Earned Income Tax Credit Policies: *Impact and Optimality*

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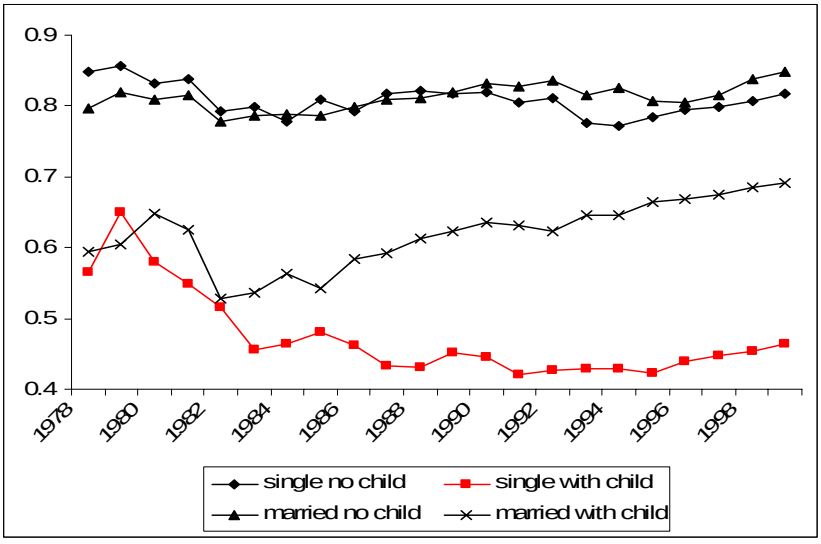
(based on joint work with
Mike Brewer and Andrew Shephard)

- The policy issue: low labour market attachment and high incidence of poverty among certain groups
- Aim: to evaluate the impact and assess the optimality of employment tax-credit reforms
- Central position in EU labour market policy debate
  - Tax Credit expansions for lone parents
  - WFTC expansion in the UK, 1999/2000
- Puzzle: WFTC about twice as generous as EITC but with only half the impact
- focus on lone mothers
    - couples - targeting and collective labour supply
- examine the impact/design of further expansions

Layout of the presentation

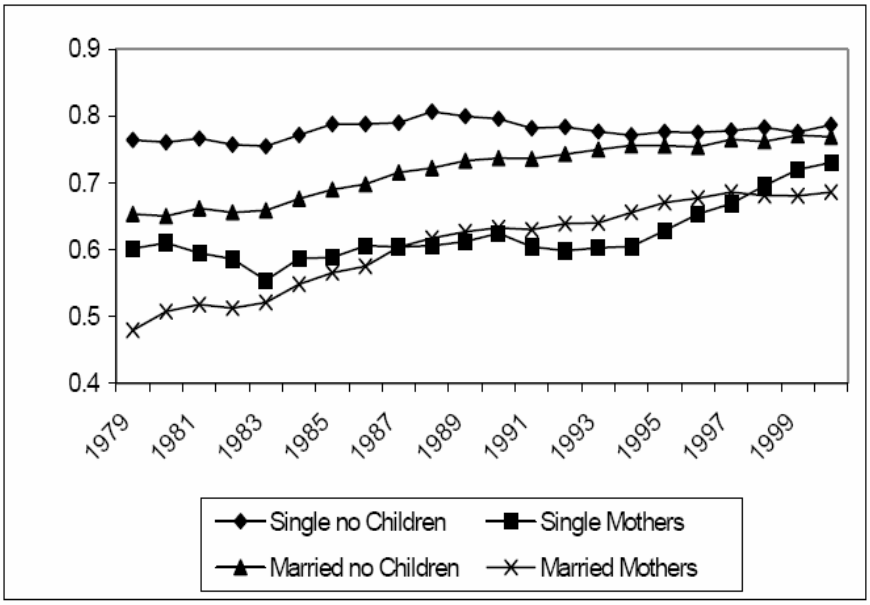
- Policy Context
- Structure of the reforms/treatment
- Ex-post evaluation of historic reforms
- Ex-ante structural evaluation model
- Robustness of ex-ante model
- Optimality of reforms
- Impact on new tax credit policy in Britian

Pre-reform Employment Trends for Women in the UK (1978 – 1999)



Blundell and Hoynes (2004)

Employment Trends for Women in the US



Notes: US March CPS data.

Blundell and Hoynes (2004)

WFTC is in the class of 'make work pay' reforms

- Objective is to balance poverty reduction and employment incentives
- Focus on a 'work condition'
- Highlight distinction between extensive and intensive margin in empirical labor and in optimal tax literature

Questions?

- How should we evaluate the impact of such a reform?
- Are such tax-credits and their expansion optimal?
- If yes, what is the optimal design?

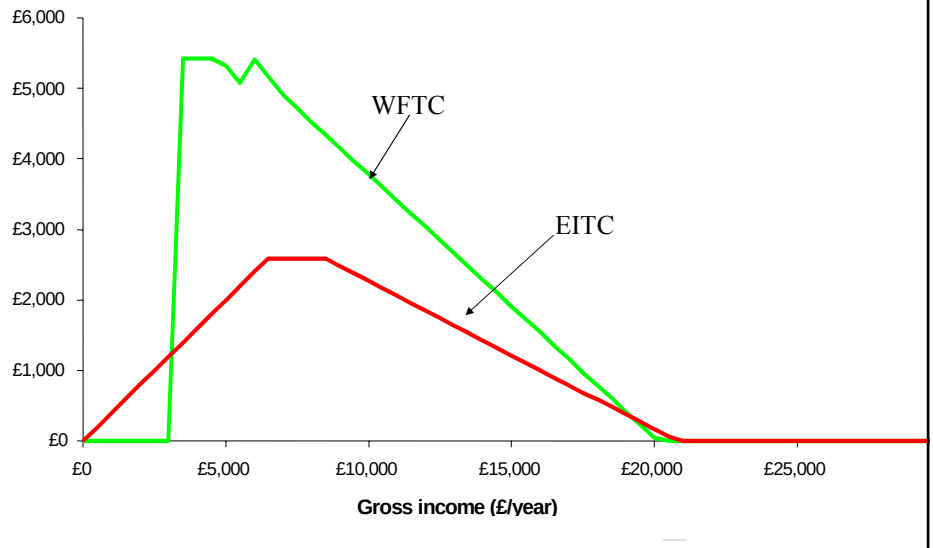
Focus on WFTC reform (compare with EITC)

