Did the Working Families' Tax Credit Work? Analysing Programme Participation For In-Work Tax Credits

Mike Brewer, Alan Duncan and María José Suárez[1]

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Abstract: In-work benefits or tax credits are motivated as a method of alleviating poverty that does not create adverse work incentives by conditioning support on labour market participation. They usually act to increase the effective marginal tax rates faced by individuals receiving them. Data suggest that not all families entitled to receive in-work benefits actually do: programme participation decisions, therefore, determine the effective incentives arising from a given tax and benefit system. With micro-data from before and after a major reform in 1999 to the structure and form of in-work benefits in the UK, this paper uses a structural model of labour supply and programme participation to show the impact of a reform to in-work benefits on both programme participation and labour supply. Estimates suggest that participating in family credit conferred a utility loss as well as a utility gain from the extra income. Preliminary results suggest this "stigma" cost may have fallen after the introduction of WFTC for lone parents, but risen for women in couples. Given the UK government's commitment to increase the use of tax credits to both encourage work and to redistribute to families with children, the analysis of programme participation in tax credits will continue to have direct policy relevance.

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1.   Introduction

The traditional policy dilemma in the design of welfare systems is to balance the desire to raise the living standards of low-income households with that of encouraging self-sufficiency through the promotion of work incentives, and reducing government expenditure – the so-called "iron triangle" of welfare reform (see Blundell, 2001). One policy which aims to overcome this dilemma is an in-work transfer programme. These in-work benefits (or earned income tax credits) are typically motivated as a method of alleviating poverty that do not create adverse work incentives, by targeting low-income families with an income supplement contingent on work.

The key features of this paper are that it recognises and quantifies the role that programme participation plays in determining the effective incentives arising from a given tax and benefit system. In addition, using micro-data from before and after a major reform to the structure and form of in-work benefits in the UK in 1999, we can analyse the impact such reforms have on both programme participation and labour supply. We do this using a structural model of labour supply and programme participation, which has two main benefits: it allows us to disentangle the impact of changes in in-work benefits from the changes in income tax, payroll tax and welfare benefits that also occurred in the UK between 1999 and 2000; it also allows to us to control for the fact that the individuals entitled to participate in income-related programmes form a self-selecting group. We make use of a new panel data-set of families with children, the Families and Children Survey (FACS). Although we analyse a past reform, the UK government is committed to increasing the use of tax credits to both encourage work and to redistribute to families with children (see Brewer, Clark and Myck, 2001, or HM Treasury, 2002), and so our findings will have implications for future policy developments.

In-work benefits have been used in the UK and the US for families with children for over two decades, and have recently gained popularity in other countries. [2] There has also been a small movement towards making such in-work transfers part of the tax system (although this can still lead to wide variations in design reflecting the variety of income tax systems). In the UK, the Working Families' Tax Credit (WFTC) was introduced in October 1999 as a replacement to the existing Family Credit (FC). Although it owes much to its predecessor in its eligibility conditions and structure, two key differences from FC are its increased generosity, and the fact that it is a payable tax credit administered by the Inland Revenue, rather than a traditional income-related cash benefit, administered by the Benefits Agency, part of the (then) Department for Social Security.

The stated goals at the time made clear that the rationale for the WFTC was to reduce in-work poverty and stimulate labour supply amongst families with children; the change in the payment mechanism and the administering agency was hoped to reduce stigma and increase programme participation. [3] This reminds us that issues concerning programme participation can in principle affect tax credits just as much as income-related benefits (indeed, this is one of the reasons why some commentators prefer to think of the WFTC as an income-related benefit: see, for example, Brewer et al, 2001) and was perhaps an acknowledgement that the new Labour government was unsatisfied with the relatively low level of programme participation (for the UK) of family credit, introduced by the previous Conservative government. [4]

Tax credits, taxes and benefits together determine the effective (income) tax rate, and the way in which they do this will depend on both the eligibility conditions attached to tax credits, and programme participation. Non-participation in any sort of government

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[2] See Gradus and J.M. Julsing (forthcoming) for recent EU developments, although note that there is a wide variation in the conditions for eligibility and generosity of European in-work credits, Hotz and Scholz (2001) for EITC in the US, Blundell and Hoynes (2001) for WFTC and its predecessors.

[3] For example, government documents stated that "[t]his change in administration [the move from DSS to IR] is intended to demonstrate more clearly the rewards from work compared with welfare, and to remove any stigma associated with receiving benefit."

[4] UK readers will be expecting to read of the "take-up rate" for WFTC, rather than the "programme participation rate" for WFTC. We will maintain the international vocabulary.

programme is often rationalised through some utility costs of participating, discussed further below. Non-participation in income transfer programmes (whether work-contingent or not) is particularly important and interesting for a number of reasons. First, it indicates how well a transfer programme is reaching its intended population, assuming that the intended population is "everyone who is entitled to it". [5] This is often the way the debate is framed in the UK, because the main political justification for using income-related transfers is that they reduce government expenditure for achieving a given amount of poverty reduction which could also be achieved (for families with children and pensioners) through non-income-related benefits, which have almost full participation rates.

But programme non-participation also needs to be studied carefully by economists wanting to model labour supply behaviour. From Moffitt (1983), writing about the Aid for Families for Dependent Children (AFDC) program, an income-related transfer: "assuming that there is heterogeneity in the population in both tastes for work and distastes for welfare (for example, stigma), only those with relatively low distastes for welfare or low distastes for work will participate in the program." Focusing back on the UK and the WFTC programme (which is conditional on working 16 hours a week), a lone parent observed working fewer than 16 hours a week in a model that assumed full programme participation would attribute to her relatively high distastes for work, relatively low tastes for income, or relatively high fixed costs of working, when the true cause could be that she has relatively high distastes for welfare. Assuming full participation in any transfer programme that affects the shape of the budget constraint may lead to inconsistent estimates of preferences for income and work in a utility-maximising model of labour supply. It will also lead to misleading inferences about the scope of high effective marginal tax rates.

The introduction of the WFTC in October 1999 provides an excellent example to investigate issues around programme participation in income-transfer schemes, and to

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[5] Although governments may deliberately allow for positive utility costs of participating as an additional

build a more accurate picture of the labour supply preferences of families with children. The WFTC is a national, entitlement-based, programme (all those who apply and satisfy the eligibility conditions receive it), and so there is no obvious "control" group. [6] For simulation purposes, we estimate a joint structural model of labour supply and programme participation, in a discrete choice framework, along the lines of Hoynes, 1996, Moffitt and Keane, 1999, Paull *et al* 2000 and Blundell *et al* 1999 & 2000. Such a model can be used to predict the behaviour of the sample as WFTC replaced FC, and can also investigate whether the change in administration and payment methods in WFTC did increase programme participation. Part of the reason for pursuing this method is that the introduction of the WFTC was by no means the only reform affecting low-income families with children around 1999: income tax and national insurance (payroll tax) changes made working more attractive, but increases in out-of-work benefits for families with children under 11 made not working more attractive: an approach that captures the impact of the whole budget constraint will be able to separate the impact of the WFTC from these other changes.

The outline of our paper is as follows. Section 2 provides more background to and a fuller description of the reforms in the UK during 1999 that we intend to study. Section 3 sets out our model of programme non-participation and labour supply; it also describes our data sources. Section 4 provides some descriptive evidence on what happened to employment, labour supply and programme participation around the time of the WFTC reform. Section 5 contains the results of the model and (to come) simulation results. Section 6 concludes. Our results so far suggest that there is a stigma/hassle cost to participating in FC/WFTC, and that this varies with family and individual characteristics. Preliminary results suggest that this programme participation cost has fallen under WFTC for lone parents, and risen for women in couples.

targeting mechanism; see, for example, Yaniv (1997) and Besley and Coate (1992).
[6] In work in progress, we are looking at the impact of budget constraint changes on the behaviour of those people receiving the WFTC compared to a number of different "control" groups of unaffected individuals either across space (eg similar families without children, people entitled to but not receiving WFTC) or over time (eg families on FC, or those who earned too much to be entitled to FC but who would have been entitled to WFTC had it existed before October 1999).

2. Background to and description of the reform

2.1 The WFTC reform

The Working Families' Tax Credit (WFTC) was introduced in the UK in October 1999 as a replacement to Family Credit (FC), and was fully phased in by April 2000. Eligibility for the programme depends on hours of paid employment, the number of children, income, capital and formal childcare costs. Couples are assessed jointly. Unlike the Earned Income Tax Credit in the US, there is no phase-in: families fulfilling the work condition – an adult in the family unit must work 16 or more hours a week – are immediately eligible for the maximum credit, but earnings above a "threshold" – £95 a week in October 1999 in current prices – reduce the credit at a rate of 55% of net income (so each pound of earnings after income tax and national insurance reduces the WFTC payment by 55p; the combined WFTC-income tax-national insurance effective marginal tax rate for someone paying basic-rate income tax is 69%: see Brewer, 2001). Financial assets over £3,000 reduce the award; savings over £8,000 deny eligibility completely. There is a small extra credit for families where someone works more than 30 hours a week, and support for childcare is also paid additionally to this. Table 1 gives parameters in 1999-2000, and Figure 1 relates the schedule to gross income. Spending on the WFTC in 2000-1 was £2.1bn (83%) higher than on family credit in 1998-9 (2001/2 prices), and there was no attempt to present it as a revenue-neutral reform. That the WFTC (and FC before it) affects labour supply decisions is suggested by the distribution of weekly hours of work of low education lone parents (Figure 4) which shows substantial spikes at 16 and 30 hours a week, matching the structure of the WFTC, in a way that is not shown by, for example, low education women without children, who almost all work full-time.

The WFTC, though, is by no means the end of the story. There are three other main ways that the UK tax and transfer system provide support for children: child benefit, child allowances in income support, and a non-refundable income tax allowance (all discussed in Brewer, Myck and Reed, 2001, Banks and Brewer, 2002, and Brewer, 2001, the last reference comparing support for children in the UK with the US; one difference that should be stressed is that there is no work requirement attached to the relatively generous

benefits for non-working lone parents in the UK) and other parts of the tax and transfer system that affect all low-income individuals. Two points need to be highlighted at this stage (both discussed further in Blundell and Hoynes, 2001). The first is that, at the same time as the WFTC was introduced and then increased further in generosity (October 1999 and April 2000 respectively), the value of out-of-work benefits for families with children under 11 also increased. The second is the role of programme interactions amongst income-related transfers in the UK. The most important of these is the help with rental housing costs and local taxes provided through Housing Benefit (HB) and Council Tax Benefit (CTB) respectively; these benefits treat WFTC (and FC) awards as income, and so reduce the value of WFTC awards by up to 85% for families receiving both HB and CTB.

Although it owes much to its predecessor, two key differences between WFTC and FC are the generosity of the WFTC and the payment mechanism. [7] WFTC is more generous than FC in three ways: it has higher credits, particularly those for young children, families can earn more before the credit is phased out, and it has a lower withdrawal rate. The change in the payment mechanism was that, while FC was paid direct as a cash benefit, the WFTC is paid by employers through the wage packet (who are themselves reimbursed by the Inland Revenue) unless a couple opts to have it paid direct to a non-working adult. The WFTC also significantly changed the system of support for (formal) childcare costs. Under FC, childcare costs up to £60 (£100) a week for families with 1 (2) children under 12 could be disregarded before the credit was phased out, which only benefited families earning more than the "threshold" referred to earlier. Under the WFTC, there is a payable childcare tax credit. It is more generous than the FC childcare disregard, providing a 70% subsidy to the parent on costs up to £150 a week for families with two or more children of any age, and is paid in addition to the WFTC, rather than an income disregard (for couples, the eligibility condition remains that both must be

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[7] A detailed history of in-work benefits in the UK, and a comparison of WFTC and FC can be found in Blundell and Hoynes (2001), with shorter accounts in Blundell et al (1999 and 2000) and Dilnot and McCrae (1999); Brewer (2001) and Blundell and Hoynes (2001) summarise comparative developments in in-work transfers in the US and UK.

working 16 or more hours). One final change is that Family Credit treated child support (or maintenance) above £15 a week as income, but the WFTC disregards all child maintenance when calculating awards.

2.2 What was expected to happen?

Figure 1 gave the WFTC schedule, but Figures 2 and 3 show some simulated budget constraints that hold all transfer programmes except FC/WFTC constant at their April 1999 values (so it only shows the impact of WFTC). These suggest that there are several types of people who face different work incentive effects from the introduction of the WFTC.

At the margin of labour market participation (defined here as working 16 or more hours in line with the WFTC eligibility conditions), families with no earners before the reform would be expected to increase labour supply, and families with two earners before the reform face incentives for one of them to stop working (see also Blundell et al 1999, 2000).

The impact on hours worked conditional on working 16 or more hours is more complex. There are (at least) five cases (this is a more complex version of the general typology in Blank, Card and Robins (1999) that takes account of the particular structure of the WFTC):

- people receiving the maximum FC award. They will see the gains from working increase, giving a small income effect away from work (unless they are already at the corner solution of 16 hours a week work), and the gains to increasing hours will (weakly) increase.

- people working more than 16 hours and not on maximum FC. These people will face an income effect away from work, and a substitution effect towards work (ie the gains/losses from increasing/decreasing hours will (weakly) increase/decrease).

