

HOUSING SUBSIDIES AND WORK INCENTIVES IN GREAT BRITAIN*

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The relationship between housing costs, wages and transfer programmes is complex yet helps determine the incentive to work for individuals in low income or high housing cost households. We estimate a static discrete choice labour supply model that allows for housing benefit programme participation, using samples of married women and unmarried women drawn from Great Britain Family Resources Surveys 1994/5–97/8. We find women are quite responsive to labour supply incentives and that housing benefit income has similar incentive effects to earned income which suggests any ‘stigma’ is small. Our analysis is complemented by simulating housing benefit and direct rent subsidy reforms.

In Great Britain, over the past 25 years, there has been a large shift in housing tenure towards owner occupation: 51% of households were owner occupiers in 1974 compared with 72% of households in 1998. This move away from rented accommodation is largely at the expense of social housing, which comprises Local Authority and Housing Association provision (see Fig. 1). This is driven, at least in part, by the changing relative costs of the alternative tenure types (see Fig. 2) as direct subsidies have been removed and policies to provide incentives for social housing tenants to buy their homes have been introduced. Associated with this has been a growing disparity between the economic circumstances of owners and renters.¹ The social renters are increasingly drawn from the bottom end of the income distribution. The labour market participation rate for women living in owner occupied housing has remained around 65% since 1974, whereas the rate for social renters has fallen from 56% to 32%. For those who do work, there is also a growing wage rate disparity. Owner-occupiers have experienced 86% real wage growth since 1974, compared with 49% for social renters.

This divergence is partly explained by a composition effect whereby entry to social housing has been available to only the poorest households, and richer renters have moved into owner occupied accommodation. In particular the move was away from Local Authority housing under the ‘right to buy’ policy of the 1990’s whereby tenants were offered generous discounts to buy their

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¹ See Wadsworth (1998) for a discussion

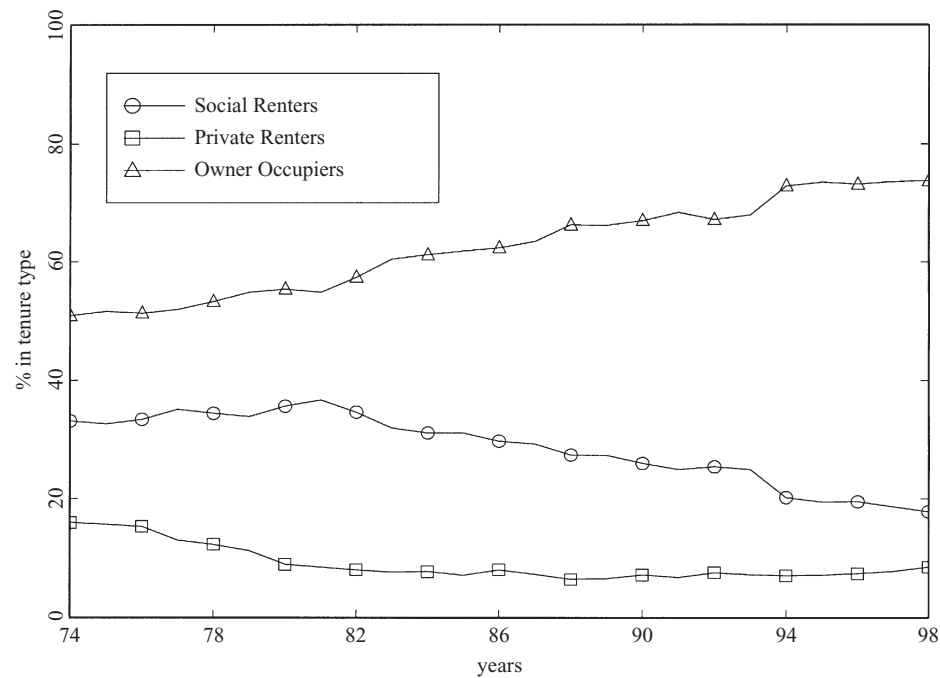


Fig. 1. *Tenure Type*

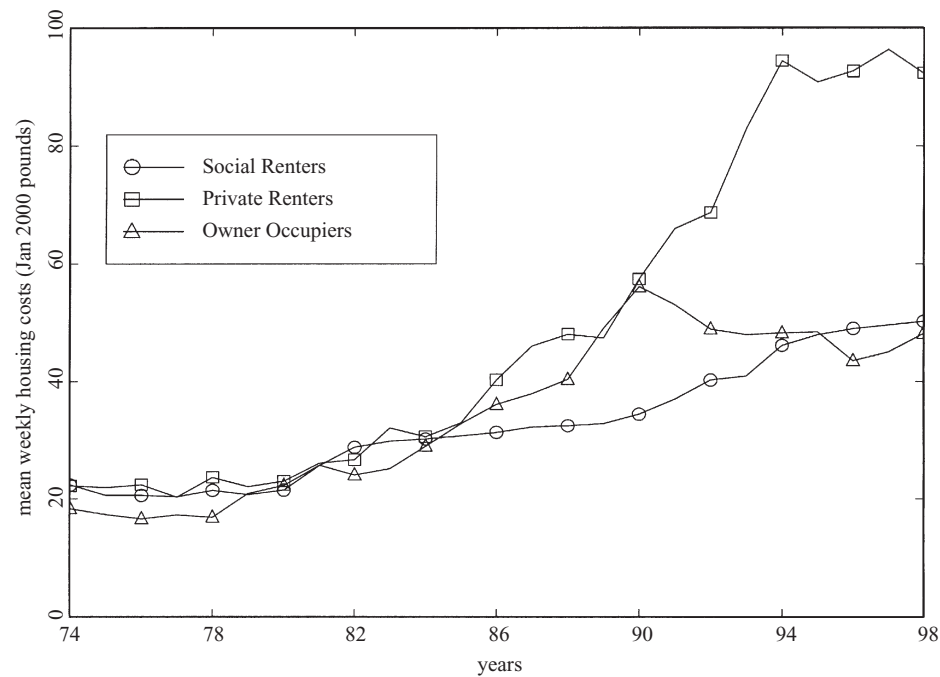


Fig. 2. *Real Housing Costs*

houses. Consequently social renters have become an increasingly impoverished group, accommodated in the lower quality social housing remaining.

Furthermore, real rents have increased rapidly, and faster than housing costs for owner-occupiers. Government housing assistance policy has moved away from subsidising rents directly towards income-related household subsidies. A rapid rise in private sector rents occurred from 1989 due to deregulation of the market. Housing Benefit (HB) is a means-tested transfer programme for low income households living in rented accommodation. Largely due to these rent increases, HB is now by far the most expensive income-related transfer programme, costing £11.2 bn in 1998/9 to support 4.5 million households compared to the other main income-related transfer programmes: Income Support (£8.2 bn to the under 60s), Family Credit (£2.4 bn), Job Seekers Allowance (£3.1 bn for the 'income based' part of the programme) and Council Tax Benefit (£2.4 bn)).² HB is means tested and the withdrawal rate (or taper) is 65%. Moreover, since other welfare transfers count as income for computing HB, this high rate is compounded by the taper on Family Credit. So, leaving aside tax and social security contributions, an HB and Family Credit recipient would face a combined taper of 90% (70% plus 65% of 30%). The interaction between HB and other programmes is crucial for welfare reform. The expansion of Family Credit, in the recent Working Families' Tax Credit reform, is largely offset by falls in HB entitlement because of this interaction.