- WFTC reform has had a big impact on the policy debate in Europe
- influenced by EITC expansion in the US
- expanded the generosity of the UK in-work benefit system
  - the move from Family Credit to WFTC.
- ex-ante evaluation in 1999
- 2004 further expansion in generosity and extension of eligibility to individuals without children
  - raises important issues about design – time limits etc.

Three criteria for eligibility in WFTC:

- work eligibility
  - 16 or more hours per week
- family eligibility
  - children in full time education
- income eligibility
  - family net income below a certain threshold given by an adult credit plus age-dependent amounts for each child
  - once income is above the threshold then the amount of credit is tapered away at 55% per extra pound of net income – previously 70%

The US Earned Income Tax Credit and the UK WFTC compared



The Expansion in Generosity in the 2000 WFTC Reform
transfers per week for a min. wage lone parent

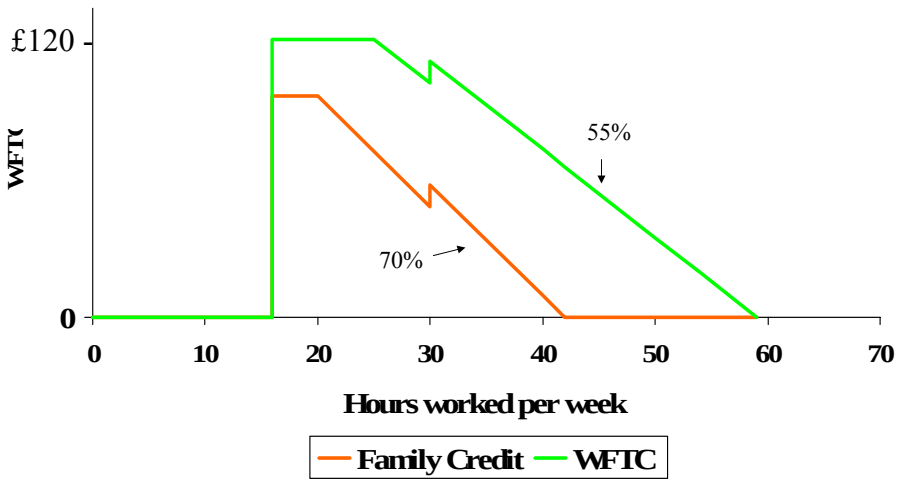


Table 2.1: Adult and Child Elements of the WFTC

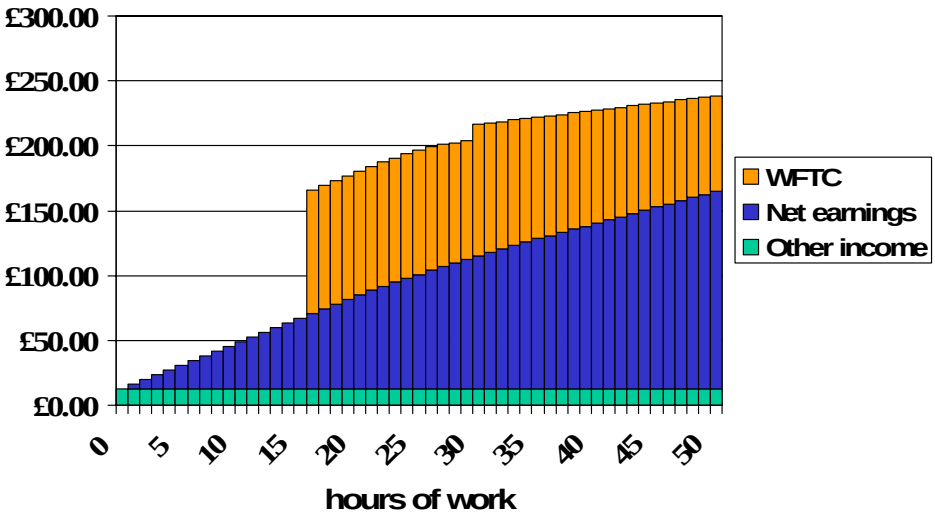
	Adult Element	Child Element, Age		
		0 to 10	11 to 15	16 to 18
March 1999 (FC)	£53.80	£16.40	£22.60	£28.00
October 1999	£56.60	£21.50	£22.60	£28.00
March 2000	£56.60	£22.60	£22.60	£28.00
June 2001	£61.90	£27.30	£27.30	£28.00
June 2002	£64.40	£27.30	£27.30	£28.00
Real Increase (1999-2002)	19.7%	66.4%	20.5%	0.0%

Note: All monetary amounts are expressed in April 2003 prices.

