THE REDISTRIBUTIVE EFFECTS OF TRANSFERS

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ABSTRACT

Existing literature assessing the impacts of transfers on low income households assumes that transfer program participants benefit by the full amount of cash transfers received. Here we argue that because tax-back arrangements accompany such transfer programmes, and endogenous participation decisions (regime choices) are involved, a money-metric measure of the utility generated by transfers will typically be substantially less than the cash value of transfers received. We use a conditional choice general equilibrium model of the UK, calibrated to literature based labor supply and labor demand elasticities, with a leisure-consumption choice for household and production involving heterogeneous labor inputs. In the model, households face non-convex budgets set due to differences in tax rates and tax-back schemes in transfer programmes. Household demands for leisure and consumption goods are evaluated numerically using optimization techniques within a larger equilibrium structure including the production side of the economy, since demands are non-analytic. Model results suggest that a money-metric measure of the utility equivalent of transfers received by the bottom deciles of UK households in the early 1990s was only 32 percent of cash transfers received due to the conditionality in these programmes.

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1.0 INTRODUCTION

Most empirical work which seeks to assess the redistributive effects of transfers paid to lower income households (AFDC in the US, income and housing benefit in the UK) assumes that recipient households are made better off by the full amount of net cash transfers received (net of any tax back), with wage and other behavioural responses largely ignored.[2] Considerable energy is devoted in some of this literature to calculating and modelling complex tax back schemes which accompany these transfers; with implicit tax rates varying by household and income characteristics, discontinuities and spikes appearing in tax rate profiles, and other complex institutional features being captured.[3]

The point of departure in this paper is the observation, seemingly not in the literature[4], that with voluntary participation in transfer programmes (with tax back or withdrawal

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[2] These transfers are large (Danziger, et al (1981) some years ago put them at 10 percent of GDP for the US), and they play a key role in assessments of overall distributive impact of government tax and transfer activity. Browning and Johnson (1984), while admittedly using a broad notion of transfers, suggested that the bottom 25 percent of households in the US receive 65 percent of their income in transfers.

As an extensive older review of the then available work on transfer programmes by Danziger, Haveman and Plotrick (1981) says "the redistributive effect of transfers is generally measured by comparing pre-transfer and post transfer income distributions. This comparison assumes that transfers elicit no behavioral response that would cause income without transfers to deviate from observed pre-transfer income". Subsequent and more recent work in this area, such as Dickert, Houser and Scholz (1994), Moffitt (1991), and Hoynes (1993) have focused on partial equilibrium labour supply impacts of transfer programmes, but with no attention to impacts on other endogenous variables including welfare and wage rates.

[3] Thus, in Chapter 6 of Atkinson (1994) where tax benefit models are discussed, detailed presentation of implicit marginal tax rates implied by complex and overlapping UK schemes appears, but wage rates are treated as exogenous. The same is true of the discussion in Dilnot and Duncan (1992).

[4] The closest discussion we are able to find is that by Browning (1973) of the welfare costs of the negative income tax, and the related discussion in Browning and Browning (1987). Browning diagramatically sets out the regime choice problem we discuss here, but does not focus on the real value of transfers and offers no numerical or explicit general equilibrium analysis.

provisions), the utility, or real income, value of transfers to participants is typically less than the cash transfers received. This is because individuals (or households) compare utility across two regimes; one with benefits and tax back arrangements, and the other with no benefits and no tax back, choosing the higher utility regime. A money metric utility comparison between the regimes (the real income difference) bears no direct relation to the net of tax back cash transfer actually received. Indeed, in an extreme case where an individual (or household) is indifferent between participating and not participating, if they were recorded as a benefit programme participant, the real income gain to them from participation in the transfer programme would be zero, despite the disbursement of public funds to the recipient. We therefore argue that, in general, the real income received by transfer recipients is smaller than the cash transfers actually made, since to the recipient the reference point for valuing them should be the reservation utility in the no benefit - no tax back regime.

Given tax back rates, we also argue that individuals (or households) will not participate in transfer programmes until some threshold level of transfers is reached, raising utility under participation above that in the no participation regime. Tax back conditions in benefit programmes thus impose a form of real income entry fee for participation, which must be deducted in evaluating the redistributive effects of transfer programmes. Conditional on participation in transfer programmes, transfers shift recipients budget constraints parallel. Hence in the homothetic case, after the entry fee has been paid, marginal increases in transfers (for fixed tax back rates) provide recipients corresponding marginal increases in real income in the fixed price, fixed wage case.

We also argue that a further effect, also seemingly missing from existing literature, needs to enter analyses of the redistribution effects of transfers, namely that with paticipation in a conditional transfer scheme, leisure consumption by the poor rises and the associated withdrawal from the market place of low wage labour drives up the wage of low wage(skill) workers relative to high wage(skill) workers. Thus, in a general equilibrium model with heterogeneous labour, the withdrawal of low wage labour associated with transfers to the poor raises their wage rate, potentially substantially magnifying the redistributive effect of transfer programmes.