There are very few studies of economic incentives in the UK housing benefit system. Wilson and Morgan (1998) describe the recent development of Central and Local Government housing finance, housing assistance and rent levels. Giles *et al.* (1997) summarise the work in Giles *et al.* (1996) that provides the best and most detailed description of the HB system, its effects on the income distribution and the effective marginal tax rates faced by tenants in the social rented sector. However, no attempt is made to model behaviour and estimate work incentives.

Ford *et al.* (1995) asked a very small sample of individuals about their understanding of the welfare system and attitudes to working. The authors highlight an unwillingness to claim and/or ignorance of in-work benefits and they are pessimistic about the prospects for increasing work incentives through changes in in-work benefits because of this. Their work suggests to us that it may be inappropriate to model work incentives simply as a function of entitlements, as has typically been the case. Blundell *et al.* (1988) model participation in the HB programme, that is, the decision to take up an entitlement and find take-up to be positively related to the level of entitlement and negatively to the level of other income. Labour supply is assumed exogenous. Rather, the evidence in Ford *et al.* (1995) suggests that it is important to model take-up and labour supply jointly.

Two important recent UK studies of work incentives illustrate the alternative

² A wide ranging review of expenditures is contained in DSS (2000).

approaches to modelling labour supply currently in use. Blundell *et al.* (1998) follow an instrumental variables and difference-in-differences approach to model the hours of work decision conditional on working for married women above the welfare system who face a linear tax schedule. Duncan and Giles (1996) model the discrete choice between non-work, working part-time and full-time for lone mothers potentially facing non-convex budget constraints due to the welfare system. The budget constraint is taken as given, and the focus is on modelling work incentives while ignoring programme participation.

For the United States, Keane and Moffitt (1998) model labour supply and participation in a housing subsidy programme, together with participation in two other welfare programmes. The empirical methodology of this study is closest to ours. In this paper we model the relation between household demographic characteristics, housing costs, the welfare system, and female wages and work incentives. The implications of estimated labour supply incentive measures for the effects of rent levels and transfer programme design are also illustrated.

The remainder of the paper is organised as follows: Section 1 presents the economic model and econometric framework, and places this methodology within the recent labour supply and programme participation literature; Section 2 describes relevant aspects of the UK Housing Benefit programme and the Family Resources Survey Samples analysed; Section 3 presents estimation results and illustrative simulations are discussed; a final section summarises and concludes.

1. Economic Model and Empirical Specification

In the absence of convincing quasi-experimental evidence,³ a detailed econometric analysis of a large sample of individuals is required. There are several empirical problems that have to be addressed when taking this approach in our context. In general, hours of work, programme participation and wages may be jointly determined. For example, individuals with high ability (which is unobserved to the researcher) may both receive high wages and work long hours; or (unobservably) energetic individuals may work long hours and participate in transfer programmes. The goal here is to obtain an unbiased measure of financial incentives for labour supply, and ignoring these potential sources of endogeneity (spurious correlations) may potentially bias estimated parameters of interest. This paper takes the general solution to the endogeneity problem, by modelling the budget constraint and hours of work jointly.

Blundell and MaCurdy (1999) survey the recent labour supply literature and conclude that current best practice in static modelling of labour supply and programme participation takes a discrete choice approach. This is an approx-

³ Good examples of studies using quasi-experimental data are Eissa and Leibman (1996) on the US 1986 income tax reform and Bell *et al.* (1999) on evaluation of the UK New Deal programmes.

imation that allows incentive measurements for individuals who face non-convex budget constraints due to the welfare system, with a reasonable computational burden.

Moffitt (1983) was the first to put together labour supply and programme non-participation in a utility maximising model. Only a few papers have subsequently taken a discrete choice approach to jointly modelling labour supply and programme participation. Hoynes (1996) uses a US sample of 1,010 families from the Survey of Income and Programme Participation to model household labour supply (that is three labour market states for husband and wife) together with participation in the Aid for Families with Dependent Children programme. The discrete choice framework is multinomial logit with semi-parametric mixing (discrete heterogeneity terms) following Heckman and Singer (1984). Gross wages are estimated in a reduced form first stage regression and multiplicative measurement error in hours is allowed for. Keane and Moffitt (1998) use a sample of 968 lone mothers also drawn from the US SIPP to model jointly three labour supply states, participation in three programmes, and wages. The discrete choice framework is multinomial probit without mixing terms. Duncan and MacCrae (1999) considers three labour supply states for a UK Family Expenditure Survey sample of lone mothers and serves to illustrate another alternative multinomial choice approach: multinomial logit with normal mixing (continuous heterogeneity terms), following the work of McFadden and Train (1998).

Our approach is closest to that of Keane and Moffitt (1998) in the sense that we use a multinomial probit with free correlation structure to model choice over three labour supply states combined with participation in one programme, jointly with the wage. We allow separate wage equations for part-time and full-time work to allow for the different nature of wage determination in the British context. Earlier versions of the model incorporated taste heterogeneity through normal mixing (random parameters on income) following Hausman and Wise (1978). But these were found to be insignificant and not improve model fit, and so were dropped in our preferred specification. Furthermore, we allow measurement error in hours following Hoynes (1996), but prefer additive rather than multiplicative errors.

To summarise the features of our approach: we adopt a multinomial probit framework with unrestricted covariance; we find that taste heterogeneity is unimportant in our samples and so our preferred model has no mixing; we allow for additive hours measurement (approximation) error; and we model, simultaneously, part-time and full-time wages, accounting for missing wages.

These features are now formalised. We approximate the budget constraint by just six discrete points which we think of as labour market non-participation (*NP*), part-time work (*PT*) and full-time (*FT*), interacted with participation in the housing benefit programme at any state.⁴ However, some individuals are

⁴ Labour supply discretization is $NP = 0$, $PT = 1-29$, $FT = 30+$ weekly hours. For the purposes of estimation, mean incomes within state are computed at 0, 20 and 40 hours respectively.

ineligible to the programme in some states and then face only a limited choice set. This restricted choice set is accounted for in estimation.

The choice between the six alternatives is assumed to be driven by differences in the utility attached to them. Let the utility associated with choosing state k be $U(y_{ik}, h_k; \mathbf{X}_i)$ where y_{ik} is the income associated with this choice and $\mathbf{X}_i$ is a vector of individual i 's characteristics.

