IZA Journal of Labor Economics
a SpringerOpen Journal

ORIGINAL ARTICLE Open Access

The labour supply effects of a partial cash-out of in-kind transfers to single mothers

Paul Bingley[1] and Ian Walker[2*]

* Correspondence:
ian.walker@lancaster.ac.uk
[2]Lancaster University Management School, Lancaster LA1 4YX, UK
Full list of author information is available at the end of the article

Abstract: We estimate a model of labour supply and participation in multiple cash and in-kind welfare programmes. The modeling exploits a reform that affected U.K. single mothers. In-work cash entitlements increased under this reform but eligibility to in-kind child nutrition programmes was lost for some households. When we allow for differences in the costs associated with each welfare programme we find that in-work cash and in-work in-kind transfers both have large positive labour supply effects. There is, however, a utility loss from programme participation which is estimated to be *larger* for the cash programme than for the child nutrition programmes. Our findings imply that the partial cash out of the in-kind transfers *reduced* labour supply and suggest that there may be a place in policy portfolios for in-kind programmes despite their "inefficiency".

JEL Codes: C31, C35, D12, J22

Keywords: Labour supply, Programme participation, In-kind transfers

1. Introduction

This paper is concerned with the effects of cash and in-kind transfers on labour supply where there are costs associated with the receipt of such transfers. In-kind transfers are widespread and extensive: housing, childcare and nutrition are commonly provided in this way. However, despite their widespread use there is very little empirical evidence that addresses the effects of in-kind transfers on labour supply. This is in stark contrast to the wealth of evidence on the labour supply effects of means-tested cash transfer programmes.

An important attribute of means-tested programmes is that participation in them is seldom 100% of the eligible population because of the costs associated with claiming and/or receiving the transfers. These costs may be real (transactions costs) or psychic (in the form of stigma), and there may be informational deficiencies that also contribute to this problem. The costs may be fixed (i.e. independent of the level of eligibility) or variable. In any event, programme participation is liable to depend on the level of entitlement and it seems likely that this applies to both cash and in-kind transfers.

In practice, cash transfer programmes are often supplemented by in-kind transfers. Yet it is often thought that cash is preferable to in-kind transfers on theoretical grounds. Thus, conventional wisdom has it that cashing out an in-kind programme would raise the welfare of recipients. It follows that cashing out an in-work in-kind transfer programme ought to make work more attractive. However, means-tested transfer programmes impose costs on recipients and the key to understanding why the

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conventional wisdom is not necessarily true is to realize that the alternative to inefficient in-kind transfers is not cash, but some other programme that gives cash which has some costs associated with it.

The objective of this paper is to measure the effect of in-kind transfers on labour supply, relative to cash transfers, allowing for transfer programme non-participation. We do so by exploiting the observed variation in labour supply of single mothers in cross-section survey data that is pooled across a number of years that bridge an important reform to the UK welfare system. The contribution of this paper is that we allow for differential costs associated with different programmes. In particular, unlike the existing literature on U.S. food stamps, we do not impose any restriction on the costs associated with in-kind programmes compared to cash programmes. Our results suggest that, although there is considerable inefficiency with in-kind transfers, participation in cash transfers can impose even greater costs than the in-kind programmes that we consider here. Thus, our findings support the idea that in-kind transfers could have an important place in the portfolio of policy options.

We model the effect on labour supply of several transfer programmes relevant to single mothers in the U.K.: Family Credit is an in-work cash transfer; Income Support is out-of-work cash; Housing Benefit for those with high housing costs and low income; Welfare Milk Tokens for low income families with pre-school age children; and Free School Lunches for children of school age in low income families. We exploit a 1988 reform to Family Credit where cash was increased but conditional eligibility to Welfare Milk Tokens and Free School Lunch was lost.

Here, we adopt structural assumptions on preferences to allow us to identify the costs, *borne by the single mother*, associated with each transfer programme and so enable us break down the effects of the 1988 reform into those due to changes in cash programme entitlement levels and those due to changes in the in-kind programme eligibility rules. Our structural model has two advantages over and above a strictly reduced form approach, such as difference-in-differences, which would only enable us to describe the gross effects of the reform. First, we are able to quantify the costs associated with participating in different welfare programmes. Secondly, we can compare the sensitivity of behaviour to variations in earned income across labour market states with responses to variations in each form of welfare programme income. This allows us estimate the relative work incentive effects of cash versus in-kind transfers.

2. Literature

The existing literature on the effects of in-kind transfers on labour supply is sparse, despite the heavy expenditures that are devoted to such transfers. Several of the published papers that are directly concerned with this issue follow Moffitt (1983) and adopt a structural approach to estimation: Fraker and Moffitt (1988) and Keane and Moffitt (1998) investigate single mothers, while Hagstrom (1996) considers the effects on the labour supplies of married couples. Such structural modeling makes explicit assumptions about the nature of preferences and identifies preference parameters from variations in budget constraints across households. Each of these papers adopts discrete choice modeling approaches to labour supply but effectively impose the assumption that in-kind transfers are equivalent to cash. In addition, most studies assume that

labour supply choices can be "ordered" in the sense that a fall in the preference for leisure implies that the individual's choice of labour supply status would rise monotonically. The implication of this ordering assumption is that if full-time work is preferred to non-participation, then so too is part-time work. As a result, it is not necessary to make utility comparisons between all possible alternatives, only adjacent ones. However, if budget constraints contain non-convexities, as is most often the case for single mothers, a fall in a preference for leisure might result in an individual switching from non-participation to full-time work rather than to part-time work.

All recent static labour supply and programme participation research, for example by Keane and Moffitt (1998), Hoynes (1996), and Brewer *et al.* (2007), adopt a discrete choice approach. The first paper uses an ordered probit Random Utility Model. Hoynes (1996) and later work estimates multinomial logit models and relaxes the Independence of Irrelevant Alternatives restriction by including an additive stochastic term in the utility associated with each possible choice. Hoynes (1996) considers participation in a single programme (AFDC-Unemployed Parents) together with husband and wife discrete choice labour supply.

The structural papers which consider food stamps find that they have small and insignificant negative effects on labour supplies. [1] In contrast, a recent paper, by Hoynes and Schanzenbach (2007), which is concerned exclusively with food stamps, exploits the staggered introduction of the programme across U.S. counties to estimate its effect using a difference-in-differences methodology. They use the U.S. Panel Study of Income Dynamics to estimate the effects on hours of work and participation and they find economically large, but statistically insignificant, negative effects on the probabilities of labour force participation. They go on to use the Census data and find economically small, but statistically significant, negative effects.

Most recently, Manchester and Mumford (2011) develop a structural model of labour supply and welfare programme participation that they use to estimate the costs associated with participating in two US in-kind programmes using a sample of single mothers. They provide estimates of the fixed costs of participating in each programme separate from the marginal cost for each programme. They find large implied psychological costs to both programmes. Identification in their model comes entirely from the structure that they impose and the non-linear budget constraints that individuals face in their single cross section of data. Our own work parallels this recent US research in several ways but we exploit variation in the budget constraint across pooled cross sections that is driven by an important reform for identification.

3. Transfer programmes in the U.K.

Income Support is intended to ensure that household incomes do not fall below some minimum and so is effectively an out-of-work cash transfer programme. For single parents eligibility to Income Support does not require them to be available or searching for work: that is Income Support was paid to single parents who were labour market non-participants as well as those declaring themselves to be unemployed. Entitlement to Income Support depends on the number and ages of children and it imposes a 100% implicit tax rate on all sources of household income above some minimal level of earnings. Family Credit was payable to low income families but only if hours of work exceed

some level (24 hours over the period of our analysis). Housing Benefit covers a proportion of the rent and rates (a local property tax) dependent on income and is something of a hybrid between cash and in-kind because it was typically paid in cash but with notional hypothecation. Apart from Housing Benefit, the other main means-tested *in-kind* transfers are for low income households with children. Free School Lunches are an in-kind transfer to households with school-aged children. Welfare Milk Tokens are an in-kind transfer to households with pre-school children[2]. Welfare Milk Tokens were available for each child under age 5, and could be exchanged for a pint of milk a day. Free School Lunches were available for each school-aged child during school days. Hereafter Free School Lunches and Welfare Milk Tokens together are denoted child nutrition programmes. We choose to group the two nutrition transfers together because they are similar in nature, they are targeted at children, and are both reformed together. Identification of their separate effects would have to rely on subsets of households with either only pre-school children (for milk) or only school age children (for free school lunches). These subsets would be too small to allow for precise estimation.

While Income Support has an unambiguously negative effect on work incentives, Family Credit exhibits a notch in the budget constraint, at the minimum level of hours for eligibility, which increases the probability of working this level of hours (although, because Family Credit is means tested, it may act as a disincentive to working longer hours). Prior to the 1988 reform both Income Support and Family Credit recipients were eligible for child nutrition programmes. Post-reform only Income Support participants were entitled, whereas Family Credit participants received cash but no child nutrition programme eligibility. The 1988 reform also involved an expansion of Family Credit so that cash entitlement levels were typically higher by approximately two thirds: average awards were around £15 per week prior to the reform and £25 after.

