Review of Income and Wealth
Series 42, Number 4, December 1996

HOUSEHOLD INCOME PLUS HOUSEHOLD PRODUCTION: THE DISTRIBUTION OF EXTENDED INCOME IN THE U.K.

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This paper provides new estimates of the distribution of extended income amongst non-elderly, one-family households in the U.K. by combining household money income data and valuations of household production time. Extended income is substantially more equal than money income and extending the income definition changes income relativities significantly between families with and without earners and between married couple families and singles.

1. INTRODUCTION

There is a substantial literature arguing in favour of measures of household economic resources which incorporate valuations of household production. Empirical analysis of these extended income measures using U.K. data is rare, however. This paper aims to go some way towards filling this gap by providing new estimates of the distribution of extended income amongst non-elderly, one-family households.

Measures of extended income are derived by combining household money income data and valuations of imputed household production time. Since there is no U.K. data set which has satisfactory information about both household time use and household income, we have to use data matching methods. We estimate models of household time use with data from the 1987 *Social Change and Economic Life* (SCEL) time budget survey, and use the estimates to impute time use to respondents to the 1986 *Family Expenditure Survey* (FES). We show that extended income is substantially more equal than money income and that extending the income definition changes income relativities significantly between families with and without earners and between married couple families and singles.

Note: This is a revised version of paper presented at the Twenty-third General Conference of the IARIW. It draws on research on "The Distribution of Full Income in the U.K." funded by the Economic and Social Research Council, and carried out in conjunction with J. Gershuny, B. Halpin, and S. Ringen. Jenkins's research was also supported by a Norman Chester Senior Research Fellowship at Nuffield College, Oxford. Thanks are due to conference participants and two anonymous referees for helpful comments, but responsibility for the analysis and conclusions expressed lies entirely with the authors.

The Definition of Extended Income

The rationale for using extended income rather than money income is straightforward: the former provides a better measure of a person's access to economic resources, and one which is less contaminated by the effects of differences in preferences. The leading example of an extended income measure is Becker's (1965) celebrated "full income" measure, implemented most notably by Fuchs (1986, 1988) and Taussig (1973):[1]

$$F = w \cdot T + v, \tag{1}$$

where w is the hourly wage rate, T is the time endowment, and v is unearned income. Another measure with the same property, and due to Garfinkel and Haveman (1977), is "earnings capacity" $= w \cdot M^0 + v$, where M^0 is some fixed number of work hours. The nice property of these two measures—that income opportunities are measured independently of preferences—is contingent on two assumptions. The first is that time spent at home and time spent in paid work can be freely substituted for one another, in which case the market wage rate measures the opportunity cost of an hour at home. The second and related assumption is that the opportunity cost of each hour of a person's time is constant at all levels of paid work (the budget constraint is linear).

We modify these assumptions in this paper. Suppose time spent at home is subdivided into two activities—household production (domestic work) time, H, and "pure" leisure, L—and suppose, plausibly, that the opportunity cost of time differs between time allocation categories. A modified definition of full income for a married couple household is then:

$$\begin{aligned} F &= w_f M_f + \omega_f L_f + \lambda_f H_f + w_m M_m + \omega_m L_m + \lambda_m H_m + v \\ &= Y + \omega_f L_f + \lambda_f H_f + \omega_m L_m + \lambda_m H_m . \end{aligned} \tag{2}$$

where Y is household money income.[2] Subscripts f and m identify females and males; coefficients λ and ω are the shadow prices of H and L, and w is the market wage rate (as before).[3]

A problem with estimating full income defined in this way is highlighted by the case of involuntarily unemployed people. According to (2), no distinction is made between an hour spent on the golf course and an hour spent studying vacancy noticeboards at the Job Centre: both form part of L. Genuine leisure activities are difficult to identify from other activities also classified under the leisure heading in available data sources, and there are valuation problems in any case. We have therefore chosen to incorporate only the value of household

[1]See Thomas and Senauer (1993) for a less extensive empirical study. Note that Fuchs focusses on the relative incomes of men and women rather than overall inequality (as the other studies do).

[2]The budget constraint for a single person household is a special case of this. In our empirical work we also net off taxes and adjust incomes using an equivalence scale to account for differences in household size and composition: see Section 2.

[3]We retain the assumption of constant shadow prices within each time allocation category. (The prices for a given activity may differ between persons, however.) For a discussion of the difficulties of measuring income opportunities independently of preferences when there are non-linearities because of non-proportional taxes or imperfect capital markets, see Le Grand (1991) and Creedy (1990).

production activities into our broader income measure.[4] That is, in this paper, we analyse *extended income*, defined as

$$E = Y + \lambda_f H_f + \lambda_m H_m \tag{3}$$
$$= Y + D,$$

where $D := \lambda_f H_f + \lambda_m H_m$. This extended income definition has also been used in empirical work by Bonke (1992), Bryant and Zick (1985), and Gershuny and Halpin (1993).

The Distributional Impact of Broadening the Income Definition

What is the impact of broadening the income definition on the shape and structure of the income distribution? Clearly, for the population as a whole, average extended income is higher than average money income:

$$\bar{E} = \bar{Y} + \bar{D} > \bar{Y}. \tag{4}$$

The factors affecting whether the inequality of extended income is greater or less than that of money income are revealed by a standard decomposition by income components. If we measure inequality using the coefficient of variation (CV), then

$$CV^2(E) = (\bar{Y}/\bar{E})^2 \cdot CV^2(Y) + (\bar{D}/\bar{E})^2 \cdot CV^2(D) \tag{5}$$
$$+ 2 \cdot \rho_{YD} \cdot (\bar{Y}\bar{D}/\bar{E}^2) \cdot CV(Y) \cdot CV(D).$$

Thus inequality of extended income is a weighted average of the inequalities of money and household production income, where the weights are the (squared) shares of each income component in total extended income, plus a term depending on the correlation between the two components (ρ_{YD}). A rearrangement of (5) shows that:

$$CV^2(E) \gtreqless CV^2(Y) \Leftrightarrow [s(s + 2\rho_{YD})]/[m(m+2)] \gtreqless 1 \tag{6}$$

where $s := \sigma_D/\sigma_Y$ summarises the relative dispersions (standard deviations) of domestic production and money income, and $m := \bar{D}/\bar{Y}$ summarises the corresponding relative means (or extended income shares).