Now consider a statistical specification which allows for random variation in behaviour due to an additive disturbance and variation in tastes, $U_{ik}^*(y_{ik}, h_k; \mathbf{X}_i, \varepsilon_{ik})$, where U_{ik}^* is latent unobservable utility of state k for individual i . The utility gain in moving from alternative k to j is

$$U_{ij}^* - U_{ik}^* = g(y_{ij} - y_{ik})\psi + \mathbf{X}_i\beta_{jk} + (\varepsilon_{ij} - \varepsilon_{ik}) \quad (1)$$

where $g(y_{ij}, y_{ik})$ is a row vector of differences of functions of the net incomes, and ψ reflects the mean tastes of the sample, $(\varepsilon_{ij} - \varepsilon_{ik})$ is an additive disturbance assumed to be iid across i but not necessarily across j . The choice of $g(\cdot)$ is arbitrary although here we assume quadratic for simplicity.

We define the choices j by categorising the actual hours distribution whereby we allocate an hours level of h_k to all those individuals whose hours fall within a range around h_k .⁵ This induces an errors in variables problem which is addressed by allowing hours to have a variance within the discrete state.

The take-up of HB is treated as an endogenous variable in our analysis: the probability of take-up is allowed to depend on the level of entitlement and other variables that also determine hours of work, and we allow for a correlation between the unobservable determinants of take-up and hours. We allow only for HB non-take-up. Relaxing this assumption to allow for non-take-up of other transfers is problematic because of the additional computational burden involved. The focus of this paper is the HB programme, which is by far the largest and suffers from the greatest take-up problem in expenditure terms, so participation in other programmes is assumed exogenously full.

The labour supply equations are identified by those observations without any transfer entitlements at any employment status: largely because they have high wages or high levels of unearned income. Identification of wages is achieved by a joint normality assumption together with exclusion restrictions: experience included only in wages, age and children included only in labour supply and take-up.

2. The Housing Benefit Programme and Data Description

Housing Benefit is a means-tested transfer which pays a proportion of the rent of low income or high housing cost households. The formula is as follows:

⁵ Bingley and Walker (1997) uses a similar multinomial probit framework, and further details are presented there. The setup in that paper is simpler in essentially three respects: a smaller choice set, no hours variation within state and exogenous wages.

$$HB = rent - (taper \times excess\ income) - non-dependent\ deductions \quad (2)$$

$$excess\ income = (earnings - disregard) + other\ income - needs \quad (3)$$

where *earnings* are after income tax and social security contributions, *disregard* is a small amount dependent on family status, *other income* includes income from all other transfer programmes, *non-dependent deductions* represent notional contributions to rent of other adults in the household, *needs* is a function of household demographics, and *taper* is the transfer withdrawal rate of 0.65. The two important features of the system are the effective additional tax rate implied by the taper of 65%, and that rent changes are, at the margin, 100% reflected in transfer entitlement.

There are effectively just two alternative potential datasets upon which to base this analysis. We exclude the General Household Survey because this does not contain financial information detailed enough to calculate transfer entitlements with any degree of precision; and the British Household Panel Survey which is not conducted continuously, but once each year, and suffers from a 'seam' problem of an infeasibly large proportion of welfare spells beginning or ending at the survey date. This leaves the Family Expenditure Survey and Family Resources Survey, which are used in illustrations below. Prior to 1978, Family Expenditure Surveys did not contain the education data required for producing reasonably accurate wage predictions. Family Resources Surveys are larger, but only available since 1994. Pooling each of the surveys separately over time yields about the same number of observations for FRS as FES. We chose to use the FRS data for our modelling on the grounds that it yields slightly more accurate benefit calculations, and contains a recent sample faced with recent welfare policies, which may be more pertinent to the current policy debate.

Thus, our analysis uses data on earnings, hours, housing costs, welfare receipts and individual characteristics drawn from four years of the Great Britain Family Resources Surveys (FRS) from 1994/5 to 1997/8. FRS is a large, continuous survey of approximately 0.1% of British households. It lends itself to the microeconomic modelling of labour market behaviour in the face of the welfare system since it has good information on welfare receipts. It is conducted by the Office for National Statistics on behalf of the Department of Social Security, and is used to compute official figures for programme participation (benefit take-up).⁶

The raw relation between HB entitlement, receipt and labour supply is illustrated in Table 1 for the Family Resources Survey samples we use, to anticipate the dataset description below. The marginals show that married women work more than unmarried women, respectively 66% and 51%; they are less often entitled to HB, respectively 13% and 56%; and less often in receipt 8% and 43%. There are many more unmarried women who are both out of work and receiving HB, and HB non-take-up is also much more important.

⁶ Department of Social Security (1997) provides a description of take-up rates computed from the Family Resources Survey.

Table 1
Female Labour Supply and Housing Benefit

% of sample in cell

Housing Benefit Status		Labour Supply Status							
		Married Women				Unmarried Women			
		NP	PT	FT	All	NP	PT	FT	All
Entitled	Receiving								
no	no	22.5	22.3	42.1	86.9	5.6	5.2	34.8	45.5
no	yes	0.2	0.1	0.1	0.4	0.0	0.1	0.5	0.6
yes	no	4.0	0.7	0.6	5.3	8.1	1.1	2.1	11.3
yes	yes	6.7	0.6	0.2	7.4	35.4	5.7	1.6	42.6
yes + no	yes + no	33.3	23.7	43.0	100.0	49.1	12.0	39.0	100.0

Notes:

- 1. Own calculations from FRS 1994/5–1997/8 estimation sample
- 2. Sample sizes are 42,491 married women and 13,340 unmarried women
- 3. NP = 0, PT = 1–23, FT = 24+ hours worked in survey week

We motivated the paper by noting that, in last 25 years, a large shift in housing tenure has occurred, and there has been an associated growing disparity in economic outcomes between renters and owner occupiers. These trends can be briefly described in three figures based on calculations from Family Expenditure Surveys 1974–93 and Family Resources Surveys 1993/4–97/8. Each figure contains three lines, one for each of the main housing tenure categories: Social renters (housing associations and local authorities), private renters (furnished and unfurnished) and owner occupiers (owned outright and paying off a mortgage).

Fig. 3 shows that female employment rates have remained roughly stable for owner occupiers, but social renter employment has experienced a large fall, with private renters in between the two other groups. Fig. 4 presents the weekly hours distribution conditional on working. This proves to be quite a noisy series, and only a small relative fall in conditional hours can be discerned for social renters compared with the other tenures. Fig. 5 shows that the real wage growth for owner occupiers has been substantially larger than for other tenure groups.