To clarify the way in which Income Support, Family Credit, and the child nutrition programmes might affect labour supply, Figure 1 shows a characterization of a possible budget constraint – the precise shapes will depend on a variety of circumstances such **AS** rent, and the number and ages of children. We assume, for simplicity of illustration,

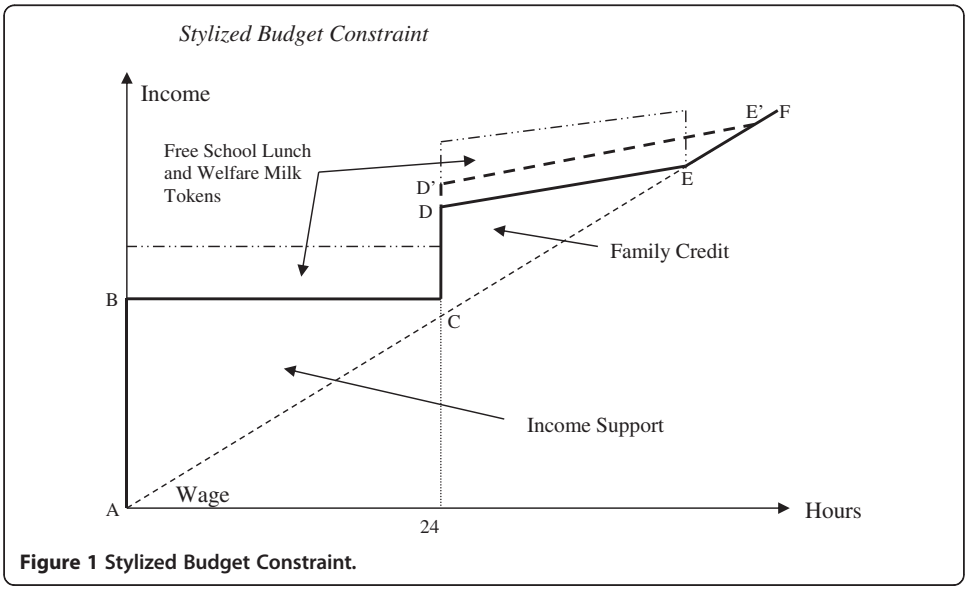


Figure 1 Stylized Budget Constraint.

that there is no Housing Benefit entitlement (i.e. this individual lives rent free or in owner occupied accommodation) and we ignore income taxation and social security contributions. The dashed line from the origin (A-F) represents the budget constraint in the absence of the welfare programmes, with slope equal to the wage rate. The bold line A-B-C-D-E-F is the budget constraint with cash transfers pre-reform. A-B is the level of Income Support entitlement at zero hours of work. B-C is flat because Income Support is means-tested with a withdrawal rate of 100%. When hours reach 24, Income Support entitlement ceases and Family Credit becomes payable with an entitlement given by the vertical distance C-D. As hours and earnings increase, Family Credit is withdrawn at 70% along D-E until entitlement is exhausted at point E. E-F is beyond the welfare system. Pre-reform Free School Lunches and Welfare Milk Tokens are associated with both Income Support and Family Credit and the monetary value of these are denoted by the dashed-dotted lines.

The reform affects both cash and in-kind transfers above 24 hours of work. The post-reform cash transfer budget line is denoted A-B-C-D'-E'-F. Changes to the cash budget line are given by the dashed line. Family Credit became somewhat more generous as denoted by C-D', and was withdrawn at 50% along D'-E'. Crucially, in-kind transfers were lost for those on Family Credit. The monetary value of this loss is denoted by the dashed-dotted line above 24 hours. In-kind transfers are now only associated with Income Support and the monetary value of this is unchanged and is denoted by the horizontal dashed-dotted line below 24 hours. Of course, in practice, Housing Benefit, income tax and social security contribution systems overlay this figure and causes additional complexities which we ignore in this stylized diagram. However the figure conveys the essential two elements of this in-work transfer reform: an increase in cash generosity and the loss of in-kind transfers above 24 hours.

Official figures based on Family Expenditure Survey (FES) data (see Department of Social Security (1993, 1998)) for single parent Family Credit programme participation in 1987 are not available although the total figure for couples and single parents together was 51% of eligible cases (so-called, caseload take-up). Earlier unofficial figures in Fry and Stark (1993) are similar. Subsequent Family Credit official statistics were based on the FES data pooled over successive pairs of years and the figure for 1990/91 (1991/1992) is 62% (66%). Comparable 1987 figures for Housing Benefit and Income Support are 69% and 95% respectively. Clearly Housing Benefit and Family Credit have a more serious "take-up" problem than Income Support, and this motivates our approach of modeling Family Credit and Housing Benefit programme participation but assuming Income Support entitlements are always received. There are no official figures for child nutrition programme participation.

Family Credit was a welfare programme and not part of the income tax system. Claiming Family Credit involved completing a (long and detailed) form every 6 months and verifying earnings by producing three consecutive monthly (or seven weekly) pay slips. Employers were contacted to verify that applicants met the minimum hours condition if that was not apparent from the pay slips. Asset information was also required but, at least for single parents, this usually involved no more than stating that one did not have financial assets which exceeded a specific large value.

Housing Benefit was complicated because it was administered by local government offices rather than the welfare authorities, each with slightly different claim procedures

and forms. Invariably the level of rent had to be verified but tenants usually had "rent books" or tenancy agreements that would serve this purpose. New applications had to be made whenever circumstances changed.

Claiming Income Support usually involved an interview at a local office of the Department of Social Security, where applicants were asked about their detailed circumstances and expected to produce substantiating documentation. Income Support for single mothers did not require that they were "available for work" so, unlike the case of the long-term unemployed, there was no requirement to "sign on" (periodically declare that one was available for work) at the local office of the Department for Employment. Income Support, Family Credit and (most of) Housing Benefit, at the time, were paid directly into a bank account or, for those without an account, by mailing a "giro" cheque that could be cashed at Post Offices.

In contrast, in-kind transfers, because they were conditional on cash benefit receipt, simply required that applicants complete a short form detailing the number and ages of their children and verify that they were in receipt of Income Support (or also Family Credit prior to the 1988 reform). Welfare Milk Tokens were small colored plastic disks which could be exchanged for milk in shops, or with doorstep delivery services, and authorized sellers were then reimbursed by the Department of Health. They were eventually replaced by books of vouchers. Over this period, schools maintained a list of Free School Lunch eligible children, and would issue them with lunch tickets each week. Ineligible children had to buy their tickets at school each week.

The major distinguishing feature of claiming cash programme entitlements is the high costs of claiming, as indicated above, compared to the small additional costs of claiming an associated in-kind transfer. Moreover, it seems likely that in the majority of cases the only agents who knew that individuals were receiving cash transfers were the recipients themselves and government officials, while knowledge of in-kind transfer receipt was potentially shared with local shop assistants, in the case of Welfare Milk Tokens, and with teachers and peers at school, in the case of Free School Lunches. It seems likely that non-participation in the cash programmes by those who were eligible was largely driven by imperfect information and the transaction costs of claiming. In contrast, it seems likely that in-kind transfers may have low value for the user, in addition to any stigma, but have relatively low information/transaction costs for the claimant. In the case of Free School Lunches it seems likely that the burden of any stigma is largely borne by the child. While we refer to stigma in what follows in principle we do not rely on this interpretation of the costs – our argument is that programmes may be differentially effective because of these costs, whatever their nature.

We allow programme participation to depend on the level of programme entitlements to capture the idea of "fixed cost stigma" in the terminology of Moffitt (1983). Moreover, our model does not require that we impose additive separability between labour supply and programme participation and it is this that allows us to capture "variable cost stigma".

4. Family expenditure survey data

Our data consist of 15 pooled cross-sections of the UK Family Expenditure Surveys (FES) from April 1978 to March 1992. [3] The FES is a continuous household survey that

records details of working behavior, earnings and other sources of income, and demographic information, as well as spending patterns. Over this period, the sample size is typically around seven thousand responding households and the response rate is around 70%. Our focus is on single mothers, that is, those living alone with their dependent children, because they are a major client group for welfare programmes in the UK and, in doing so, we abstract from intra-household distributional issues that would complicate any analysis of couples. Our sample of single mothers who are heads of household consists of 4527 observations from these 15 pooled cross-sections.

We compute eligibility and the level of entitlement from a very detailed routine that acknowledges all relevant features of the tax, welfare and social security contribution systems including in-kind transfers. [4] The labour supply data is the response to a question about "usual" weekly hours. [5] We divide the observed data into groups according to weekly hours of work as: unemployed (UE), defined as usual hours are less than 10 and economic position (labour market status) coded as "searching for work"; non-participants (NP), defined as having weekly hours of work less than 10 [6] and not searching for work; lower part-time (LPT) defined as an employee with weekly hours ranging from 10 to 19; higher part-time (HPT) are employees with weekly hours from 20 to 29; and full-time (FT) are employees with weekly hours 30+.

Our analysis centres on the expansion of Family Credit together with the loss of in-kind transfers in 1988 and Table 1 shows some summary statistics broken down by pre/post reform. There is a clear fall in positive hours from 41% to 32%. This would be consistent with child nutrition in-kind transfers having low stigma compared to the

Table 1 Sample means (Standard deviations)