When combined with existing estimates of the marginal welfare costs of taxes (Browning (1978), Stuart (1984), Ballard, Shoven and Whalley (1985)) which suggests high marginal dead-weight losses of taxes, and much lower average costs; a picture for the social costs of distortionary tax financed redistribution in OECD countries also emerges from our analysis. This suggests that average social costs per dollar of tax financed redistribution should be upward revised above existing dead-weight loss estimates from taxes due to the added distortionary cost from conditionality in transfer schemes noted above; but marginal social costs per dollar of tax financed redistribution should be downward revised due to the labour withdrawal low wage rate effect also noted above.

We use conditional choice general equilibrium models to assess the importance of these effects. These models embody both endogenous programme participation by households and heterogeneous labour (by income range or skill type) in production. In such models, program participation by low income households is endogenously determined in equilibrium, along with

the wage distribution since wage rates change as transfer programmes characteristics (benefit levels, tax-back rates) change.

In these models, the budget sets for households are non-convex, presenting special computational problems not tackled, as far as we are aware, in existing general equilibrium tax computation literature. Commodity demands by households, including leisure, are no longer analytic, even for conventional CES or Cobb Douglas utility functions. This means that household demands have to be evaluated numerically using optimization techniques within a larger equilibrium structure, including the production side modelling of the economy. The larger model is itself solved through separate application of numerical optimization methods; in essence, in such models, solution procedures use optimization embedded within wider optimization, since consumer demands are non-analytic.

We first present numerical examples which illustrate the potential significance of the two features we highlight above as missing in existing literature. We then apply our techniques to an assessment of the redistributive effects of UK transfer programmes using 1994 data. Relative to previous literature on assessments of benefit programs, our model results show that the welfare (or utility) value of transfers received differs markedly from their cash value; in our central case specification being lower by a factor of around three. Model results also show that incorporating heterogeneous labour in production adds an important and neglected channel for distributional effects from conditional transfer programmes which operate through the induced withdrawal of lower income labour from the market, since this increases the wage rate of low wage labour. At the margin, this significantly reduces the tax cost of marginal real income

transfers to the poor since induced wage rate changes reinforce the redistribution effect. These two features emerge as substantial under all model parameterizations, including those calibrated to the skill specific labour demand elasticity estimates reported in Hammermesh (1988). These are used in model calibration for cross elasticities of substitution among labour types in production in the model.

The bottom line conclusion we offer is that assessing the redistributive effects of conditional transfers is neither as straight forward as it at first sights appears, nor is the real income value of such transfers seemingly so large as is implicitly assumed in the literature. Regime choice significantly affects such measures, and their general equilibrium effects through programme induced low wage labour withdrawal need to be taken into account. These effects seem to be virtually ignored in available literature in the area, and are important because they can radically change perceptions as to the redistributive effects of transfers. We offer our conditional choice general equilibrium model as a way forward, and investigate these effects using UK data.

2.0 A CONDITIONAL CHOICE GENERAL EQUILIBRIUM MODEL FOR ANALYZING THE REDISTRIBUTIVE EFFECTS OF TRANSFERS

2.1 Background

As we note in our introduction above, when analyzing the redistributive effects of transfers the conventional treatment in the literature is to assume that recipients of transfers are made better off by the cash value of the transfers they receive. The effects of programme conditionality through tax back and other arrangements are ignored, as is the impact of transfers on high and low skill wage differentials through induced low wage labour withdrawal from the market.

The role of programme conditionality in affecting participation decisions can be analysed as a regime choice problem. If p and w denote the consumption good price and the wage rate, and if the household indirect utility function evaluated at given benefit and tax-back levels is U_B, and with no benefits and no tax back is U_{NB}, then if

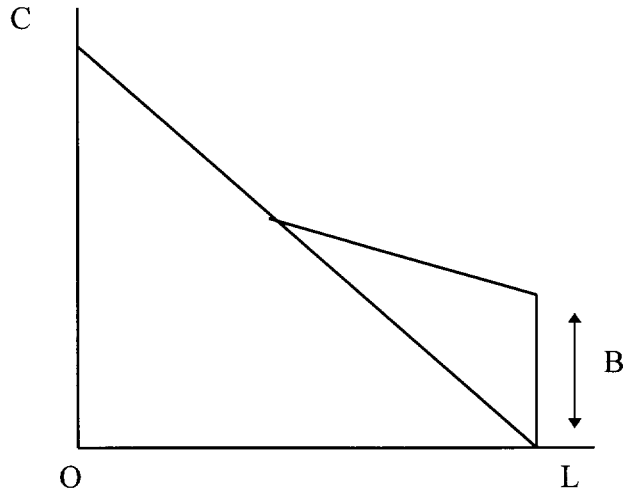
$$U_B(p,w) > U_{NB}(p,w) \qquad (1)$$

the household participates in the benefit programme. However, the value to the household of participation is a money metric measure of the difference (U_B - U_{NB}), not the level of cash benefits actually received. The marginal real income gain from an increase in benefits where the benefit level B increases to B', may be closely related to the benefit change. In the homothetic case, the money metric measure of the real income gain from transfers increases by (B'-B) assuming the household participates in the programme at a benefit level B.