In Great Britain, the weekly hours of work distribution has a relatively high variance for women compared to men. Moffitt (1992) summarises the empirical consensus that female labour supply is more responsive to work incentives than that of men. Consequently in this paper, we focus on measuring female work incentives as being the margin of interest. We consider separate samples of unmarried women and married (or cohabiting) women, where male partners labour supply is assumed to be exogenous.⁷ The age

⁷ Male partner labour supply is assumed exogenous in order to reduce modelling complexity, and family labour supply is beyond the scope of this paper (see Chiappori (1992) for an analysis). While this assumption is common in the labour supply literature (see Blundell and MaCurdy (1999)), it may be considered strong in the recent British context. Machin and Waldfogel (1994) document growth in the number of workless households, and Gregg *et al.* (1999) show that workless households are particularly common among social renters. This suggests there is scope for future work on housing subsidies and household labour supply.

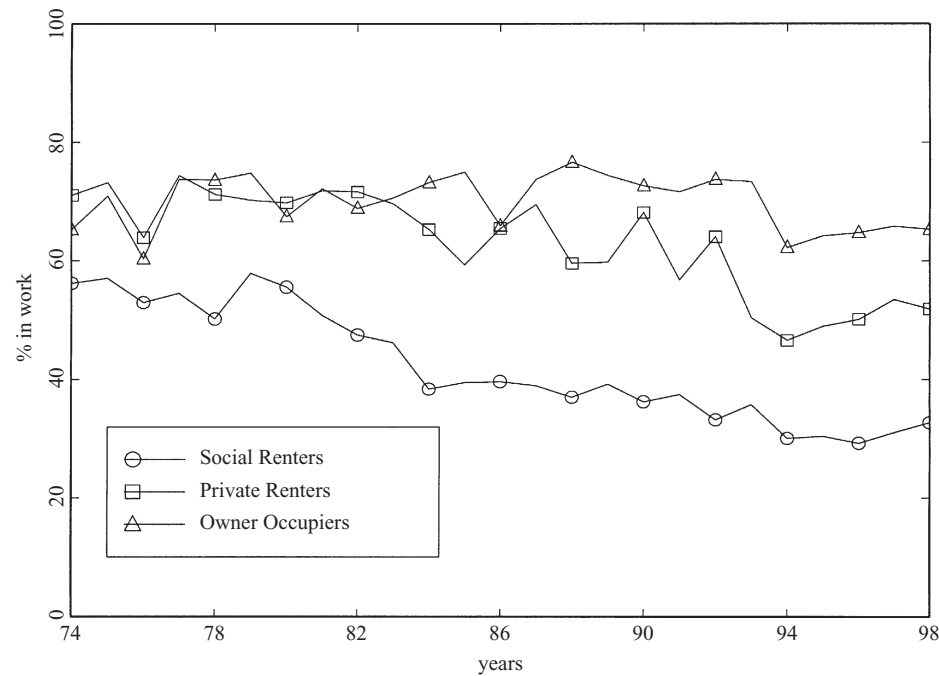


Fig. 3. *Female Work*

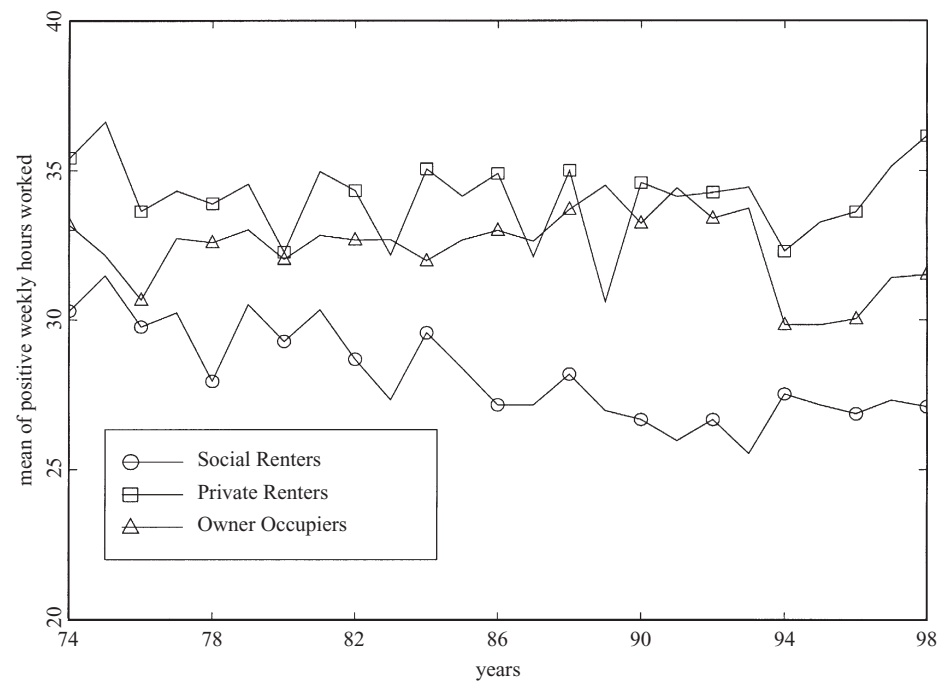


Fig. 4. *Female Hours Conditional on Participation*

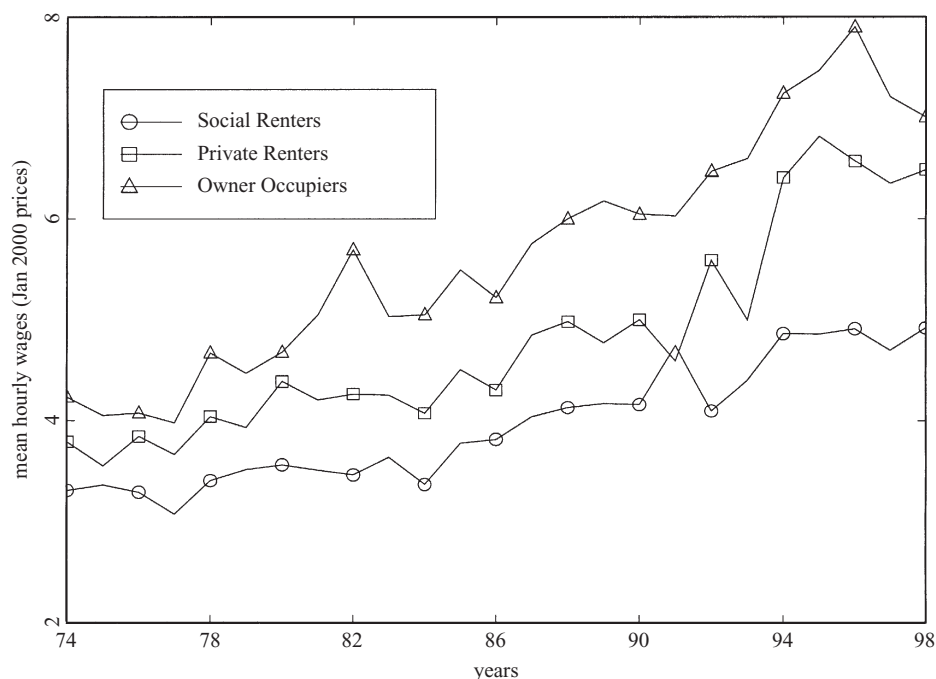


Fig. 5. *Female Real Wages*

range is 20–59 inclusive in order to abstract from education and retirement decisions.