If the correlation between money and household production incomes were negligible ($\rho_{YD} \approx 0$), then the smaller household production income inequality is relative to money income inequality, or the larger its relative mean, then the more likely it is that extended income inequality is smaller than money income inequality. However, the correlation is important: inequalities are reinforced when it is positive, offset when it is negative. For ρ_{YD} sufficiently negative, extended income

[4]To put things another way, we are assuming $\omega_m = \omega_f = 0$, an assumption at the opposite extreme from the full income one in equation (1) which assumes (implausibly) that $\omega_m = w_m$ and $\omega_f = w_f$. Concerns about the treatment of unemployment also motivated Garfinkel and Haveman's (1977) and Haveman and Buron's (1993) downward adjustments to M^0 for people who do not work full-time for the full year. Our data sets contain no information about annual work hours so we cannot derive similarly adjusted estimates of earnings capacity.

inequality is unambiguously smaller than money income inequality. The sign of the correlation is not obvious *a priori*, however, since it depends on both (shadow) wages, market and domestic work hours:

$$\rho_{YD} = \text{corr}\,(w_f M_f + w_m M_m + v,\ \lambda_f H_f + \lambda_m H_m). \tag{7}$$

One might expect a negative correlation from a negative association between market and domestic hours (given the time budget constraint and assuming little variation in pure leisure hours). However, offsetting this may be a positive association between market and shadow wage rates, depending on assumptions about how the latter are defined (more about this below).[5]

We conclude that firm predictions about the size of extended income inequality relative to money income inequality cannot be made without more precise information about the correlation and the relative sizes of income component inequalities and means. Hence the importance of empirical work.

When looking at how the structure of the distribution changes when the income definition is broadened, comparisons across groups of households classified according to their labour market attachment are particularly interesting. Since zero- and one-earner couple households typically engage in more domestic work than two-earner couple households, extending the income definition will move zero- and one-earner couple households up the income distribution relative to two-earner couple households. Similarly non-earner singles will move up relative to earner singles. We therefore get a different picture about which groups are better off or worse off, and this has relevance for issues such as tax reform:

> A longstanding and central concern in the taxation of families is that of horizontal equity in the treatment of those with different time allocations to household production and market work. Conflicting interpretations of what the criterion implies for policy typically reflect different weightings on household production in the calculation of the welfare indicator used to assess the distributional merits of a particular reform. The traditional objection to household income as a welfare indicator in this context is that it implies a zero weighting of the benefits of non-market work and therefore understates the relative welfare position of families in which a spouse, typically the wife, specialises in home work. (Apps, 1994, p. 140.)

Although we can predict which way income rankings will change amongst married couple households, or amongst singles, it is not obvious how the position of married couples changes relative to singles if we take household production into account.[6] Nor can we tell *a priori* how large or small the various rerankings are. To resolve these issues we need empirical work.

[5]Notice that whether extended income inequality is less than money income inequality also may depend on how broad the chosen definition of extended income is. Broadening the income definition must increase m and, other things equal, this increases the likelihood that $CV^2(E) < CV^2(Y)$. Of course other things may not be equal: s and ρ_{YD} might also change.

[6]Apps only looked at couples in her empirical work.

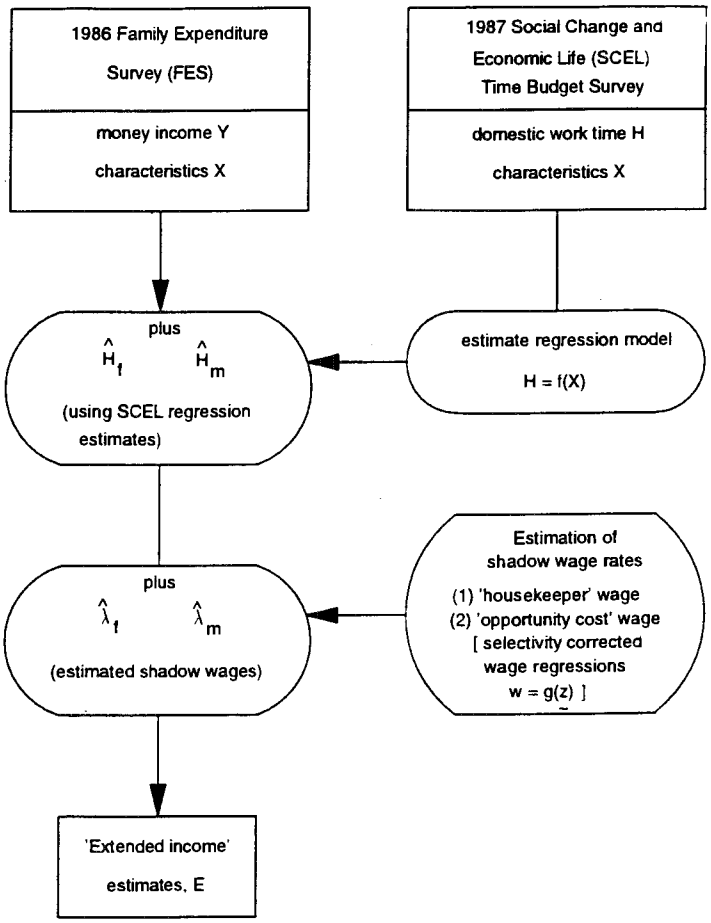

Figure 1. Schematic Summary of Derivation of 'Extended Income' Estimates

2. Derivation of Extended Income Estimates

Estimation of extended income distributions makes big demands on data sets: ideally one requires a household survey combining information about time use, money income, and household characteristics.[7] No such survey exists in the U.K.: existing sources contain either income data or time use data, but not both. What we have therefore done is impute domestic work time values to respondents to the U.K.'s preeminent income survey using regression matching methods. Figure 1 provides a schematic summary of our approach.