- people working more than 16 hours and earning too much to be entitled to FC but not WFTC ("windfall beneficiaries") will face income and substitution effects away from work (ie the losses from decreasing hours will (weakly) decrease).

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- as we said above, second earners in couples will face an income effect away from work, and the incentives to reduce work effort will not be bounded at 16 hours (unless the couple claims help with childcare costs).

- over and above these effects on labour supply, existing and potential childcare users will face income effects (if childcare is a normal good) and substitution effects towards more childcare expenditure.

As we highlighted earlier, housing benefit (HB) recipients – and the overwhelming majority of non-working lone parents are also claiming HB –face lower incentives to work 16 or more hours, and lower incentives to increase hours conditional on working 16 or more hours (see Giles, Johnson and McCrae (1997) for more details on HB; Brewer (2001) contains some recent quantification of how it affects work incentives under WFTC, Bingley and Walker, 2001, models labour supply and programme participation in HB jointly).

A thorough *ex ante* evaluation of the WFTC is presented in Blundell et al (1999 & 2000). This uses data from before the evaluation to estimate labour supply preferences, which are then used to simulate the impact of introducing the WFTC. The methodology is explained more fully later, as we borrow and build on much of it in this study, and allowed for joint decision making in couples, programme non-participation under FC/WFTC, and changes in childcare use. It predicted an increase in labour market participation rates for lone parents of 2.2 percentage points, a small net decline (0.57 percentage points) in labour market participation amongst women in couples, and no net effect on the labour market participation rates of men in couples (a similar order of magnitude was predicted by a simpler. reduced-form study, which related moves into work with financial gains to work. See Gregg et al, 1999).

But, as we suggested above, more things changed between April 1999 and April 2000 than just the WFTC: out-of-work benefits rose for families with children under 11, and income tax and national insurance payments fell slightly. The impact of all these reforms on replacement rates for lone parents with young children is shown in Figure 4: in fact, the increases in out-of-work benefits for families with young children meant that replacement rates rose for this group between 1998 and 2000 when contemplating part-time work at the minimum wage: as stressed in Blundell and Hoynes (2001) and Brewer,

Clark and Goodman (2002), the WFTC should be seen as part of attempts by UK governments since 1992 to increase the amount of money paid to low-income families for their children, whether in or out of work, whilst maintaining welfare benefits for adults in real terms. That policy makers seem to view support for families with children in this way – with separately identifiable parts that support adults and children – can be seen in the next reform to in-work benefits due in 2003, a structural reform which will bring together all income-related child-contingent transfers into a single instrument (see HM Treasury, 2002, or Brewer, Clark and Myck, 2001 for more on this).

3. Modelling programme non-participation and labour supply.

3.1 Modelling programme non-participation

It has been known (or at least strongly suggested by the data) that in-work benefits in the UK have experienced less-than-full participation since the early 1980s. As we have heard, part of the motivation for the administrative changes between WFTC and FC were to reduce stigma. Our goal is to model jointly labour supply and programme participation decisions. [8] Empirically, studies of programme non-participation typically compare data on receipt of benefits as recorded in household surveys (or in linked administrative data) with data on entitlement for benefits produced by a micro-simulation model operating on data on household characteristics from the same household survey. Programme non-participation is rationalised by assuming that there are some costs to participating. Let B^* be the true entitlement of a family as determined by the benefit rules in legislation. If R is an indicator for receipt of benefit, then the population can be partitioned into four sets:

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[8] Adam et al (forthcoming) reviews the literature that has examined and attempted to model programme non-participation, conditional on labour supply behaviour.

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Eligible recipients : $\{R = 1 \ \& \ B^* > 0\}$
Eligible non - recipients : $\{R = 0 \ \& \ B^* > 0\}$
Non - eligible recipients : $\{R = 1 \ \& \ B^* = 0\}$
Non - eligible non - recipients : $\{R = 0 \ \& \ B^* = 0\}$

The group of interest for this paper is the set of non-eligible recipients: people who are participating, but should not be. A good measure of programme participation, T^*, would be the probability that a truly-entitled family receives the benefit, or:

$$T^* = P(R = 1 | B^* > 0) \, . \,^{9}$$

3.1.1 An economic model of programme non-participation

A standard framework for analysing programme non-participation says that people do not participate if the disutility of claiming and participating outweigh the utility gain of the extra income (see Moffitt, 1983). Families will therefore take up some benefit which is worth $B^*(y;X)$ if

$$U(y + B^*(y; X), I = 1; X) > U(y, I = 0; X)$$

where y is exogenous income, X describes the family characteristics, I is an indicator of programme participation, and families know their entitlement. This gives the observation rule in Table 2 (easily generalised to more than one programme, even if they interact).

3.1.2 Estimating programme non-participation

Several studies have proceeded to estimate a model based on the observation rules in Table 2 and a simple parameterisation of the net utility function.

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[9] B^* is, of course, not observed. If the analyst estimates entitlement $B_a = B^* + e_a$, then the estimate of the programme participation rate is $T_a = P(R = 1 | B_a > 0)$. Duclos (1995) shows that if the analyst estimates correctly the proportion of the whole population who are participating, then the analyst's estimate of programme participation will under-estimate the true rate the greater the inaccuracy of the analyst's

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If there are some unobservable preference or taste effects, then

$$\Pr(participation_j) = P(U_j \geq U_k) \forall k = 1,2,....M \ ,$$

where there are *M* states (reflecting all the combinations of participating or not). With a single programme (ie M=2), assuming that U_j-U_k is linear in parameters with an additive disturbance (ie the utility gain from participating is $X'b + e$), the observation rule then becomes:

$$\Pr(participation) = 1 - F(-X'b) \ , \text{ where } F() \text{ is the CDF of } e \ . ^{10}$$

3.2 Modelling programme non-participation and labour supply

The exposition above has assumed, for convenience, that pre-transfer income is exogenous. But there are two reasons why one should model labour supply behaviour and programme participation jointly. First, entitlement to income-related benefits will depend upon labour supply behaviour, and labour supply incentives will be altered by the value of income-related benefits. As set out in Moffitt (1983), this simultaneity implies that, even if preferences for working and claiming benefits are uncorrelated, individuals working and claiming some in-work benefit will have lower propensities to work than those working and not claiming. The second reason to want to model both decisions jointly is that preferences for working and preferences for programme participation may be correlated.

We allow for this theoretically by expanding the choice set to include *h*, hours of work, as well as whether or not to participate in the programme. There are several examples of this

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measure of entitlement relative to the agency's, but the magnitude of bias still depends on unknown factors. We hope to return to this issue in future work.

[10] Examples are Blundell et al (1987), Riphahn (2001), McKay (2002). This approach only uses observations who are modelled to be entitled to the programme, so it ignore the set of apparently non-eligible recipients. One way to proceed is given in Duclos (1995), where the modelling error is parameterised: identification arises because entitled non-recipients can be explained either by a high stigma cost of participation or by modelling error; whereas non-entitled recipients can only be explained by both a high (absolute) modelling error and low cost of participation. Again, we hope to return to this issue.

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in the literature: indeed, many studies of labour supply preferences have allowed for programme non-participation, but sometimes seem to have viewed the programme participation model as a means to more accurate labour supply preferences. Our approach in this study builds directly on the work in Blundell et al (1999 & 2000); other studies include Hoynes (1996), Moffitt and Keane (1999) and Bingley and Walker (1997). These are all discrete choice labour supply models, where the simplification of modelling choices over a small subset of hours of work trades off against the complexity and non-convexities of individuals' budget constraints (Moffitt, 1983, also models labour supply and programme participation jointly, but that study simplifies the budget constraint so that hours of work can be modelled as a Tobit).

The starting point for our model – building directly on that presented in Blundell et al (1999) – is where preferences over working time, income and participation are given by a utility function that is quadratic in hours and net income, giving flexibility in the labour supply function, with separable programme participation costs (although the results presented in Section 5 make a few further simplifications beyond what is presented here).[11] Omitting the subscript for individuals, the functional form is:

$$U(h_j, y_{h_j,P}, P) =$$

$$\tag{1}$$

$$\boldsymbol{a}_{11}(y_{h_j,P} - C * I_h)^2 + \boldsymbol{a}_{22}h_j^2 + \boldsymbol{a}_{12}(y_{h_j,P} - C * I_h)h_j +$$

$$(\boldsymbol{b}_1 X_1 + u_y)(y_{h_j,P} - C * I_h) + (\boldsymbol{b}_2 X_2)h_j - (\boldsymbol{b}_h X_h + h)P + e_{h_j}$$

$\boldsymbol{a}_{11}, \boldsymbol{a}_{22}, \boldsymbol{a}_{12}, \boldsymbol{b}_1, \boldsymbol{b}_2, \boldsymbol{b}_h$ are parameters, h_j represents working time at hours choice j, I_h is an indicator for $h_j>0$, P is a equal to one when the individual is entitled to and participating in FC/WFTC, $y_{h_j,P}$ is net income at h_j hours, computed as the product of hours of work and the hourly wage, plus investment income, net of all taxes and income-related programmes, and depends, in general, on P (we assume that families participate

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[11] Stern (1986) discusses the quadratic specification and other alternatives.

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fully in all other income-related programmes), X_1, X_2, and X_h are explanatory variables, $b_h X_h + h$ reflects the stigma costs to participating in FC/WFTC. Costs of working, such as transport and childcare costs, are denoted as C in equation (1); they are subtracted from net income at positive values of working time, and may vary with hours of work in general. We allow for some general unobserved fixed costs of work that depend on observed characteristics and a random component: $b_{fc} X_{fc} + u_{fc}$. We also (intend to) model childcare costs explicitly, given that both FC and WFTC provided some support for childcare costs for families where all adults are working. Following Blundell et al (1999, 2000), this would allow for a deterministic relationship between hours of childcare and hours of work, represented by:

$$H_{CC} = G(H \mid X)$$

and fitted from those women observed working and using childcare. We would then use the (observed) distribution of childcare prices to integrate through the sample log likelihood contribution for each family. These two components would give the following expression for costs of working:

$$C = b' X_{fc} + u_{fc} + pc.H_{CC}$$

Heterogeneity in observables is allowed to affect the coefficients on the linear terms in the utility function (through X_1 and X_2). As described, the utility function has several random components: ε_{hj} are unobserved heterogeneity terms for each working time value, which are assumed distributed as extreme value random variables. They can be interpreted as unobserved alternative specific utility components, or errors in perception of the alternatives' utilities, but they do not reflect random preferences derived from, for example, unobserved family characteristics (because of the Independence of Irrelevant Alternatives assumption). A random term in the linear coefficient on income, u_y, allows for these heterogeneous responses by individuals and relaxes the impact of the extreme value distributional assumption. As already outlined, costs of working and programme participation may also depend on random unobservables, u_{fc} and h (hours of childcare are assumed deterministic).

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Results in Blundell et al (1999, 2000) suggested that men in families with children were relatively insensitive to financial incentives, and so we assume as an approximation that women in couples choose their working time taking their partner's labour supply as given. Since the tax and benefit system generates a complex non-convex budget set, we assume a choice set of weekly working hours $\{0, 10, 19, 26, 33, 44\}$[12] At some of these hours choices, mothers will face a choice about whether to participate in FC/WFTC: clearly, lone mothers and partners who do not work only face this choice when hours of work are greater of equal to 16, but mothers with working partners could face the choice at all of their own hours choices.

The probability of any hours choice being made, conditional on the random component u_y, the observable explanatory variables X, and the wage w is (other random components dropped for clarity):

$$\Pr(h = h_j \mid X, w, u_y)$$

$$= \Pr[U(h_j, y_{hj,P}, P; X, w, u_y) > U(h_k, y_{hk,P}, P), \forall h_k \neq h_j, P; X, w, u_y]$$

$$= \frac{\exp\{U[h_j, y_{hjP}; X, w, u_y]\}}{\sum_s \exp\{U[h_s, y_{hjP}); X, w, u_y]\}}$$

Wages (w) are assumed to be generated by:

$$\log w = \boldsymbol{b}_w X_w + u_w$$

where X_w is the vector of explanatory variables in the wage equation and u_w the (independent of X_w) random component.

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[12] Blundell and MaCurdy (2000) reviews labour supply modelling and conclude that discrete choice modelling represents best practice. Assuming a limited discrete choice reduces the complexity of modelling, but allows for the non-convex budget constraints that we almost always observe in practice. The risk is that the parameter estimates may not be robust to changes in the thresholds and the hours values chosen.

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Assuming independent unobservable components to wages, programme participation costs, and the linear coefficient on income, the extended log-likelihood is:

$$\log L = \sum_i \log \int_{\mathbf{h}} \int_{u_w} \int_{u_y} \prod_{j=1}^{J} \Pr(h = h_j \mid X, u_y, u_w, \mathbf{h})^{1(h=h_j)} f(u_y) f(u_w) f(\mathbf{h}) du_y du_w d\mathbf{h}$$

In our actual estimation, the integrals in the previous equations are approximated by summations, as described below. Identification is given by the comparison across different tax and benefit regimes and across different types of individual with varying eligibility status. Costs of working are identified as women are choosing between 5 states with positive working time; stigma costs are identified because some women are not entitled to FC/WFTC at certain levels of hours.