There are three further restrictions on the sample: First, the self-employed are excluded because of poor data quality on income and hours. Second, the disabled are excluded because they are a very heterogeneous group for which it would be difficult to fit an economic model of labour market behaviour, especially addressing the low take-up of Disability Living Allowance. Third, multiple benefit unit households are excluded because of the difficulty of apportioning housing costs between benefit units.

3. Results and Discussion

The model presented in Section 1 is essentially a multinomial probit for the choice among three labour supply alternatives and participation in the Housing Benefit programme. Housing Benefit may be available at any of the labour supply states. So dependent upon rent, unearned income and wages, households may have the choice between three alternatives (pure labour supply), six (labour supply with HB everywhere), or of course four and five.

Tables 2 and 3 present parameter estimates for married and unmarried women respectively. Direct interpretation of coefficients in a multinomial model is problematic because they are estimated relative to a reference. They are presented here for completeness, and their interpretation is facilitated

Table 2

*Married Women Labour Supply, Housing Benefit Take up and Wages*Model estimates (*standard errors*)

	<i>PT</i> → <i>NP</i>	<i>FT</i> → <i>NP</i>	<i>HB</i> Takeup	Wage (part-time)	Wage (full-time)
Constant	1.180 <i>0.156</i>	2.761 <i>0.136</i>	0.211 <i>0.136</i>	−0.756 <i>0.351</i>	−2.354 <i>0.212</i>
Income					
<i>Y</i> (<i>XHB</i>)	0.009 <i>0.001</i>	0.012 <i>0.001</i>	0.101 <i>0.007</i>		
<i>Y</i> (<i>XHB</i>) ²	−0.014 <i>0.003</i>	−0.054 <i>0.003</i>	−0.529 <i>0.023</i>		
<i>Y</i> (<i>HB</i>)	0.128 <i>0.006</i>	0.121 <i>0.008</i>			
<i>Y</i> (<i>HB</i>) ²	−0.313 <i>0.048</i>	−0.344 <i>0.071</i>			
<i>DY</i> (<i>XHB</i>)	0.032 <i>0.002</i>	0.040 <i>0.002</i>			
<i>DY</i> (<i>XHB</i>) ²	−0.007 <i>0.004</i>	−0.016 <i>0.003</i>			
<i>DY</i> (<i>HB</i>)	−0.099 <i>0.014</i>	−0.057 <i>0.015</i>	0.182 <i>0.007</i>		
<i>DY</i> (<i>HB</i>) ²	−0.087 <i>0.111</i>	−0.218 <i>0.139</i>	−0.440 <i>0.044</i>		
Housing tenure					
housing association	0.022 <i>0.018</i>	0.170 <i>0.019</i>	0.409 <i>0.022</i>	−0.029 <i>0.040</i>	0.044 <i>0.034</i>
private rental	−0.386 <i>0.016</i>	−0.356 <i>0.013</i>	−0.291 <i>0.021</i>	0.088 <i>0.033</i>	0.132 <i>0.023</i>
owner outright	−0.055 <i>0.012</i>	0.004 <i>0.011</i>		0.172 <i>0.025</i>	0.291 <i>0.022</i>
mortgagee	−0.293 <i>0.011</i>	−0.507 <i>0.009</i>		0.220 <i>0.023</i>	0.362 <i>0.020</i>
Demographics					
age	−0.968 <i>0.025</i>	−1.095 <i>0.024</i>	−0.610 <i>0.048</i>	1.938 <i>0.285</i>	3.159 <i>0.167</i>
age ²	1.228 <i>0.034</i>	1.793 <i>0.029</i>	0.324 <i>0.060</i>	−0.301 <i>0.058</i>	−0.564 <i>0.036</i>
education	0.064 <i>0.016</i>	−0.088 <i>0.013</i>	0.274 <i>0.031</i>	0.153 <i>0.035</i>	0.310 <i>0.022</i>
education ²	−0.009 <i>0.004</i>	−0.006 <i>0.003</i>	−0.123 <i>0.008</i>	−0.014 <i>0.010</i>	−0.057 <i>0.006</i>
no. kids 0–2	0.420 <i>0.012</i>	0.871 <i>0.007</i>	0.055 <i>0.012</i>		
no. kids 5–10	0.110 <i>0.008</i>	0.520 <i>0.006</i>	0.145 <i>0.010</i>		
no. kids 11–15	0.237 <i>0.006</i>	0.263 <i>0.006</i>	0.338 <i>0.013</i>		
no. kids 16–18	0.191 <i>0.010</i>	0.092 <i>0.009</i>	0.075 <i>0.021</i>		
no kids	0.379 <i>0.016</i>	−0.260 <i>0.012</i>	0.064 <i>0.024</i>		
Regions					
North	−0.301 <i>0.013</i>	0.112 <i>0.013</i>	0.105 <i>0.030</i>	0.051 <i>0.037</i>	−0.057 <i>0.025</i>
York & Humbs	−0.070 <i>0.012</i>	0.231 <i>0.011</i>	−0.651 <i>0.027</i>	0.028 <i>0.023</i>	−0.024 <i>0.016</i>
E. Midlands	−0.049 <i>0.011</i>	0.063 <i>0.010</i>	−0.539 <i>0.027</i>	−0.028 <i>0.029</i>	−0.033 <i>0.020</i>
W. Midlands	−0.030 <i>0.011</i>	0.033 <i>0.010</i>	−0.626 <i>0.026</i>	0.037 <i>0.023</i>	−0.030 <i>0.015</i>
E. Anglia	−0.153 <i>0.014</i>	−0.002 <i>0.014</i>	−0.527 <i>0.036</i>	−0.023 <i>0.034</i>	0.015 <i>0.024</i>
G. London	0.209 <i>0.012</i>	−0.121 <i>0.011</i>	−0.240 <i>0.024</i>	0.244 <i>0.039</i>	0.133 <i>0.026</i>
S. East	−0.014 <i>0.009</i>	0.097 <i>0.008</i>	−1.124 <i>0.023</i>	0.034 <i>0.034</i>	0.129 <i>0.023</i>
S. West	−0.092 <i>0.012</i>	0.165 <i>0.011</i>	−0.778 <i>0.028</i>	−0.051 <i>0.030</i>	−0.034 <i>0.021</i>
Wales	0.086 <i>0.014</i>	0.483 <i>0.013</i>	−0.516 <i>0.025</i>	−0.039 <i>0.027</i>	−0.083 <i>0.019</i>
Scotland	−0.187 <i>0.011</i>	0.148 <i>0.011</i>	−0.281 <i>0.023</i>	0.064 <i>0.023</i>	0.015 <i>0.016</i>
Survey year					
1994	0.061 <i>0.007</i>	0.116 <i>0.007</i>	−0.116 <i>0.017</i>	−0.086 <i>0.021</i>	−0.082 <i>0.014</i>
1995	0.035 <i>0.007</i>	0.118 <i>0.006</i>	−0.309 <i>0.017</i>	−0.051 <i>0.015</i>	−0.043 <i>0.010</i>
1997	−0.043 <i>0.007</i>	−0.035 <i>0.007</i>	−0.179 <i>0.017</i>	−0.045 <i>0.019</i>	−0.015 <i>0.013</i>
1998	−0.071 <i>0.011</i>	−0.038 <i>0.011</i>	−0.302 <i>0.029</i>	−0.041 <i>0.030</i>	0.000 <i>0.021</i>
Covariance					
sigma	2.543 <i>0.067</i>	1.007 <i>0.016</i>	1.000 <i>0.000</i>	0.711 <i>0.003</i>	0.784 <i>0.003</i>
Wage (part-time)	0.066 <i>0.033</i>	−0.091 <i>0.018</i>	0.120 <i>0.025</i>		
Wage (full-time)	−0.240 <i>0.028</i>	0.107 <i>0.014</i>	0.160 <i>0.029</i>		
<i>HB</i> Takeup	0.016 <i>0.012</i>	−0.265 <i>0.016</i>			
<i>NP</i> → <i>FT</i>	0.415 <i>0.044</i>				