These features of conditional transfer programmes are illustrated in Figures 1 and 2. In Figure 1 the household decides its consumption/leisure choice given a fixed wage, w, but is also offered participation in a transfer programme which pays a fixed benefit B, but taxes any additional labour income at some (typically high) tax back rate, t_B. The budget set for the household in the presence of these features is no longer convex, being given by the intersection of the no transfer budget and the with transfer budget constraint.

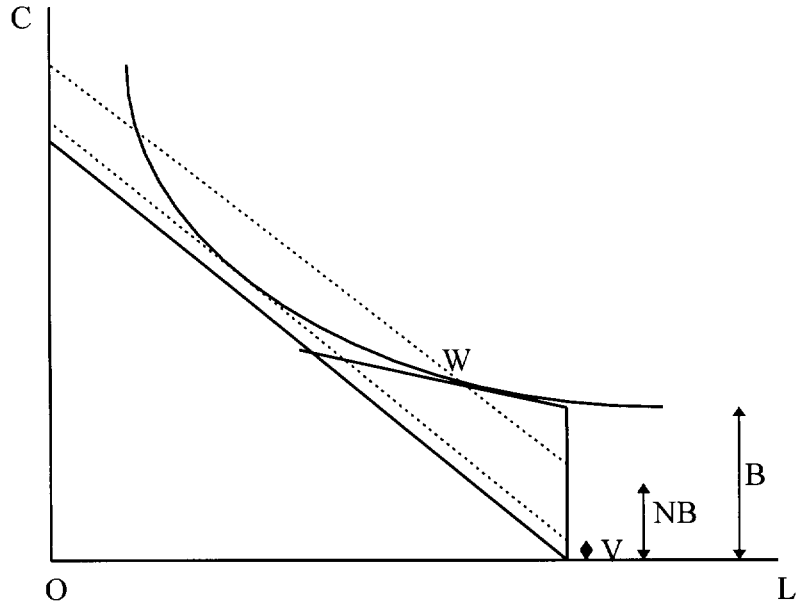
In Figure 2 the household participates in the transfer programme receiving B, but faces a tax back rate on additonal labour income to yield a net benefit of NB, and consuming at point W. The utility value of programme participation is, however, smaller than NB because the point of comparison is utility in the no benefit - no tax back regime. In money metric terms, participating in the transfer programme yields a gain of V rather than NB. Studies of the redistributive effects of transfers which show households as gaining from transfers by the amount of cash received (receiving NB on a net basis) overestimate their redistributive effect, since, in utility terms, the household receives a smaller real benefit from participating in the programme. In the extreme case where the household is indifferent between participating and not participating, but chooses to participate, there would be no gain despite the disbursement of funds involved.

Figure 1
Non-Convex Budget Set in the Presence of Conditional Transfers



C = Consumption
L = Leisure
B = Transfer

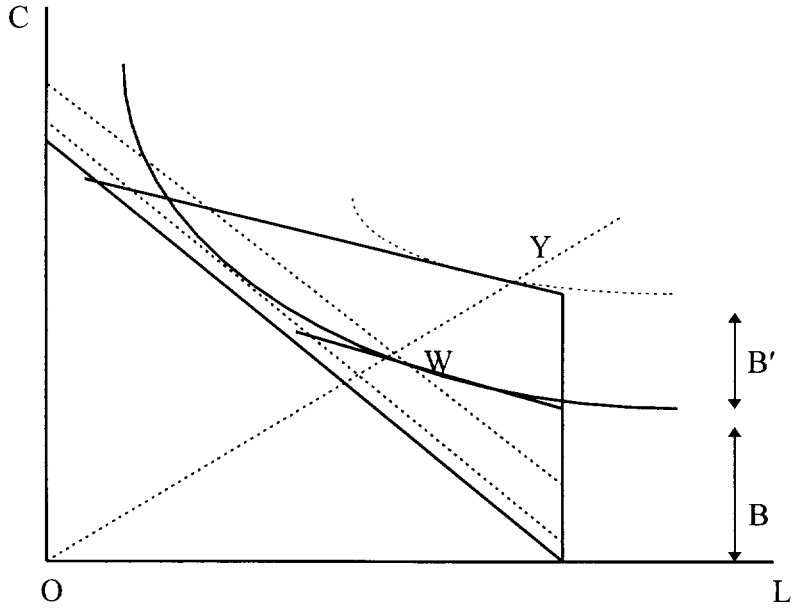
Figure 2
Participation Choice and the Value of Conditional Transfers



W = Consumption / Leisure point under programme participation
B = Benefit paid
NB = Net benefit paid (after tax back)
V = Money metric measure of the value of participation in transfer / tax back scheme

Figure 3

The Impact of an Increase in Transfers



B = Original transfer
B″ = Increase
W = Original equilibrium point for transfer recipients
Y = Equilibrium with additional transfers, B″

Figure 3 illustrates the impact of an increase in transfers. Conditional on participating in the transfer programme, if the household were to receive an increase B″ in benefits under the programme, and if preferences were homothetic, consumption would move along a radial expansion from the origin from W to Y. Real income would also increase by B″, and at the margin, the real income gain would equal the incremental transfer. Thus, the marginal and average value of transfers to recipients differ. Conditional upon participating in a transfer programme, the real value of an additional transfers equals their cash equivalent but the average

value of all transfers received will be below their cash value, because of the tax back features of these programmes.