The analysis is restricted to adults in one-family households (single adults and married couples with and without children) aged between 20 and 59 years.

[7]Cf. estimation of distributions of full income or earnings capacity. Conventional income surveys can be used for this, since no disaggregated time use information is required.

We excluded multi-family households because there were additional problems for this group estimating time use and matching. Households with heads aged less than 20 years were excluded because there are no respondents of this age in our time budget survey. In any case we wanted to focus only on groups for whom labour market work and household production are both important, and this motivated our exclusion of elderly households (as well as young ones).

The 1986 *Family Expenditure Survey* is our source of data about money incomes and household characteristics. The FES is a national household survey of some 7,000 households per annum and is widely recognised as the best income microdata source there currently is for the U.K. It forms the basis of the official statistics about the income distribution, and is widely used by academics and others as well. Our definition of a household's money income is a standard one:

> *equivalent disposable income* = the sum across all household members of money income from all sources, i.e. earnings, income from investments and savings, occupational pensions, cash social assistance and social insurance benefits including state retirement pensions, less personal income tax payments and National Insurance contributions, with the total deflated by a household-specific equivalence scale factor.

Income refers mostly to income received during the previous week, and is expressed in pounds per week. The month in which a respondent household is sampled can vary between January and December, and so to account for within-year inflation, all incomes are expressed in terms of the same price level (that for April 1993).[8]

From the distributions of household income, we derive distributions amongst persons using conventional procedures. To take account of differences in household size and composition, we deflate the disposable income for each household by the relevant McClements equivalence scale rate.[9] We also assume that all incomes are pooled and shared equally within each household (the conventional assumption). Each person is imputed with the equivalent disposable income of the household to which they belong. We apply the same equivalisation and weighting methods to money income and to household production income.[10]

The FES also contains information about a wide range of household characteristics and we exploit this in our data matching and shadow wage estimations, as well as in our income distribution breakdowns: see below.

Our time use data are derived from the Time Budget extension to the 1987 *ESRC Social Change and Economic Life* (SCEL) household survey of six travel-to-work areas.[11] Seven-day time diaries were completed by survey respondents

[8]The data are from the "CCJ" data set derived from the public-use FES micro-data tapes: see Coulter (1991), Coulter *et al.* (1994), and Jenkins (1995) for a detailed discussion of the income definitions and sub-samples.

[9]The McClements equivalence scale is the most widely used one in the U.K. It is used to produce the official income distribution and low income statistics and also used by many non-governmental researchers. See DSS (1993).

[10]Arguably the equivalence scale rates for money income and the proceeds of household production should differ, but there is no clear view about this in the literature: see e.g. the discussion of the equivalisation of non-cash income by Smeeding *et al.* (1993) and Radner (1994).

[11]See Gershuny *et al.* (1988) for a detailed discussion of response rates and representativeness.

and their spouses, and the returns averaged to provide estimates of time use on a "minutes per day" basis.

The definition of "domestic work time" in the SCEL survey is a standard one and covers food preparation, housework, odd jobs about the home (including do-it-yourself activity), gardening, shopping, child care, plus some domestic travel associated with these activities. For further details, see Gershuny *et al.* (1988, Appendix A1).

Our time use sub-sample comprises persons aged 20–59 years who are either the "central adult" in one-adult households, or the husband or wife of a "central spouse pair" in multi-adult households.[12] In addition to the detailed time use data, there is information about respondents' age group, marital and employment status, and household composition.[13] These variables are also in the FES and this commonality is the basis of our regression matching procedure.

Data Matching

Using the SCEL time budget data we estimate OLS regressions of the form

$$H = \beta' X_{\text{SCEL}} + \varepsilon, \qquad \varepsilon \sim N(0, \sigma^2) \tag{8}$$

for each of four groups of respondents classified by marital status and sex. The variables comprising the regressor vector X_{SCEL} are those cited in the last paragraph. See Jenkins and O'Leary (1995) for discussion of the specification including potential endogeneity issues, and for the regression estimates (Table 3, columns 5–8). The fit of the equations is reasonably good, especially for women: the adjusted R^2 for the equation for single males is 0.28, for single females, 0.58, for married men, 0.13, and for married women, 0.39.

We then impute domestic work times, $\hat{H}$, to adults in our FES sub-sample using the appropriate set of regression estimates:[14]

$$\hat{H} = \hat{\beta}' X_{\text{FES}} + \hat{\varepsilon} \tag{9}$$

where $\hat{\varepsilon}$ is an individual-specific random draw from a Normal distribution with mean zero and variance $\hat{\sigma}^2$.[15]

[12]Multi-adult households without a central spouse pair are excluded from the analysis. However we do use information for a person belonging to a central spouse pair even if their spouse did not complete their diary.

[13]There are no education data and no suitable wage data.

[14]This regression matching method has been used in previous studies of extended income measures: see e.g. Apps (1994), Fuchs (1986, 1988), and Gershuny and Halpin (1993). Bonke (1992) used exact matching: for the respondents to his Danish time budget survey, he got information about their incomes from the "register of income taxation." (However, Bonke had other data problems. His time use data came from a survey of individuals, not of households, and so he had time use data for only one member of each husband–wife pair—he had to estimate the value for the other spouse.) Notice that all these studies, and ours as well, use information about domestic work activities of adults but not children. (Money income earned by children is included in the measure of household money income.)