3.3 Valuing stigma costs

Any model of non-take-up that directly models the utility function is able to quantify in some way the magnitude of the stigma costs. Letting I indicate participation, an obvious measure of the stigma costs in utility terms is

$$Stigma(X) = U(y, I = 0; X) - U(y, I = 1; X)$$

evaluated at some y. Then, there are four obvious monetary measures of the stigma cost. Three of these are expressed in terms of income:

$CV = y_{cv} - y$, where y_{cv} is defined by $U(y_{cv}, I = 1) = U(y, I = 0)$ (y includes income from the transfer programme);

$EV = y_{ev} - y$, where y_{ev} is defined by $U(y, I = 1) = U(y_{ev}, I = 0)$ (y includes income from the transfer programme);

and $y_{stigma} = \dfrac{Stigma(X)}{\partial U / \partial y}$.

The first two are the compensating variation and the equivalent variation – how much extra income would someone need to compensate them from the stigma of participating

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in FC/WFTC? or how much income would someone forego to avoid the stigma of participating in FC/WFTC? – and the last is the monetary value of stigma costs (only really valid if stigma costs are small). The fourth measure is in terms of programme entitlement, and is the level of entitlement at which families are indifferent between taking up some benefit or not, or $\tilde{B}$ defined by

$$U(y + \tilde{B}, I = 1) = U(y, I = 0).$$

Few published studies actually report their valuations of stigma costs in this way, though.[13]

4. What happened to employment and programme participation around the WFTC reform?

We first describe the changes in the labour market and programme participation around the time of the WFTC introduction, before analysing this in a structural model below.

4.1 Changes in employment, poverty and WFTC caseload

Employment rates for low-education women in various family-types around this time are given in Figure 6. A simple difference-in-difference analysis between lone parents and single women without children post-October 1999 (along the lines of Eissa and Liebmann, 1996) would show an increase in employment for lone parents of between 2 and 3 percentage points. A comparison of mothers in couples with a working partner with those with a non-working partner would show an employment increase of those with non-

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[13] Moffitt (1983) reports the stigma cost of receiving Food Stamps in utility terms, but does not convert into the financial equivalent. Moffitt and Keane (1998) directly value in dollars the impact of changes in the explanatory variables on stigma costs (for example, they estimate that a one year increase in age increases the stigma cost ($y_{cv} - y$ above) of Food Stamps by $1.80 a week), but they do not report the mean stigma cost in money terms of receiving benefits. Bingley and Walker (1997) estimate the mean $y_{cv} - y$ for lone mothers for family credit to be £5.91 a week, compared to mean receipt of £25 a week. Duclos (1995) reports $\tilde{B}$ for Supplementary Benefit for a number of different families in his data-set.

working partners of around 2 percentage points. Both of these results are consistent with the predictions made in Blundell et al (1999 & 2000); unfortunately, similar increases in employment seemed to have taken place before the introduction of the WFTC, between 1997 and 1999. [14]

Have these employment changes been reflected in the WFTC caseload? The number of WFTC recipients increased markedly on its introduction in October 1999, and has continued to rise at a much faster growth rate than seen under Family Credit (see Figure 7). A year after its introduction, caseload had risen by 39%. The majority of this increased caseload seems to have come directly from the increased generosity making more families entitled, rather than from families moving into work. Figure 7 also shows the caseload of lone parents on out-of-work benefits (income support): this shows a slow but steady decline since late 1996, with no discernable change around 1999-2000. Analysis of administrative data that tracks individuals across income-related programmes shows that the net inflow of lone parents from out-of-work benefits to WFTC in the 12 months from November 1999-November 2000 was 50,000, 17,000 higher than the last 12 months of FC. [15]

The changing profile of WFTC recipients is shown in Table 3 (from administrative data; it is not possible to separate those families who would have been entitled to FC), which gives the unsurprising result than WFTC recipients earn more and work longer hours than those receiving FC. Use of help with childcare costs has grown enormously though, with 21% of lone parents receiving WFTC also receiving the childcare tax credit by August 2000, almost double the proportion under FC (very few couples were receiving help with childcare costs). WFTC is certainly making families with children better off: Figure 8 estimates how much a sample of families with children receiving WFTC in summer 2000

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[14] We cannot think why the WFTC would have an announcement effect.

[15] This compares net movements from "lone parents" to "working family" in Table 10.5 of the November 2000 and Table 3.5 in the August 1999 CGA of Working Age (DSS/DWP, various b). It excludes lone parents who claim unemployment (as opposed to "inactive"), sickness or disability benefits, and it will not capture lone parents who experience a change in family status. It is even more problematic to track couples using this dataset.

would be worse off if it were replaced by FC (with no behavioural changes). Families on the maximum FC/WFTC award, or those receiving housing benefit, are better off by only small amounts (under £10 a week), and some families newly-entitled to the childcare tax credit could be up to £100 a week better off under WFTC than FC. [16]

4.1 Changes in programme participation

4.1.1 Data

Studies of non-participation usually require a dataset that both records programme participation and allows entitlement to be calculated using a micro-simulation model. We have used two data-sets to estimate programme participation under FC/WFTC. One of these is a well-known UK data-set, the Family Resources Survey (FRS), and the other is a new government-commissioned panel data-set, the Families and Children Survey (FACS). [17]

The first wave of FACS was drawn from child benefit records. An income screening test was applied to couples to screen out those with joint incomes more than 35% above the point at which FC entitlement (in 1999) ran out (see Woodland and Collins, 2001, and Marsh et al, 2001). There were additional samples drawn from both the stock of FC recipients and new FC claimants. So FACS wave 1 should be a random sample of lone parents with children who claim child benefit (about 2% of families with children do not claim child benefit), and a random sample of low-income couples with children (defined in a particular way). The FRS is a cross-section household-based survey drawn from postcode records across Great Britain: around 30,000 families are asked detailed questions about earnings and other forms of income. It is the dataset most often used to micro-simulate tax and benefit reforms in the UK, and was used to model labour supply in Blundell et al (1999, 2000) and Paull et al (2000). FACS is an annual panel survey of low-income families with children. More specifically, the panel started with around 2,500

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[16] If we look just at families entitled to some FC, the average increase in generosity is 46%.
[17] Results in Adam et al (forthcoming) also use the Labour Force Survey (LFS).

lone parents (of any income) and 2,500 low-income couples with children in summer 1999; these families are being followed in successive years, regardless of their income, and the sample topped up with new low-income families. High-income couples with children were screened out during the interviews, but potentially in a way that tends to exclude families with self-employed workers (the definition of low-income includes all potential FC/WFTC recipients). Sample weights are not provided with the survey, and it is not clear that it is intended to be a nationally representative sample of low-income families with children. Other than being a panel, its advantages are that it records childcare use in more detail than other surveys, and it contains relationship, employment and FC participation histories (although we have not yet made full use of these advantages). A limited comparison of the three datasets is given in Tables 4 and 5, with reasonable similarities across the data-sets.

4.1.2 Recording FC/WFTC receipt

Tables 6 & 7 analyse how well each survey records FC/WFTC receipt (see Clark and McCrae, 2001, for more detail on the FRS and FC receipt). The patterns are reasonable approximations to the estimates from administrative data, but there are some concerns that recipients are under-represented as a whole in the samples.

4.1.3 Estimating entitlement and calculating programme participation

Official estimates of the programme participation rates for the main means-tested benefits in the UK are published every year. These are based on FRS data, except that they estimate the recipient population from administrative data, and estimate the eligible non-participants from survey data.[18] Tables 4-6 show recent figures.

Our estimates (which only use survey data) operate by calculating entitlement to all income-related programmes and simulate tax payments using a micro-simulation

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[18] There is no intuitive way of thinking about this, but this measure of the programme participation rate is:

$$T^*_{iner} = \frac{P(R=1)}{P(R=1) + P(R=0 \ \& \ B^* > 0)} = \frac{P(R=1)}{P(R=1) + P(B^* > 0).(1 - T^*)}.$$

model.[19] Table 11 shows the number of families modelled as being entitled to FC/WFTC, and how that overlaps with recipients, since 1994. [20] Estimates of the programme participation rate and mean entitlement, conditional on being modelled as entitled, are shown in Table 12. Those families not participating have lower estimated entitlements on average: this is confirmed in Figures 9 & 10, which show estimated density functions of receipt, entitlement for those receiving, and entitlement for those not participating. Figures 11 & 12 show univariate kernel regressions of take-up on modelled entitlement by family type, programme and survey: these show the positive relationship between entitlement and the probability of participating that would be suggested by a stigma model of non-participation.

We model the programme participation decision in a simple way. We assume that there is an index I_p : if this index is positive, the benefit unit claims the benefit, otherwise not. The index can be thought of as the net utility of claiming a benefit – it will depend (in very general terms) upon an individual preferences for income and for welfare participation. We assume that these preferences depend on a set of individual variables - the observable component – and on a random term – unobservable tastes for income and welfare participation. If we also assume that the unobserved term is normally distributed then we can estimate the probability of taking up FC/WFTC using probit models. We model the participation decision parametrically by assuming that

$$\Pr(participation) = 1 - \Phi(-X'b)$$

where the net utility of participating in FC/WFTC, conditional on being eligible, is $X'b + e$. We estimated models for lone parents and couples with children separately. In

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[19] Initially, we use a simplified version of the Institute for Fiscal Studies' TAXBEN that will run on a variety of data-sets, previously used in Paull et al, 2000. Further work will use the Institute's full model.

[20] We cannot model entitlement perfectly for families observed between October 1999 and April 2000, as we cannot tell whether families are receiving FC or WFTC. Our approach is to model WFTC entitlement for those not participating (this does represent the gains to participating), and for those participating, we estimate the weighted average of entitlement under FC and WFTC, weighted by the number of months since October 1999. This will still tend to underestimate entitlement for those families observed participating in this 6 month period.

the estimates for lone parents we include a dummy for single female, and for couples we include a dummy for female earnings greater than the male. Our other explanatory variables are: age, number of children, dummy for a pre-school child, education variables, housing tenure, dummies for non-labour and maintenance income, and earnings and entitlement (although, as argued above, earnings and therefore entitlement may be endogenous to the decision to participate. In addition, entitlement is a function of earnings and the number and age of the children, so identification will be achieved mainly through the increases in real entitlements over time). Earnings and entitlement are entered in logarithms: this will force the probability of participation to tend to 0 or 1 as entitlement and earnings fall to zero. The samples consist of those benefits units which are estimated as being entitled to FC, and so the estimates are conditional on our modelling entitlement correctly.

Marginal effects from a regression for FC only from both the FRS and FACS surveys are shown in Tables 13 and 14: entitlement and earnings affect participation positively and negatively respectively (and generally significantly) as would be expected; the next most important correlates are education and housing tenure: less educated families and those in social housing are more likely to participate, conditional on being eligible. The remaining variables are significant in none or some of the four regressions. The estimated elasticity of entitlement on take-up is shown in Figure 13: the median values are between 0.1 and 0.2 across the 4 models. [21] The distribution of the participation-indifferent value of entitlement (this is the $\tilde{B}$ defined in section 4) is shown in Figure 14 (this is the value of entitlement that implies a 50% chance of participating), and confirms that lone parents are much more likely to participate than couples at given levels of entitlement (it also shows some differences between FACS and FRS for couples).

Specifying entitlement in logarithms is a restriction on the functional form. A test of this functional form can be approximated by a goodness of fit Chi-squared test (see Andrews, 1988). This compares actual and predicted probabilities of success across various cells of

the data; by defining the cells on entitlement, the test compares the model against a non-parametric alternative. The test statistic is merely the explained sum of squares from regressing a vector of ones onto the matrix A = [B | C], where B is the difference between actual and predicted probabilities of success by cell, and C is a matrix of score vectors. The null of a correctly specified model cannot be rejected in the 2 FACS models, but is rejected in the FRS models. [22]

Can we see a change after WFTC was introduced? Extending the FRS sample to include WFTC, and interacting entitlement and earnings with dummies for families observed between October 1999 and April 2000, and for those observed after April 2000, suggests there is neither a significant level effect of the WFTC on programme participation, nor a significant change in responsiveness to entitlement for either lone parents or couples (full results available on request).

However, this experiment is changing the characteristic of the sample by including the better-off families who are newly entitled to WFTC. To focus more specifically on the impact of introducing the WFTC, we restricted the sample to observations in the 12 months before the abolition of FC, and those families observed in the 12 months following the full introduction of the WFTC who would have been entitled to FC given their incomes. The median participation-indifferent level of entitlement for lone parents fell from £15.24/wk under FC to £3.41/wk under WFTC; for couples, it rose from £39.27/wk to £57.78/wk (the regressions are not reported here; the very low figure for lone parents derives from the small sample, the high levels of participation amongst this group, and the weak relationship between entitlement and participation).

FACS allows us to make use of a panel. Under a random-effects probit model on a sample with the same criteria as above (ie families entitled to FC in its final year and those entitled to WFTC who would also have been entitled to FC had it existed in 2000,

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[21] So a 10 per cent increase in entitlement increases the probability of participation by somewhere between 1 and 2 percentage points; recall that for those entitled to FC, WFTC was, on average, 46% more generous.
[22] The cells used are deciles of entitlement.

given their incomes) the hypothesis that no coefficients changed upon the introduction of WFTC could not be rejected (there was a strong positive and significant correlation between the random effects). A fixed-effect logistic model, estimated on the few families who were entitled to both FC and WFTC but only participated in one programme – revealed a positive but badly determined coefficient on entitlement.