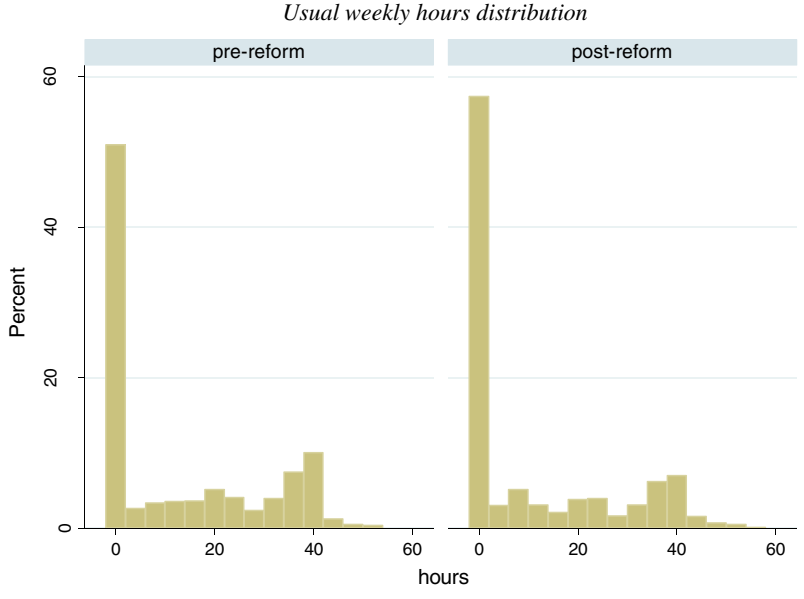
	Pre April 1988	Post March 1988	All
Prob Hours>0	0.406	0.324	0.375
Prob Hours>0 | child 0-4	0.154	0.176	0.163
Prob Hours>0 | no child 0-4	0.501	0.437	0.484
Hours | Hours>0	26.4 (12.5)	25.3 (13.7)	26.0 (13.0)
Own age	35.5 (9.1)	33.1 (8.4)	34.6 (8.9)
# Children aged 0-4	0.37 (0.62)	0.53 (0.69)	0.43 (0.65)
# Children aged 5-10	0.57 (0.73)	0.62 (0.77)	0.59 (0.75)
# Children aged 11-16	0.74 (0.83)	0.52 (0.72)	0.66 (0.80)
Renter	0.57	0.68	0.61
Widow	0.11	0.05	0.09
Income Support participation	0.52	0.64	0.57
Family Credit participation	0.06	0.07	0.06
Housing Benefit participation	0.18	0.18	0.18
Child nutrition prog. participation	0.50	0.55	0.51
Income Support | Income Support>0	38.22 (14.26)	57.06 (24.57)	46.04 (21.34)
Family Credit | Family Credit>0	12.65 (7.83)	31.29 (17.39)	20.09 (15.51)
Housing Benefit | Housing Benefit>0	28.88 (33.53)	31.34 (20.12)	30.23 (27.05)
Child nutrition | CH>0	2.63 (2.03)	2.69 (1.31)	2.65 (1.83)
# Observations	2906	1621	4527

Source: FES data. Sample of single mother heads of household April 1978 to March 1992. Notes: Welfare figures are the levels of receipts conditional on receipt and are £ per week in 1992 prices. Child nutrition programme figures are the levels of receipt evaluated at market prices of milk and school meals as recorded in this FES data.

Family Credit cash but it is clear from Table 1 that other changes are occurring as well: single mothers are younger post-reform, their children are younger, and there has been a growth in the proportion renting. These changes reflect the changing drivers of single motherhood over the period – there was a dramatic drop in the proportion of widows where mothers and their children tended to be older and live in the family-owned home; towards young never partnered and middle-aged separated and divorcees who would often move into rented accommodation if they were not already renting. The fall in positive hours is driven by mothers with a youngest child of school age. There was a reduction in hours of work, conditional on participation: something we would expect if the income effect of the larger cash entitlements dominates the substitution effect associated with lowering the phase-out rate of Family Credit from 70% to 50%, and/or if there was significant costs associated with child nutrition programmes – but such a fall in hours is also consistent with having younger children, for example.

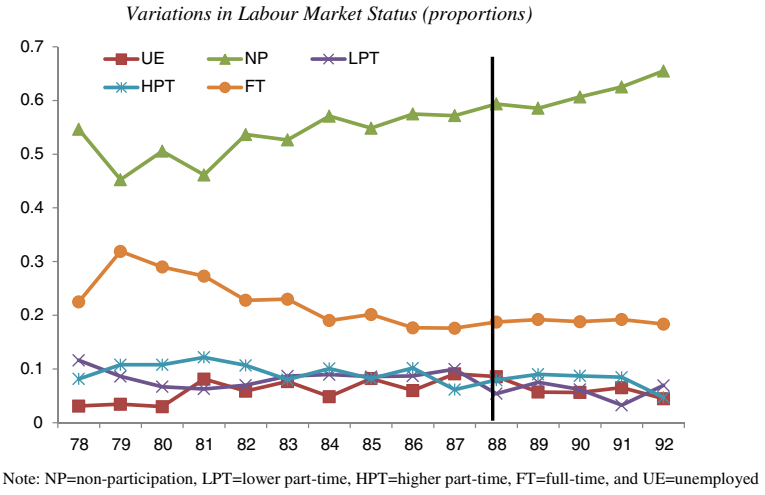
Figure 2 shows the usual weekly hours of work distributions (in 4-hour bin widths) both before and after the 1988 reform. As also shown in Table 1, there is an increase in the proportion with zero hours, and this is largely at the expense of full time work. Hourly data (not shown) exhibits reporting modes at multiples of 10 and 5 hours, and there is a pronounced spike at 24 which is the minimum hours of work requirement for receiving Family Credit. Figure 3 confirms the rise in non-participation and the fall in full-time work that is reflected in Table 1 and Figure 2 and shows no dramatic changes around the reform. This is also true when the sample is split by youngest child of school age (not shown).

Programme participation is summarized in Table 2 where the data is divided according to our definition of labour force status. The table uses usual weekly income and hours worked data to compute which households are entitled to which transfers, and uses recorded receipt to indicate who is receiving. The "take-up" rate of



Note: 4-hour bins, 0.1% have hours>60.

Figure 2 Usual weekly hours distribution.



Note: NP=non-participation, LPT=lower part-time, HPT=higher part-time, FT=full-time, and UE=unemployed

Figure 3 Variations in labour market status (proportions).

entitlements (by which we mean receipt of a transfer programme conditional on being eligible for some non-zero amount) are computed to be 45.4% for Family Credit, 58.4% for Housing Benefit and 85.6% for child nutrition programmes (conditional on receiving the associated cash transfer). Post reform take-up rates for child nutrition programmes and Family Credit are 9% and 3% higher, but Housing Benefit take-up is unchanged. As is to be expected there are significant numbers of participants who are apparently ineligible - indicated by rows where individuals are receiving (Receiving = Y) but not entitled (Entitled = N) for mismeasurement reasons. [7]

Households could be in receipt of multiple transfers. The importance of multiple transfer receipt (ignoring calculated entitlement), for the welfare programmes we consider here is shown in Table 3 where we break down receipt of the various combinations of

Table 2 Labour supply, transfer programme eligibility and participation

Transfer programme status			Labour market status					
Programme	**Receiving**	**Entitled**	**UE**	**NP**	**LPT**	**HPT**	**FT**	**All**
Family	N	N	234	2527	317	228	670	3976
Credit	N	Y	32	0	0	75	136	243
	Y	N	4	25	25	16	36	106
	Y	Y	5	0	0	77	120	202
Child	N	N	79	539	172	261	769	1820
nutrition	N	Y	35	241	18	25	36	355
	Y	N	9	114	23	27	79	252
	Y	Y	152	1658	129	83	78	2100
Housing	N	N	233	2349	260	215	246	3303
Benefit	N	Y	17	87	34	54	175	367
	Y	N	11	52	21	39	217	340
	Y	Y	14	64	27	88	324	517
			275	2552	342	396	962	4527

Source: FES data. Sample of single mother heads of household April 1978 to March 1992. Note: UE=unemployed (defined as zero usual hours and economic position "searching for work"); NP=non-participants (hours<10 and not searching); LPT=lower part time (hours 10–19); HPT=higher part time (hours 20–29); and FT=full time (hours>29). Income Support is excluded from the table because of its very high take-up rate and it is available only to UE, NP and LPT status.

Table 3 Labour supply and multiple transfer receipt

Programme participation			Labour market status					
Child nutrition	Housing benefit	Family credit	UE	NP	LPT	HPT	FT	All
N	N	N	75	566	93	120	299	1153
N	N	Y	1	3	4	18	38	64
N	Y	N	36	207	79	113	402	837
Y	N	N	154	1717	134	59	54	2118
N	Y	Y	2	4	14	35	66	121
Y	N	Y	6	7	2	18	19	52
Y	Y	N	1	37	11	11	51	111
Y	Y	Y	0	11	5	22	33	71
			275	2552	342	396	962	4527

Source: FES data. Sample of single mother heads of household April 1978 to March 1992. Note: Income Support receipt is not included in this table – all of those whose status is UE or NP will be eligible for Income Support and are invariably observed to be receiving Income Support. UE=unemployed (defined as zero usual hours and economic position "searching for work"); NP=non-participants (hours<10 and not searching); LPT=lower part time (hours 10–19); HPT=higher part time (hours 20–29); and FT=full time (hours>29).

programme by labour market status. Multiple transfer receipt is obviously somewhat less frequent post-reform (not shown) because Family Credit no longer gives eligibility to child nutrition programmes.

We omit Income Support from the table because the take-up rate is close to 100% and we therefore treat it as equivalent to non-transfer income for modeling purposes. The sample proportions receiving 3, 2, 1 and 0 transfers (excluding Income Support) are respectively 1.6, 6.3, 66.7 and 25.4%. While the data appears to be dominated by individuals receiving just a single transfer this is because of the low level of labour market participation. We would expect to find multiple transfer receipt for those in-work while those who are unemployed or non-participants will be on Income Support only. [8] The sample proportions *entitled* to multiple transfers are much higher. [9]

5. Econometric framework

We follow much of the literature on modeling the labour supply of low-income households in approximating the continuous hours of work data by a choice among discrete alternatives. Like Hoynes (1996) and Brewer *et al.* (2007), we allow for unordered labour supply choices, but we do not adopt the logit with mixing to avoid IIA but rather use the multinomial probit. That is, like Keane and Moffitt (1998) we adopt a probit specification, but we do not restrict it to be ordered. Like Hoynes (1996) and Brewer *et al.* (2007) we also allow for unobserved heterogeneity through random parameters. While our Random Utility Model unordered probit approach would not scale up to a larger choice set with the same ease as those based on a multinomial logit framework, it has at least the same degree of flexibility for the problem at hand. Furthermore, we control for the fact that some of those not working would rather be employed – i.e. they are unemployed. This seems particularly important since our data covers a period when there was widespread unemployment: aggregate unemployment rates reached 10% in the mid 1980's, fell to around 7% in the late 1980's and started to rise again after that.

There are four elements to our empirical model: the constraint, the specification of preferences, the specification of take-up that embeds assumptions about costs, and

how the model combines to allow the identification of fixed and variable costs. We discuss each element in turn.