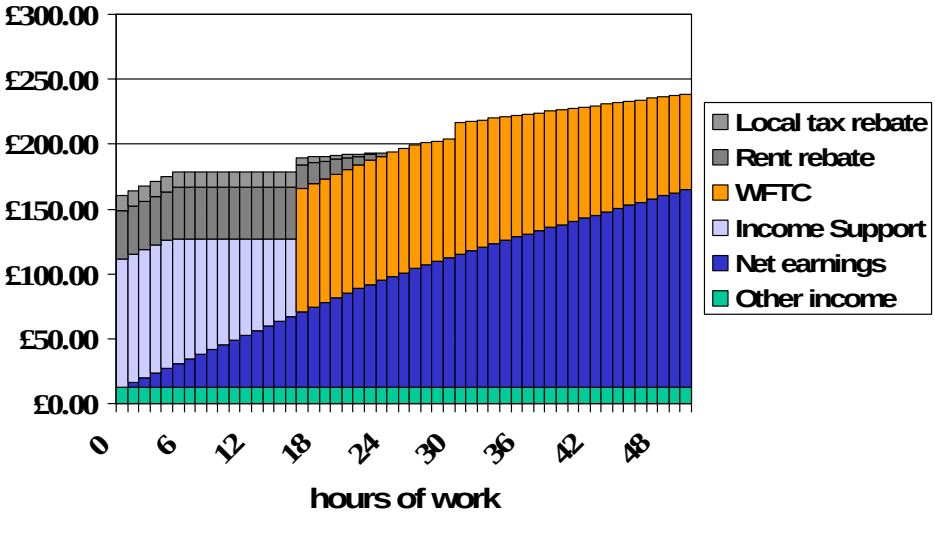
- unlike the US EITC the credit is based on net (rather than gross) family income

– interaction with other benefits and taxes matter
  - differing size of the 'treatment' across eligibles
– coincident reforms to family income support
  - different direction of these reforms to US
– not all eligibles take-up credit
  - stigma/information

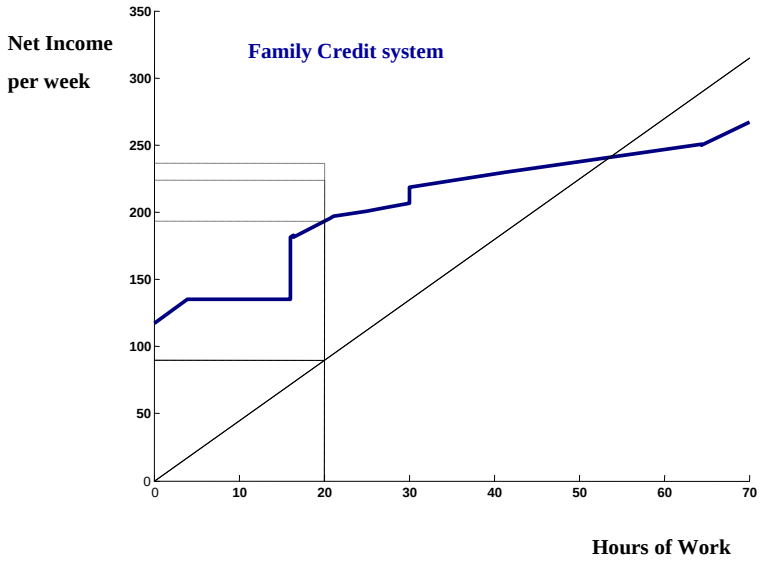
WFTC interactions with other taxes and benefits in the UK (single parent on minimum wage)



WFTC interactions with other taxes and benefits in the UK (single parent on minimum wage)



Transfers and Taxes under Family Credit (lone parent, min wage)



Transfers and Taxes under the WFTC Expansion (lone parent, min wage)

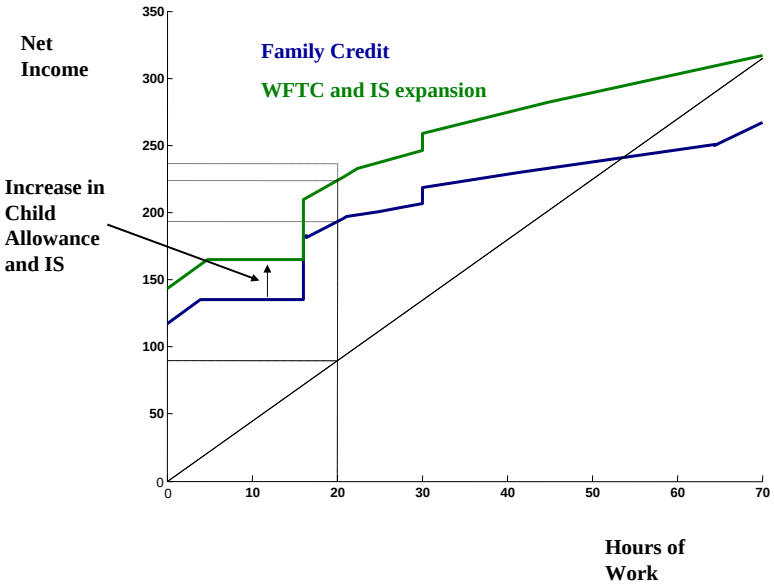
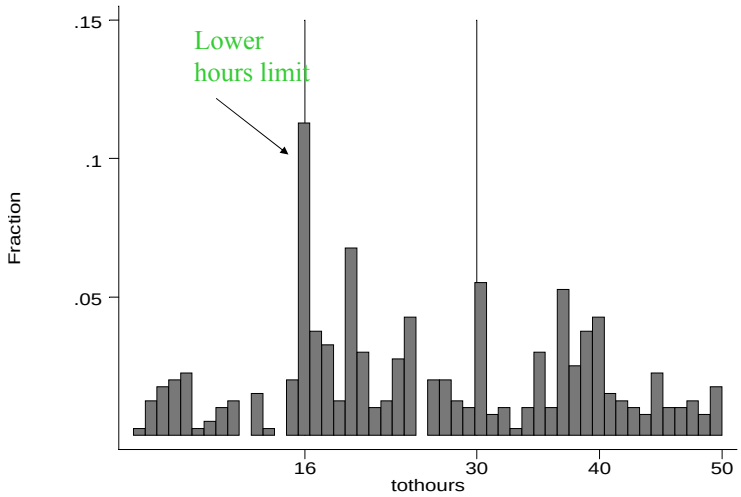