Section 2 described how housing benefit (HB) treats FC/WFTC awards as income. We explored whether families were aware of this interaction by modelling FC/WFTC participation conditional on the increase in net income from participating (rather than just FC entitlement). We substitute as follows:

$$\log (FC + \Delta HB) = \log \left(\frac{(FC + \Delta HB)\ FC}{FC} \right) = \log FC + \log \left(1 + \frac{\Delta HB}{FC} \right)$$

where *FC* is the Family Credit or Working Family Tax Credit entitlement and *ÄHB* is the value of the change in Housing Benefit when claiming FC/WFTC (always negative). Comparing the coefficients on these two terms should allow us to check whether the benefit units perceive the change in Housing Benefit and take it into account when applying for FC/WFTC. [23] If families take the HB change fully into account, the coefficients should be equal. If the coefficient on the second term is zero, families are not valuing the variation in this benefit at all. Results from FACS suggest that those entitled to HB are, in fact, more likely to take up FC/WFTC, but the relationship between participation and entitlement is not well determined: we cannot reject the null hypothesis that the two coefficients are equal, but the coefficient on the change in HB is slightly and insignificantly negative (which would suggest that housing benefit withdrawal encourages FC/WFTC programme participation).

We can examine the response to the support for childcare in a similar way: by separating FC/WFTC income into support for childcare costs (the childcare disregard under FC and

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[23] This analysis is assuming that there is full programme participation of HB. An exact approach would be to model joint programme participation of FC and HB simultaneously.

the childcare tax credit under WFTC) and the benefit that would be received were no childcare used, we can see whether the two kinds of income are regarded in the same way, and estimate the effect of support for childcare costs on programme participation of FC/WFTC. As with HB, we include the two parts of FC/WFTC as separate regressors; again, coefficients are generally badly determined and the results are unclear (too few couples are entitled to support with childcare). Results from FACS suggest that under FC, lone parents appeared to value the childcare disregard (the coefficient is significantly greater than zero) and the coefficient is similar to that on the "normal" FC award (0.20 on childcare disregard income and 0.18 on FC). Under WFTC, though, - which has much more generous support for childcare – the coefficient on the childcare tax credit was not significant in determining participation (although it was also insignificantly different from the coefficient on WFTC. See Adam et al, forthcoming, for more on this).

5.   Joint labour supply and programme participation estimates

5.1   Results

Chapter 3 presented a general utility function. At this stage, we present results from a model with some small simplifications. In particular, the wage equation is estimated (using a Heckman-style selection correction) before estimating the parameters of the utility function. The explanatory variables in the wage equation include proxies of human capital and demand-side factors and year dummies; identification comes from including age of the youngest child, the net income that the benefit unit would obtain if no member of the couple were working and a dummy for cohabiting couples in the employment equation. The results are shown in Table 17, with plausible coefficients on years of education in the wage equation, and age of youngest child and modelled out-of-work income in the selection equation. We then draw one realisation from the error distribution for each woman, and use a single wage prediction for each woman in our sample to compute earnings at the 5 hours choices.

The vector of variables (X) that affects the marginal utilities of income and working are: dummies for the youngest child being under 2, under 5, or under 10, functions of age, and age at which continuous education finished and ethnicity. The (unobserved) fixed costs of working are assumed to be deterministic, and allowed to vary by age of youngest child and region. Stigma costs are also assumed deterministic, and vary with age of youngest child, age, education, and a dummy for participating in WFTC rather than FC (in other words, families observed after October 1999). (Random components in either of these terms substantially increased convergence times without changing the properties of the model). Sample means of these variables are given in Table 18, and their interactions with hours of work and programme participation are given in Tables 19 and 20. The random component u_y is integrated out by drawing 10 times from the distribution, and computing the average likelihood across these 10 realisations.

As a starting point, we ignore childcare costs (whilst allowing for unobserved fixed costs of working). With no data on the childcare use of non-working mothers, there is no satisfactory way of modelling the childcare costs of those observed not working or not using childcare at the observed hours. [24] The 6 weekly hours bands are: 0, 1-15, 16-22, 23-29, 30-36, 37-99. Estimates for our sample of mothers are shown in Table 21. Around 1% of our sample have negative marginal utilities of income at their observed hours of work, and 11%/20% of women in couples/lone parents having positive marginal utilities of working time. Young children lower the marginal utility of income and increase the disutility of working, families with larger families have higher marginal utility of income and disutility of working. Older and more educated women have lower marginal utilities of income and lower disutilities of working. Estimated fixed costs of work are high, particularly for lone parents, and this may reflect our initial simplification that sets childcare costs to zero for all: mean weekly costs of working are £38/£111 for women in couples/lone parents. Stigma is significantly different from zero, decreasing with the age of the youngest children, and increasing with years of education, in line with the "reduced

form" results in Section 4. [25] For both lone parents and women in couples, stigma costs for FC/WFTC are (unsurprisingly) higher for those entitled and not participating than those participating; those working but not entitled (and therefore richer) have even higher stigma costs, whilst those not working have the lowest stigma costs of all (most of these women will be participating in income support, which, given the administrative implications, we would expect a priori to have higher participation costs than FC/WFTC). Interestingly, whereas the results in section 4 could find no significant change after the introduction of WFTC, stigma costs do appear to have changed significantly in the structural model since October 99, although they have increased for women in couples, and decreased for lone parents. [26]

[To come: predicted and actual probabilities of working and participating. Goodness of fit tests].

5.2   Policy simulation

The obvious advantage of a structural model is the ability to make predictions about what would happen under alternative scenarios. In particular, we will consider the impact of 1 hypothetical reform – increasing WFTC entitlements by £10 for those families already entitled – and one very relevant reform – the introduction of the WFTC. We also show what the impact of the other reforms were that were introduced at the same time as the WFTC.

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[24] In work in progress, childcare prices are allowed for as described in Section 3, and integrated out as follows: in-work incomes less childcare were computed at 6 possible childcare prices (per hour per child), and the probabilities of each price estimated from the sample of working women, given characteristics X.

[25] For lone parents, though, estimated stigma costs can be negative: this perhaps reflects a misspecification. In particular, if we are over-estimating participation in housing benefit, then we will be under-estimating the gain to participating in FC/WFTC (this is confirmed by results that assumes that families ignore the theoretical decline in HB when participating in FC/WFTC: stigma costs for lone parents rise, and are almost always positive).

[26] We offer two explanations. The pessimistic explanation is that this reflects a misspecification error: in particular, assuming no childcare costs means we under-estimate the gain to participating in WFTC for lone parents who actually are using childcare and using the childcare tax credit. This could explain the large negative coefficient. Optimistically, the increase in stigma for women couples could relfect that, under WFTC, payments are not made automatically to the main carer, who we might think more likely to want to claim FC/WFTC.

Preliminary and incomplete

We will also show the impact of less-than-full programme participation on effective marginal tax rates.

6.   Conclusions

[To come].

Preliminary and incomplete

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Table 1. Parameters of FC/WFTC (all in current prices, weekly amounts)

	April 1999 (FC)	October 1999 (WFTC)	June 2000 (WFTC)
Basic Credit	49.80	52.30	53.15
Child Credit			
under 11	15.15	19.85	25.60
11 to 16	20.90	20.90	25.60
over 16	25.95	25.95	26.35
30 hour premium	11.05	11.05	11.25
Threshold	80.65	90.00	91.45
Taper	70% of earnings after income tax and NI	55% of earnings after income tax and NI	55% of earnings after income tax and NI
Help with childcare	Childcare expenses up to £60 (£100) for 1 (more than 1) child under 12 disregarded when calculating income	Award increased by 70% of childcare expenses up to £100 (£150) for 1 (more than 1) child under 15.	Award increased by 70% of childcare expenses up to £100 (£150) for 1 (more than 1) child under 15

Source: CPAG (various).

Table 2: **Observation rule for programme participation assuming exogenous income, no agency errors, no analyst errors. no expectational errors.**

	$U(y + B*(y;X), I = 1; X) \leq U(y, I = 0; X)$	$U(y + B*(y;X), I = 1; X) > U(y, I = 0; X)$
Not entitled ($B^g = B* = 0$)	No award, not entitled	Never happens
Entitled ($B^g = B* > 0$)	Genuine non-participant	Award, entitled

Table 3. Changing profiles of FC/WFTC awards, 1999-2000

	Lone parents		Couples	
	August 1999	August 2000	August 1999	August 2000
Receiving WFTC	405,000 (52%)	527,000 (48%)	379,000 (48%)	562,000 (52%)
Mean award	£62.60	£76.71	£63.27	£73.32
% with childcare tax credit/disregard	11%	21%	0.4%	2%
Actual childcare costs	£43.88	£51.26[c]	£33.93[a]	£60.15[c]
Extra award through childcare tax credit/disregard	£22.08[b]	£33.38[b]	-	-
Mean age main earner	35	36	35	36
Mean number of children	1.7	1.6 [c]	2.4	2.3 [c]
Mean gross weekly earnings (employees only)	£112	£142	£144	£176
Mean hours worked (employees only; maximum for couple)	24.2	26.7	31.7	35.1
Number claiming 30 hour premium	125,000 (31%)	239,000[c] (41%)	255,000 (67%)	414,000[c] (76%)
% main earner self-employed	8%	4% [d]	23%	15% [d]

Notes: [a] Excludes those receiving because of a disabled partner. [b] Averaged over couples as well. [d] November 2000. All figures for GB only except [c] UK.
Source: various DSS (1999) and IR (2002)

Table 4. Family credit take-up rates

	Lone parents		Couples	
	As % caseload	As % expenditure	As % caseload	As % expenditure
1998/9	81	88	58	66
1997/8	77	84	62	74
1996/7	81	88	68	82
1995/6	80	91	62	76
1994/5	80	90	61	75
1993/4	77	86	66	76
1992	73	66		
1990-1991	68	62		

Notes: different methodologies were used for each of the shaded categories. Estimates were not broken down by family type before 1992: figures are averaged across lone parents and couples. About half of FC claims were by lone parents throughout the period under consideration. Figures shown are mid-points of stated range in some years; DSS estimate 95% error bands to be about +/- 4 percentage points. Excludes full-time self-employed. No official figures were published for 1999/0, as this was the year WFTC was introduced. Using a slightly different methodology, estimates of WFTC participation in summer 2000 were 62% caseload (70% expenditure), down from 70% under FC using the same dataset (see Marsh et al, 2001, and McKay, 2002).
Source: Department of Work and Pensions, "Income Related Benefits Estimates of Take-Up", various years.

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Table 5. Income support take-up rates

	Pensioners		Non-pensioners with children (lone parents before 1996/7)		Non-pensioners without children	
	As % caseload	As % expenditure	As % caseload	As % expenditure	As % caseload	As % expenditure
1999/0	72	80	97	98	84	89
1998/9	75	83	97	98	85	90
1997/8	75	83	97	98	85	90
1996/7	71	82	97	98	82	88
1995/6	63	75	98	99	83	89
1994/5	62	76	97	98	86	91
1993/4	69	79	96	98	91	93

Notes: different methodologies were used for each of the shaded categories, mostly affecting estimates for pensioners. Figures shown are mid-points of stated range in some years; estimated 95% error bands range from +/- 1 to +/- 6percentage points. Excludes full-time self-employed.
Source: Department of Work and Pensions, "Income Related Benefits Estimates of Take-Up", various years.

Table 6. Housing benefit take-up rates

	Pensioners		Non-pensioners with children (lone parents before 1996/7)		Non-pensioners without children	
	As % caseload	As % expenditure	As % caseload	As % expenditure	As % caseload	As % expenditure
1999/0	89	93	99	99	92	95
1998/9	93	96	99	99	94	96
1997/8	95	92	99	99	96	95
1996/7	94	96	99	99	95	96
1995/6	88	91	98	99	94	95
1994/5	89	92	99	99	96	97
1993/4	90	93	95	97	94	96

Notes: different methodologies were used for each of the shaded categories, mostly affecting estimates for pensioners. Figures shown are mid-points of stated range in some years; estimated 95% error bands range from +/- 1 to +/- 5 percentage points. Excludes full-time self-employed.
Source: Department of Work and Pensions, "Income Related Benefits Estimates of Take-Up", various years.

Table 7. Comparing family characteristics

Person	Dataset	N	As % of all with kids	Mean number of children	% with pre-school	% owner	% social renters	% non-white	% on FC or WFTC
Lone mothers	FACS2	1695	49.5	1.78	32.3	29.1	58.1	7.7	26.4
	FACS1	2339	50.4	1.75	37.3	27.9	54.7	9.1	21.6
	FRS00	1855	51.1	1.77	36.8	31.1	53.3	10.0	25.5
	FRS99	1930	49.2	1.79	37.7	29.9	55.1	9.9	20.4
Lone fathers	FACS2	74	2.2	1.49	8.1	48.7	44.6	9.5	8.1
	FACS1	141	3.0	1.59	8.5	46.8	39.7	9.9	6.4
	FRS00	205	5.7	1.54	12.2	50.2	37.6	6.3	19.5
	FRS99	211	5.4	1.62	17.1	52.6	36.0	13.3	11.4
Couples	FACS2	1659	48.4	2.18	44.3	57.2	34.8	10.0	24.8
	FACS1	2162	46.6	2.18	47.1	54.8	34.3	13.3	21.4
	FRS00	1567	43.2	2.17	46.0	51.6	38.0	15.7	29.6
	FRS99	1785	45.5	2.17	49.0	52.0	37.9	14.2	20.1

Notes: Families included in FACS2 only if they still have dependent children. FRS and LFS are all families with children.

