Female Labor Supply, Human Capital, and Welfare Reform

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1. Introduction

2. Tax and Welfare Policy in the U.K.

TABLE I

WORKING TAX CREDIT AND INCOME SUPPORT UNDER DIFFERENT TAX AND TRANSFER SYSTEMS—LONE MOTHERS AND MOTHERS WITH LOW-WAGE PARTNERS WORKING FULL-TIME; 1 CHILD FAMILIES[a]

	Lone Mother				Mother in Couple Partner Working Full-Time			
	1995	1999	2002	2004	1995	1999	2002	2004
Income Support								
(1) Maximum award	109.7	108.6	122.0	62.9	0.0	0.0	0.0	0.0
(2) Withdrawal rate	100%	100%	100%	100%	100%	100%	100%	100%
Tax Credits								
Maximum awards								
(3) Work contingent component, no CC costs	93.6	96.5	117.1	115.7	43.9	43.2	74.9	47.0
(4) Work contingent component with CC costs	93.6	96.5	186.3	184.9	83.3	96.5	147.7	119.8
(5) Not work contingent component	0.0	0.0	0.0	47.2	0.0	0.0	0.0	47.2
(6) Withdrawal rate	70%	70%	55%	37%	70%	70%	55%	37%
Female earnings at which tax credit award is exhausted								
(7) No childcare costs	298.2	294.2	402.0	1255.5	61.7	60.8	142.3	1052.1
(8) With childcare cost	384.9	407.9	596.7	1255.5	131.9	148.6	335.6	1052.1

[a]Tax and benefit systems as in April each year. CC: Child care. Figures for mothers in couples assume partner works full-time at the April 2004 minimum wage. Work requirement is 16 hours per week for 1 adult (rows 3 and 4) or all adults for CC component (difference between rows 4 and 3). Monetary amounts expressed in £ and in weekly terms, uprated to January 2008 prices using RPI. Detailed notes in Appendix F, Table XXXIII.

TABLE II

TAX RATES AND THRESHOLDS UNDER DIFFERENT TAX AND TRANSFER SYSTEMS[a]

	1995	1999	2002	2004
Income Tax: Thresholds				
Personal allowance	95.5	105.9	106.0	103.1
Starting rate upper limit	182.1	142.5	150.1	147.0
Basic rate upper limit	753.4	789.7	792.6	785.3
Income Tax: Rates				
Starting rate	20%	10%	10%	10%
Basic rate	25%	23%	22%	22%
Higher rate	40%	40%	40%	40%
National Insurance: Thresholds				
Lower earnings limit (LEL)	81.67	83.82	106.27	102.81
Upper earnings limit (UEL)	619.54	634.99	698.54	689.17
National Insurance: Rates				
Entry fee (up to LEL)	2%	0%	0%	0%
Main rate (earnings in LEL-UEL region)	10%	10%	10%	11%
Rate above UEL	0%	0%	0%	1%

[a]Amounts expressed in weekly terms and uprated to January 2008 prices using RPI. Allowance for couples is the married couple allowance and additional personal allowance. Tax and benefits systems as in April each year.