Table 2.2: Child Rates of Income Support and income-based JSA

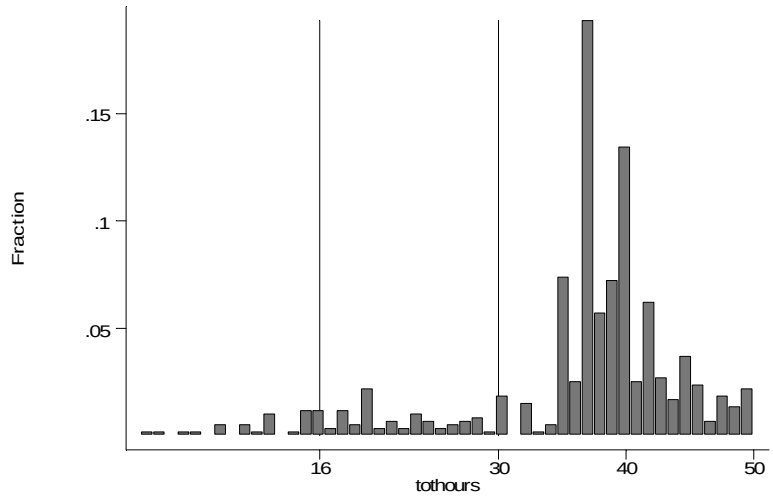
	Child Element, Age		
	0 to 10	11 to 15	16 to 18
March 1999	£21.90	£28.00	£33.50
October 1999	£27.00	£28.00	£33.50
March 2000	£28.40	£28.40	£33.80
March 2001	£33.00	£33.00	£33.80
October 2001	£34.50	£34.50	£35.40
March 2002	£34.50	£34.50	£35.40
October 2002	£38.10	£38.10	£39.00
April 2003	£38.50	£38.50	£38.50
Real Increase	76.2%	37.3%	14.9%

Note: All monetary amounts are expressed in April 2003 prices.

Weekly Hours Worked: Low Education Single Mothers (aged 18-45)



Weekly Hours Worked:
Low Education Single Childless Women (aged 18-45)



How should we assess the impact of the expansion in tax-credit?

- Ex-post evaluation
  - Quasi-experimental evaluation strategy
- Ex-ante evaluation
  - 'Structural' evaluation model
    - 'necessary' for simulating further reforms
    - 'necessary' for assessing optimality
- use an appropriate mix of both strategies

To assess optimality

- Use Mirrlees optimal tax approach
- Suppose we wish to allocate £R to low income lone parents, how best should we do this?
- Need *robust* estimates of preferences
  - at least elasticities at *extensive* and *intensive* margins – Saez approximation/assumptions.
- Given elasticities, we can pose the question:
  - is the WFTC expansion 'optimal' for reasonable social welfare weights?
  - are there obvious aspects for improvement?

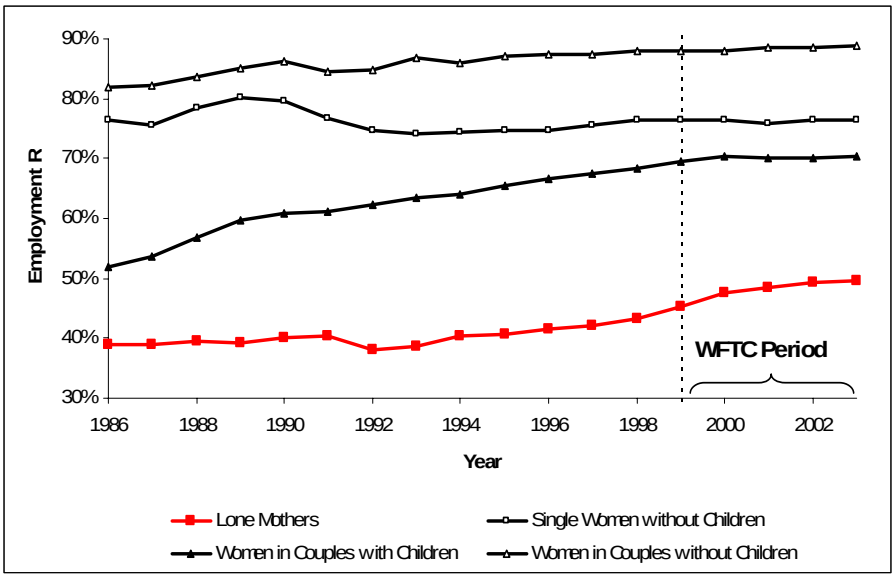
Robustness of the ex-ante evaluation model

- Compare structural evaluation model (simulated likelihood) estimated on pre-reform data to quasi-experimental ex-post evaluation
- The idea is to simulate the quasi-experimental estimate (moment)
  - we consider difference-in-differences

Ex-post evaluation: WFTC reform in 2000

- comparing outcomes of eligibles versus those who are not eligible
- identify impact of WFTC on eligibles *assuming*
  - common trends for eligible and non-eligible groups
  - invariance in group heterogeneity over time
  - *conditional* on a set of (matching) covariates X
- can structurally simulate this moment anyway!