Notes:

1. Married women aged 20–59 from FRS 1994/5–97/8

2. Maximum likelihood estimates of multinomial probit selection equations. Standard errors are heteroscedastic-consistent

3. Reference groups are North West, 1996, local authority renters

4. No. observations = 42,491, log likelihood = 41,475

5. Probit variances normalised to unity. Labour supply 'sigma' represents hours measurement error within state

Table 3.

*Unmarried Women Labour Supply, Housing Benefit Take-up and Wages*Model estimates (*standard errors*)

	<i>PT</i> → <i>NP</i>	<i>FT</i> → <i>NP</i>	<i>HB</i> Takeup	Wage (part-time)	Wage (full-time)
Constant	1.183 0.309	2.759 0.250	0.221 0.430	-2.912 0.633	-2.621 0.324
Income					
<i>Y</i> (<i>XHB</i>)	0.017 0.012	0.039 0.007	0.089 0.007		
<i>Y</i> (<i>XHB</i>) ²	-0.013 0.043	-0.054 0.021	-0.526 0.017		
<i>Y</i> (<i>HB</i>)	0.140 0.012	0.117 0.012			
<i>Y</i> (<i>HB</i>) ²	-0.302 0.123	-0.335 0.095			
<i>DY</i> (<i>XHB</i>)	0.014 0.020	-0.006 0.009			
<i>DY</i> (<i>XHB</i>) ²	-0.018 0.048	-0.023 0.019			
<i>DY</i> (<i>HB</i>)	-0.113 0.024	-0.066 0.021	0.087 0.007		
<i>DY</i> (<i>HB</i>) ²	-0.085 0.283	-0.213 0.172	-0.462 0.041		
Housing tenure					
housing association	0.026 0.024	0.176 0.019	0.410 0.022	0.001 0.040	0.116 0.032
private rental	-0.384 0.023	-0.328 0.018	-0.273 0.018	-0.032 0.037	0.271 0.026
owner outright	-0.046 0.003	-0.002 0.023		0.141 0.043	0.427 0.028
mortgage	-0.290 0.033	-0.602 0.014		0.218 0.039	0.566 0.024
Demographics					
age	-0.955 0.055	-1.198 0.042	-0.532 0.053	1.489 0.548	3.611 0.259
age ²	1.233 0.075	1.720 0.051	0.377 0.069	-0.163 0.111	-0.635 0.054
education	0.082 0.030	-0.123 0.024	0.356 0.049	0.372 0.063	0.334 0.032
education ²	-0.023 0.007	0.020 0.006	-0.143 0.014	-0.076 0.016	-0.066 0.008
no. kids 0-2	0.427 0.028	0.862 0.012	0.052 0.013		
no. kids 5-10	0.098 0.022	0.531 0.013	0.132 0.011		
no. kids 11-15	0.228 0.015	0.271 0.015	0.294 0.011		
no. kids 16-18	0.197 0.030	0.083 0.022	0.072 0.030		
no kids	0.385 0.045	-0.262 0.026	0.086 0.021		
Regions					
North	-0.290 0.030	0.112 0.024	0.107 0.040	0.055 0.078	-0.080 0.045
York & Humbs	-0.066 0.024	0.224 0.019	-0.643 0.022	0.051 0.048	-0.007 0.027
E. Midlands	-0.048 0.026	0.062 0.022	-0.545 0.024	0.030 0.064	-0.035 0.036
W. Midlands	-0.030 0.023	0.044 0.020	-0.621 0.024	0.040 0.047	0.034 0.028
E. Anglia	-0.161 0.025	0.001 0.028	-0.528 0.031	-0.046 0.075	0.044 0.041
G. London	0.214 0.028	-0.118 0.020	-0.251 0.020	0.227 0.086	0.097 0.042
S. East	-0.018 0.020	0.097 0.018	-1.114 0.020	0.078 0.073	0.148 0.040
S. West	-0.097 0.025	0.158 0.021	-0.764 0.025	-0.001 0.066	-0.018 0.037
Wales	0.085 0.031	0.470 0.024	-0.513 0.026	-0.130 0.054	-0.043 0.035
Scotland	-0.180 0.023	0.141 0.020	-0.274 0.023	0.076 0.049	0.009 0.026
Survey year					
1994	0.060 0.018	0.099 0.013	-0.114 0.017	-0.048 0.048	-0.046 0.025
1995	0.033 0.017	0.120 0.012	-0.300 0.015	-0.006 0.035	-0.045 0.018
1997	-0.053 0.016	-0.038 0.013	-0.173 0.017	0.013 0.042	0.025 0.023
1998	-0.069 0.024	-0.033 0.018	-0.305 0.023	-0.004 0.067	0.036 0.036

Table 3.
(continued)

Model estimates (*standard errors*)

	<i>PT</i> → <i>NP</i>	<i>FT</i> → <i>NP</i>	<i>HB</i> Takeup	Wage (part-time)	Wage (full-time)
Covariance					
sigma	2.378 0.100	0.767 0.031	1.000 0.000	0.682 0.005	0.705 0.006
Wage (part-time)	0.056 0.054	−0.079 0.033	0.151 0.021		
Wage (full-time)	−0.499 0.041	0.107 0.014	0.280 0.018		
<i>HB</i> Takeup	−0.047 0.020	−0.263 0.023			
<i>NP</i> → <i>FT</i>	0.409 0.120				

Notes:

1. Unmarried women aged 20–59 from FRS 1994/5–97/8
2. Maximum likelihood estimates of multinomial probit selection equations. Standard errors are heteroscedastic-consistent
3. Reference groups are North West, 1996, local authority renters
4. No. observations = 13,340, log likelihood = −13,654
5. Probit variances normalised to unity. Labour supply ‘sigma’ represents hours measurement error within state

later by defining representative individuals and simulating changes in characteristics and policy reforms. However, some guidance may still be in order. Labour supply equations are in the first two columns. First comparing part-time with non-participation (*PT* → *NP*), where a positive coefficient means a relative preference for non-participation. Second comparing full-time with non-participation (*FT* → *NP*), where a positive coefficient once again means a relative preference for non-participation. The *HB* take-up equation is in the third column, where a positive coefficient means more likely to take up.⁸ Part-time and full-time wage equations are in columns four and five.⁹ The eight income coefficients can be divided into two sets: on income in the reference state, denoted *Y*; and income difference between reference and comparison states, denoted *DY*. These can be further divided according to source: *HB* denoting housing benefit entitlement; *XHB* denoting income from all other sources. A final division into linear and quadratic terms gives the eight.