The income levels associated with each state constitute the constraint which contributes to the determination of the choice of labour market state. Since we only observe the one alternative that is chosen, we need to predict incomes for each state from the income in the observed state. It would be computationally demanding to estimate the incomes associated with each labour market alternative jointly with the choice among alternatives. Since we only require consistent predictions of wages in order to estimate the determinants of each state, we adopt a two-step procedure. In the first step we estimate full-time and part-time wage equations which use a reduced form for labour market status to control for the endogeneity of hours and use these estimates to predict incomes in the part-time and full-time states. [10] Income for non-participants is computed from the welfare system and observed unearned (non-transfer) income. For participants, we compute the levels of tax liability and transfer entitlement using these predicted earnings at the specific discrete levels of hours of work.

The budget constraint is approximated by just four discrete labour supply alternatives: non-participation (NP), low hours part-time (LPT), high hours part time (HPT) and full-time (FT) [11] in combination with three transfer programmes: Family Credit, Housing Benefit and in-kind transfers to children. We model the choice between 32 alternatives. These are combinations of 4 labour market states and participation in each of three transfer programmes (2*2*2). The 8 possible programme participation combinations, across the 4 labour market states yields the 32 alternatives. Since each alternative is a composite of a labour supply state and a combination of programme participations, we maintain this structure in the decision modeling. [12]

In the second step, we estimate the random utility model using the predicted incomes in each state. [13] The second element of the model is preferences. Here choices between these alternatives are driven by differences in the utilities attached to them. Consistency with choice theory implies that we determine all 31 utility differences (8 alternatives involve unemployment which we do not regard as a distinct choice driven by utility maximizing considerations). Let p index each programme in the set of programmes P = {*Housing Benefit, Family Credit, child nutrition programmes*}. Participation in each separate programme is indicated by categorical indicators T^p, which together compose the complete programme participation vector $\mathbf{T}_s^p = (T^{HB}, T^{FC}, T^{CH})'$ where HB = Housing Benefit, and FC = Family Credit. Hence labour supply h_s and participation in programmes $\mathbf{T}_s^p$ completely characterize a state, s.

Let the utility associated with choosing state s be $U^*\left(\mathrm{y}_{is}^0, h_{is}, \mathbf{y}_{is}^p, \mathbf{T}_{is}^p; \mathbf{X}\right)$ where $\mathbf{y}_{is}^p$ is the income associated with the programmes P, y_{is}^0 is other income (effectively Income Support and earned income, which we pool because the participation rate in the Income Support programme is so close to unity) [14] , and $\mathbf{X}$ is a vector of individual characteristics. Now consider a statistical specification which allows for random variation in behavior due to an additive disturbance and to variation in tastes, $U^*\left(y_{is}^0, h_{is}, \mathbf{y}_{is}^p, \mathbf{T}_{is}^p; \mathbf{X}, \varepsilon_{is}\right)$, where U_{is}^* is unobservable utility of state s for individual i, and ε_{is} is an alternative specific random error term. Thus, the utility gain of moving from alternative s to t is:

$$U_{is}^* - U_{it}^* \equiv U^*\left(y_{is}^0, h_{is}, \mathbf{y}_{is}^p, \mathbf{T}_{is}^p; \mathbf{X}, \varepsilon_{is}\right) - U^*\left(y_{it}^0, h_{it}, \mathbf{y}_{it}^p, \mathbf{T}_{it}^p; \mathbf{X}, \varepsilon_{it}\right) \quad (1)$$

In a discrete choice model the set of alternatives is assumed to be common across individuals. This is a rather general specification since it allows for the possibility that the effect of entitlement on programme participation and the effect of each type of income on labour supply might differ across ***X*** and *both p* and *s.* Of course, this is far too general to be practical even though some of the types of income are not available in some of the *s* because of the nature of the welfare rules. Thus, we assume (as seems reasonable) that programme participation decisions over *p* should be affected by **X** and by its level of entitlement, y^p, and not by the entitlement to any other programme or by one's labour market state (except insofar as entitlement varies across *s*). It also seems reasonable that labour supply choices should depend on **X** and on levels of receipt of each type of income and not on programme participation *per se*.

Thus, we assume that labour supply is a function (which is allowed to vary across hours) of individual characteristics (which are fixed irrespective of hours), and a function (which is fixed across hours, but varies across programmes) of characteristics of alternative combinations of programmes and hours (which vary across hours and programmes). In other words, labour supply is a function of individual-specific characteristics and alternative-specific characteristics. In particular, hours comparisons are a function of demographics and incomes. As usual in this class of model, only the utility *differences* between the number of alternatives minus one can be identified. Since, we are implicitly assuming that the decision to participate in a programme affects welfare in the same way for all comparisons of labour market states, then utility differences between labour supply states can be expressed as

$$U_{is}^{*} - U_{it}^{*} \equiv \mathbf{g}(\mathbf{y_{is}} - \mathbf{y_{it}})\boldsymbol{\psi}_i + X_i\boldsymbol{\omega}_{st} + (\varepsilon_{is} - \varepsilon_{it}) \tag{2}$$

where here $\mathbf{g}(\mathbf{y_{is}} - \mathbf{y_{it}})$ is assumed to be linear [15], and $\boldsymbol{\psi} = (\psi^{HB}, \psi^{FC}, \psi^{CH}, \psi^{0})'$, with $\psi_i^p = \bar{\psi}^p + \tilde{\psi}_i^p$, is a matrix of parameters of functions of differences in the levels of each type of income across pairs of states (from HB = Housing Benefit, FC = Family Credit and CH = child nutrition transfer programmes $\left(y_{is}^p\right)$ and other sources (y_{is}^0, which is Income Support and other non-transfer income)). That is, the programme participation decisions difference out of this expression. [16] We think of the ψ^p's as capturing the value that individuals attach to variations in differences in the *p*-type of income differences relative to ψ^0 which captures the effects of wage income on the choice of state. In particular, we think of ψ^{CH} as capturing the discount that the individual applies to the market value of the in-kind transfers. $\bar{\psi}$ reflects the mean tastes of the sample while $\tilde{\psi}_i$ is a coefficient which shows how *i* differs from the mean individual, and $(\varepsilon_{is} - \varepsilon_{it})$ is an additive disturbance assumed to be i.i.d. across *i* but not necessarily across *s.* The ε_{is} term captures taste variation (or unobserved attributes of alternatives) that is uncorrelated with the income levels – that is purely random variation. The interpretation of the parameters $\boldsymbol{\omega}_{st}$ is the gain (or loss) in utility from comparing the alternative *s* to the alternative *t*, where the latter choice is the reference, when one has the characteristics **X**.

To summarize, from equation (2), the probability of observing *i* in labour market state *s* is given by

$$\Pr\left[U_{is}^{*} > U_{it}^{*}\right] = \Pr[\mathbf{g}(y_{is} - y_{it})\boldsymbol{\psi}_i + X_i\boldsymbol{\omega}_{st} > (\varepsilon_{it} - \varepsilon_{is})] \quad \forall s \neq t \tag{3}$$

The third element of our model is programme participation which is assumed to be functions (which do not vary across hours) of individual and programme characteristics: specifically, demographic variables and the levels of entitlement. Consequently programme participation can vary with labour market state, as does entitlement and eligibility. In particular, an individual i, in labour market state s will participate in transfer programme p if it offers a utility gain. This is assumed to be determined by the following latent and observed programme participation (take-up) equations:

$$T_{is}^{p} = \begin{cases} 1 \text{ if } T_{is}^{p*} \equiv \mathbf{V}_i^p \beta^p + y_{is}^p \gamma^p + \eta_{is}^p > 0 \\ 0 \text{ otherwise} \end{cases} \tag{4}$$

where T_{is}^{p*} is the latent variable corresponding to observed take-up T_{is}^{p} of a transfer programme p (Housing Benefit, Family Credit, Chuld nutrition), which we define to be unity if i is observed to be participating in the programme p and zero otherwise; $\mathbf{V}_i^p$ is a vector of individual characteristics which do not vary across labour market states; β^p is a corresponding vector of parameters; y_{is}^p is transfer entitlement which may vary across labour market states; γ^p is an associated coefficient and η_{is}^p is a random error.

The final element of the model is the relationship between labour supply and programme incomes which is established through the functions, $\mathbf{g}(.,.)$. Labour market status choices are made on the basis of these income differences, amongst other things. These differences are decomposed into Housing Benefit, Family Credit, child nutrition programmes and other (Income Support and non-transfer) income differences separately. Other income is differenced directly, whereas the differences in programme incomes are the differences in the programme participation indices, which are, in turn, a function of entitlement levels. It is straightforward to show that when comparing labour market states s and t, the difference in programme participation indices between states turns out to be a function of entitlement differences only. That is,

$$T_{is}^{p*} - T_{it}^{p*} \equiv \left(Y_{is}^{p} - Y_{it}^{p}\right)\gamma^p + \left(\eta_{is}^{p} - \eta_{it}^{p}\right) \tag{5}$$

It is evident from equation (5) that T_{is}^{p*} has the dimension of income, and can be interpreted accordingly. Restricting programme participation to be a function of size of programme entitlements captures the idea of "fixed cost stigma" in the terminology of Moffitt (1983). This fixed cost depends on individual demographic characteristics, $\mathbf{V}_i^p$, so that "fixed cost stigma" varies with observed characteristics. Because programme participation is discrete it must be the case that programme participation decisions can only identify fixed costs.

However, our model does not require that we impose additive separability between labour supply and programme participation. [17] Indeed, imposing the restriction $\psi^p = 0$ allows a direct test of separability between labour supply and receipt of each type of programme income. It is this feature that allows us to capture the "variable stigma costs" that arise because, conditional on programme participation, the level of each type of income matters for labour supply and welfare. Allowing for fixed and variable cost stigma with multiple programmes is an innovation of our work. Furthermore, $\widetilde{\psi}_i^p$ allows taste heterogeneity to vary across types of income.