Employment Trends for Women in the UK (1986 – 2003)



Sample Descriptives

		1996	1997	1998	1999	2000	2001	2002
No children	Work	0.753	0.762	0.769	0.770	0.774	0.767	0.775
	Age	26.789	26.906	26.799	26.957	27.104	27.317	27.450
	Non-white	0.073	0.077	0.080	0.084	0.091	0.098	0.102
	Left education before 1	0.078	0.072	0.062	0.057	0.052	0.047	0.043
	Left education at 16 or	0.394	0.381	0.375	0.375	0.363	0.353	0.356
	London and South-East	0.341	0.350	0.349	0.347	0.354	0.360	0.352
	Rented accommodatior	0.343	0.353	0.358	0.340	0.339	0.350	0.346
	Observations	26243	24463	24410	23987	22558	23517	22846
Children	Work	0.417	0.425	0.444	0.464	0.477	0.487	0.496
	Age	32.330	32.580	32.655	32.863	33.181	33.280	33.288
	Non-white	0.100	0.099	0.091	0.098	0.106	0.112	0.111
	Left education before 1	0.209	0.196	0.189	0.169	0.154	0.161	0.155
	Left education at 16 or	0.632	0.627	0.633	0.635	0.646	0.641	0.637
	London and South-East	0.285	0.285	0.285	0.293	0.294	0.303	0.301
	Rented accommodatior	0.686	0.704	0.708	0.696	0.697	0.694	0.676
	Number of kids	1.783	1.785	1.791	1.784	1.778	1.776	1.794
	Age of youngest child	6.187	6.249	6.272	6.414	6.592	6.612	6.676
	Observations	14613	14172	14550	14343	13572	14097	13996

Difference-in-Differences

suppose F^{-1} is an inverse probability function, let $W=1$ denote eligibility and $t=1$ after the program, consider:

$$\alpha(X) = \{F^{-1}[E(Y|X, W=1, t=1)] - F^{-1}[E(Y|X, W=1, t=0)]\}$$
$$-\{F^{-1}[E(Y|X, W=0, t=1)] - F^{-1}[E(Y|X, W=0, t=0)]\}$$

then use F and the empirical distribution of X for $W=1$ to recover the average impact on the eligibles.

- cubic polynomial for propensity scores for each of the comparison groups.
- estimate impact using predicted outcome for three non-treatment cases for each of the matched treated observations

Difference-in-Differences Results

Single Women	Marginal Effect	Standard Error	Sample Size
Family Resources Survey	**3.5**	***1.55***	**25,163**
Labour Force Survey	**3.6**	***0.53***	**233,208**

Data: Spring 1996 – Spring 2003.

Drop: Summer 1999 – Spring 2000 inclusive; individuals aged over 45.

Outcome: employment. Average impact x 100, employment percentage.

Matching Covariates: age, education, region, ethnicity,..

Robustness analysis

- Alternative groups
  - low education: 5.4 (0.61)
    - larger response on a lower base
  - Youngest child aged < 5: 3.13 (0.51)
  - Youngest child aged 5-10: 3.86 (0.54)
- Choice of pre-treatment years
  - results are robust to changing the pre-treatment time window
  - 'hypothetical' reform on pre-reform years
    - Spring 1997: treatment effect: .07 *(.11)*

Structural analysis

- Data from 1995-2003 - FRS
  - 1995-1999: pre-reform estimation data (ex-ante)
  - 2001-2003: 'post-reform' validation sample
    - model does not reject provided 'take-up' is modelled
  - Use complete sample for ex-ante analysis of 2004 reforms
- Variation: geographic, time, precise rules.
  - Tax and benefit system (accurate income/benefits)
  - Housing costs/benefits (local variation)
  - Local taxation

Key features of the structural model

main elements:

- budget constraint – tax/benefit interactions and take-up
- preferences – discrete hours; flexible parametric utility
- heterogeneity – demographics, age and unobserved het.
- fixed costs of work
- stigma/hassle costs – take-up versus eligibility
- childcare costs

  - mixed-multinomial specification across discrete hours choices.

Net Income schedule for the program:

P: program participation

$$y_{hP} = wh + I - \Gamma(wh, I|Z_\Gamma) + \Psi(w, h, I, P|Z_\Psi)$$

Tax Transfers

the program payment function $\Psi(w,h,I,P|Z_\Psi)$ depends on:

- hours (through the hours condition of entitlement)
- investment income I,
- participation P in the tax-credit program,
- and household characteristics Z_Ψ

Net Income Schedule and Program Participation

$$\begin{aligned} y_{hP} &= wh + I - \Gamma(wh, I|Z_\Gamma) + \Psi_0(w, h, I|Z_\Psi) + P \cdot \Psi_1(w, h, I|Z_\Psi) \\ &= \tilde{y}_h + P \cdot \Psi_1(w, h, I|Z_\Psi), \end{aligned}$$

let $E_h = 1(\Psi_1 > 0)$

be an indicator of entitlement at hours h.

P=1 if participate in program

additional term: $\eta = X_\eta \beta_\eta + u_\eta$ 'cost' of receiving in-work support

$$\begin{aligned} U_P(h, y_{hP}, P, C) &= \alpha_{11}(\tilde{y}_h + P \cdot \Psi_1 - C)^2 + \alpha_{22}h^2 + \alpha_{12}(\tilde{y}_h + P \cdot \Psi_1 - C) \cdot h \\ &+ \beta_1(\tilde{y}_h + P \cdot \Psi_1 - C) + \beta_2 h + \varepsilon_{hP} - (P \cdot E_h) \cdot \eta \\ &= U(h, \tilde{y}_h + P \cdot \Psi_1 - C) - (P \cdot E_h) \cdot \eta, \end{aligned}$$

important in structural simulation of increasing generosity

Stochastic specification and discrete hours

discrete hours alternatives: $h \in \{h_1, \ldots, h_J\}$

payoff 'utility' for each hours point:

$$U(h, y_{hP}) \approx \alpha_{11} y_{hP}^2 + \alpha_{22} h^2 + \alpha_{12} y_{hP} h + \beta_1 y_{hP} + \beta_2 h + \varepsilon_{hP}$$

$$\beta_1 = X_1 \beta_{1x} + u_y$$
$$\beta_2 = X_2 \beta_{2x} + u_h$$
$$\alpha_{11} = X_{11} \alpha_{11x}$$
$$\alpha_{22} = X_{22} \alpha_{22x}$$
$$\alpha_{12} = X_{12} \alpha_{12x}$$