The discussion above implicitly adopts the partial equilibrium assumpion that wage rates for transfer recipients remain unaffected by the introduction of transfer programmes. In the conditional choice general equilibrium model we use here to value the redistributive impacts of transfers, we do not incorporate such a fixed wage-price assumption since wage rates across the heterogenous labour types are endogenously determined. As participation occurs in transfer programmes, low wage labour withdraws from the marketplace bidding up low wage rates, and amplifying the redistributive effect of transfers..

Production in the economy involves a single output and heterogeneous labour inputs, profit maximizing behaviour yields labour demand functions by skill type, and wage rates by skill type will be endogenously determined. Conditional transfers result in the withdrawal of low skilled labour from the market relative to the no transfer programme regime and the supply function of low skilled labour shifts. Conditional transfer programmes thus have the further effect in the model of raising the wage rate of low skilled labour through conditionality induced labour withdrawal from the market place. This effect also plays an important role determining the distributional impact of transfer programmes.

2.2 A Conditional Choice General Equilibrium Model

We use a general equilibrium model with both transfer and no-transfer regime choice by households and endogenous wage determination by skill type. We are able to solve the model both where transfers are present and where they are absent, numerically solving the model in each case. This allows both for a comparison of the redistributive effects of transfer programmes between conventional analyses and those based on the modelling approach used here, as well as further analyses of average and marginal redistributive effects of transfers.

Essentially, we develop our conditional choice general equilibrium model as an extension standard general equilibrium tax model set out in Shoven and Whalley (1973, 1992). The main departure from the traditional model is that with non-convex budget sets, household demand functions, including those derived from conventional functional forms such as CES or Cobb-Douglas are no longer analytic. Demands thus need to be solved numerically, and embedded within the larger equilibrium problem, rather than analytically as is usually done using household optimization sub models. We use GAMS optimization code for this purpose, with solutions of household optimisation sub models communicating with the master economy wide equilibrium formulation, which includes production. The production modelling explicitly incorporates labour input heterogeneity.

The implications of non-linear budget constraints for the estimation of labour supply elasticities have been extensively discussed in the literature (see Hausman (1981), and Heckman (1978)), but little attention has been given to the impacts of non-convex budget sets on the

welfare and redistributive impacts of transfer programmes. These pose the special problems of potentially multiple solutions to household optimization problems, discontinuities in responses to wage rates and transfer programme characteristics as households change regimes, and local rather than global optima being found by numerical optimisation packages used in any simulation analysis.

More concretely, using the two household (high wage and low wage) case for illustrative purposes, we consider a single commodity (consumption good) and two labour (leisure) types. Distorting income taxes collected from the high wage household finance transfers to the low wage household. In the presence of a household income tax at rate t_1, a transfer programme with eligible benefits B; and a tax back rate of t_2 (significantly higher than t_1), demand functions for the consumption good are obtained by solving an optimization problem for each household (ie. for each of the high and low wage types). These optimization problems can be written as

$$Max\ U_i(C_i, L_i); \qquad i = (H,L) \tag{2}$$

subject to

$$P_c C_i = \max\left[\{I_i - w_i(1-t_1)L_i + R_i\}, \{I_i - w_i(1-t_2)L_i + B_i + R_i\}\right]$$

where C_i and L_i are consumption of goods and leisure by household i, P_c is the price of the consumption good, I_i is household income, and w_i is the wage rate applying to the labour type i, which in, turn is specific to the i th household type. R_i defines that portion of aggregate tax revenues (net of transfers) that are redistributed to household i. In the determination of household demands these are taken as parametric; but in equilibrium, when summed across

households, these must equal the revenues actually collected by the government. These household utility maximization problems mirror those represented by Figure 2, with choice between two regimes entering for each household.

We represent production in our model though a production frontier defined over the consumption goods and the two types of leisure. This formulation is computationally simpler to use than an aggregate production function with labour inputs and explicit labour endowments by household types, and implies an implicit production function.. Under this production frontier approach, parameters of preferences and technology jointly imply wage-leisure consumption elasticities, with point estimates of these elasticities at the benchmark equilibrium used in calibrating the model specification we employ. The model parameters which generate these elasticities can in turn be related to literature based labour supply elasticities.

This frontier is written in implicit form as

$$F(C, L_H, L_L) = 0 \tag{3}$$

where

$$C = C_H + C_L \tag{4}$$

and C denotes aggregate consumption, and C_H, C_L, L_H, and L_L denote the good consumption and leisure consumption respectively of the high and low wage (skill) households. We use CES functions to represent household preferences (2), and CET functions to represent the production frontier (4).

Household (non-transfer) income I_i take the form of shares in aggregate economy wide income which exhaust the value of production (of C, L_H, and L_L) along the frontier i.e.

$$I_H = a_H I \; ; \; I_L = a_L I \; ; \quad a_H + a_L = 1 \; ; \qquad a_H, a_L \geq 0 \tag{5}$$

and on the expenditure side

$$I = P_c C + w_H L_H + w_L L_L \tag{6}$$

where I is the value of production at producers prices, and defines a factor cost economy wide budget constraint. Explicit labour income taxes, or tax back rates accompanying the transfer programme, affect the consumption prices of leisure on the expenditure side of the budget constraint (6).