[15]The $\hat{\varepsilon}$ term accounts for unobserved variations in domestic work time within cells defined by the observed variables: see Garfinkel and Haveman (1977) and Haveman and Buron (1993). For a very small number of people, adding in $\hat{\varepsilon}$ made $\hat{H} \leq 0$, in which case $\hat{H}$ was set equal to 30 seconds per day when calculating inequality indices. Some alternative procedures did not alter the conclusions of the paper. Indeed ignoring $\hat{\varepsilon}$ altogether does not affect our story overall (as shown by our IARIW conference paper, which did not incorporate the $\hat{\varepsilon}$ terms).

The quality of our matching procedure is difficult to assess. As pointed out by Sims (1972), Rodgers (1984), and others, the matching can be guaranteed correct only if there is conditional independence—i.e. controlling for household composition, age, etc., money income and household production are statistically independent. Data are rarely available for researchers to check this assumption properly and we are no exception. The only checks which we were able to make utilised a money income variable in the SCEL time use survey, but because this variable is poorly documented and of low quality, we do not wish to place much emphasis on our results.[16] That said, what we did was examine the correlations between total household domestic work time and household money income for each value of the regressor variables used in the matching regressions, and in only three cases was the correlation significantly different from zero at the 5 percent level.[17] Overall, our view is that the conditional independence assumption is unlikely to hold exactly, but we believe that it may be a satisfactory approximation in the current context. The impact on our results of the quality of matching is discussed further below.

The unconditional correlation between domestic work time and money income is nearly zero and barely significant. And in scatterplots of domestic work time against income, the corresponding regression line is virtually horizontal.[18] In other words, on average, the amount of time spent in home production appears to be much the same regardless of household income. This pattern has important implications for the estimates of the distribution of extended income, as we discuss below.

Estimation of Shadow Wage Rates (λ_f, λ_m)

We follow previous literature in using two alternative methods of valuing household domestic work time: those based on the so-called "housekeeper wage" ("market alternative"), and "opportunity cost" principles. The first aims to value time according to what it would cost to buy the equivalent services in the market, whereas the second aims to value an hour in domestic work in terms of the cost to a person of foregoing an hour of paid work. As in previous studies, our empirical measures are somewhat less sophisticated than the theoretical ideals.

The housekeeper wage rate we use is the hourly wage rate of full-time employees on adult rates who work in a miscellaneous service (catering, cleaning, hairdressing and other personal services).[19] Taking a weighted average of the rates for males and females (£4.80 and £3.87), and converting to April 1993 prices, gives a rate of = £4.236 per hour.

Opportunity cost estimates are derived using selectivity-corrected wage regressions. If all adult household members in our survey were in paid work, then we could use their wage rates as the relevant shadow price. However, many are

[16]The emphasis of the SCEL time use survey was the time use variables and not monetary variables. By contrast the FES is specifically an income (and expenditure) survey.

[17]For single females aged 40–49 years, or with no children, there were small negative correlations. For single males aged 40–49 there was a small positive correlation.

[18]See Jenkins and O'Leary (1994) for the scatterplots with regression lines. We got similar pictures when incomes were not equivalised or person weighted.

[19]Derived from the Department of Employment's *New Earnings Survey 1986*.

not, the majority of whom are women. So what we do is estimate a regression model of hourly wage rates for working age U.K. adults in 1986, and use the estimates to impute wage rates to all adults in the sample. We used the well known maximum likelihood "selectivity correction" method due to Heckman (1979) to derive consistent estimates of the wage regression, controlling for the fact that the relationship between wages and unobserved characteristics may differ between earners and nonearners.[20] Regressions were run using data from the 1986 FES about adults of working age (16–59 years), with separate equations for males and females.[21] See Jenkins and O'Leary (1994, Appendix) for the details of the regression results. (The mean imputed wage rate is about £4.75 per hour, with a standard deviation of roughly 2.) These gross wage rates were then adjusted downwards by a marginal tax rate which varied with household income (mean rate $\approx$ 30 percent).[22]

The most important difference between the housekeeper wage and opportunity cost approaches in terms of their impact on the estimates of extended income distributions is that the former imputes the same shadow wage rate to every person, whereas the latter imputes a person-specific rate. Clearly household production income derived using opportunity cost wages will have a larger dispersion than that derived using a housekeeper wage, and the correlation ρ_{YD} will be larger too (see the earlier discussion). "Housekeeper wage" extended income inequality is more likely to be smaller than money income inequality than "opportunity cost wage" extended income inequality is.

3. The Shapes of the Money and Extended Income Distributions Compared

We are now in a position to assess how extending the income definition changes the shape of the income distribution. The results are dramatic: see Table 1.

Extended incomes are very much more equally distributed than money income for non-elderly one-family households, regardless of which method is used to value household production. Broadening the income definition substantially increases the income shares of the poorest tenths and decreases those of the richest tenths. The cumulative income share estimates imply that the extended income Lorenz curve lies well inside the money income Lorenz curve and so all standard inequality measures will show extended income more equal than money income. In fact the Lorenz curve for the "housekeeper wage" extended income lies entirely

[20]These methods have also been used by Bonke (1992), Thomas and Senauer (1993) and Haveman and Buron (1993). Fuchs (1986, 1988) and Gershuny and Halpin (1993) used wage data for current earners to impute values to non-earners, but did not use selectivity corrections.

[21]The youngest adults, aged 16–19 years, were included in the estimation of wage equations because their labour force participation contributes to the determination of the wage offer relationship for all non-elderly adults.