Program Participation

Utility 'cost' of receiving in-work support

$$\eta = X_\eta \beta_\eta + u_\eta$$

claim Ψ_1 in FC/WFTC at hours h_j if:

$$U_P(h_j, \tilde{y}_{h_j} + \Psi_1 - C, P = 1) > U(h_j, \tilde{y}_{h_j} - C).$$

utility cost among those who choose to claim WFTC must not exceed the utility gain from receipt of WFTC transfer income relative to non-receipt:

$$\eta < U(h_j, \tilde{y}_{h_j} + \Psi_1 - C) - U(h_j, \tilde{y}_{h_j} - C)$$

$u_\eta < \Omega_U$ where $\Omega_U = U(h_j, \tilde{y}_{h_j} + \Psi_1 - C) - U(h_j, \tilde{y}_{h_j} - C) - X_\eta \beta_\eta$

Probability specification and likelihood

$$\log L = \sum_i \log \int_{u_{-u_\eta}} \Big[\int_{u_\eta < \Omega_U} \prod_j \Pr(h = h_j, P = 1 | X, u)^{1(h=h_j, E_{h_j}=1, P=1)} f(u_\eta) du_\eta$$
$$+ \int_{u_\eta > \Omega_U} \prod_j \Pr(h = h_j, P = 1 | X, u)^{1(h=h_j, E_{h_j}=1, P=0)} f(u_\eta) du_\eta$$
$$+ \int_{u_\eta} \prod_j \Pr(h = h_j, P = 1 | X, u)^{1(h=h_j, E_{h_j}=0)} f(u_\eta) du_\eta$$
$$\Big] f(u_{-u_\eta}) du_{-u_\eta}$$

where $u_{-u_\eta} = (u_w, u_{cc}, u_y, u_h)$

Elasticities by 'Earnings' Class/Hours

Earnings Class	1 (10)	2 (19)	3 (26)	4 (33)	5 (40)
Extensive	0.376 (.129)	0.425 (.072)	0.460 (.056)	0.649 (.053)	0.555 (.035)
Intensive		0.2403 (.091)	0.1816 (.072)	0.1485 (.071)	0.0978 (.054)

£4.80 per hour wage hours/earnings class

Structural Evaluation Results: WFTC Expansion

Pre-WFTC \ Post-WFTC	Not working	Part Time	Full Time	Total
Not working	**51.90**	**1.95**	**2.71**	**56.56**
Part Time	**0.00**	**20.84**	**1.47**	**22.31**
Full Time	**0.00**	**0.93**	**20.20**	**21.13**
Total	**51.90**	**23.72**	**24.37**	**100.00**

Change in employment 4.66

(.25)

Structural Evaluation Results: WFTC Expansion

	All	Age of Youngest Child			
		0-2	3-4	5-10	11+
Change in employment rate	**4.66**	**3.60**	**5.15**	**5.64**	**3.98**
	(.25)	*(.33)*	*(.41)*	*(.64)*	*(.47)*
Average change in hours:					
Unconditional	**1.63**	**1.10**	**1.56**	**1.97**	**1.65**
Workers only	**0.75**	**0.75**	**0.70**	**0.91**	**0.65**

Estimated on pre-reform FRS data;

4.12 without change in take-up

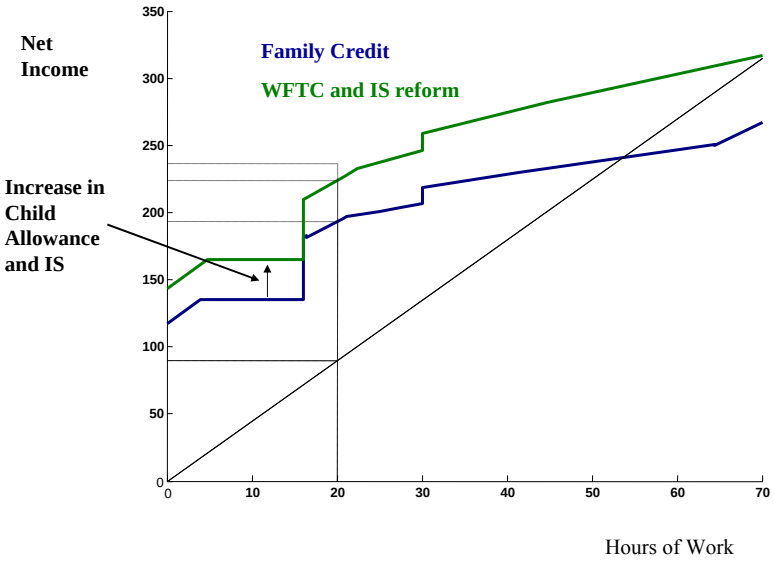
Structural Evaluation Results: All Reforms

	All	Age of Youngest Child			
		0-2	3-4	5-10	11+
Change in employment rate	**3.48**	**2.12**	**3.29**	**4.08**	**3.70**
	(.23)	***(.31)***	***(.42)***	***(.67)***	***(.45)***
Average change in hours:					
Unconditional	**1.22**	**0.66**	**0.91**	**1.45**	**1.56**
Workers only	**0.57**	**0.47**	**0.40**	**0.68**	**0.63**

Estimated on pre-reform FRS data;

3.12 without change in take-up

Remember! Transfers and Taxes under the WFTC Expansion (lone parent, min wage)



Evaluation of the ex-ante model

- The *simulated* diff-in-diff parameter from the structural evaluation model does not differ significantly from the diff-in-diff estimate
  - Compare *simulated moment* with *diff-in-diff moment* 3.48 (.23) - 3.6 (.55)
  - Chi-square test statistic p-value .42
  - Consider additional moments
    - education; youngest child interaction

Evaluation of the ex-ante model

- small average treatment on treated effect appears to be due to interaction of WFTC with other taxes/benefits and rise in IS.
- rather than 'small' response elasticities:
  - extensive elasticity .81 (.13)
  - intensive elasticity .31 (.09)

Is the design 'optimal'?