The model is complex, so it is useful to summarize the restrictions we have put on the labour supply and programme participation model so as to place these in the context of the literature. We assume that participation in a programme is a function of

demographics and income from that programme (but not of income that might come from any other programme). This function does not vary across labour market states and while demographics do not vary across state, programme income does. Hence we obtain a programme participation index which varies across labour market states according to this function of entitlement. Exploiting the nature of the choice set and restricting programme participation functions makes the problem much more tractable without imposing further restrictions on preferences or functional form. For example, Family Credit eligibility is restricted to those in work, and child nutrition programme eligibility is restricted to Income Support recipients and to pre-reform Family Credit recipients.

The relationship between labour supply and programme participation comes through *differences* in incomes and functions of entitlements. We assume multivariate normality of the error terms and allow additional flexibility by estimating random coefficients on income differences. The novelty of our empirical approach is that: we allow taste heterogeneity through random coefficients; we nest additive separability of labour supply and programme participation, but impose only a minimal economic structure on the data. Details concerning stochastic specification and likelihood contributions are available online and on request from the authors.

The labour supply parameters are identified because there are households without eligibility to *any* transfers at *any* employment status: largely because they have high wages and/or unearned (non-transfer) incomes that imply zero entitlements even at low hours of work (recall that we exclude Income Support as a choice on the grounds that the take-up rate is close to 100%). The labour supply choice itself is distinguished from unemployment rationing by the exclusion of the regional unemployment rate from the labour supply functions and through joint normality. Identification of the determinants of participation in the various programmes is achieved through exogenous variation in eligibilities and entitlements. For example, time series variation in real housing costs are important in affecting Housing Benefit entitlement, and the variation in real school lunch and milk prices determine the market value of child nutrition entitlements. For both Family Credit and child nutrition programmes we exploit the fact that the data spans the reform in 1988: Family Credit entitlements were increased and associated in-kind transfers lost. Thus, our method uses both step changes associated with the policy reform and the time series variation in entitlements that using 15 years of data allows. In estimation we pool 15 years of cross-sections, and assume preferences are stable over the period having controlled for the observed drivers of sample composition and behavior described in Table 1, together with year and region effects.

6. Estimates

Model estimates are presented in Table 4. The labour supply and rationing equations (upper pane) and programme participation equations (lower pane) are estimated simultaneously. It is convenient to discuss each pane in turn as the nature of the two sets of dependent variables is different, and interpretation differs accordingly. [18]

In the top pane, the labour supply model has two types of explanatory variable: alternative-specific variables (i.e. income differences) and alternative invariant variables (i.e. demographics). For income differences we estimate a coefficient mean and a

variance (indicated in the table by *Random* to indicate that these are the random parameters in the model) and for demographics we estimate only a coefficient mean (indicated by *Fixed*). [19]

Consider the fixed parameters in the labour supply model. A negative sign implies that a variable is associated with *decreasing* the probability of choosing between one state and another. For example, a negative coefficient on *Widow* in the *LPT→NP* equation means that being a widow makes one less likely to prefer a labour market status of non-participation than a status on lower part-time, compared to the default single

Table 4 Estimates of labour supply, unemployment and programme participation

Labour supply	**LPT→NP**		**HPT→NP**		**FT→NP**		**Unemployment**	
Fixed								
intercept	0.961	*0.188*	0.893	*0.521*	1.085	*0.661*	−1.040	*0.228*
renter	0.187	*0.028*	0.009	*0.035*	0.046	*0.019*	0.261	*0.039*
Age	−0.043	*0.894*	−0.269	*0.717*	−0.963	*0.448*	−1.805	*1.107*
age^2	−0.126	*1.168*	0.261	*0.897*	1.425	*0.662*	−0.203	*1.468*
child 0-4	0.235	*0.087*	0.487	*0.241*	0.155	*0.067*	0.230	*0.045*
child 5-10	−0.075	*0.037*	0.046	*0.034*	0.077	*0.036*	0.087	*0.030*
widow	−0.147	*0.035*	0.027	*0.040*	0.060	*0.030*	−0.146	*0.052*
Unemp %							0.009	*0.092*
Random		$\bar{\psi}^p$		$\tilde{\psi}^p$				
y^{other}		4.474	*0.211*	1.049	*0.049*			
y^{other} - y^{FC}		0.322	*0.154*	0.980	*0.399*			
y^{other} - y^{HB}		0.008	*0.025*	0.598	*0.400*			
y^{other} - y^{CH}		0.484	*0.219*	1.000	*0.550*			
Covariance	LPT→NP		HPT→NP		FT→NP			
$\rho_{LPT->NP}$			0.091	*0.090*	0.445	*0.060*		
$\rho_{HPT->NP}$					−0.699	*0.092*		
σ	1.000	-	0.560	*0.560*	0.232	*0.196*		
Programme participation		FC		HB		CH		
intercept		−1.055	*1.205*	−0.469	*0.908*	0.102	*0.572*	
renter		0.448	*0.231*	-		0.626	*0.115*	
age		−0.048	*0.588*	−0.317	*0.439*	0.019	*0.297*	
age^2		−0.042	*0.777*	−0.359	*0.547*	−0.347	*0.414*	
child 0-4		−0.123	*0.229*	0.232	*0.190*	0.369	*0.125*	
child 5-10		−0.082	*0.156*	0.092	*0.117*	0.089	*0.105*	
widow		−1.451	*0.664*	0.252	*0.135*	−0.258	*0.201*	
unemp. rate		0.565	*0.181*	0.459	*0.131*	−0.008	*0.085*	
y^p		0.069	*0.036*	0.279	*0.090*	0.074	*0.005*	
Covariance								
ρ_{CH}		−0.220	*0.154*	0.211	*0.114*			
ρ_{FC}				0.435	*0.123*	−0.220	*0.154*	

Source: Author estimates.

Note: Standard errors *in italics*. Log likelihood −6825. Number of observations is 4527. The labour supply and unemployment equations also include 8 region dummies and 7 dummies for consecutive pairs of benefit years. FC = Family Credit; HB = Housing Benefit; CH = child nutrition programme, Renter is not included in HB participation equation since HB is only available for renters. Age is defined as age/100 and age^2/1000 and the unemployment rate, as a %, has been divided by 10. Note that all observations are single mothers so the omitted demographic profile is a never partnered or separated mother in owner occupied accommodation whose youngest child is 11–18.

mother (who is separated or never married). A number of coefficients are worth remarking on. The presence of young children aged 5–10 reduces the *full time* probability, and pre-school aged children reduce the probability of working any positive hours (both relative to the omitted category where the youngest child is aged 11–16). The coefficients in the *HPT→NP* equation are not as well determined, though they are significantly different from the corresponding coefficients in the other comparisons with non-participation.

The interpretation of the *random* parameters on alternative-specific variables is more direct. This tells us of the impact of the difference in the income variable between states on the probability of being in any state. A positive sign on an income type variable implies that states with larger values of that income are preferred to those with smaller values. The positive coefficient, $\bar{\psi}$, on an income difference implies that more of that income is preferred to less. As well as estimating the mean of the income difference coefficients, the variance, indicated by $\widetilde{\psi}_i$, is also estimated to allow for taste heterogeneity.

Income difference coefficients are estimated by programme. These programme income differences arise through differences in y_i^p across different states, where p is Family Credit, child nutrition programmes or Housing Benefit. Family Credit and Housing Benefit are cash, and for child nutrition programmes we use the market value of the transfer. Since the demographic variables are alternative-invariant, what remains is a function of transfer entitlement only. These functions are comparable across programmes, and our estimates imply that Family Credit entitlement has less of a labour supply effect than child nutrition entitlement has, and Housing Benefit does not appear to have a different effect on labour supply than variation in other income. There is no reform to Housing Benefit, and identification relies on variation in real housing costs over time and across regions because the Housing Benefit formula was typically just up-rated with inflation. On the face of it, our results imply that Housing Benefit, although suffering from fixed stigma, seems to be close to cash, conditional on Housing Benefit participation.

Other (Income Support and non-transfer) income enters into the labour supply function directly. We can put the y^{other} coefficient into some perspective by calculating the implied utility gain associated with an additional pound of other income at 0.0447 (4.474/100). Furthermore, the utility loss associated with working lower part time, higher part time, full time is 0.92, 1.06, 1.27 respectively, on average for the sample. We can compute a money metric of these utility differences from the mean effect of other income on utility. This values the loss in welfare from moving from labour force non-participation to lower part time at £20.56 (i.e. 0.92/0.0447) with a standard deviation of 5.14; and to higher part time at £23.69 (1.56); and to full time at £28.38 (4.47). The results suggest that the canonical economic model of labour supply is supported by the data: there is a utility gain from income and a utility loss from working that increases with hours of work – there is nothing in the econometric model that *imposes* such results.

When it comes to welfare income we can compare the utility gain from an extra £1 of welfare entitlement (or an extra £1 of receipt conditional on programme participation), with an extra £1 of other income. For example, the effect of £1 of extra Family Credit entitlement is zero unless it triggers programme participation in which case it is 4.152 (= 4.474 - 0.3223) – which, in money metric terms, is approximately £0.93 (i.e.