[22]Household-specific marginal tax rates were estimated from a regression of household direct tax payments on a quadratic in household gross income (details available from the authors). Housekeeper wage rates are expressed gross of income taxes, since they are supposed to reflect the price a person pays for a service. The net wage variable does not include further adjustments for e.g. the cost of child-care: suitable data were not available.

TABLE 1

THE EXTENDED INCOME DISTRIBUTION IS MORE EQUAL THAN THE MONEY INCOME DISTRIBUTION

(non-elderly one-family households, U.K. 1986)

Decile Group	Income Shares (%)					Cumulative Income Shares (%)			Household Production Income as % Extended Income*	
	Y	$D(h)$	$E(h)$	$D(o)$	$E(o)$	Y	$E(h)$	$E(o)$	$E(h)$	$E(o)$
1	3.7	4.2	5.8	3.5	5.1	3.7	5.9	5.2	72	65
2	5.1	6.8	7.1	5.9	6.5	8.7	12.9	11.7	64	55
3	6.1	8.0	7.9	7.2	7.3	14.8	20.8	18.9	59	50
4	7.1	8.8	8.5	8.1	8.0	21.9	29.3	26.9	55	47
5	8.1	9.6	9.1	9.1	8.7	30.0	38.4	35.7	52	44
6	9.3	10.4	9.8	10.1	9.6	39.3	48.1	45.2	48	42
7	10.6	11.2	10.5	11.1	10.5	49.9	58.7	55.8	45	39
8	12.2	12.1	11.4	12.4	11.8	62.1	70.1	67.5	41	36
9	14.8	13.2	12.8	14.1	13.6	77.0	82.8	81.1	35	31
10	23.0	15.7	17.2	18.5	18.9	100.0	100.0	100.0	26	24
Y_{90}/Y_{10}	3.63	2.33	2.05	2.99	2.46					
Gini	0.292	0.180	0.170	0.232	0.209					
$I_a : a =$										
-1	0.913	0.642	0.053	1.097	0.077					
0	0.148	0.082	0.050	0.118	0.072					
1	0.152	0.057	0.053	0.091	0.077					
2	0.210	0.052	0.066	0.090	0.096					

Notes: Y: money income. $D(h)$, $E(h)$: household production and extended income (housekeeper wage valuations). $D(o)$, $E(o)$: household production and extended income (opportunity cost wage valuations). Equivalent income distributions, person weighted (equivalent £ per week, April 1993 prices). Decile groups are ranked from poorest (1) to richest (10). Y_{90}/Y_{10}: 90th percentile/10th percentile.

I_a : Generalized Entropy class of indices (see Shorrocks, 1984).

$I_2 = CV^2/2$. I_1 = Theil index. I_0 = Mean logarithmic deviation.

The 1986 FES sub-sample comprises 3,474 households, 9,833 persons.

*Persons ranked by decile groups of money income (Y).

inside the "opportunity cost wage" extended income, indicating an unambiguous inequality ordering too (and it is the ordering we predicted earlier).

The inequality indices in the bottom panel of Table 1 show how big the equalising impact of broadening the income definition is. Middle-sensitive indices (Gini, y_{90}/y_{10}) fall by about a third. Most other indices are roughly halved, except for the one most sensitive to income differences at the bottom of the income distribution (I_{-1}), for which the decrease is even larger, reflecting the greater income share changes at the bottom compared to the middle or top. To put the size of these changes in perspective, compare the changes in inequality amongst all U.K. households between 1976 and 1986 (using income definition Y, as here): the Gini coefficient increased by 18 percent, I_0 by 41 percent, I_1 by 45 percent, and I_2 by 66 percent (Jenkins, 1995). The magnitude of these secular increases is widely acknowledged to be large; the impact of extending the income definition is even larger.

What underlies these big changes? The answer is to be found in the right hand columns of Table 1, and in Figures 2a and 2b. In Section 2 we reported that on average the amount of time spent in home production is much the same regardless of the income of the household. Since the housekeeper wage is the same for all households, the amount of household production income valued with this wage will also be much the same for all households on average. (In this case, $\hat{\rho} = -0.10$. Also see the regression line in Figure 2a.) By contrast, estimated opportunity cost wage rates differ across households and are positively correlated with money income. This means that on average the amount of household production income valued with these wages more noticeably increases with income, though in fact it is not by very much. (In this case, $\hat{\rho} = 0.07$. Also see the regression line in Figure 2b.) Thus, regardless of the valuation method, the amount of household production income in absolute terms does not vary much with money income level. However, this also means that as a share of total extended income, household production income is proportionately much more important for poorer households than richer ones: see the right-hand columns of Table 1. For the poorest tenth, household production income comprises at least two-thirds of total extended income but about one quarter for the richest tenth.

In other words, lower money income shares are offset by higher household production income shares when the income definition is extended. Or, referring back to (5) and (6), extended income inequality is lower than money income inequality because household production income comprises a significant share of total extended income, its inequality is lower than money income inequality, and the correlation with money income is low.

Our clearcut equalisation finding and its large size contrasts with previous results. Bonke, using data from the 1987 Danish Time Use Survey for adults aged 16–76, found no clearcut equalisation from extending the income definition: the result depended on the inequality measure (1992, Tables 3, 5).[23] This was also Apps's finding from her analysis of Australian married couple households with children and a head in employment aged 20–64 years, using the 1986 Income Distribution Survey with matched data from the 1987 Time Use Pilot Survey (1994, Table 6.6). The changes were not large in either study, however. Bryant and Zick, using a U.S. Panel Study of Income Dynamics sub-sample of white married couple families with the husband in employment, report that incorporation of opportunity cost valuations of domestic work increased the Gini coefficient slightly in 1975–76, and decreased it slightly in 1979–80 (1985, Table 2). Taussig, examining U.S. urban households of all age groups using the 1967 Survey of Economic Opportunity, found a small decrease in the Gini coefficient using opportunity cost wage valuations and a larger decrease when a housekeeper wage valuation was used (1973, Table 7).