Simulations combine the above estimated parameters with an arbitrarily defined representative individual and change each characteristic in turn in order to illustrate the modelled behaviour. Table 4 presents representative individual simulations separately for married and unmarried women. Consider the left part of the table for married women. The first row shows the percentage probability of the representative individual being in each labour supply

⁸ Regional differences in Housing Benefit take-up are quite large. This may be due to variation between regions in tastes for welfare or welfare stigma. Differential information and transactions costs may also arise because the programme is administrated locally.

⁹ Housing tenure is found to be an important determinant of wages. While there may be no direct effect of tenure on productivity, unobservable variables correlated with tenure may also be correlated with wages. Accordingly, the housing tenure dummies should be viewed only as controls.

Table 4.
Labour Supply & Housing Benefit Take-up Simulations

% Expected in each state

Reference*	Married Women				Unmarried Women			
	E(NP)	E(PT)	E(FT)	E(HBTU)	E(NP)	E(PT)	E(FT)	E(HBTU)
	49.09	29.57	21.34	39.11	57.07	16.90	26.03	85.02
age 40	0.49	5.24	-5.73	-8.33	-1.57	2.58	-1.01	-6.36
education 18	-3.86	-4.24	8.10	-10.74	-2.88	-1.05	3.93	-7.89
$Y(NP) + £10$	1.74	-0.86	-0.88	-1.39	1.95	-0.64	-1.31	0.44
$Y(PT) + £10$	-0.96	1.55	-0.59	-2.59	-0.40	0.50	-0.10	-0.31
$Y(FT) + £10$	-0.52	-1.08	1.60	0.72	-0.10	-0.16	0.26	-1.47
$HB(NP) + £10$	2.04	-1.25	-0.79	2.53	1.94	-1.00	-0.93	0.56
$HB(PT) + £10$	-0.21	0.47	-0.26	1.32	-0.13	0.27	-0.13	0.25
$HB(FT) + £10$	-1.16	-0.26	1.42	-0.98	-0.05	-0.17	0.21	0.35
1 child 0-4	14.35	-8.07	-6.28	6.71	13.56	-5.61	-7.95	1.36
1 child 11-15	-3.81	-6.60	10.41	-0.40	-5.52	-5.13	10.65	0.30
1 child 16-18	-9.24	-6.92	16.16	-10.35	-11.87	-6.03	17.90	-7.63
no children	-17.52	-15.91	33.43	-18.19	-22.02	-11.41	33.43	-13.06
housing association	4.02	0.47	-4.50	14.00	4.77	0.60	-5.37	8.29
private rental	-16.03	11.01	5.02	-16.03	-15.51	8.00	7.51	-10.61
owner outright	-1.20	2.04	-0.84	0.00	-0.87	1.23	-0.35	0.00
mortgage	-17.39	5.24	12.15	0.00	-21.24	1.46	19.78	0.00

* Definition of representative individual:

1. Age 30, left education aged 16, North West, 1998, Local Authority Renter, 1 child aged 5-15
2. $HB(NP) = £46$, $HB(PT) = £20$, $HB(FT) = £5$
3. For married women $Y(NP) = £180$, $Y(PT) = £258$, $Y(FT) = £363$
4. For unmarried women $Y(NP) = £84$, $Y(PT) = £146$, $Y(FT) = £230$

state and taking up HB. Other rows show the change in this percentage due to a change in the variable defined in the row header. The first substantive row and column for example shows that the non-work-participation rate for 40 year old woman is 0.49 percentage points higher than for a 30 year old woman all else equal.

Married women's work is quite responsive to income at all hours of work. Unmarried women are similarly responsive out of work, but much less so in work. HB coefficients are quite similar to those for non-HB income, except for at part-time work. This suggests stigma has only a small variable cost element, and the large part is fixed costs of programme entry. Take-up generally is positive in entitlement value and negative in non-HB income. Household demographics have entirely conventional signs. According to housing tenure, priors from the raw data are confirmed, now including controls: social renters work less than private renters, who in turn work less than owner occupiers. This is now disaggregated further to show that among social tenants, those in housing associations work least; and not surprisingly, among owner-occupiers, those paying off a mortgage work most.

The major worry about HB has been its potential adverse effects on work incentives. In particular, the high taper together with the large levels of entitlement, especially in high housing cost areas, imply that income and

substitution effects reinforce each other and both reduce labour supply. There are two alternative approaches to resolving the issue: changing the taper, and changing housing costs through bricks and mortar subsidies.

Policy simulations for the representative married woman of Table 4 are now presented in Figs. 6 and 7. Whereas we chose HB level previously without needing to state an associated rent, now we first choose a weekly rent of £76 and allow HB to be determined by programme rules. This is a high rent for our social renter representative, as it is the mean of private sector rents. Furthermore, she has enough unearned income (at zero hours, perhaps due to husband's earnings) so that the HB taper is already binding and rent is never fully paid by the transfer.¹⁰ There are two solid lines in each of the figures, representing the expected percentage of the sample not working (i.e. 1 minus the predicted participation probability) and the expected number of hours worked conditional on working (ie the hours weighted sum of the probabilities of PT and FT). These simulated effects are enclosed by dashed lines that indicate the 95% confidence bands.