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Table 8. Comparing individual characteristics

Person	Dataset	N	Mean age	Mean age left school	% with degrees	% employees	% self-employed	% full-time	Mean hours of work	Median gross earnings (£/wk)	Median net earnings (£/wk)
Lone mothers	FACS2	1695	35.3	16.4	5.7	41.4	2.8	42.7	26.1	121	111
	FACS1	2339	34.5	16.4	6.0	40.4	2.9	39.7	25.7	116	109
	FRS00	1855	35.1	16.6	n/a	44.9	1.8	49.1	28.1	170	
	FRS99	1930	34.8	16.5	n/a	41.6	2.4	50.4	28.3	143	
Lone fathers	FACS2	74	42.5	16.6	13.5	44.6	9.5	97.5	43.0	310	235
	FACS1	141	43.4	17.1	12.1	43.3	11.4	89.6	40.8	300	224
	FRS00	205	42.6	16.8	n/a	47.3	10.7	81.6	40.6	324	
	FRS99	211	42.2	16.7	n/a	47.9	10.0	82.9	40.5	349	
Women in couples	FACS2	1659	39.0	16.5	5.0	47.9	4.8	32.2	23.3	101	97
	FACS1	2162	35.7	16.4	4.6	40.0	3.5	22.5	21.1	89	86
	FRS00	1567	35.8	16.5	n/a	32.2	4.0	30.7	23.2	82	
	FRS99	1785	35.5	16.5	n/a	32.6	4.5	26.7	22.4	70	
Men in couples	FACS2	1659	36.1	16.5	4.5	61.3	15.3	93.9	41.1	270	210
	FACS1	2162	39.0	16.4	4.0	55.1	13.0	93.7	40.7	260	203
	FRS00	1567	38.9	16.5	n/a	48.6	16.9	89.9	42.9	243	
	FRS99	1785	38.4	16.4	n/a	47.7	17.7	90.7	43.4	240	

Notes: Families included in FACS2 only if they still have dependent children. FRS and LFS are all families with children. % full-time defined for all in work.
Hours and earnings defined only for employees who report it. Missing values ignored.

Table 9. What do household surveys tell us about FC receipt?

	Lone parents		Couples	
	FACS	FRS	FACS	FRS
Receiving FC (N)	514	1657	462	1902
Above as % of all receiving (LP+C)	52%	46%	47%	53%
Recipients as % sample	21%	15%	21%	6%
Recipients as % sample working more than 16 hours	50%	41%	28%	6%
Mean award	£ 65.30	£ 57.14	£ 61.06	£ 54.69
% with childcare tax credit	-	-	-	-
Mean age main earner	35	35	36	36
Mean number of children	1.7	1.7	2.3	2.4
Mean gross weekly earnings (employees only)	£ 92	£ 95	£ 160	£ 136
Mean net weekly earnings (employees only)	£ 85	-	£ 133	-
Mean hours worked (maximum for couple)	23.3	25.7	32.2	37.6
% main earner self-employed [b]	5%	4%	18%	18%

Table 10. What do household surveys tell us about WFTC receipt?

	Lone parents		Couples	
	FACS	FRS	FACS	FRS
Receiving WFTC (N)	454	478	415	483
Above as % of all receiving (LP+C)	52%	50%	47%	50%
Recipients as % sample	26%	26%	25%	10%
Recipients as % sample working more than 16 hours	62%	58%	30%	11%
Mean award	£ 78.37	£ 77.10	£ 71.89	£ 71.10
% with childcare tax credit	28%	-	8%	-
Mean age main earner [b]	36	35	37	35
Mean number of children	1.7	1.7	2.4	2.3
Mean gross weekly earnings (employees only)	£ 124	£ 151	£ 188	£ 202
Mean net weekly earnings (employees only)	£ 108	-	£ 156	-
Mean hours worked (maximum for couple)	26.3	27.8	35.4	39.6
% main earner self-employed [b]	5%	4%	16%	15%

Notes: FACS2 uses child benefit sample with dependent children only. [b] Main earner is assumed to be the man for couples.

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Table 11. Eligibility and receipt of FC or WFTC (benefit units with dependent children) , including self-employed

	FRS							FACS	
	1994	1995	1996	1997	1998	1999	2000	1999	*2000*
Eligible:									
Recipients	420	522	504	522	572	631	845	842	789
Non recipients	541	627	617	509	436	823	841	661	695
Non eligible:									
Recipients	99	93	132	127	124	147	84	134	80
Non recipients	7149	7063	6801	6180	5702	6073	4836	3005	1866
Total sample size	8209	8305	8054	7338	6834	7674	6606	4642	3430

Notes: FRS years are financial years. FACS years are summer. FRS 1999 includes people entitled to FC and WFTC.

Table 12. Participation in FC or WFTC (benefit units with dependent children) , excluding self-employed

	FRS							FACS	
	1994	1995	1996	1997	1998	1999	2000	1999	*2000*
Lone parents Participation %	0.639	0.673	0.606	0.668	0.717	0.630	0.692	0.721	0.725
Mean receipt	59.71	56.54	60.32	60.79	59.72	65.37	72.86	64.76	77.38
Mean entitlement, entitled participants, £/wk	59.72	58.40	60.34	62.44	59.10	65.85	77.91	70.22	85.87
Mean entitlement, non-entitled participants, £/wk	37.16	39.84	40.58	41.53	38.59	40.84	56.29	47.78	59.19
Couples Participation rate	0.424	0.439	0.443	0.462	0.526	0.361	0.441	0.553	0.445
Mean receipt	45.89	54.11	53.85	55.39	56.21	60.71	65.41	57.74	67.21
Mean entitlement, entitled participants, £/wk	51.06	57.71	56.18	58.32	58.76	66.22	69.39	58.89	80.10
Mean entitlement, non-entitled participants, £/wk	30.65	34.57	34.82	35.59	37.84	35.90	39.91	38.17	42.65

Notes: FRS years are financial years. FACS years are summer. FRS 1999 includes people entitled to FC and WFTC. The monetary amounts are in July 2000 prices.

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Table 13. Determinants of FC participation: reduced-form regressions, lone parents

Independent variables	FRS (04/1994-09/1999)		FACS wave 1	
	Marg. effect	s-e	Marg. Effect	s-e
Marginal effects at mean				
Age	0.0107	0.0119	-0.0461	0.0238
Age^2	-0.0002	0.0002	0.0005	0.0003
D. finishing education >18	-0.1594	0.0458	-0.1286	0.0805
Female head	0.0118	0.0508	0.1863	0.1292
D. children 0-4	-0.0348	0.0320	0.1146	0.0480
No. of dependent children	-0.0166	0.0165	0.0221	0.0283
D. Social renter	n/a	n/a	0.0830	0.0425
D. Private renter	-0.0410	0.0334	0.1333	0.0494
D. home owner	-0.1234	0.0260	n/a	n/a
D. maintenance income	0.0513	0.0247	-0.0148	0.0433
D. Non-labour income	-0.0116	0.0245	-0.0579	0.1102
D. multi-family household	-0.1722	0.1274	n/a	n/a
Log net earnings	-0.0557	0.0320	-0.1276	0.0592
Log entitlement	0.2048	0.0206	0.1323	0.0386
D. 1995-6	0.0334	0.0367	n/a	n/a
D. 1996-7	-0.0391	0.0390	n/a	n/a
D. 1997-8	0.0091	0.0378	n/a	n/a
D. 1998-8	0.0584	0.0357	n/a	n/a
D. 1999-00	0.0472	0.0402	n/a	n/a
Sample size	2077		583	
Log L	-1112.961		-279.454	
Likelihood ratio	420.46		124.31	

Notes: starting point for sample is women with dependent children in the FRS, 1994-2000. The following families are omitted: those with extremely high values of hours worked, those with missing values for any variable in the table above, those with a self-employed person. All monetary values in July 2000 prices.

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Table 14. Determinants of FC participation: reduced-form regressions, couples

Independent variables	FRS (04/1994-09/1999)		FACS wave 1	
Marginal effects at mean	Marg. effect	s-e	Marg. Effect	s-e
Male Age	0.0219	0.0108	0.0377	0.0251
Male Age^2	-0.0003	0.0001	-0.0005	0.0003
Female Age	-0.0806	0.0124	-0.0593	0.0274
Female Age^2	0.0001	0.0002	0.0007	0.0004
Male finish educ. >18	-0.0669	0.0421	-0.0808	0.0953
Female finish educ. >18	-0.1529	0.0452	-0.0846	0.0949
D. Cohabiting couple	0.0552	0.0328	-0.0086	0.0605
D. children 0-4	0.0720	0.0290	n/a	n/a
No. of dependent children	0.0051	0.0119	-0.0295	0.0275
D. Female main earner	-0.1363	0.0260	-0.1124	0.0643
D. Social renter	n/a	n/a	0.1989	0.0494
D. Private renter	-0.0100	0.0352	0.2570	0.0808
D. home owner	-0.1868	0.0239	n/a	n/a
D. maintenance income	0.0159	0.0637	0.1340	0.1143
D. Non-labour income	-0.0774	0.0234	-0.3396	0.1200
D. multi-family household	0.0083	0.1452	n/a	n/a
Log net earnings	-0.1921	0.0333	-0.0866	0.0948
Log entitlement	0.2083	0.0175	0.1754	0.0387
D. 1995-6	-0.0279	0.0364	n/a	n/a
D. 1996-7	-0.0204	0.0360	n/a	n/a
D. 1997-8	-0.0148	0.0371	n/a	n/a
D. 1998-8	0.0506	0.0382	n/a	n/a
D. 1999-00	-0.0484	0.0431	n/a	n/a
Sample size	2544		526	
Log L	-1410.1743		-295.4373	
Likelihood ratio	688		131	

Notes: starting point for sample is women with dependent children in the FRS, 1994-2000. The following families are omitted: those with extremely high values of hours worked, those with missing values for any variable in the table above, those with a self-employed person. All monetary values in July 2000 prices.

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Table 15. Changes in FC/WFTC take-up in FACS

Lone parents	Entitled in 1999:	
Entitled in 2000:	No	Yes
No	Number: 1123	Number: 108 Mean FC entitlement: £ 65.35 FC take-up rate: 67.6%
Yes	Number: 232 Mean WFTC entitlement: £ 64.27 WFTC take-up rate: 56.5%	Number: 341 Mean FC entitlement: £ 63.57 FC take-up rate: 78.9% Mean WFTC entitlement: £ 77.98 WFTC take-up rate: 81.8%

Note: child benefit sample observed in both waves, excluding families with someone self-employed in either wave. Family status measured at start of panel. 43 families modelled as entitled to neither benefit in fact received at least one; 22 families modelled as entitled only to FC in fact received WFTC; 20 families modelled as entitled only to WFTC in fact received FC.

Table 16. Changes in FC/WFTC take-up in FACS

Couples	Entitled in 1999:	
Entitled in 2000:	No	Yes
No	Total:596	Total:96 Mean FC entitlement: £ 54.77 FC take-up rate: 49.0%
Yes	Total:332 Mean WFTC entitlement: £ 56.49 WFTC take-up rate: 31.6%	Total:288 Mean FC entitlement: £ 64.90 FC take-up rate: 57.3% Mean WFTC entitlement: £ 81.99 WFTC take-up rate: 60.8%

Note: child benefit sample observed in both waves, excluding families with someone self-employed in either wave. Family status measured at start of panel. 51 families modelled as entitled to neither benefit in fact received at least one; 13 families modelled as entitled only to FC in fact received WFTC; 25 people modelled as entitled only to WFTC in fact received FC.