Most of the studies cited use samples of married couple households and all use distributions of household income rather than personal equivalent income as we do, but these choices do not explain the differences between our results and theirs. E.g. the breakdowns shown in Tables 2 and 3 below show that our

[23]Extending the income definition led to a slight increase in the Gini coefficient and a small fall in the variance of the logs. Moreover the Lorenz curves crossed.

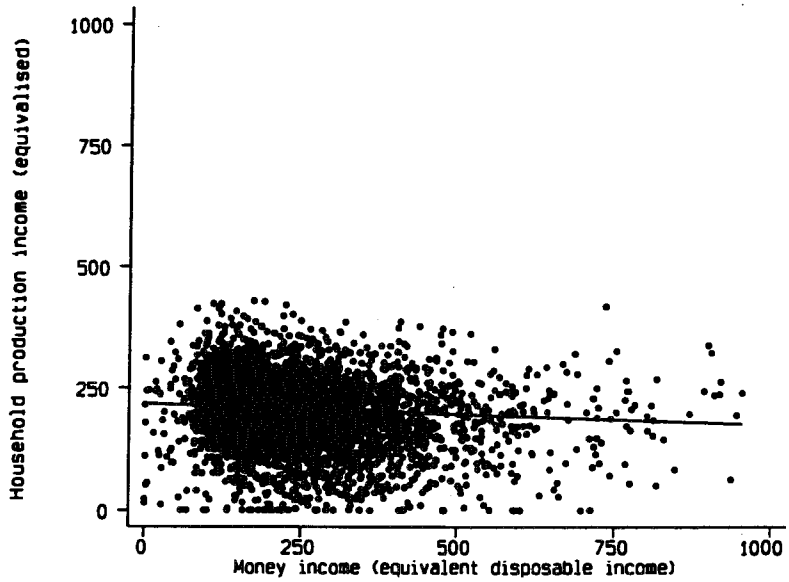

Figure 2a. The Relationship Between Household Production Income (Housekeeper Wage Valuations) and Money Income

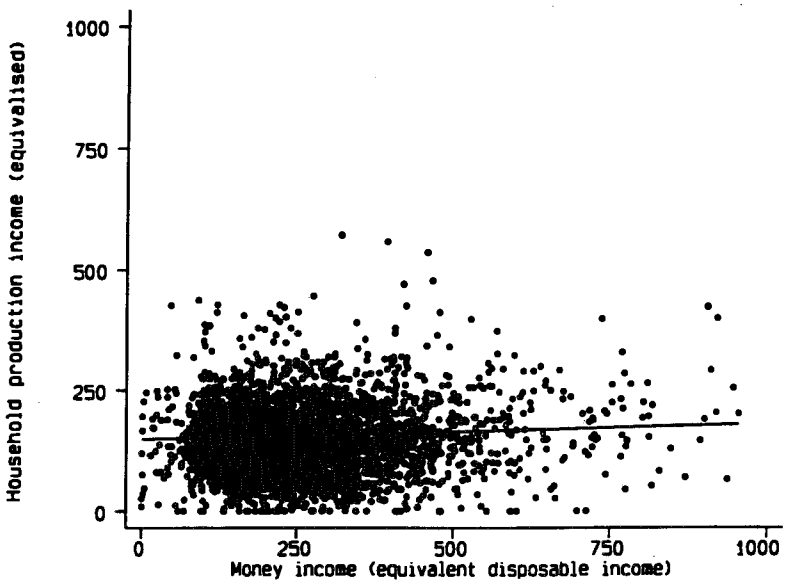

Figure 2b. The Relationship Between Household Production Income (Opportunity Cost Wage Valuations) and Money Income

equalisation result applies also to married couples considered separately. (Since the equalisation result applies to every family type-earnings status subgroup, and since the subgroup partitions are similar to age group ones, we suspect the different age ranges of respondents across the various studies does not play a large role.)

The use of personal equivalent income distributions does not affect the conclusion either. We have redone our calculations using unweighted unequivalised distributions and find our equalisation conclusions are robust.[24]

There are two other potential explanations for the results. The first, suggested by a referee, is that the results are an artefact of the matching process. His/her argument is that if we had simply allocated household production times randomly to households in the FES, then one would expect to find household production time (and income) also randomly allocated across income groups, and thus household production income not varying much with income—as we find. The argument is plausible, but given the reasonably good fit of our matching regressions, and similar findings with the same data using different matching regressions (Gershuny and Halpin, 1993), we do not believe that the data matching process is driving our results. Moreover we have checked our conjecture with a counterfactual imputation which deliberately introduced a greater degree of randomness. If the equalisation result were due to randomness as the referee suggested, we would expect the revised extended income distribution to be even more equal than the one we have focussed on. In fact this was not the case. When we excluded significant explanatory variables (the participation dummies) from our matching regressions thence producing a much poorer fit and a larger random error variance $\hat{\sigma}^2$, the modified imputations still produced significant equalisation in extended income, but not by as much as when we used the imputations from our preferred matching equation.

The other potential explanation for the difference in results is that the income-domestic work relationship differs across countries. We have not found other studies of this issue which would enable us to investigate it further.