In this equilibrium structure, household budget sets are non convex and optimizing behaviour cannot be represented by a series of first order conditions from utility maximization. Household optimization problems therefore have to be solved numerically to yield household demands, and a separate numerical evaluation is needed at each step of the equilibrium computational procedure in which prices are revised. We use the GAMS (Generalised Algebraic Modelling System (Brooke, Kendrick, and Meeraus (1988))) optimization software for this purpose, since this is now widely used by equilibrium modelers, and is thought to be the most suitable optimization code available. Because of the non-convexities in the household budget sets, at any computed equilibrium we also check optimizing outcomes for each household in both regimes, in order to confirm that a global rather than a local solution to each sub optimization problem has been found.

Set up in this way, tax rates (income and tax back rates) can be exogenous in the model as in the original Shoven-Whalley formulation, and the revenues (net of expenditures on transfer programmes) dispersed to households endogenously determined. Alternatively, R can be set exogenously, and the income tax rates endogenously determined (with the tax back rates exogenous) to meet a given net of transfer revenue requirement. An R=0 case is where income taxes raised from non transfer participants exactly finance transfers dispersed.

Wage rates in this formulation are given by

$$w_H = \frac{\partial F / \partial L_H}{\partial F / \partial C}; w_L = \frac{\partial F / \partial L_L}{\partial F / \partial C} \tag{7}$$

and are endogenously determined. If the production frontier for the economy is non-linear (as is typically the case) wage rates by skill type vary as transfer programme characteristics change.

In equilibrium, the goods price and wage rates are endogenously determined such that the goods market clears (equation (4)), and the solutions to the (non-analytic) optimization problems, (2) for each household, yields solutions L_L^*, L_H^* which correspond to the solutions for L_L and L_H implied by the first order conditions (7) to the production frontier (3).

In equilibrium, government budget balance must hold. This can be written in this case as

$$\sum_{i=H,L} B_i N_i + \sum_{i=H,L} R_i = \sum_{i=H,L} (1 - N_i) \frac{t_1}{1 - t_1} C_i + \sum_{i=H,L} N_i \frac{t_2}{1 - t_2} C_2 \tag{8}$$

where N_i is an index for household i, which takes the value 1 if household i participates in the conditional transfer programme and 0 otherwise. The first right hand side term reflects income taxes at a rate t_1 on household income which are here applied to goods consumption (income tax collection); this is collected from non benefit programme participants. The second term denotes revenues from tax backs at a rate t_2 applied to transfer program participant households. This is collected from non benefit programme participants.

This model can be used in counterfactual equilibrium mode as set out in Shoven and Whalley (1973), first with calibration of the model structure to a base case equilibrium, followed by counterfactual equilibrium computation under a change in model specification (such as the level at which benefits are paid). Calibration also provides for a test of the model's ability to replicate the base case equilibrium. These procedures enable equilibria with and without benefits to be compared, and calculations made of the redistributive effects of transfers.

2.3 A Simple Numerical Example

In Table 1 we provide a small dimensional example using the model set out above, which we have used to evaluate the redistributive effects of conditional transfer. The parameter values and functional forms we use in this case are illustrative rather than realistic, but nonetheless serve to illustrate both how the model can be applied and underline the central theme of the paper.

Tables 2 and 3 report model equilibria in the presence and the absence of transfers. Prices, goods consumption, leisure consumption, taxes and benefits, and welfare are all displayed. Table 3 indicates that if transfers are abolished, the high wage household gains because taxes are no longer paid to finance transfers, and the low wage group loses. However, losses in real income for the low wage are only one quarter of the cash transfers which terminate with the elimination of the transfer programme. The evaluation of programme impact implied by these model results thus differs sharply from that from a more conventional calculation which simply measures cash benefits paid and nets out taxes collected through tax back arrangements, with the net payment taken as the benefit to the transfer recipient.

Table 1

A Simple Numerical Example Illustrating the Evaluation of the Redistributive Effects of Transfer Programmes Using Conditional Choice General Equilibrium Models.

1. No. of Labour Types:	2 (High and Low Wage)
2. Preferences:	CES with shares 0.4, 0.6 on consumption/leisure for low wage with shares 0.6, 0.4 on consumption/leisure for high wage with substitution elasticities 0.5 for low wage, 0.5 for high wage
3. Production:	CET Transformation Frontier with share parameters of 0.2, 0.4, 0.4 on consumption, and low and high wage leisure. Substitution elasticity in production set at -1.25. The unit term in the CES function (which controls the position of the frontier) is set at 200.
4. Tax Rates:	Income tax rates 0.3 for high wage and 0.2 for low wage Benefit tax back rate 0.8 for both households.
5. Benefit Levels:	20 for the low wage worker who participates in the transfer programme in the with benefit case).
6. Revenue distribution	Each household receives 1/2 of net revenues (tax revenues less transfers paid) as a lump sum redistribution

