cumulative Income Distributions (%) for Households with Electricity Allowances*

Gross Income £/week	*A<65*	*A>65*	*M2A*	*Other*
<40	0	1.4	.3	.6
>40 and up to 50	4.4	3.5	.3	.6
>50 and up to 60	73.5	30.2	.3	1.2
>60 and up to 70	82.4	67.0	1.4	1.8
>70 and up to 80	86.8	76.9	2.0	1.8
>80 and up to 90	92.6	81.2	7.2	1.8
>90 and up to 100	92.6	84.6	16.9	1.8
>100 and up to 110	92.6	87.7	27.5	4.2
Number in Group	68	810	349	166

Comparing the critical values to the distributions, only a few households fall below the critical income value in three of the four groups and even then, they do not fall much below on average. For example, only 4 per cent of single adults under 65 with allowances should prefer to receive the £2.75 in cash. Also, since

6. Based on the Wald statistic, which is asymptotically chi-squared. Since the coefficients have not been estimated by OLS, the standard Chow type F tests may not be applicable. The difference in coefficients suggests that the standard assumption of a constant income coefficient, but different constants (or a size coefficient) may be unduly simplistic.

none have an income below £40 per week (when, without an allowance, they would spend £2.50 on electricity), the "loss" per person is below 25 pence per week. Similar remarks apply to married couples and "other" households with the allowance. Even the word "loss" is not really a correct description and something like "unpreferred expenditure" is more accurate, because households still get utility from extra electricity consumption.

At first, matters seem quite different for single adults over 65 with the allowance. Almost 75 per cent are below the critical income and, of course, this is the household type with the largest proportion of allowances. However, for many of these households the possible utility losses are quite small in magnitude. From the Engel curve, someone on an income of £70, without an allowance, would spend £2.44 on electricity, so a direct payment would be worth at most 31 pence more. Indeed, it can be argued that this ignores a "second order" effect, in that with an income of £72.75 a little more (12 pence) would be spent on electricity, reducing the "loss" to 19 pence. But at an income of £60 spending on electricity would have been £1.95 and at £50 would have been £1.37 and Table 6 showed 30 per cent of households with incomes below £60. However, this is very suspect because the full Social Welfare non-contributory old age pension was virtually £60 per week in 1994-95. But as the pension is means tested, only a proportion (or none) is paid to households assessed to have substantial other income or assets. The relevant households in the Household Budget Survey may well not have provided this information,[7] although in reality their true incomes exceed the critical value. So it seems advisable to suppose no incomes are below £60.

Then setting all households with incomes below £60 to £62.75 (to include the "second order" effect), adding £2.75 to all other household incomes below the critical income and summing electricity "expenditures" over households gives a total "loss" of £276. This is an overestimate, because as already mentioned, some "true" incomes for households with incomes nominally below £60 may have been higher still and perhaps even greater than the critical income. Also the figure assumes no benefit from electricity consumption above the "desired" level. Full investigation of this latter topic would lead too far afield, as expenditure to income equations would have to be obtained for all other consumption commodities in order to assess the utility gains from alternative expenditure. A complete demand system, along with its utility function, would require estimation.

7. Understatement of income occurs in the Household Budget Survey as is mentioned in the Appendix. However, this need not always be intentional. While the questionnaire includes a location to record interest payments from deposits, respondents may not be able to correlate this to maturing Post Office Savings Certificates etc.

A remark in the report of the Commission on Social Welfare (1988), if true, would permit a shortcut here. Describing the free electricity allowance, it (p. 480) said:

> A disquieting aspect of the scheme is that it is under-utilised. Although practically all (97%) of those entitled to the allowance do make use of it, considerable numbers do not use the full quota of 1,500 units a year.

This would mean that the utility of electricity consumption beyond some level was perceived as zero. But perhaps the accuracy of the statement is questionable. It is quite plausible that in a fine summer period a household might use less than the allowance for the period and there are data in the 1994/95 Household Budget Survey to support that.[8] But that is why unused units can be transferred onward. Remembering that a household is not surveyed over a year, but at a time point within the year, there is nothing in the evidence from the 1994/95 Household Budget Survey to suggest that holders of the allowance do not fully utilise it, which is hardly surprising since that is rational economic behaviour, as long as any utility is derivable from extra electricity consumption. Certainly, if the sums paid to the ESB in various years are divided by the numbers holding the allowance (Department of Social Welfare, various years), the resulting figures are close to the standing charge plus charge for 1,500 units.