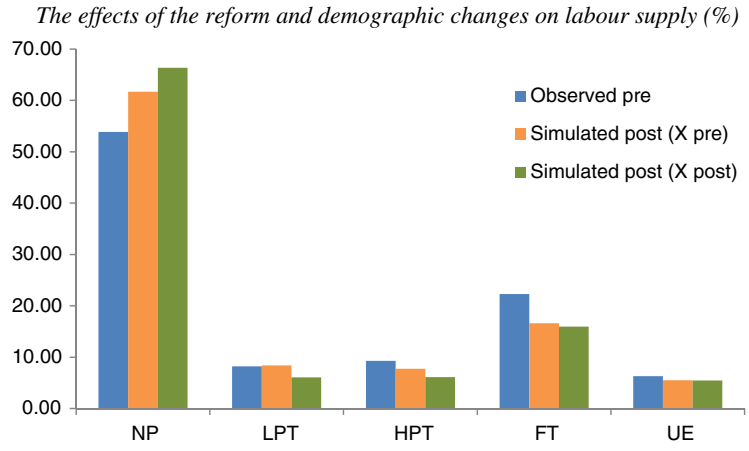
4.152/4.474), which is what it is for those already taking up. The probability that it triggers programme participation is the marginal effect of entitlement of 0.03 (0.069 x 0.45, the take-up rate). Thus, the expected impact on someone not taking up is just 0.125 (3% of 4.152), worth £0.03. The overall expected impact is 0.03 for the 55% not taking up and 0.93 for those who are – on average an effect of approximately £0.44. Similarly £1 of child nutrition has no effect unless it triggers programme participation in which case the effect is 3.9 – in money metric terms approximately £0.87, which is what it is for those already taking up. While the expected impact is just 0.25 (6% of 3.9) – which, in money metric terms, is approximately £0.06 for someone not taking up. Therefore, the overall average effect, across the 15% who are not taking up and the 85% who are, is £0.74. Importantly, our results indicate that Family Credit is valued less than child nutrition programmes.

The results suggest that the underlying economic model is supported by the data: there are significant fixed cost stigma associated with programme participation and variable cost stigma associated with spending each £1 of welfare income. Further support for the choice of modeling framework is given by the significant correlations between the unobservables in the choice equations. Significant random parameters on the income functions support our random utility approach to accommodate taste heterogeneity.

In the lower pane of Table 4 the programme participation results are presented. Participation in each transfer programme is a positive and significant function of entitlement level. The unrestricted correlation structure which we allow across programme participation unobservables appears to be appropriate. Unobservable determinants of Housing Benefit participation are positively correlated with both Family Credit participation and with child nutrition programme participation but the unobservable determinants of Family Credit and child nutrition programmes are uncorrelated with each other. This latter finding is surprising since Family Credit gives rise to eligibility for the latter in 20% of cases in our data. A possible explanation is that those with Income Support, who are mainly out of work, have quite different unobserved characteristics. This result suggests that the nature of child nutrition transfers and their take-up is distinctive: perhaps, not surprising, since the stigma, at least in the case of Free School Lunches, is directly borne by the children.

A direct test of separability between programme participation and labour supply is a test of the significance of the programme participation indices in the labour supply functions. These tests indicate that labour supply and programme participation *per se* are non-separable. Non-separability is a feature of Family Credit and child nutrition programmes but not of Housing Benefit.

Ideally one would like to be able to evaluate the model by seeing how well it simulates actual events in the data, such as welfare reforms. Unfortunately, although we have a reasonably large sample we still rely on post-reform cell sizes that are sometimes quite small. Thus, there is little prospect for being able to estimate over sub-samples of the data. Moreover, we cannot treat the post-reform data as a hold-out sample to see how well the model simulates the reform, because we rely on the reform for identification. However, we can see how well the estimates enable us to track the data over time. In Figure 4 we show the predicted effects of demographic changes and the budget constraints that occurred across the reform. It is clear that the increase in the proportion of single mothers with young children, that has a large negative effect

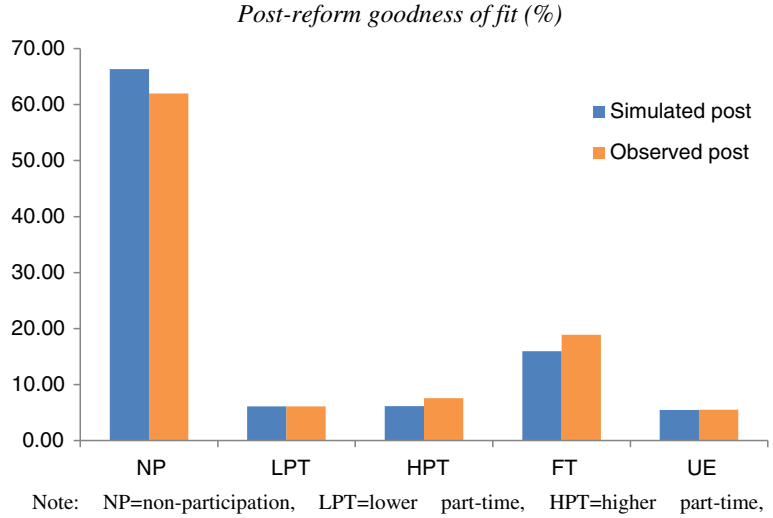


Note: NP=non-participation, LPT=lower part-time, HPT=higher part-time, FT=full-time, and UE=unemployed. X=characteristics.

Figure 4 The effects of the reform and demographic changes on labour supply (%).

on labour supply, meant that the reform was swimming against the tide of falling labour market participation. That is, the change in demographics that were occurring over time would have implied a large increase in non-participation. However, despite the *intention* to increase labour supply, our estimates imply that this would, controlling for demographics, have actually been reduced even further by the reform itself. In Figure 5 we go on to compare the predicted post reform labour supply pattern with the observed post-reform pattern. This comparison shows that we are overestimating the extent of post-reform participation and, correspondingly, under-predicting post-reform full-time and higher part-time participation rates, although the discrepancies are relatively small compared to the observed change in behavior over time.

A more transparent way to examine the implications of the estimated parameters is to define a representative individual and simulate the effects of changing some of her characteristics. Our representative woman has median or modal values for all



Note: NP=non-participation, LPT=lower part-time, HPT=higher part-time, FT=full-time, and UE=unemployed.

Figure 5 Post-reform goodness of fit (%).

characteristics. She has weekly other income (in 1992 prices) of £105 (including Income Support), £115, £130, £145 at non-participation, lower part time, higher part time, full time respectively; has zero eligibility for Family Credit, Housing Benefit or child nutrition programmes in any labour market state; lives in rented accommodation; has a youngest child at secondary school (aged 11–16); faces a local unemployment rate of 5%; and lives in the South East in 1992. The simulation exercise performed in Table 5 shows the response of participation in Housing Benefit, Family Credit and child nutrition programmes to changes in the levels of entitlements of each programme and to demographics. The first line is the simulated programme participation probability for our reference single mother and the subsequent three rows show how this changes in response to a £10 increase in the level of entitlement for each programme. The bold figures show the "own" effects of entitlement on participation probability - thus £10 of extra child nutrition entitlement raises the probability of participation by almost 9% compared to the 84% reference level. Housing Benefit and child nutrition programme participation respond most to increasing level of entitlement. Family Credit is only one third as responsive as Housing Benefit, despite the same low reference levels. Subsequent rows show the effect of changes in the definition of the reference single mother: adding a young child, for example.

In a similar way, we simulate labour supply responses in Table 6 for the same representative individual. That variable stigma costs have important consequences for labour supply incentives is clear from comparing the responses to the various transfer incomes with the response to other income, Y. The bold figures here show the effects of raising each type of income in a given labour market state on the probability of being in that state. That is, comparing the effect of different kinds of incomes on labour market status reveals the relative effects of the costs associated with different benefits. Other (Income Support and non-transfer) income has the largest effects: £10 added to income at labour force non-participation increases the non-participation probability by almost 6% from 31%, while £10 of Family Credit income would increase the probability by just

Table 5 Programme participation simulations for a representative individual % expected and expected change by state

Variable	Programme		
	CH	Housing benefit	Family credit
Reference	84.42	40.89	41.61
CH + £10	**8.76**	0.00	−0.01
HB + £10	0.01	**10.75**	0.01
FC + £10	0.01	0.01	**3.16**
owner	−19.80	0.00	−13.87
age + 10	−0.35	−1.77	−1.45
unemp. + 1%	−0.22	1.85	2.05
child 0-4	7.39	10.12	−5.02
child 5-10	2.19	3.81	−3.14
widow	−10.23	−9.48	−25.42

Source: Author calculations.
Note: FC = Family Credit; HB = Housing Benefit, CH = child nutrition programmes. The representative individual has a weekly income (in 1992 prices) of £105, £115, £130, £145 at NP, lower part time, higher part time, full time respectively; has zero eligibility for FC, HB or CH; lives in rented accommodation; has a youngest child at secondary school (aged 11–18); faces a local unemployment rate of 5%; and lives in the South East in 1992.

Table 6 Labour supply simulations for a representative individual % expected and expected change by state

Variable	Labour supply				Ration
	NP	LPT	HPT	FT	UE
Reference	30.68	8.95	10.82	43.01	6.53
Y_{NP} + £10	**5.72**	−0.01	−0.48	−4.68	−0.54
Y_{LPT} + £10	0.04	**0.38**	−0.05	−0.37	0.00
Y_{HPT} + £10	−0.56	−0.05	**0.63**	−0.07	0.05
Y_{FT} + £10	−3.40	−0.35	−0.15	**3.57**	0.32
CH_{NP} + £10	**4.05**	−0.04	−0.34	−3.28	−0.38
CH_{LPT} + £10	−0.04	**0.27**	−0.03	−0.20	0.00
CH_{HPT} + £10	−0.39	−0.03	**0.39**	−0.01	0.04
CH_{FT} + £10	−3.56	−0.20	−0.01	**3.44**	0.34
FC_{NP} + £10	**2.43**	−0.02	−0.21	−1.97	−0.23
FC_{LPT} + £10	−0.02	**0.16**	−0.02	−0.12	0.00
FC_{HPT} + £10	−0.23	−0.02	**0.23**	0.00	0.02
FC_{FT} + £10	−2.15	−0.12	0.00	**2.08**	0.20
owner	−10.30	3.22	0.20	8.83	−1.96
age + 10	−0.13	0.49	0.54	1.07	−1.98
unemp. + 1%	0.00	0.00	0.00	−0.01	0.01
child 0-4	41.40	−2.08	−7.75	−28.62	−2.60
child 5-10	17.54	2.16	−1.36	−17.48	−0.85
widow	13.19	3.87	−0.71	−13.85	−2.50

Source: Author calculations.
Note: FC = Family Credit; HB = Housing Benefit, CH = child nutrition programmes. Representative individual same as for Table 5.