Table 2

Model Equilibria With and Without Conditional Transfer Programmes for the Numerical Example Specified in Table 1

1. Equilibrium in the Presence of Transfer Programme				
A. Prices:	consumption good high wage leisure low wage leisure	0.78 0.87 0.13	B. Regime Choice	high wage does not participate in transfer programme. low wage participates in transfers programme
B. Consumption:	consumption by high wage leisure of high wage consumption by low wage leisure of low wage	54.22 38.67 43.85 65.78	D. Taxes/Transfer:	Total Tax Revenues Collected 41.89 Transfers Paid 20.00 Net Tax Revenue Redistributed 21.89
C. Welfare:	utility high wage utility low wage	92.38 10.96		
2. Equilibrium in the Absence of Transfer Programme				
A. Prices:	consumption good high wage low wage	0.82 0.99 0.12	B. Consumption:	consumption by high wage 62.52 leisure of high wage 43.55 consumption by low wage 37.95 leisure of low wage 54.92
C. Welfare:	utility high wage utility low wage	105.90 9.28	D. Taxes/Transfer:	Total Tax Revenues Collected 29.89 Transfer Paid 0.00 Net Tax Revenue Redistributed 29.89

Table 3

Comparing Model Based and Conventional Evaluations of the Redistributive Effect s of Transfer Programmes Using the Example from Table 1

1. Model Evaluation of the Effects of Eliminating Transfers Programme

	HighWage Household	Low Wage Household	Sum Over Households
Hicksian EV	6.20	-5.31	0.83
Hicksian CV	-6.46	5.66	-0.79
Wage Rate Changes under programme elimination	High/Low Wage Rate Ratio Before Benefit Elimination	6.59	
	High/Low Wage Rate Ratio After Benefit Elimination	8.36	

2. Conventional Evaluation of Redistributive Impact of Transfers

Gross Cash Benefits received under programme by low wage household	20.00
Taxes paid by low wage household through tax back	3.18
Net benefit received by low wage household	16.82

3. Ratio of welfare loss to low wage from transfer elimination to loss in net cash benefit 0.316

3.0 AN ASSESSMENT OF THE REDISTRIBUTIVE EFFECTS OF GOVERNMENT TRANSFERS IN THE UK

We have also used the framework set out above to investigate the implications of our conditional choice general equilibrium model for more empirically based assessments of the redistributive impacts of tax financed government transfer programmes. We base our analysis on data produced annually by the UK Statistical Office (Office of National Statistics, ONS), and published in Economic Trends. In this, taxes paid and benefits received from both real government expenditures and transfers are allocated to deciles of the household population. We use the data for 1994/95 (the latest available such analysis (Economic Trends, 1996)) as the starting point for an analysis of the redistributive effects of transfers using the conditional choice general equilibrium framework set out above.

We take this data as representative of a base case economy wide equilibrium to which we calibrate a ten household model, reflecting the UK household decile groups used in the ONS data. We use data on non-retirees only to avoid including in our analyses redistribution through public pensions for which there is no endogenoulsy determined participation decision. We perform similar counter factual analyses to those reported for the numerical example above, including removal of and incremental increases in transfers. In so doing, we incorporate literature estimates on benefit tax back rates, and labour supply (leisure demand) and labour demand (leisure supply) elasticities.

3.1 Base Case Data

Our base data is for the UK tax year 1994/95 as published by Economic Trends (1996) which reports data for non retired households grouped by income decile[5]. This data source also reports components of income, benefits, and taxes for each household decile. These are grouped under broad headings, with the constituent elements for each displayed, in Table 4.

We use components of this dataset by decile to construct a model admissible data set for an analysis of the redistributive effects of transfers in the UK incorporating endogenous participation decisions. Original income in this data is taken as the value of non-leisure production in the model admissible data set; non-contributory benefits give net benefits paid to households in the base year; benefits in kind plus contributory scheme benefits are summed to yield non conditional benefit related transfers which are recycled to households in lump sum form. We separate direct taxes, which can be avoided by not working (i.e. consuming leisure), from indirect taxes which must still be paid on transfer financed consumption, even if the household does not work.

To yield a model admissible data set as a base case model representation for calibration purposes, a series of further adjustments are made to the base case data in Table 4;

[5] The income concept used in the published data is equivalized disposable income.

Table 4[6]

Base Case1994/95 UK data for Household Deciles on Household Incomes, Taxes, and Transfers in £ /Year Per Household

Decile House-holds	Original income[7]	Noncon-tributory Benefits[8]	Direct Cash Benefits[9]	Direct Tax[10]	Indirect Tax[11]	In Kind Transfers[12]	Earnings per week[13]	Working weeks[14]	Value of Leisure[15]	Total Income[16]	Consum ption[17]
Poorest H1	2149	4525	469	930	2139	4647	160	13	14491	16640	13246
H2	4724	4866	782	1194	2183	4007	210	23	17085	21809	15868
H3	9141	3510	963	1880	2759	3765	223	41	14076	23217	16250
H4	13296	2745	746	2815	3213	3561	243	55	11934	25230	17065
H5	17353	2027	704	2831	3572	3266	272	64	10895	28248	18974
H6	21416	1653	603	4745	3957	3276	306	70	10455	31871	19899
H7	24609	1348	522	5531	4266	2755	355	69	12293	36902	20785
H8	28038	1037	447	6576	4362	2304	403	70	13895	41933	21925
H9	33743	788	386	8175	4537	2189	473	84	8190	41933	25182
Richest H10	49549	778	301	15082	5551	1826	543	91	6871	56420	31831

Source: Based on Table 3A (Appendix 1) of Economic Trends, 1995/96, p. 36, and authors' own calculations.