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Table 17. Wage equations (Heckman selection model): FRS (04/1994-03/2000)

Independent variables	Lone Mothers		Women in couples	
	Coeff.	t-statistic	Coeff.	t-statistic
Wage equation				
Constant	-0.0096	0.06	-0.2766	3.38
Age completed education	0.0891	22.31	0.1094	64.96
[Age-mean(age)]	0.0333	3.48	0.0146	2.79
[Age-mean(age)]^2	-0.0007	2.75	-0.0006	3.92
[(Year-age)-mean(year-age)]	0.0270	2.83	0.0051	0.97
[(Year-age)-mean(year-age)]^2	0.0002	0.95	-0.0001	0.88
[(Year-age)-mean(year-age)]^3	-0.0000	1.64	-0.0000	2.44
House owner	0.2987	13.11	0.2560	22.20
Regional unemployment rate	0.0011	0.08	-0.0094	1.28
Non-white	0.0125	0.46	-0.1906	10.44
Selection equation				
Constant	-2.3482	7.96	-1.1118	6.00
Youngest child age	0.0847	21.46	0.0951	38.24
Cohabiting couple	----	----	0.0695	2.47
Net income at 0 hours	-0.0004	1.87	-0.0004	4.35
Age completed education	0.1124	12.97	0.0445	11.22
[Age-mean(age)]	0.0470	2.50	0.0102	0.87
[Age-mean(age)]^2	-0.0016	3.59	-0.0018	5.95
[(Year-age)-mean(year-age)]	0.0539	2.85	0.0358	3.02
[(Year-age)-mean(year-age)]^2	0.0004	0.89	-0.0003	1.10
[(Year-age)-mean(year-age)]^3	-0.0000	1.19	-0.0000	3.80
House owner	0.8182	25.94	0.6724	32.61
Regional unemployment rate	-0.0145	0.58	-0.0076	0.47
Non-white	-0.0706	1.42	-0.5575	17.16
Rho	0.0459	0.57	0.2899	11.06
Sigma	0.4579	94.95	0.5112	159.75
Lambda	0.0210	0.56	0.1482	10.62
Sample size	10665		28166	
Censored sample	5981		8862	
Uncensored sample	4684		19304	
Log Likelihood	-8906.432		-29311.26	

Note: The estimates also contain dummies for year and region

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Table 18. Summary statistics of the variables used in the labour supply estimates

Variable	Lone mothers		Wives	
	Mean	Standard deviation	Mean	Standard deviation
d. Greater London	0.1519	0.3589	0.1002	0.3002
d. Youngest child 0-2	0.2454	0.4303	0.3101	0.4625
d. Youngest child 3-4	0.1578	0.3646	0.1397	0.3467
d. Youngest child 5-10	0.3481	0.4764	0.2884	0.4530
d. Yrm ≥ 9910	0.2001	0.4001	0.2041	0.4031
Children	1.7554	0.9233	1.8751	0.8634
Age	33.6161	8.0977	36.0795	7.1999
Age completed educ.	16.4941	1.6840	17.2315	2.2283
Non-white	0.1007	0.3009	0.0736	0.2611
Weekly hours	11.9290	15.8862	18.1354	15.6406
Predicted wage	5.5633	3.3957	6.6962	4.6500
Predicted income (0 h.)	175.3069	58.9949	374.1557	247.2734
Predicted income (10 h.)	186.2091	56.4646	427.9398	261.4848
Predicted income (19 h.)	223.3461	56.1207	470.4935	272.7265
Predicted income (26 h.)	234.7656	63.6005	501.7004	282.5953
Predicted income (33 h.)	251.9748	74.2999	532.6347	293.3277
Predicted income (44 h.)	275.9961	96.5625	580.3803	312.2781
Predicted income, no take-up (0 h.)	175.3069	58.9949	368.7048	250.4557
Predicted income, no take-up (10 h.)	186.2091	56.4646	425.5362	263.1569
Predicted income, no take-up (19 h.)	178.9222	65.0848	465.5149	277.4820
Predicted income, no take-up (26 h.)	203.0155	72.5987	497.9378	286.3953
Predicted income, no take-up (33 h.)	224.7431	83.0971	529.4605	296.6634
Predicted income, no take-up (44 h.)	258.0128	104.0146	578.1329	314.7712

Notes: starting point for sample is women with dependent children in the FRS, 1994-2000. The following families are omitted: those with extremely high values of hours worked, those with missing values for any variable in the table above, those with a self-employed person. All monetary values in July 2000 prices.

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Table 19. Observed entitlement and programme participation at discretised earnings and working time

Hours band	0	1-15	16-22	23-29	30-36	37+	All
Lone parents							
Not eligible	5981	754	92	101	286	764	7978
Eligible, participant	0	0	849	328	257	274	1708
Eligible, non-participant	0	0	186	120	254	419	979
All	*5981*	*754*	*1127*	*549*	*797*	*1457*	*10664*
Couples							
Not eligible							
Eligible, participant	1039	79	110	34	20	39	1321
Eligible, non-participant	786	166	141	60	55	81	1289
All	*8862*	*3775*	*4462*	*2662*	*3320*	*5085*	*28166*

Note: see note to Table 18.

Table 20. Observed weekly hours band

% in hours band	0	1-15	16-22	23-29	30-36	37+	All
Lone parents							
d. Youngest child 0-2	78.2	4.1	6.8	2.5	2.9	5.4	100.0
d. Youngest child 3-4	68.1	6.3	10.2	3.7	4.9	6.8	100.0
d. Youngest child 5-10	51.8	9.2	12.8	6.1	7.5	12.5	100.0
"Age left school" less than average	61.3	7.3	10.8	4.9	5.7	10.1	100.0
"Age" less than average	68.7	6.2	9.5	4.1	4.1	7.4	100.0
d. Greater London	66.8	4.3	4.9	2.5	9.4	12.2	100.0
All	*56.1*	*7.1*	*10.6*	*5.2*	*7.5*	*13.7*	*100.0*
Couples							
d. Youngest child 0-2	47.7	11.2	14.1	5.9	7.9	13.3	100.0
d. Youngest child 3-4	37.4	16.7	15.9	7.4	9.2	13.4	100.0
d. Youngest child 5-10	24.9	16.1	18.2	9.5	11.8	16.8	100.0
"Age left school" less than average	32.9	14.3	16.3	9.7	10.3	16.5	100.0
"Age" less than average	38.4	13.3	15.7	8.1	9.4	15.3	100.0
d. Greater London	42.5	8.4	10.2	7.4	13.8	17.6	100.0
All	*31.5*	*13.4*	*15.8*	*9.5*	*11.8*	*18.1*	*100.0*

Note: see note to Table 18.

Table 21. Labour supply estimates: FRS (04/1994-03/2001)

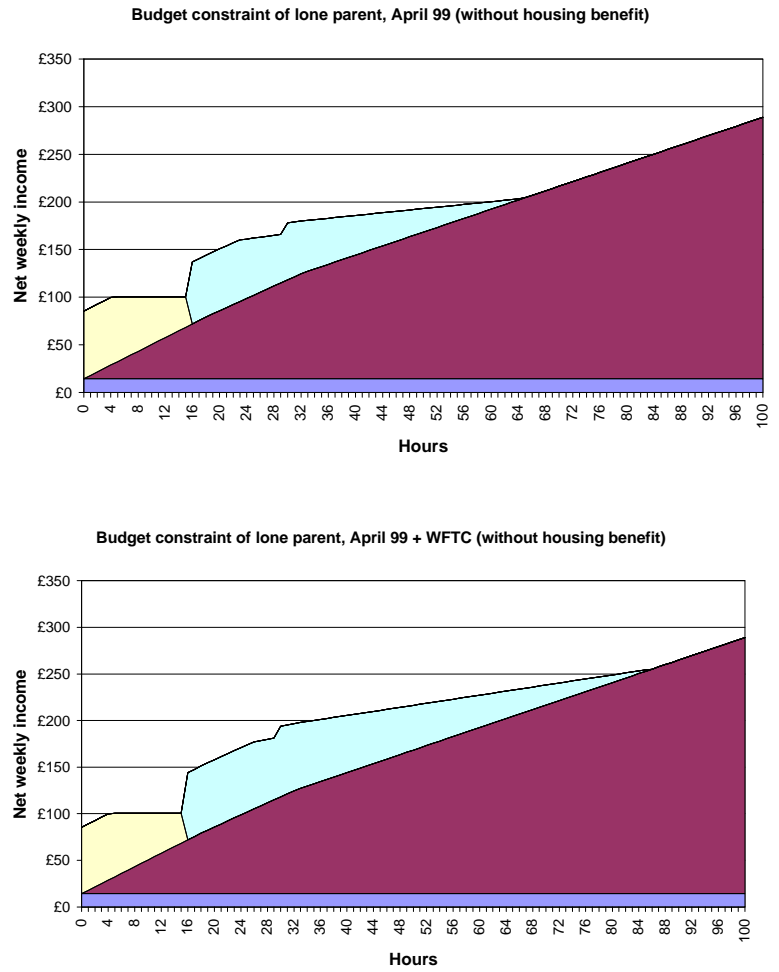|	Lone mothers		Women in couples	
Independent variables	Coefficient	t-statistic	Coefficient	t-statistic
Income (£ per week/10)				
Constant	0.1101	13.02	0.1444	31.23
x d. Youngest child 0-2	-0.0675	5.91	-0.0467	9.52
x d. Youngest child 3-4	-0.0522	4.83	-0.0330	6.10
x d. Youngest child 5-10	-0.0196	3.18	-0.0218	5.42
x children	0.0153	5.90	0.0048	3.29
x [(age-mean)/10]	-0.0191	5.38	-0.0251	10.23
x age completed educ.-mean	-0.0042	4.52	-0.0021	3.97
x non-white	0.0007	0.12	0.0459	11.30
standard deviation (u_y)	0.0008	2.79	0.0014	11.95
Hours (weekly working time)				
Constant	-0.1144	15.04	-0.0282	7.39
x d. youngest child 0-2	-0.0148	3.41	-0.0184	7.10
x d. youngest child 3-4	-0.0216	4.99	-0.0252	8.03
x d. youngest child 5-10	-0.0184	9.46	-0.0130	6.16
x children	-0.0137	13.07	-0.0141	19.66
x [(age-mean)/10]	0.0098	7.70	0.0044	3.73
x age completed educ.-mean	0.0081	18.53	0.0028	8.70
x non-white	0.0013	0.57	-0.0168	7.98
Income^2/10000	-0.1075	10.97	-0.0363	16.18
Hours^2/100	0.2200	18.81	0.0903	17.10
Income x Hours / 100	0.0044	4.39	-0.0033	11.05
Fixed costs (£ 00s)				
Constant	0.4537	4.56	0.0224	0.55
x d. Youngest child 0-2	1.6417	5.94	0.8793	16.55
x d. Youngest child 3-4	0.8478	4.03	0.2153	3.65
x d. Greater London	0.8098	10.49	0.5895	11.76
Stigma (utils)				
Constant	0.0968	2.10	0.9965	14.70
x d. Youngest child 0-2	-0.3093	3.15	-0.5094	6.55
x d. Youngest child 3-4	-0.3548	3.53	-0.3468	3.34
x age completed educ.-mean	0.1228	5.48	0.0627	2.52
x d. Yrm ≥ 9910	-0.3748	6.03	0.2784	3.74
Sample size	10665		28166	
Mean Log Likelihood	-1.41669		-1.66697	
Marginal utility of income < 0*	139 obs.		243 obs.	
Marginal utility of work >0*	2135 obs.		3231 obs.	

*Note: The marginal utilities of income and work have been computed at the observed values (after discretization) and assuming u_y=0.

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Figure 1. WFTC schedule
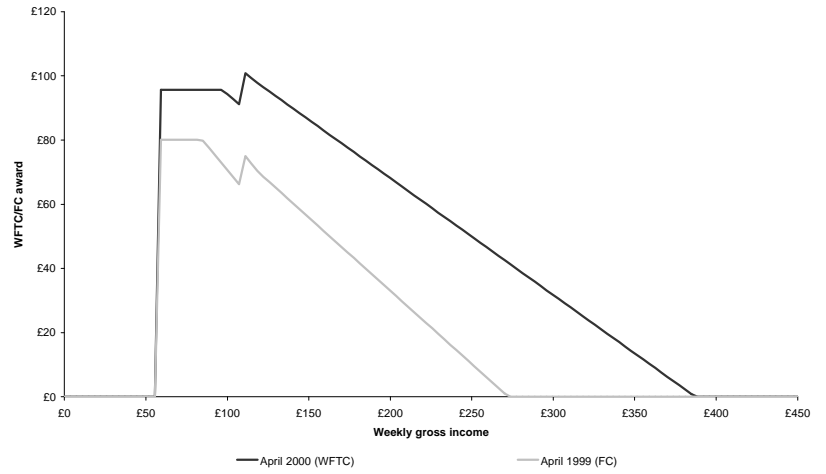
Notes: assumes minimum wage, no rent or childcare costs.

Figure 2. Budget constraints before and after WFTC, lone parent

Budget constraint of lone parent, April 99 (without housing benefit)

Budget constraint of lone parent, April 99 + WFTC (without housing benefit)

Notes: assumes minimum wage, no rent or childcare costs.