2.4%, and the same amount spent on child nutrition programmes while not participating in the labour market would increase the probability by 4%. Again it is clear that child nutrition transfers appear to be much less stigmatized than Family Credit. This may be a reflection of it being borne by the children rather than the parent in many cases; or perhaps that it is establishing eligibility for the initial cash transfer that is stigmatizing and subsequent in-kind transfer participation is less so. Furthermore, most child nutrition programme recipients (80%) also receive Income Support, and have lower incomes than Family Credit recipients.

The labour supply simulations in Table 6 indicate low responsiveness to relative income differences at both lower part time and higher part time. Transfers that increase income in the higher part-time state generally do not reduce the probability of full-time work. A crude "wage" elasticity can be constructed from the simulated effects – for example £10 on Y_{NP} would constitute approximately a 10% rise and this raises the NP probability by almost 6% points, or about 20% of the probability for a reference case – an elasticity of about 2. A £10 rise in Y_{FT} (about 8% rise in Y_{FT}) raises the probability of FT by 3.5% points (or about 8%) – an elasticity of about one. However, extending in-work transfers down to lower part-time is mainly at the expense of full time status. The last column of Table 6 shows that the unemployment rationing function appears to be working well. As more women are encouraged to participate by increasing potential in-work income levels, a larger proportion of individuals are unable to find jobs and

record themselves as unemployed. Misclassifying this group as non-participants would bias downwards the labour supply incentive effects.

Table 7 shows simulations of the labour supply effects of eliminating fixed and variable cost stigma from Family Credit and child nutrition programmes. The "own" effects are again emboldened. Essentially the same type of simulation exercise is performed as in Table 5 and the differential incentive effects of Family Credit and child nutrition programme income relative to other income are decomposed. To capture the idea of eliminating fixed cost stigma, we assume full participation in the transfer programme, but allow transfer income to have a different impact to other income. When we eliminate variable cost stigma, we assume that transfer income has the same effect as other income, but we allow for programme non-participation. Without fixed or variable cost

Table 7 Labour supply effects of stigma and programme non-participation for a representative individual (% expected by state)

Variable	Stigma cost		Labour supply				Ration
	Variable	Fixed	NP	LPT	HPT	FT	UE
Reference			30.68	8.95	10.82	43.01	6.54
CH_{NP} + £10	Y	Y	**4.05**	−0.04	−0.34	−3.28	−0.39
CH_{LPT} + £10	Y	Y	−0.04	**0.27**	−0.03	−0.20	0.00
CH_{HPT} + £10	Y	Y	−0.39	−0.03	**0.39**	−0.01	0.04
CH_{FT} + £10	Y	Y	−3.56	−0.20	−0.01	**3.44**	0.33
CH_{NP} + £10	Y	N	**5.83**	−0.03	−0.50	−4.75	−0.55
CH_{LPT} + £10	Y	N	−0.27	0.40	−0.04	−0.12	0.03
CH_{HPT} + £10	Y	N	−0.91	−0.08	0.71	0.19	0.09
CH_{FT} + £10	Y	N	−3.72	−0.39	−0.17	3.93	0.35
CH_{NP} + £10	N	Y	**5.47**	−0.06	−0.46	−4.44	−0.51
CH_{LPT} + £10	N	Y	−0.05	**0.36**	−0.04	−0.28	0.01
CH_{HPT} + £10	N	Y	−0.53	−0.04	**0.53**	−0.01	0.05
CH_{FT} + £10	N	Y	−3.62	−0.28	−0.01	**3.46**	0.45
FC_{NP} + £10	Y	Y	**2.43**	−0.02	−0.21	−1.97	−0.23
FC_{LPT} + £10	Y	Y	−0.02	**0.16**	−0.02	−0.12	0.00
FC_{HPT} + £10	Y	Y	−0.23	−0.02	**0.23**	0.00	0.02
FC_{FT} + £10	Y	Y	−2.15	−0.12	0.00	**2.08**	0.19
FC_{NP} + £10	Y	N	**5.41**	0.03	−0.43	−4.50	−0.51
FC_{LPT} + £10	Y	N	0.92	**0.35**	−0.10	−1.08	−0.09
FC_{HPT} + £10	Y	N	0.44	0.01	**0.42**	−0.83	−0.04
FC_{FT} + £10	Y	N	−2.30	−0.22	−0.12	**2.42**	0.22
FC_{NP} + £10	N	Y	**3.52**	−0.03	−0.30	−2.86	−0.33
FC_{LPT} + £10	N	Y	−0.03	**0.23**	−0.03	−0.18	0.01
FC_{HPT} + £10	N	Y	−0.34	−0.03	**0.34**	−0.01	0.04
FC_{FT} + £10	N	Y	−3.11	−0.18	−0.01	**3.00**	0.30
Y_{NP} + £10	N	N	**5.72**	−0.01	−0.48	−4.68	−0.55
Y_{LPT} + £10	N	N	0.04	**0.38**	−0.05	−0.37	0.00
Y_{HPT} + £10	N	N	−0.56	−0.05	**0.63**	−0.07	0.05
Y_{FT} + £10	N	N	−3.40	−0.35	−0.15	**3.57**	0.33

Source: Author calculations.
Note: FC = Family Credit; HB = Housing Benefit, CH = child nutrition programmes. Representative individual same as for Table 5.

stigma, child nutrition programmes and Family Credit would have the same effect as other income on labour supply. The fixed and variable cost components of stigma seem to be of about equal importance in explaining the somewhat weaker incentive effects on labour supply of child nutrition programmes relative to other income. Whereas for Family Credit, fixed cost stigma explains most of the associated weaker labour supply incentive effects. Accounting for both fixed and variable costs stigma and allowing these to differ across programmes is a new contribution, and one which we find to be empirically important.

7. Conclusions

In 1988 the U.K. reformed the main in-work transfer programmes for low income households with children: the value of cash transfer entitlements were increased but conditional eligibility to associated in-kind nutrition programmes for children was removed. This was a partial cash-out of the in-work in-kind transfers while out-of-work transfer entitlements were left unchanged.

If we used difference-in-differences estimation it would be difficult to differentiate between the effects of the loss of in-kind with the gain in cash. Thus, we confine ourselves to estimating a structural model of labour supply and participation in multiple transfer programmes using a sample of single mothers drawn from repeated cross-section surveys that bridge the reform. We find that in-work cash and in-work in-kind transfers both have large positive labour supply effects. There is, however, some utility loss from transfer programme participation and this appears to be larger for cash than for nutrition programmes. This implies that the partial cash out of the in-kind benefits effectively reduced labour supply. We cannot, however, be definitive on why this occurs. We have no further information in our data concerning attitudes to the transfers. Nor does the data bridge any changes in the nature of the transfers that might allow us to make inferences. On the one hand, this would make our results quite specific to this context – where the change in cash receipt is experienced by one household member but the change in in-kind receipts is experienced by another. On the other hand, it would be quite common for in-kind transfers to be made to some household members while cash transfers are made to another – because of fear that there are agency effects associated with making transfers to one person on behalf another. There is clearly a need for qualitative research in this area to try to unpick the issues.

Our findings have several implications for public policy. First, we show that an increase in transfer entitlements available for part-time work has only a modest impact on the probability of working part-time, and has essentially no adverse effect on the probability of full-time work. Expanding transfer entitlements to full-time work has stronger participation effects. However, increasing the availability of in-work transfers to those lower down the hours distribution does cause moderate reductions in the probability of working full-time. This reflects the non-convexities in the budget constraints faced by single mothers.

Secondly, we find that nutrition transfers are actually more important for labour supply than the cash equivalent in cash transfer programmes. We interpret this as cash and in-kind having different values to recipients since our estimates imply that nutrition programmes suffer from only mild stigma/transaction/information costs. Several

distinctive features of the programmes we analyse help to explain this difference. There are high transactions costs of claiming these cash transfers, whereas the additional transactions costs of claiming associated conditional in-kind transfers is relatively small. Regarding stigma: for cash transfers it is likely that the only others knowing about receipt were administrating government officials; while knowledge of in-kind transfer receipt was potentially shared with local shop assistants, in the case of Welfare Milk Tokens, and with teachers and peers at school, in the case of Free School Lunches. It seems likely that non-participation in the cash programmes by those who were eligible was largely driven by imperfect information and the transaction costs of claiming. In contrast, it seems likely that in-kind transfers may have low value for the household, in addition to any stigma, but have relatively low information/transaction costs for the claimant. In the case of Free School Lunches it seems likely that the burden of any stigma is largely borne by the child. Our results suggest that nutrition transfers may have a useful role to play in promoting work incentives. The 1988 partial cash-out of nutrition transfers in-work is thus shown to have *reduced* labour supply – quite the opposite to what was intended.

Third, however, we find evidence of statistically significant, and not inconsiderable, stigma/ transaction/ information costs which implies that in-work transfers are not as effective at countering the disincentive effect of out-of-work transfers, or at countering poverty amongst the working poor, as they might otherwise be. If it were possible to reduce these costs associated with transfer programmes, this would have an important impact on the labour force non-participation rate for single mothers, it would imply large savings in government expenditure on Income Support payments for those not working, and it would increase the welfare of those in receipt of transfers. Finally, we demonstrate that even though there is Pareto-inefficiency associated with in-kind transfers, such transfers may have a place in the policy portfolio because the alternative may be an even more inefficient cash transfer programme.

Of course, our estimates are conditional on unobserved attributes of the U.K. transfer system. Thus, one could not generalize from our estimates to another country. Furthermore, our analysis is not simply cash versus in-kind because the programmes we consider differ according to whether they are in-work or out-of-work transfers and in-kind nutrition versus in-kind non-nutrition But there is a general point that remains – differential costs associated with different transfers can easily exist and can make a difference to behavior. The U.S. trend of moving away from cash programmes towards in-kind may not be as inefficient as it first appears, and the estimates here suggest that such differential costs of in-work transfers might be exploited to raise labour force participation in the U.K. at no cost to the government. The results also imply that *raising* the costs of out-of-work welfare might also promote labour force participation. That is, a policy of cashing out the eligibility for in-kind transfers for those on out-of-work transfers, instead of those on in-work cash transfers, would have better served UK work incentives.