4. The Structure of the Money and Extended Income Distributions Compared

We now look at how extending the income definition changes the structure of the income distribution. For the reasons set out earlier we examine breakdowns by household labour market attachment, distinguishing five subgroups: non-earner singles, earner singles, and married couple families with 0, 1, or 2 earners.[25] Single persons comprise 15 percent of all non-elderly one-family households, and about half of them are earners. Just under 15 percent of all non-elderly one-family households are married couple families with no earned income, about one-third are married couple families with either the head or spouse earning, and almost

[24]E.g. the Lorenz orderings for y, $e(h)$, and $e(o)$ remain the same, and the Gini coefficients are 0.309, 0.227, and 0.255. Gershuny and Halpin (1993), also using the 1987 SCEL and 1986 FES data, found that "opportunity cost" extended income inequality was larger than money income inequality, but "housekeeper wage" inequality was smaller. However, we give greater weight to our results than to theirs, especially since Gershuny and Halpin used an early, less "clean," version of the data sets (which have been substantially revised subsequently). They also used different subsamples and time use imputation assumptions. Note however that Gershuny and Halpin do report, as we do, that domestic work time varied little with household income on average.

[25]In preliminary research we also did some further breakdowns by whether families had children or not, but they were not very illuminating.

TABLE 2

AVERAGE MONEY INCOME, HOUSEHOLD PRODUCTION INCOME, AND EXTENDED INCOME, BY ECONOMIC STATUS
(non-elderly one-family households, U.K. 1986)

Household Type	Population Share (%)	Money Income		Household Production Income (Housekeeper Wage Valuations)		Extended Income		Household Production Income (Opportunity Cost Wage Valuations)		Extended Income	
		Y		$D(h)$		$E(h)$		$D(0)$		$E(0)$	
		£	(%)	£	(%)	£	(%)	£	(%)	£	(%)
Single											
non-earner	7.2	168	(70)	171	(83)	339	(76)	107	(68)	275	(69)
earner	7.3	268	(112)	133	(64)	401	(90)	95	(61)	363	(91)
Married couple											
0 earners	14.4	155	(65)	248	(120)	403	(90)	183	(117)	338	(85)
1 earner	33.4	226	(94)	229	(111)	455	(102)	176	(112)	402	(101)
2 earners	37.7	293	(122)	194	(94)	487	(109)	152	(97)	445	(112)
All	100.0	240	(100)	207	(100)	447	(100)	157	(100)	397	(100)

Notes: As for Table 1.

40 percent are married couple families with both head and spouse earning. See Table 2 for details.

If money income distributions are used to summarise personal economic well-being, then clearly two-earner married couple families are the richest subgroup, with mean income a fifth larger than the overall mean. The poorest subgroups are families without earners, married couples and singles, with incomes about one-third below the overall average. Single earners are better-off than married couple families with only one earner.

If we take household production income into account, the relative positions of the subgroups change in interesting ways. Incomes of families with earners were predicted to fall relative to non-earner families, and we can now see by how far. It is quite a lot (and largely insensitive to the valuation method used). The income of zero-earner married couple families increases from 65 percent of the money income average to at least 85 percent, whereas the income of two-earner married couple families falls from 20 percent above the money income average to 10 percent above the extended income average. The relative income of non-earner singles stays much the same, but that for earner singles falls substantially, from 10 percent above the money income average to 10 percent below the extended income average.

For a different perspective on the changes in relative positions of the different subgroups, look at Figures 3a and 3b which show the economic status subgroup composition of each decile income group of the money and extended income distributions.[26] As a benchmark, note that if income were independent of economic

[26]Valuing household production using the housekeeper wage yields the same conclusions as using opportunity cost wages does and so the picture for that case is not shown.

status then we would expect the composition of each decile income group to reflect the composition of the population as a whole. This is clearly not the case.

Two-earner married couple families comprise about 40 percent of all non-elderly one-family households, but in the money income distribution they comprise one half or more of each of the top five decile income groups. When we move to the extended income distribution, this overrepresentation diminishes. Taking their place are zero- and single-earner married couple families whose representation is greater at the top of the extended income distribution than the money income one. The composition of the very poorest income groups changes even more dramatically with the extension of the income definition. In the money income distribution zero-earner couples are heavily over-represented: they comprise almost two-thirds of the poorest tenth, which is more than four times higher than would be expected on the basis of their population share. In the extended income distribution, this group comprises just over one-fifth of the poorest income group. Their place at the bottom of the distribution is taken mostly by single earners and dual-earner couples.

In sum, our results not only confirm the predictions of previous authors, but also reveal more. We have found, as predicted, that extending the income definition raises the incomes of non-earner married couple families relative to earner married couple families. A novel finding is that the income of singles falls relative to the incomes of married couple families on average when the income definition is extended. For example, in the money income distribution, earner singles are much richer than zero-earner married couple families on average, but in the extended income distribution they are roughly equally well-off (see Table 2).[27]

Nevertheless if we look at the effect of extending the income definition on between-group inequality for all five subgroups, we find that it falls. Between-group income differentials decrease for the three married couple subgroups, and for the two singles ones. The reason is that subgroups with the larger money incomes have lower household production incomes and vice versa: see Table 2.[28] This implies a reduction in differentials within marital status subgroups is much larger than the increase in differentials between marital status subgroups. Table 3 shows that total between-group inequality is about a third smaller in the extended income distribution than the money income one according to both indices I_0 and I_2.[29]

Although extending the income definition has clear effects on incomes between subgroups, the pattern of within-group inequalities does not change much. Inequality falls substantially within all five subgroups, as it did in the aggregate. The contribution each subgroup makes to total inequality within groups does not change much either: look at the right-hand columns of Table 3.

[27]The same re-rankings across economic status subgroups occur if we look at only households with children, or only childless households.

[28]For another perspective, note that household production income comprises about 30 percent of extended income for two-earner married couple families, but almost two-thirds of extended income for zero-earner married couple families.

[29]A referee pointed out that our result may be partly related to the quality of data matching. The argument is that our matching assigns household production hours on the basis of marital status (and other variables), and this may reduce the variation of these hours within marital status groups relative to the between-group variation.