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[6] This table is derived from Table 3A (Appendix 1) of Economic Trends, 1995/96, p. 36.

[7] Original income includes wages and salaries, imputed income from benefits in kind, self-employment income, occupational pensions, annuities and other income.

[8] Non-contributory benefits include income support, child benefit, housing benefit, invalid care allowances, attendance allowance, disability living allowance, industrial injury disablement benefit, student maintenance awards, government training schemes, family credit and other non-contributory benefits.

[9] Direct cash benefit consists of contributory retirement pension, unemployment benefit, invalidity pension and allowance, sickness and industrial injury benefit, widow's benefits, statutory maternity pay/allowance, Christmas bonus for pensioners.

[10] Direct taxes include employees' national insurance (NI) contributions.

[11] Indirect taxes includes taxes on final goods and services, VAT, duty on tobacco, beer and cider, wines and spirits, hydrocarbon oils, vehicle excise duty, TV licences, stamp duty on house purchase, customs duties, betting taxes, fossil fuel levy, Camelot national lottery fund. It also includes intermediate taxes such as commercial and industrial rates, employer's NI contributions, duty on hydrocarbon oils, vehicle excise and other duties.

[12] Benefits in kind consists of education, national health service, housing subsidy, rail travel subsidy, bus travel subsidy, school meals and welfare milk.

[13] Earnings per week for top and bottom deciles, and first and third quartiles are taken from the New Earnings Survey 1995. These are interpolated for other deciles.

[14] Working weeks are derived by dividing the original income by the weekly earnings.

[15] The value of leisure is obtained by multiplying non-working weeks by the weekly earnings rate. The number of non-working weeks is the difference between the working weeks and 104 weeks, which represents the total labour endowment per household with two working members.

[16] Original income plus the value of leisure gives the total income of the economy.

[17] Consumption for a household is derived by adding cash, in kind and non-contributory benefits to original income and subtracting the direct and indirect taxes paid by the household.

(i) **government budget balance:** Government budget balance does not hold in the base 1994/95 data available form UK government sources, while this is a property of equilibrium in the model. To have budget balance hold in the model we proportionately scale all taxes across all deciles in the unadjusted base case data so that this is the case. This is one of several scaling adjustments that could be used to satisfy this element of model admissibility.

(ii) **Netting out benefits and income taxes:** In our model representation, households receiving benefits (net of tax back) cannot pay personal income taxes in addition to paying the tax back on benefits. But in the unadjusted data for 1994/95, coexisting income tax payments and transfer receipts occur because each decile consists of an aggregation across different households within the cell. We net out these receipts and payments within a cell, so that each household decile is either a net payer of income taxes, or a net recipient of benefits. After this netting out, 3 out of 10 household groups receive net benefits in the data used in the model; while 7 out of 10 household groups are net payers of income taxes.

(iii) **Setting model tax rates:** We calculate both income and indirect tax rates by decile using unadjusted raw data, assuming that average and marginal tax rates for any household within a decile grouping are the same for all households within that decile. We set model tax back rates on additional labour income for the transfer recipients at 80 %. This is lower than the combined 75% withdrawal rate on income support and 20% rate on housing benefit that apply in the UK. In reality, and as Dilnot and Duncan (1992) document, tax back rates vary significantly across

households, depending upon household characteristics and on how both programmes and income sources interact. We abstract from these complications here by setting a common tax back rate in the model across all household deciles receiving transfers.

(iv) **Adding leisure consumption:** To incorporate leisure consumption into the base case data used in the model, we use UK time use survey data reported in Dex (1996). This data does not have clear time use information by income range, and we supplement this source with alternative information on hours of work data by decile. The use of these data are reported on in Table 4, and the associated footnotes (footnote 14, in particular), while table 5 reports the calibrated model parameters.[18]

Table 5
Calibrated consumption and production parameters in the presence of taxes

Household Deciles	Share parameters on consumption (α_C)	Share parameters on leisure (α_L)	Income tax rates	Share parameters on PPF
Bottom decile	0.310	0.690	0.000	0.084
Next to Bottom decile	0.351	0.649	0.000	0.073
Third decile	0.448	0.552	0.000	0.087
Fourth decile	0.552	0.448	0.187	0.100
Fifth decile	0.616	0.384	0.205	0.108
Sixth decile	0.647	0.353	0.279	0.112
Seventh decile	0.625	0.375	0.303	0.097
Eighth decile	0.614	0.386	0.322	0.088
Second highest decile	0.627	0.373	0.328	0.080
Top decile	0.849	0.151	0.341	0.161

[18] The changes in share parameters for the top decile reflect the large capital income which accrues to this group.