Endnotes

[1] We assume that fertility and marital status are exogenous. Evidence on how responsive these are to welfare is mixed. See, for example, Joyce *et al.* (2003) on fertility and Bitler *et al.* (2004) on marital status.

[2] See Currie (1996) for an exhaustive review of U.S. in-kind transfers.

[3] It is difficult to use data prior to 1978 because of the absence of education information, used in the estimation of wage equations, and data beyond 1992 does not contain appropriate information about housing costs to deal with changes in the local tax system that occurred at this time. Moreover, from April 1992 the minimum hours of work requirement for Family Credit was reduced to 16.

[4] The routine is based on the Institute for Fiscal Studies' TAXBEN computer programme but deals with all of the changes that have taken place between 1978 and 1992. See Johnson *et al.* (1990) for details of TAXBEN. Moreover, we allow for wages to be determined differently across employment states because of the large differential between part-time and full-time wages rates that is a feature of the U.K. labour market (see Ermisch and Wright (1991)).

[5] Family Credit eligibility is based on a history of hours of work at claim time and responses to the "usual hours worked" question might not match the required history. However, it seems likely to be better than using current hours of work because current receipt will depend on hours of work in the past when eligibility was established - usual hours may better capture this. Furthermore, our eligibility and programme participation measures calculated on this basis seem to fit well with published aggregates.

[6] We choose 10 rather than 0 because a small number of single parents do record very low levels of hours which we think is associated with casual activity such as baby-minding. Our estimates are not sensitive to the precise definition of non-participation. The Income Support system does incorporate an "earnings disregard" that allows small amounts of income to be earned without affecting Income Support entitlement.

[7] In the case of Family Credit there is a small proportion of the not entitled who are receiving (2.5%) and this arises because there is no requirement to report changes in circumstances once eligibility is established and eligibility lasts for 6 months before it needs to be re-assessed. For CH there are further measurement difficulties: the reform resulted in a delay of up to six months while those who were in receipt of Family Credit got reassessed and then lost their conditional eligibility to CH transfers; there was some local authority discretion in the provision of nutrition transfers to children at school; and disabled children may be eligible but we cannot observe this in our data. Together these factors probably account for most of the ineligible CH participants. Housing Benefit has the largest proportion of participating ineligibles (9.3%). Fry and Stark (1993) point out that this is largely because of processing delays that resulted in payments being made in arrears so that some households are currently observed to be in receipt for Housing Benefit but not entitled on the basis of current circumstances. This measurement error is unlikely to be correlated with our measures of other sources of income, but will reduce the precision of our Housing Benefit participation estimates.

[8] Only 1% record receipt of Income Support and Family Credit at the same time, and just 6% record Income Support and HB. Table 3 shows small numbers on Family Credit who have a labour market status of UE or NP which is inconsistent. In our econometric analysis we respect the observed data but because we assume that choices depend on levels of entitlements we will be unlikely to predict someone choosing a point of zero entitlement. Note that we treat Income Support as equivalent to non-transfer income; but some individuals who record themselves as UE or NP receive Unemployment Benefit (sometimes plus Housing Benefit) rather than Income Support. Unemployment

Benefit is conditional on searching for work but is not actually means tested. Thus, single parents with some asset income, perhaps child support (although this was rather uncommon during this period), might be better off on Unemployment Benefit and Housing Benefit than on Income Support. Since we treat Income Support as equivalent to non-transfer income, and since Income Support and Unemployment Benefit are effectively interchangeable, since there was no obligation to search for this group, we treat Unemployment Benefit and Income Support as equivalent.

[9] Recall that Income Support receipt is not included in Table 3. Consequently multiple receipts are understated, for example, 80% of CH recipients also receive Income Support.

[10] The specification for the determination of wages is $\log w_i^h = Z_i^h \gamma^h + e_i^h$ where h stands for part time (both higher and lower) and full time work. We estimate the wage equations by including the Mills Ratios from a Bivariate Probit model of participation *vs.* non-participation and full-time *vs.* part-time work conditional on participation. We include the level of unearned income in the reduced form labour force status equations but not in the wage equations to achieve identification. Other covariates included in the reduced from selection and wage equations are education, a quadratic in experience, numbers and ages of children, region and year dummies. MaCurdy *et al.* (1990) show that inconsistent estimates may result from using predicted gross wages in a non-linear second stage labour supply equation. One solution is to integrate out the prediction error in the wage equations, at the cost of increasing the dimensionality of the estimation problem. Van Soest (1995) does this for the Netherlands, on top of a much simpler logit structure, and finds labour supply elasticities to be unchanged.

[11] We compute their incomes at 6, 16, 26, and 36 hours.

[12] The Family expenditure data we have access to contains hours of work, and for those with zero hours of work, whether or not they are unemployed (i.e. seeking work). We model hours of work as a choice between four discrete alternatives: non-participation, low hours part-time, high hours part-time and full time work. For those who are not unemployed, we assume that they are observed in their most preferred labour market state. For those with zero hours who are unemployed, we assume they reveal themselves to not be in their most preferred labour market state. Note that we are not introducing a new discrete alternative. We use the information on unemployment to distinguish among the preference orderings of those working zero hours: that the unemployed would rather be working at the going wage rate, so zero hours is not the most preferred labour market state for the unemployed. In doing this we follow Blundell *et al.* (1987) and others who use this information to discriminate between non-participation and unemployment. This is important because women who are unemployed are not observed to be in their most preferred state, and must be classified appropriately in a choice model. For the purposes of labour supply modeling this group is assumed to reveal, by stating that they are searching for work, that some positive hours state is preferred to zero. Furthermore, individuals observed in any positive hours labour market state are assumed to prefer their observed state to all alternatives and are not rationed in exercising this preference. They are distinguished by the following reduced form latent and observed unemployment rationing equations $R_i = 1$ if $R_i^* \equiv \mathbf{Z}_i \tau + \upsilon_i > 0$, and 0 otherwise, where R^* is the latent variable describing the rationing process, and R_i is the observed outcome, which we define to be unity if i is observed to be not working and

searching for work and zero otherwise. $\mathbf{Z}$ is a vector that includes demand side variables, $\boldsymbol{\tau}$ is a corresponding vector of parameters, and υ_i is a random error. While this is an extension that has not previously been considered in the literature concerned with joint labour supply and programme participation, we consider it important here because we would otherwise understate the extent of programme non-participation.

[13] In common with the literature, we do not take into account errors in classification which may arise through mis-measurement of transfer receipt or errors in calculating eligibility. We appeal to our good match with aggregate data and our adoption of precise entitlement calculations to support this. See Poterba and Summers (1995) for a treatment of errors in classification in the context of unemployment transitions.

[14] Ideally we would unbundle Income Support receipt from other sources of unearned income at zero hours in order to distinguish programme participation costs. However we lack variation in Income Support programme participation in our data in order to identify such a distinction.

[15] The choice of $\mathbf{g}(.)$ is arbitrary. Brewer *et al.* (2007) use a quadratic utility function in their analysis of the successor programme to Family Credit, but here we find that a linear local approximation can be accepted.

[16] This would not be the case if programme participation impacted directly on labour supply apart from through the budget constraint – for example, if claiming a transfer took a lot of time and this reduced labour supply. We ignore this possibility here because once a claim is made the eligibility lasts for 6 months unless circumstances change. So claiming and reclaiming is infrequent and will have little effect on an average week.

[17] Non-separability means that programme incomes directly affect labour market status in addition to its effect through income levels at each state. Note from Equation (5) that although the terms in individual characteristics cancel out, the error terms do not. These terms carry through into the variance of the labour supply function (see the Appendix available online, or from the authors on request).

[18] The sensitivity of the labour supply model estimates to the hours grouping was tested. Parameters were not significantly affected by altering the lower part time and higher part time criteria, until higher part time reaches 35 hours, which effectively brought the fulltime hours of work peak into the higher part time range.

[19] The rationing equation contains year and region effects and the regional unemployment rate data features relatively little relative variation so it is not very surprising that it does not appear significant in the rationing equation. Nonetheless, we feel it appropriate to allow for the distinction in the model because whether individuals declare themselves as UE or NP will still depend on the financial attractiveness of working – which we demonstrate in a later simulation.

Competing interests
The IZA Journal of Labor Economics is committed to the IZA Guiding Principles of Research Integrity. The authors declares that they have observed these principles.

Acknowledgements
We are grateful to the U.K. Economic and Social Research Council (grant RES 00027200) and to Princeton University who provided a fellowship that contributed to the completion of this research. The data has been made available to us with the permission of the Controller of Her Majesty's Stationary Office by the ESRC Data Archive. We would like to thank Richard Blundell, Gauthier Lanot, David Neumark, Martin Feldstein, and Karl Scholz, for their insightful comments. Stuart Adam of the Institute for Fiscal Studies provided detailed advice on the evolution of the U.K. welfare system.

Our tax-benefit routines were developed in conjunction with the IFS and we are indebted to many of their staff. The usual disclaimer applies.

Responsible editor: Pierre Cahuc

Author details
[1]SFI - Danish National Centre for Social Research, Herluf Trolles Gade 11, Copenhagen K DK-1052, Denmark. [2]Lancaster University Management School, Lancaster LA1 4YX, UK.

Received: 12 November 2012 Accepted: 24 January 2013
Published: 28 February 2013

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doi:10.1186/2193-8997-2-1
Cite this article as: Bingley and Walker: **The labour supply effects of a partial cash-out of in-kind transfers to single mothers.** *IZA Journal of Labor Economics* 2013 **2**:1.

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