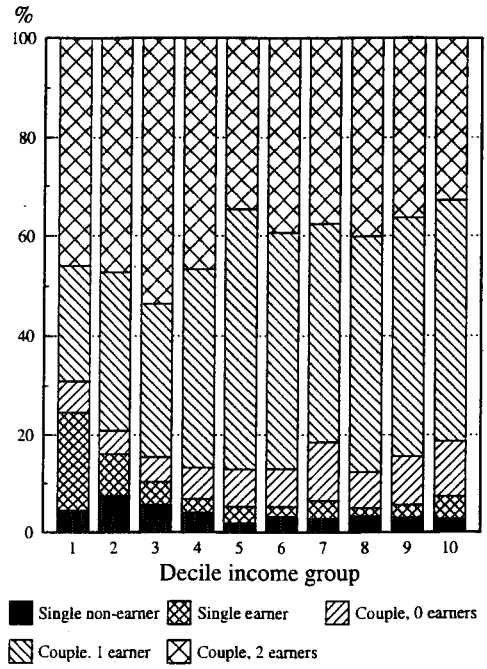

Figure 3a. Composition of Decile Income Groups, by Household Economic Status (Extended Income Estimates with Opportunity Cost Wage Valuations)

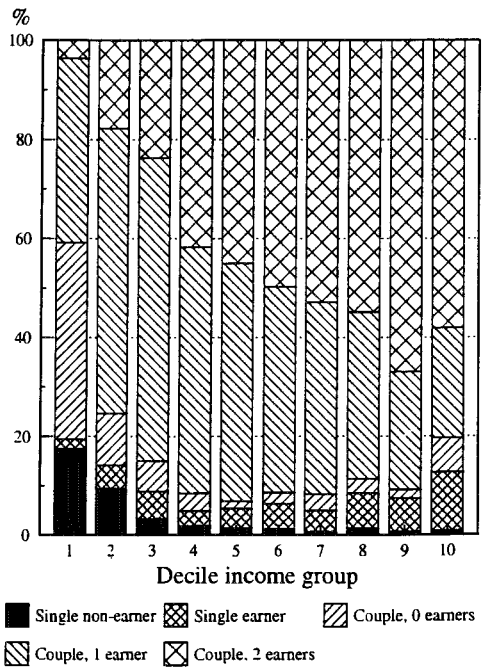

Figure 3b. Composition of Decile Income Groups, by Household Economic Status (Money Income Estimates)

TABLE 3

INEQUALITY BREAKDOWNS BY ECONOMIC STATUS
(non-elderly one-family households, U.K. 1986)

	Subgroup Inequality (I_{ak})			Subgroup Inequality Contribution (%)		
	Y	$E(h)$	$E(o)$	Y	$E(h)$	$E(o)$
			$CV^2/2$ (I_2)			
Single						
non-earner	0.843	0.222	0.382	14	14	13
earner	0.145	0.068	0.105	6	6	7
Married couple						
0 earners	0.483	0.082	0.136	14	14	13
1 earner	0.163	0.049	0.077	23	26	27
2 earners	0.119	0.049	0.069	32	33	33
Within-groups	0.187	0.062	0.093	89	93	93
Between-groups	0.023	0.005	0.009	11	7	7
Total	0.210	0.067	0.102	100	100	100
			Mean log deviation (I_0)			
Single						
non-earner	0.202	0.084	0.108	10	12	11
earner	0.118	0.059	0.085	6	9	9
Married couple						
0 earners	0.216	0.051	0.072	21	15	14
1 earner	0.109	0.038	0.057	25	25	27
2 earners	0.085	0.037	0.051	22	28	27
Within-groups	0.123	0.044	0.063	84	89	88
Between-groups	0.025	0.005	0.009	16	11	12
Total	0.148	0.049	0.072	100	100	100

Notes: See Table 1 for definitions. Subgroup inequality contribution $= v_k(\mu_k/\mu)^a\, I_{ak}/I_a$, where v_k = subgroup k's population share; μ_k/μ = subgroup k's mean income relative to the overall mean; and I_{ak}/I_a is inequality within subgroup k relative to overall inequality.

5. CONCLUDING COMMENTS

This paper provides new estimates of the distribution of extended income amongst one-family households in the U.K. in 1986. We have shown that broadening the definition of income to take account of household production income has a significant impact on our perception of what the shape and structure of the distribution of personal access to economic resources are. Our principal empirical findings are:

- Extended income is substantially more equally distributed than money income in the U.K. in the mid-1980s.
- When the income definition is extended, families without earners are shifted up the distribution relative to families with earners.
- The former group remains poorer on average, however, even though the income differential is significantly reduced.
- When the income definition is extended, single persons are shifted down the distribution relative to married couple families.
- These conclusions are little affected by changing between housekeeper and opportunity cost methods for valuing household production time.

The main reason why extended income is more equal than money income is that the amount of domestic work households do—and hence their household production income—appears not to vary much in absolute terms with money income level. As discussed earlier, this finding might be the artefact of a poor data match or, more plausibly, may be genuine but a peculiarly U.K. phenomenon.

As it happens, our work repeating the analysis of this paper using the 1974/5 *BBC Time Use Survey* and the 1976 *Family Expenditure Survey*, yielded the same equalisation results and for the same reason. Thus not only did money income inequality rise between the mid-1970s and mid-1980s but so too did extended income inequality: broadening the income definition does not change the conclusion about distributional trends. Again it is not obvious whether this is solely a U.K. phenomenon (and there are data matching questions about our mid-1970s data too, of course).

In sum, an important topic for future research is to uncover why the equalising impact of extending the income definition appears larger for the U.K. than for other countries. Ideally this analysis should be based on surveys combining good time use and income data, so that data matching is redundant.

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