- Assume we want to redistribute '£R' to low ed. lone parents, what is the 'optimal' way to do this?
- Recover optimal tax/credit schedule in terms of earnings
  - use approximation in terms of extensive and intensive elasticities at different earnings
  - as 'first step' in a Mirrlees optimal tax problem
- Given elasticities at extensive and intensive margin, we can pose the question:
  - is the WFTC expansion 'optimal' for reasonable social welfare weights?

Optimal Structure

- Suppose we distinguish two groups
  - 'low' or 'no' earners: group 0
  - 'higher' earners: group 1
- Suppose the social welfare weight is higher for low earners, group 0
- Choose transfers and taxes T to maximise welfare

Optimal design gives

$$\frac{T_1 - T_0}{c_1 - c_0} = \frac{(g_0 - 1)}{\zeta_1}$$

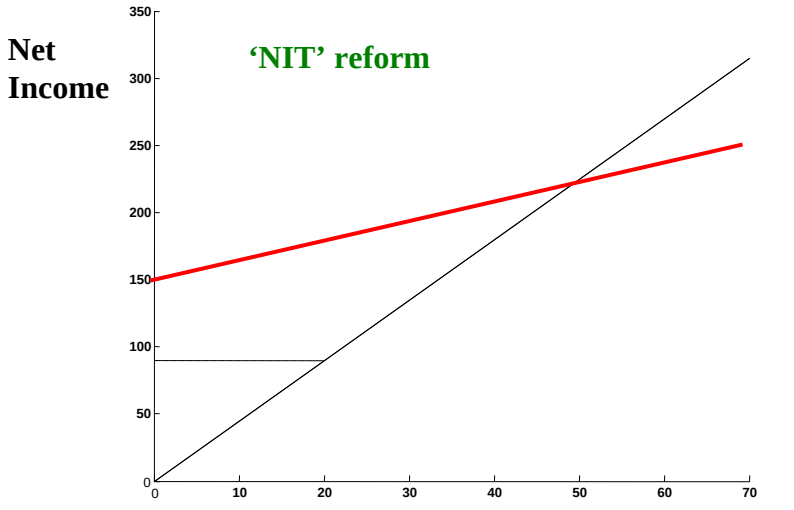
ζ_i is the labour supply elasticity

g_0 is the social welfare weight

$-T$ is the subsidy given to that group

c is the net of tax income for that group

Optimal Structure



Suppose we distinguish ‘non-employed’, ‘low earners’ and ‘higher’ earners, 0, 1, 2 .. etc

$$\frac{T_i - T_{i-1}}{c_i - c_{i-1}} = \frac{1}{\zeta_i} \sum_{j=i}^{I} \left[1 - \hat{g}_j \right]$$

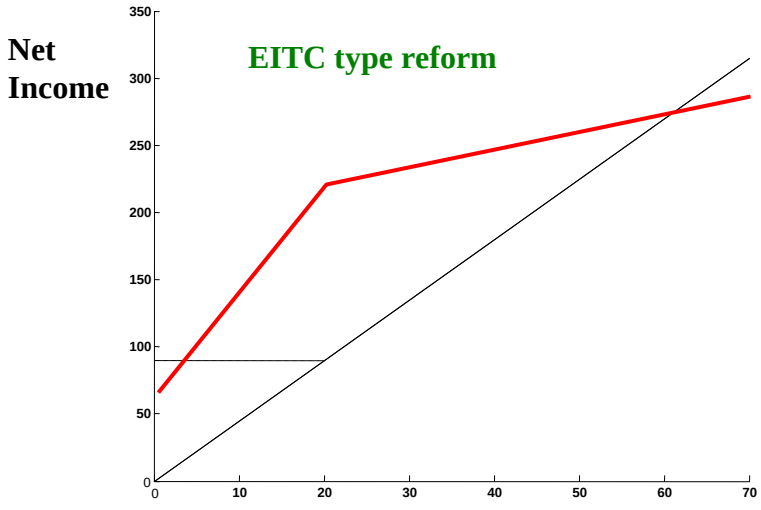
where

$$\hat{g}_j = g_j + \eta_j \, k$$

ζ_i is the intensive elasticity, η_j is the extensive elasticity

note that a ‘large’ extensive elasticity can ‘turn around’ impact of social weights - implying an optimal tax credit structure – e.g. a higher transfer to lower skilled workers than to those out of work

Optimal Structure



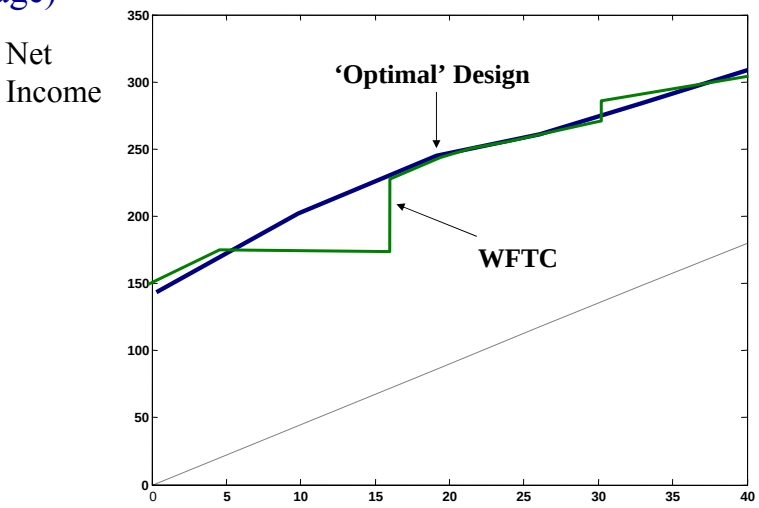
Implied Social Welfare Weights by 'Earnings' Class

Earnings Class	0	1 (10)	2 (19)	3 (26)	4 (33)	5 (40)
WFTC with IS	1.27	.90	1.11	.93	1.02	.80
WFTC alone	1.10	.93	1.06	.92	1.02	.81

£5 per hour wage hours/earnings class
(minimum wage is £4.30)
Lone parent; child aged 4.