Fig. 6 shows the labour supply effects of varying the HB taper. Increasing the

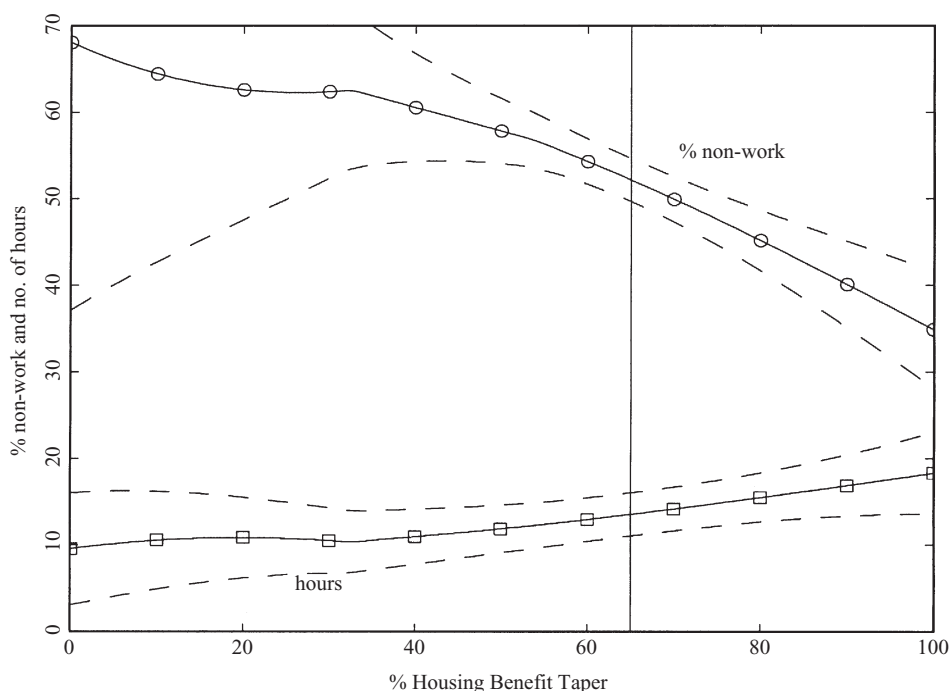


Fig. 6. *Housing Benefit Taper Simulation for Married Women*

¹⁰ The main differences between the simulations for married and unmarried women is driven by the level of unearned income that it is sensible to assume. For unmarried women, work-participation effects of increasing the taper are weakened relative to married women because net income at zero hours is now unaffected since the taper does not yet bind.

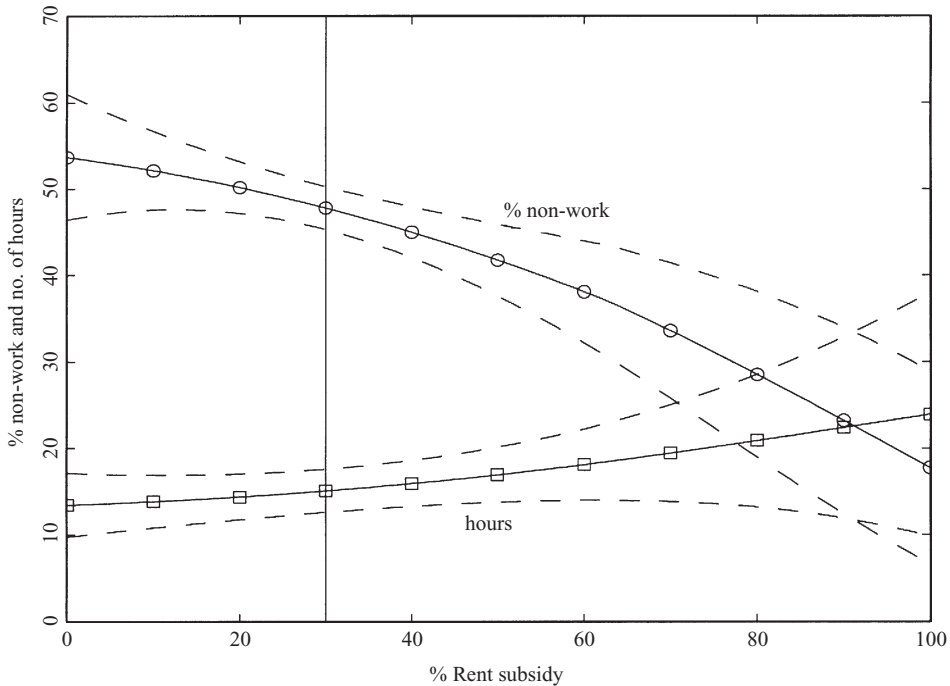


Fig. 7. *Rent Subsidy Simulation for Married Women*

taper lowers the level of net income at zero hours (because we assume that the taper is already binding for this individual when hours of work are zero). It also reduces the net wage rate. Thus the effects on labour supply are a mixture of income and substitution effects: the lower intercept income increases the probability of working, the lower net wage reduces it. The model shows that the associated hours increase is barely significant. It is the switch from full-time to part-time that is counteracting the participation increase, so that expected hours rise little as the taper rises. The effect of choosing a lower representative rent would be to flatten off the decline in non-work at the point where HB was exhausted out of work.

Fig. 7 shows the labour supply effects of directly subsidising rents but keeping the HB system unchanged.¹¹ The confidence bands are computed under the assumption that social sector rents are currently subsidised by 30%, which is half the difference between mean social and private rents. In this case, the subsidy becomes a lump-sum transfer for those in receipt of HB and the incentive to participate therefore rises. Since the breakeven level of hours (where HB ceases) falls as the subsidy rises, so the incentive to work part-time rises relative to full-time.

¹¹ The rent subsidy effects are simulated simply by changing the gross rent for the representative household, passing that through the benefit system to generate net incomes, and then predicting the probabilities from the estimated coefficients.

The abolition of Family Credit and the introduction of Working Families' Tax Credit (WFTC) in 2000 expanded in-work transfers higher up the income distribution. This has the effect of reducing the number of households eligible for HB especially for those working full-time. Bingley and Walker (1997) and Paull *et al.* (2000) both suggest that this reform will leave participation little changed but will increase the incentive to work full-time rather than part-time even allowing for the interaction with HB. Thus, it seems likely that the qualitative results here will stand even under WFTC.

4. Summary and Conclusion

The aim of this analysis has been to model the impact of changes in net incomes on labour supply, paying special attention to the impact of housing benefit. We find that women are quite responsive to labour supply incentives, and housing benefit income has similar incentive effects to earned income which suggests any 'stigma' is small. However, we do find that working behaviour is less sensitive to part-time income than full-time or non-work income, and this is especially true for HB. This is consistent with the idea that the housing benefit system suffers from a perception or fixed costs problem: the data seems to suggest that HB at part-time work is not well perceived.

The motivation for this research is that housing benefit is behind the width of the poverty trap in Britain. Thus, our econometric analysis is complemented with simulations of housing benefit and direct rent subsidy reforms. For married women with high housing costs and unearned income (husband working), significant participation reactions to both changing the housing benefit taper (withdrawal rate) and rent subsidies are found. However, hours effects are insignificant because of offsetting movements between part-time and full-time states.

The policy implications from our simulations suggest pessimism about the prospects of using direct rent subsidies to circumvent the poverty trap problem induced by housing benefit. Indeed, the impact of changing the HB taper and the housing subsidy are similar, at least locally around their existing levels. Moreover, addressing the take-up problem at the level of income associated with part-time work would also be a mixed blessing: while it seems likely that it would raise participation it would also give rise to incentives for full-time workers to become part-time.

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