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Figure 3. Budget constraints before and after WFTC, second earner in couple

Budget constraint of two-earner couple, April 99

Budget constraint of two-earner couple, April 99 + WFTC
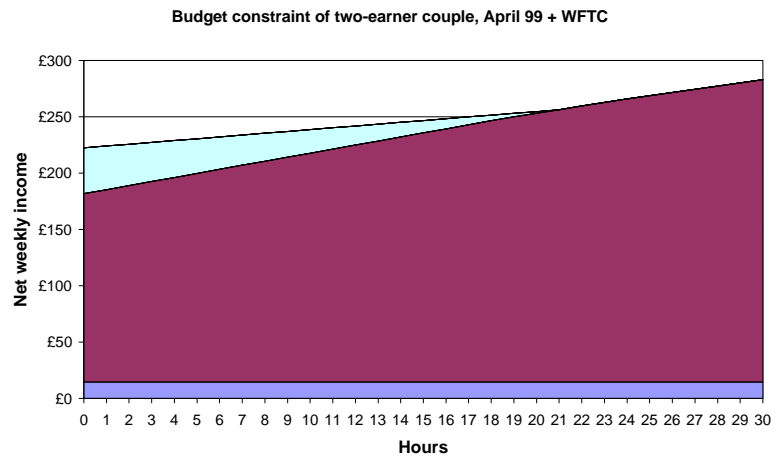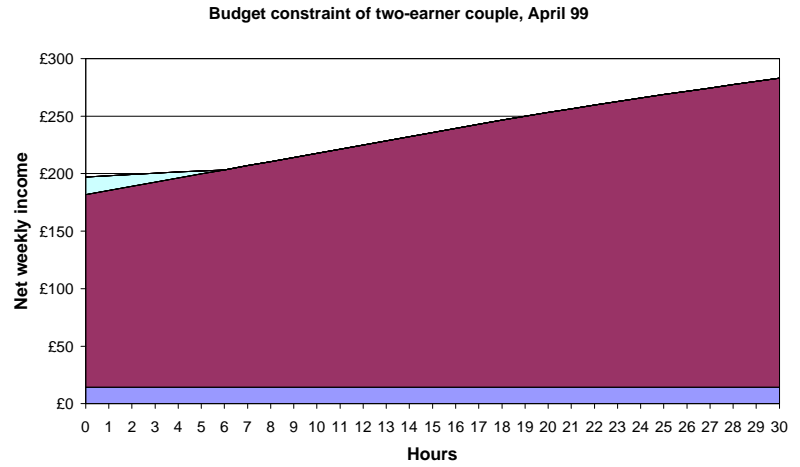
Notes: assumes 1st earner on £ 200/wk, 2nd earner on minimum wage, no rent or childcare costs.

Figure 4. Hours distribution for working low-education lone parents, FRS 1994-2000 (hours>50 omitted)
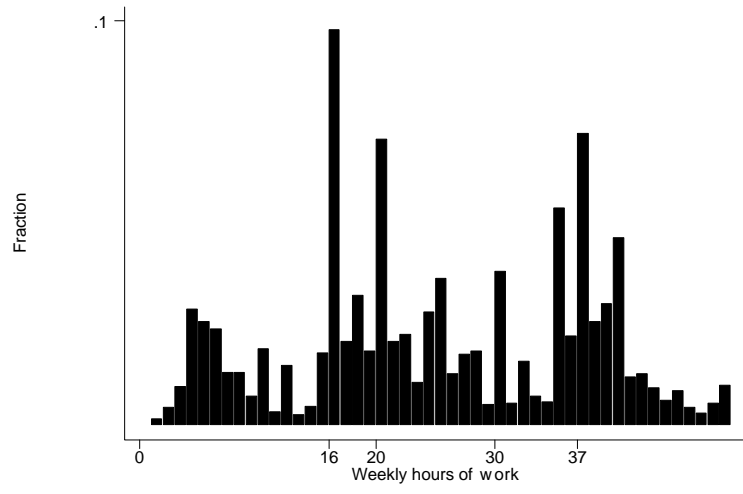
Figure 5. Replacement rates since 1979

Lone parent, 2 children under 10, no housing costs

Lone parent, 2 children under 10, with HB, BHC
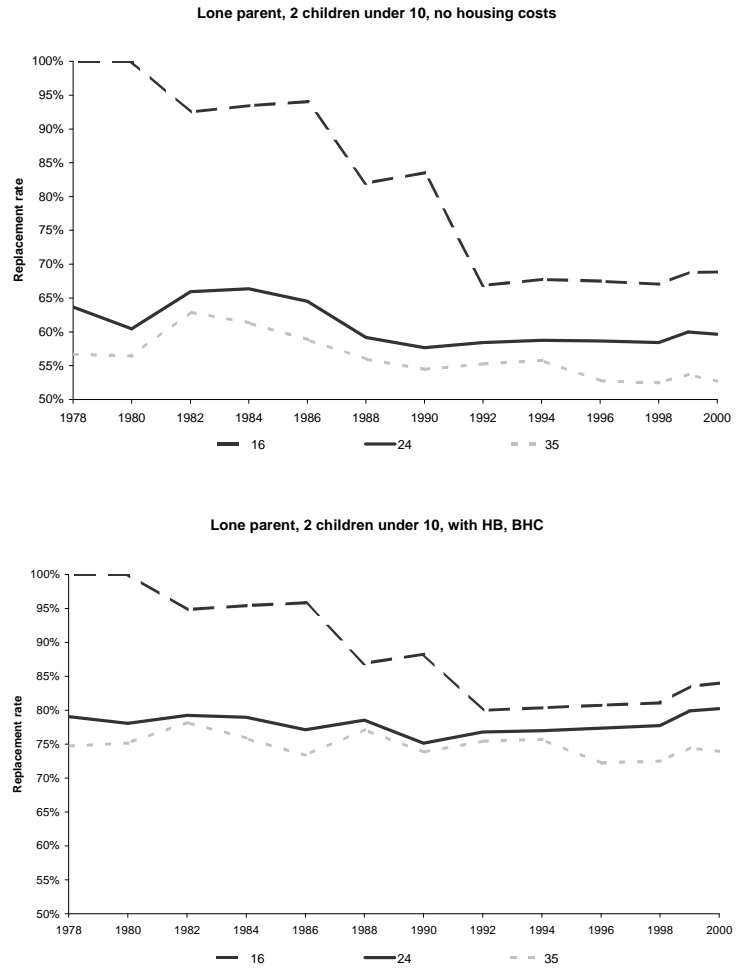
Notes: assumes hourly wage of £3.60, rent of £50/wk in 1999/0 prices.

Figure 6. Employment rates, low-education women (various groups)
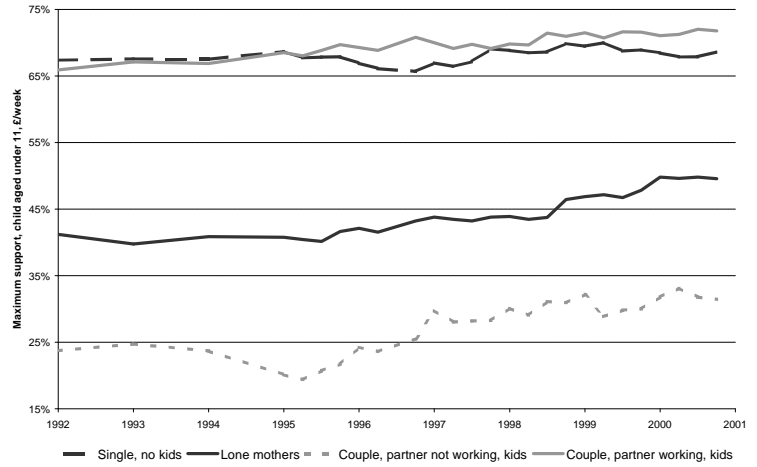
Note: low education defined as finished education aged <=16.
Source: LFS.

Figure 7. FC/WFTC and income support (out-of-work lone parents) caseloads, 1996-2001
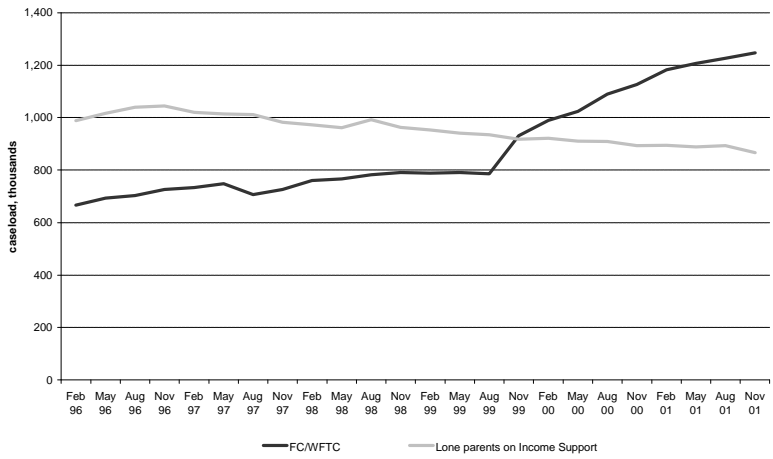
Source: DWP (2002) and IR (2002)

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Figure 8. Extra generosity of WFTC compared with FC for WFTC-receiving families, £ /week (vertical line shows median)

Change in disposable income, 2-4
Kernel Density Estimate

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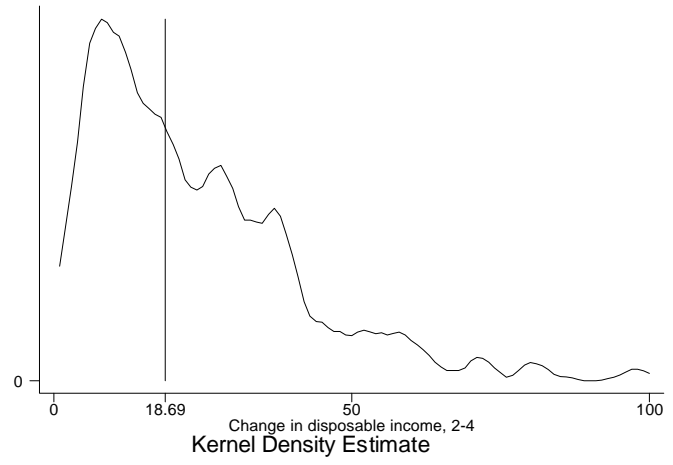
Preliminary and incomplete

Figure 9. Estimated densities of FC/WFTC entitlements and receipt, lone parents
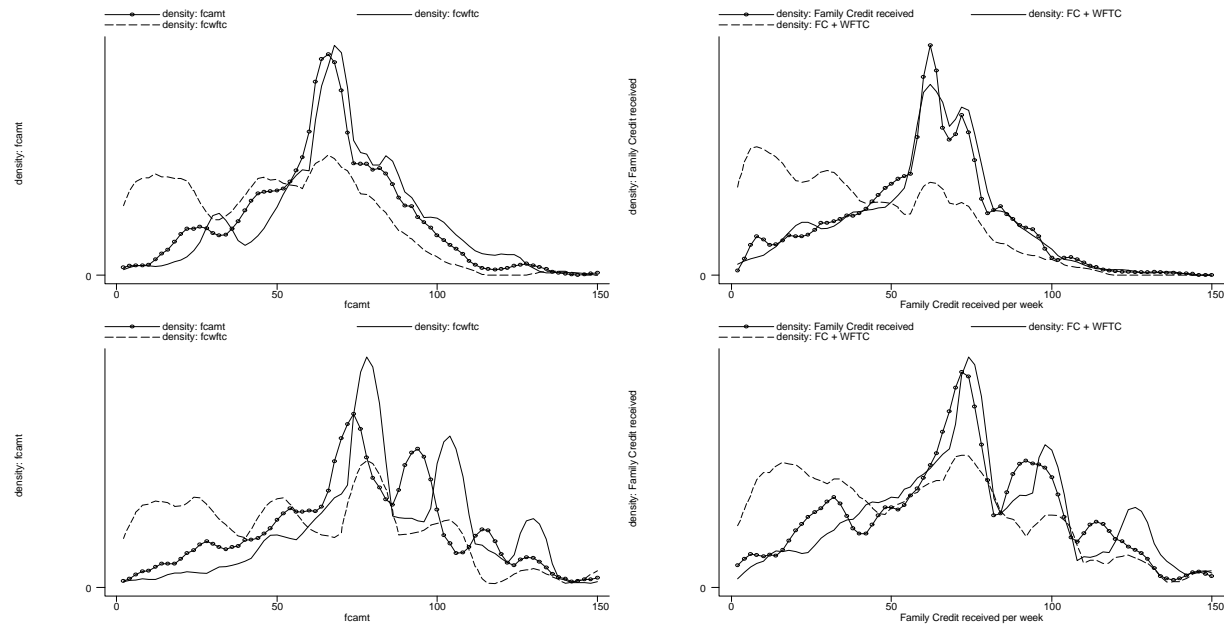
Note: kernel density estimates for lone parents, excluding self-employed. FACS on left, FRS on right; FC on top, WFTC on bottom. Marked line receipt, solid line entitlement of recipients, broken line entitlement of non-recipients. FRS: 4/94-9/99, FACS: summer 1999.