- 'Almost' monotonically declining social welfare weights make the reform optimal
  - non-monotonicities correspond to 'peculiar' hours conditions
- Weight g_0 higher than a pure tax-credit expansion
- Choose monotonic weights =>

Optimal Transfers and Taxes and WFTC (lone parent, min wage)



Hours of Work = Earnings/Min Wage

The new tax credits in the UK

- Child Tax Credit (CTC): no work condition
  - increase in generosity and combined child elements in IS
- Working Tax Credit (WTC): work condition
  - increase the generosity relative to WFTC for workers with children
  - ex-ante prediction of further 3.8 increase in employment
- WTC for childless single people and couples
  - lower rate
  - only people aged 25 and over
  - working 30 hours or more per week
  - implicitly much lower social welfare weight for workers without children
- Opens debate on time limits – tax-credits may under insure b over providing static incentives

Summary

- Empirically robust elasticities and knowledge of the full tax and benefit system can can easily reconcile EITC and WFTC 'puzzle'.
- Can justify the WFTC expansion even with social welfare weights that decline monotonically with income – except for hours conditions.
- Contrast with implicit social welfare weights for the EITC expansions in the US.
- Contrast to the 2004 WTC/CTC expansions UK for individuals with and *without* children

Adequacy of the specification

- line-up structural model with quasi-experiment treatment effects
- work experience and wages?
  - Gladden and Tamer (2000)
  - Grogger (2005)
  - Card and Hyslop (2004)
- program impact on gross wages?
- couples?
  - targeting in collective labour supply models with children - forthcoming JPE paper
- childcare? ; impact on fertility?

Some References:

Beaudry, P., and C. Blackorby (2000), "Taxes and Employment Subsidies in Optimal Redistribution Programs," Discussion Paper 22, UBC, October.

Besley, T. and S. Coate (1992), "Workfare versus Welfare: Incentive Arguments for Work Requirement in Poverty Alleviation Programs", *American Economic Review*, 82(1), 249-261.

Blundell, R. (2001), "Welfare-to-Work: Which Policies Work and Why?" *Keynes Lecture in Economics*, 2001.

Blundell, R.W., Duncan, A. and Meghir, C. (1998), "Estimating Labour Supply Responses using Tax Policy Reforms", *Econometrica*, 66, 827-861.

Blundell, R, Duncan, A, McCrae, J and Meghir, C. (2000), "The Labour Market Impact of the Working Families' Tax Credit", *Fiscal Studies*, 21(1).

Blundell, R. and Hoynes, H. (2004), "In-Work Benefit Reform and the Labour Market", in Richard Blundell, David Card and Richard .B. Freeman (eds) *Seeking a Premier League Economy*. Chicago: University of Chicago Press.

Blundell, R. and MaCurdy (1999), "Labour Supply: A Review of Alternative Approaches", in Ashenfelter and Card (eds), *Handbook of Labour Economics*, Elsevier North-Holland.

Brewer, M. (2003), "The New Tax Credits", *IFS Briefing Note* No. 25, www.ifs.org.uk

Blundell, R. Brewer, M. A. Duncan and A. Shephard (2003), "Analysing the impact of in-work support on labour supply and programme participation", IFS report to Inland Revenue, December.

Card, David and Philip K. Robins (1998), "Do Financial Incentives Encourage Welfare Recipients To Work?", *Research in Labor Economics*, 17, pp 1-56.

Chone, P., and G. Laroque (2003): "Optimal Incentives for Labor Force Participation," Discussion Paper 25, *Journal of Public Economics*.

Diamond, P. (1980): "Income Taxation with Fixed Hours of Work," *Journal of Public Economics*, 13, 101-110.

Eissa, Nada and Jeffrey Liebman (1996), "Labor Supply Response to the Earned Income Tax Credit", *Quarterly Journal of Economics*, CXI, 605-637.

Immervoll, H. Kleven, H. Kreiner, C, and Saez, E. (2004), `Welfare Reform in European Countries: A Micro-Simulation Analysis' CEPR DP 4324, forthcoming *Economic Journal.*

Keane, M.P. and Moffitt, R. (1998), "A Structural Model of Multiple Welfare Program Participation and Labor Supply", *International Economic Review*, 39(3), 553-589.

Laroque, G. (2004), “Income Maintenance and Labour Force Participation”, presidential address to the Econometric Society, *Econometrica.*

Liebman, J. (2002), ‘The Optimal Design of the Earned Income Tax Credit’, in Bruce Meyer and Douglas Holtz-Eakin (eds.), *Making Work Pay: The Earned Income Tax Credit and Its Impact on American Families*, New-York: Russell Sage Foundation.

Mirrlees, J.A. (1971), “The Theory of Optimal Income Taxation”, *Review of Economic Studies*, 38, 175-208.

Moffitt, R. (1983), "An Economic Model of Welfare Stigma", *American Economic Review*, 73(5), 1023-1035.

Phelps, E.S. (1994), “Raising the Employment and Pay for the Working Poor”, *American Economic Review*, 84 (2), 54-58.

Saez, E. (2001): "Using Elasticities to derive Optimal Income Tax Rates," *Review of Economic Studies*, 68, 205-239.

Saez, E. (2002): "Optimal Income Transfer Programs: Intensive versus Extensive Labor Supply Responses," *Quarterly Journal of Economics*, 117, 1039-1073.

Seade, J.K. (1977), “On the Shape of Optimal Income Tax Schedules” *Journal of Public Economics*, 7, 203-236.