So the £276 must be taken as very much an upper bound to the loss in the single adult over 65 category. For the three other household types, frequencies below critical values were small and worries about accuracy of stated low incomes would apply again. So any possible contribution to loss from these household categories will be ignored. Expressing the £276 as a percentage of the total cost (£2.752 x 1,425 = £3,919) of allowances to survey households gives 7 per cent. Since this is very much an upper bound, it is clear there were not substantial welfare losses loss implicit in the free electricity scheme in 1994/95.

There must have been greater percentage losses in the past. The number of free units of electricity has not changed since 1972 although incomes have risen greatly. The relative price of electricity was higher in the past and in addition the variety of electrically powered appliances was smaller then. For these reasons the critical incomes must have been much lower in the past and greater proportions of all categories of households with the allowance would have preferred expenditures on other commodities. On the other hand, the numbers

8. When surveyed, households are asked about the amount of the most recent electricity bill and also the number of units involved. Even if the former is zero (because of the allowance) the latter could show if allowance units were underused in the period. It must be said, however, that households sometimes fail to retain the number of units and the Central Statistics Office estimate the units from the expenditure. This can set the number of units to zero for households with the allowance, which, if misinterpreted, could exaggerate underuse.

of households with the allowance was lower in the past. It has steadily increased over the years — from 131,000 in 1978, to 170,000 in 1985 and to 197,000 in the survey year of 1994. Between then and 1997 the number has increased by a further 14,000. So, although the past percentage loss may have been higher, the absolute amount may not have been in proportion. If, in the future, the possibility of a substantial increase in the number of free units of electricity per household is contemplated, the potential for corresponding loss should be borne in mind before reaching a decision.

Returning to electricity expenditure, the upper bound to welfare loss could also be considered an upper bound to unnecessary electricity expenditure and hence production. Expressing the £276 "loss" figure as a percentage of the total average weekly expenditure on electricity by all survey households gives an upper bound of .5 per cent for excess production. So, whatever about possible welfare losses to allowance holding households, the effect on the total supply of electricity to the household sector is negligible. This is important for the validity of deductions drawn from employing the revised elasticities to be derived in the next section. Once again, however, a future substantial increase in the number of free units could change the picture.

At this point it is worth returning to the assumption that underlies all of this section — that the Engel curve for households without the free electricity allowance would have also applied to households with the allowance had they not possessed it. The single adult over 65 group is clearly the crucial one in that virtually everyone in receipt of a Social Security pension (including residents here entitled to such a pension from another EU country) holds the allowance. Usually, those without the allowance have higher incomes (sometimes very much higher) than those with the allowance, but if the very idea of an Engel curve — the relationship between expenditure on a commodity and income — is acceptable, the same curve should hold in the lower income range as in the higher. Of course, the curve fitted is really an approximation to the unknown true curve and it is possible that what fits well in the higher income range might not fit well elsewhere. Other biases to the estimate of the critical value might arise from "sample selection bias" type problems — households without the allowance differing from those with it in other relevant[9] (although perhaps unrecorded) characteristics besides income. While various income related characteristics like Education and Social Group (see Appendix) do differ between groups, these do not seem relevant and are more properly treated as instrumental variables.

There seem to be severe technical difficulties to finding a rigorous way of testing the assumption, but when problems like these occur in other micro-

9. That is, the characteristics directly affect electricity expenditure, separately from any effect through income.

economic fields (for example, labour market studies), a common approach is to treat the situation as one of specification, or measurement, error and to employ IV estimators rather than OLS. So the IV method employed in this paper, for the reasons described in the Appendix, should also provide some protection against such sources of bias. If some bias persists, leading to overestimation of the critical income (which seems intuitively more plausible than underestimation of it), the implication would be that estimates of welfare loss and unnecessary electricity production should be reduced. But these have earlier been assessed as effectively negligible.

V REVISING ELASTICITIES AND CONCLUDING REMARKS

The re-estimated equations and elasticities, (having added the imputed value of the allowance, where possessed, to both expenditure and income, but omitting any household below the critical income from the estimating sample) are shown in Table 7.

Table 7: *Income and Household Size Effects — Electricity Expenditure*

	Income Coefficient	*t Value*	*Size Coefficient*	*t Value*	*Income Elasticity*	*Size Elasticity*
Urban	2.28	9.79	.58	.96 ns	.33	.08
Rural	3.20	3.96	–.72	–.43 ns	.45	–.10

ns = not statistically significant.

Comparing back with Table 1, the income coefficients and elasticities are smaller and no longer statistically significantly different between urban and rural. The formerly significant positive coefficient for the urban size effect is no longer so, although still positive. The rural size effect still has the negative sign, but the coefficient is now not statistically different from zero. While, as noted earlier, there could still be residual problems related to estimation of expenditures in farm households, perhaps responsible for the negative sign, an overall finding of a statistically insignificant size effect is not implausible. Although larger households will tend to use more electricity, substantial economies of household scale in electricity use seem likely. In addition, at fixed household income, households with children incur extra necessary expenditures and this must, to some extent, prevent the acquisition of some electrically powered luxury consumer durables.