Preliminary and incomplete

Figure 10. Estimated densities of FC/WFTC entitlements and receipt, couples
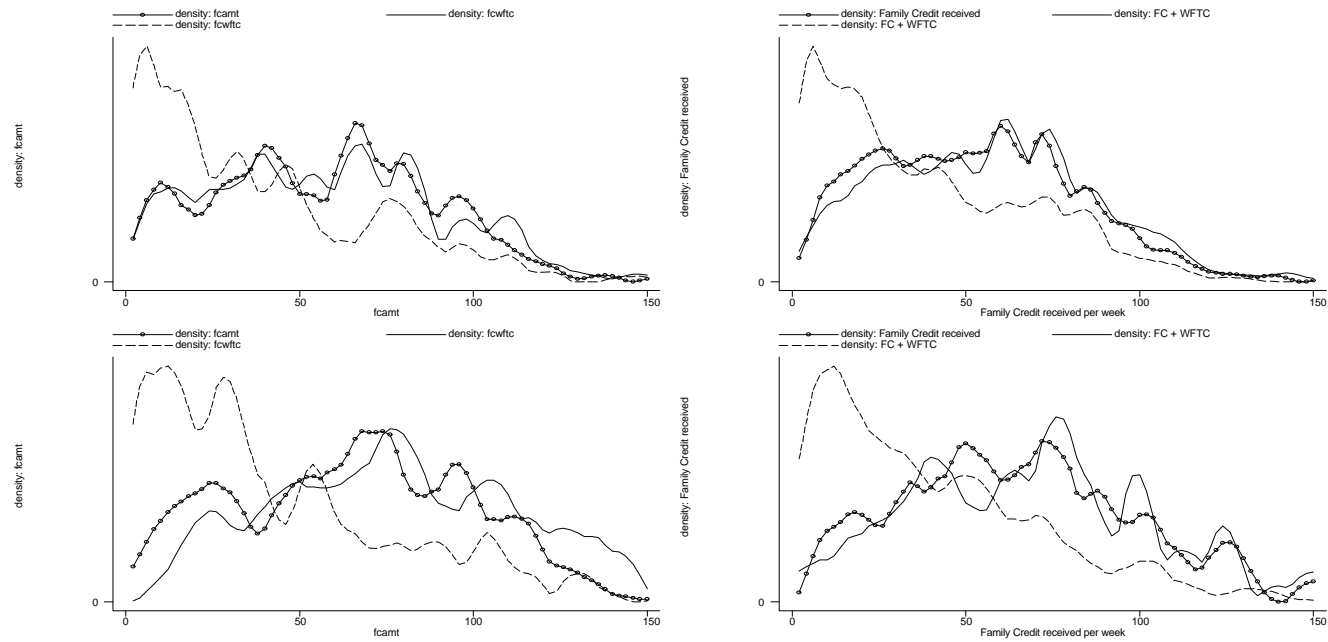
Note: Kernel density estimates for couples with children, excluding self-employed. FACS on left, FRS on right; FC on top, WFTC on bottom. Marked line receipt, solid line entitlement of recipients, broken line entitlement of non-recipients. FRS: 4/94-9/99, FACS: summer 1999.

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Figure 11. Non-parametric regression of participation on entitlement, lone parents
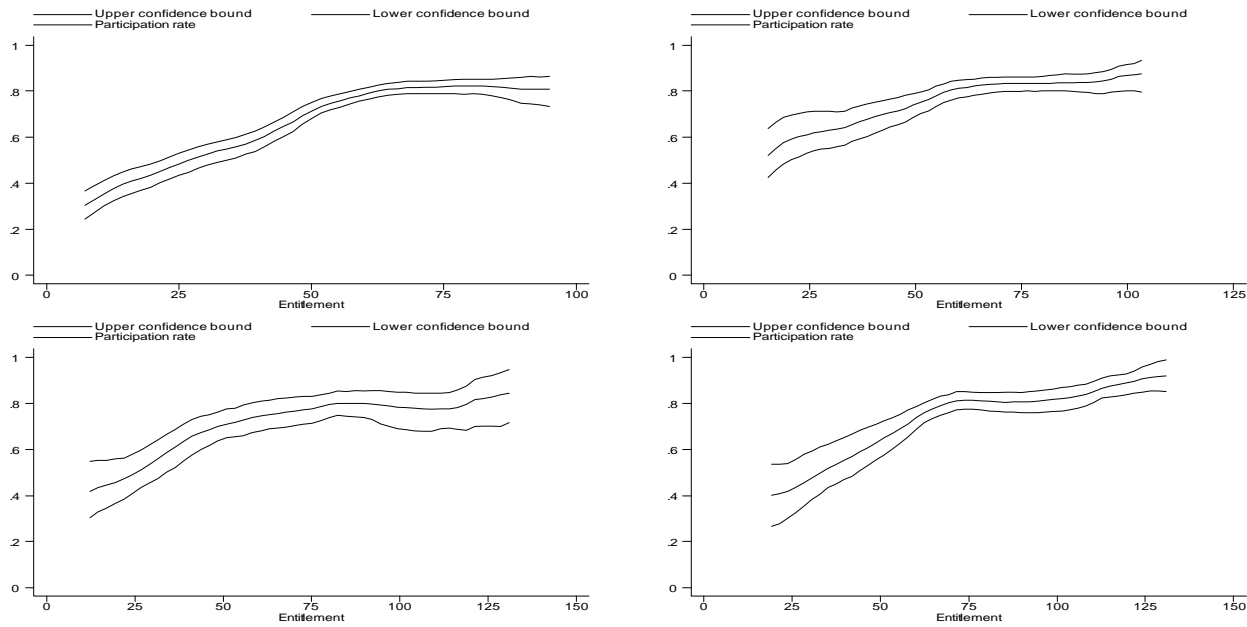
Note: kernel regressions for lone parents, excluding self-employed. FACS on left, FRS on right; FC on top, WFTC on bottom. Bootstrapped 95% confidence intervals shown. Sample trimmed before estimation to remove families with highest and lowest 5% of entitlement. FRS: 4/94-9/99, FACS: summer 1999.
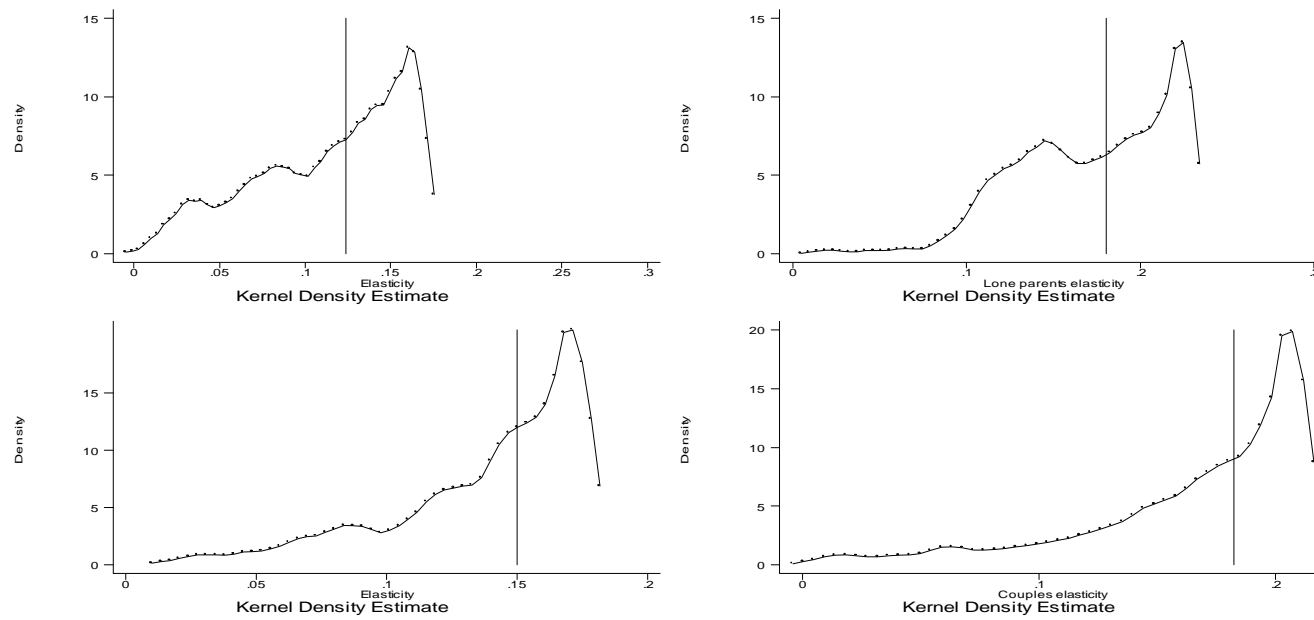
Preliminary and incomplete

Figure 12. Non-parametric regression of participation on entitlement, couples
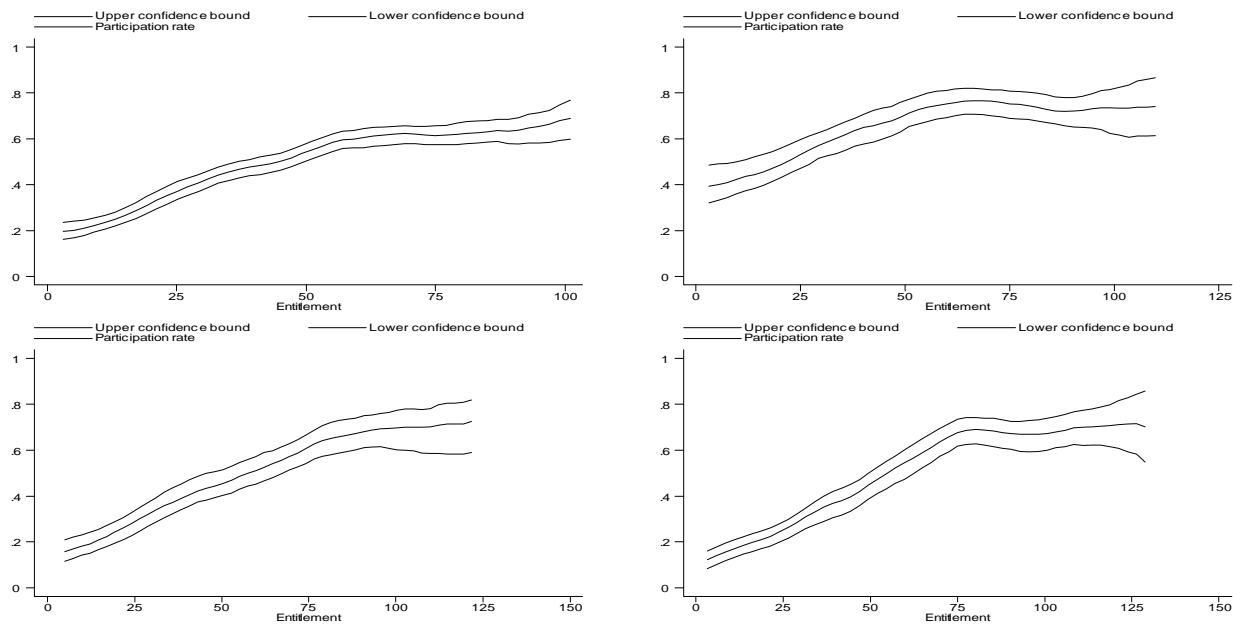
Note: kernel regressions for lone parents, excluding self-employed. FACS on left, FRS on right; FC on top, WFTC on bottom. Bootstrapped 95% confidence intervals shown. Sample trimmed before estimation to remove families with highest and lowest 5% of entitlement. FRS: 4/94-9/99, FACS: summer 1999.
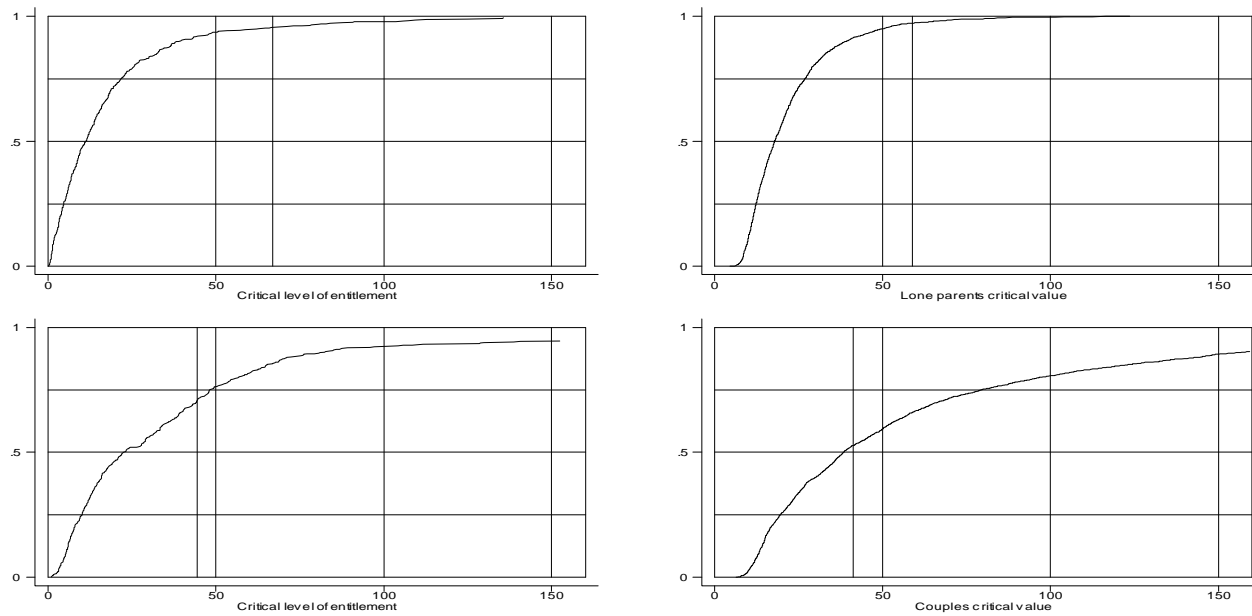
Preliminary and incomplete

Figure 13. Estimated density of entitlement elasticity of programme participation under FC

Notes: see text for details. FACS on left, FRS on right, lone parents on top, couples on bottom. Unlabelled vertical line shows median over sample of entitled families.

Preliminary and incomplete

Figure 14. Participation-indifferent entitlement levels under FC, July 1999 prices

Notes: see text for details. FACS on left, FRS on right, lone parents on top, couples on bottom. Unlabelled vertical line shows median entitlement over sample of entitled families.

Preliminary and incomplete.