(v) **Elasticities:** The two key elasticity parameters in the model are substitution elasticities in consumption (CES preferences) and production (CET production frontier). We calibrate values of these elasticities so as to be consistent with implied literature values of labour supply (and hence leisure demand elasticities) used in household CES preferences. Literature on labour demand elasticities are used in selecting our specifications of elasticities for the CET frontier. We use Killingsworth (1983) as our main source of labour supply elasticities, and Hammermesh (1988) for labour demand elasticities.

3.2 Model Results

Using both the model and the constructed model admissible microconsistent data set, we are able to perform similar experiments to those undertaken for the simple numerical example reported on earlier. The results, reported on in Table 6, confirm the themes suggested by both the line of argument of the paper and our earlier numerical examples, namely that valuing the redistributive effects of transfers in terms of their cash value to recipients is misleading. For the bottom decile of UK households, the loss in real income when all benefits are eliminated is only 32% of the value of net cash transfers withdrawn. For the second and third deciles, the losses are again smaller than their cash value; between 35 and 55% of net cash benefits forgone. On average, the real value of transfers to transfer recipients in the UK is less than 38% of their cash value. These results reinforce the earlier observation that the appropriate reference point for the valuation of the benefit of transfers to recipients is their reservation utility in the no transfer receipt regime.

Table 6

Evaluation of the Redistributive Impact of Transfers Using a Ten Decile Conditional Choice Household General Equilibrium Model Calibrated to 1994/95 UK Data

	Net cash benefits received by household decile in £/household per year.	Hicksian EV (real income loss or gain) under elimination of benefits in £/household per year.	Ratio of real income loss to loss of cash benefit under elimination of benefits
Bottom decile	4072	-1301.7	0.320
Next to Bottom decile	4278	-1602.2	0.375
Third decile	2099	-1108.0	0.528
Fourth decile	0	1562.9	-
Fifth decile	0	2381.0	-
Sixth decile	0	4168.6	-
Seventh decile	0	4836.1	-
Eighth decile	0	5576.0	-
Second highest decile	0	6868.5	-
Top decile	0	15797.2	-

Given positive income elasticities for the demand for leisure by each houshold group, the net effect of transfers is to increase leisure consumption by lower income groups, lower labour supply by them, and increase their wage relative to higher wage groups. These effects are shown in Table 7.

Table 7

Wage Rates and Leisure Consumption in the Benefit and No-benefit Regimes

	Wage rate in benefit regime	Wage rate in no benefit regime	Change in the wage rate	Leisure in benefit regime, £	Leisure in no benefit regime, £	Change in leisure, £
Bottom decile	1.000	0.745	-0.255	11147	8683	-2464
Next to Bottom decile	1.000	0.774	-0.226	13142	10699	-2443
Third decile	1.000	0.840	-0.160	10828	9687	-1141
Fourth decile	1.000	0.999	-0.001	9180	10026	846
Fifth decile	1.000	1.020	0.020	8381	9378	997
Sixth decile	1.000	1.076	0.076	8082	9568	1486
Seventh decile	1.000	1.089	0.089	9456	11408	1952
Eighth decile	1.000	1.101	0.101	10688	13053	2365
Second highest decile	1.000	1.107	0.107	11883	14598	2715
Top decile	1.000	1.135	0.135	6871	7686	815

At the margin, increases in transfers yield increases in real income which are magnified by the induced wage rate increases for the lower deciles as withdrawal of additional labour income occurs. Our results imply that the money metric marginal value for an extra one pounds of transfers to the lower decile is about 1.49 pounds, reflecting the marginal wage rate effect highlighted by Table 7.

4.0 CONCLUSION

This paper is based on the simple observation that when evaluating the redistributive effects of transfers it is the real income equivalent of transfers to recipients that is relevant, and this typically is less than their cash value. Because of conditionality in transfer programmes, households face a choice between receiving transfers with a tax back scheme on additional labour income, and non participation with no tax back. The reference point when evaluating the redistributive effects of transfers is thus the utility level in the no transfer regime. For a household indifferent between participating and not participating in such programmes, the value of such transfers is zero, even if participation by them involves receipt of cash. Typically, attaching a tax back scheme to a transfer mechanism will lower the real value of transfers to the recipient.

In the paper, we report numerical examples and an empirical implementation of a conditional choice general equilibrium model using 1994/95 UK data. Results from both of these clearly show that the conventional belief that transfer recipients are made better off through transfer programmes by the cash transfer received does no hold. For this UK data, a conditional general equilibrium model suggests that real gains to transfer recipients in the bottom decile of households may be no more than 32% of cash transfers received. We also show that general equilibrium effects from changes in transfer programmes come into play, reflecting induced low wage labour withdrawal attributable to tax back schemes. These effects compound with the conditionality related effects noted above in modifying the redistribution

attributable to transfers. From what we can discern, both of the effects we emphasize in the paper appear to be neglected in current literature on the evaluation of the redistributive effects of transfer programmes; a reconsideration of what these programmes actually accomplish on the redistributive side seems to us to be called for.

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