Since there were not significant differences between urban and rural and no significant size effects, a single income elasticity was computed (by a semi-log regression on income alone) for the whole State. The value (at the mean) was

.35. A similar calculation without imputation would have given a value of .51. The difference would be important if, for example, deducing the implications of current projections of household income growth for the next few years (for example: Duffy, Fitz Gerald, Kearney and Smyth, 1999) on electricity demand by the household sector. It is true the elasticity may not apply to households below the critical income, but it is clear from the previous section that this would have negligible impact on an overall prediction.

The semi-log form was retained in these analyses for consistency in making comparisons, although there was no real statistical advantage over the linear functional form. The latter was actually a slightly better fit for urban data, although slightly worse for rural households. It appears that much of the original non-linearity derived from treating the apparent expenditures of allowance holding households on the same basis as other households.

The likelihood of past welfare losses has already been discussed. Previous estimates of the electricity expenditure elasticity, based on rounds of the Household Budget Survey since 1967, must also have been biased to some degree. Several authors, including myself (Conniffe and Scott, 1990), have published such estimates. However, until 1997 the Central Statistics Office did not allow researchers access to the detailed household level data in the Household Budget Survey, without which the analyses in this paper would not have been possible. Previous estimates were based either on data in the Central Statistics Office's own publications, or on special tabulations obtained from the Central Statistics Office, but compiled at some aggregate level.

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APPENDIX

Instrumental Variables (IV) and Analysis of Means of Groups of Households

The method of instrumental variables was developed by various authors, including Geary (1949), to deal with the problem of an explanatory variable being endogenous, or subject to measurement errors. These problems arise here because total household expenditure y is used as the measure of income. The Household Budget Survey does record household income as well as expenditures, but there are several reasons why expenditure may be a better measure of true, long run, income. Many peoples' incomes fluctuate over time and expenditure may be determined by expected, or average, income over a multi-year period, with saving or dissaving in sub-periods. Also, as noted by the Central Statistics Office (1997), some survey respondents understate their incomes. However, treating total expenditure as "income" introduces an element of endogeneity, because the dependent variable x (electricity expenditure) is then a direct component of the income measure.

The IV method requires "instruments" — variables related to total expenditure y, but unrelated to the dependent variable except through y. Appropriate Household Budget Survey variables are often qualitative or categorical in nature. A qualitative variable with r categories defines r – 1 instrumental variables each of which is a binary (dummy) variable taking the values 0 or 1. However, it can be algebraically demonstrated that, in this situation, the IV estimator is exactly the same as that obtained by defining groups by categories and regressing, weighting by group size, means of x on means of y. The method, which originated with Wald (1940) and was developed by Bartlett (1949), require that group sizes be fairly large. The more variables are simultaneously employed the larger the number of groups and the smaller the number of households in each group. Avoiding small group sizes restricts the number of categorical variables employable (many combinations being unlikely, such as high social class and low level of education).

However, there is an even more important reason to keep group sizes quite large and so restrict the number of groups. The Central Statistics Office's inter-

viewers spread the survey work over a year, recording detailed expenditures with one set of households for 14 consecutive days and then moving to the next set. So there can be large seasonal effects on y (Christmas spending, for example) and group means must be based on a substantial number of households reasonably distributed across the seasons. The sources of instrumental variables for the analyses in this paper are a categorisation by deciles of gross household income (note this just uses reported *annual* income as a grouping factor) and the categorisation Social Group (from Headers 7 and 17 of the HBS respectively). Social Group *could* be a dubious source of instrumental variables for estimating Engel curves for *some* commodities. The assumption that the instrument affects the dependent variable only through its relationship to income would be invalid if Social Groups differ in their "tastes" for a commodity. However, this could hardly apply to electricity.

The double classification would generate 99 instrumental variables, but some of the corresponding group means would be based on too few values, since a Social Group like "Higher Professional" will have few or no households in the low income groups. On the other hand the Social Group "Farmers" contains a wide range of income groups. Obviously, when working with subsets of the data the number of groups have to be reduced to maintain group size, which is reflected in higher standard errors of coefficients and lower "t" values. Since the mechanics of the IV estimation are identical to weighted regression of group means, standard regression programmes produce the correct coefficients and t values. However, many of the conventional goodness of fit and diagnostic test criteria usually produced by such programmes are either not applicable or require rather different interpretation. Some such points have been noted in the paper.