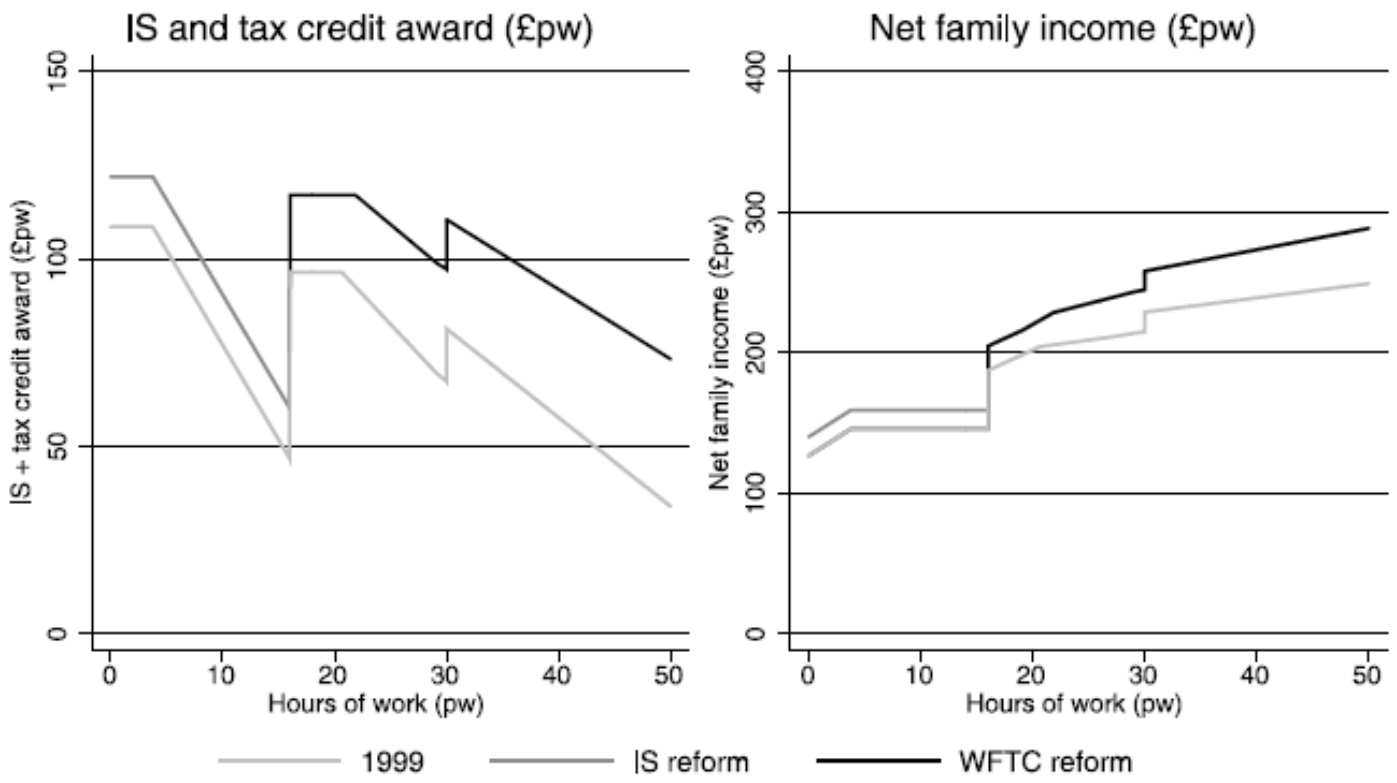

FIGURE 1.—IS/tax credit award and budget constraint for low-wage lone parent. Notes: Lone parent earns the minimum wage (April 2004) and has one child aged 4 and no expenditure on childcare or rent. All monetary values in 2008 prices.

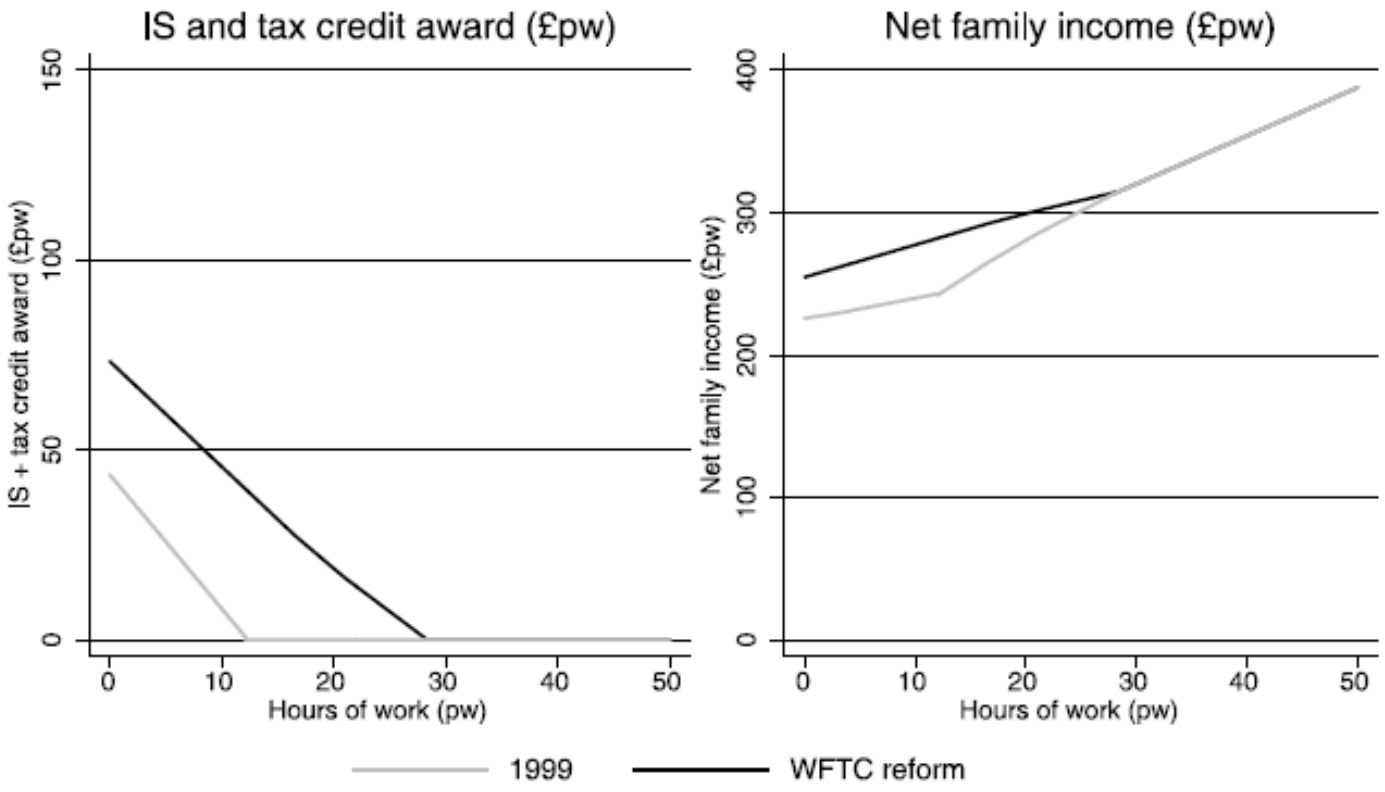

FIGURE 2.—Tax credit award for low-wage parent with low-wage partner working full time. Notes: Parents earn the minimum wage (April 2004) and have one child aged 4 and no expenditure on childcare or rent. Partner works 40 hours per week. All monetary values in 2008 prices. IS reform absent from figure because family not entitled to IS.

3. Data and Reduced Form Analysis

TABLE III

DISTRIBUTION OF FAMILY TYPES IN 2002—WOMEN AGED 19–50[a]

	Mothers		Childless Women	Number of Observations
	Singles	In Couples		
All	0.10	0.44	0.46	2,096
	(0.007)	(0.011)	(0.011)	
			By education	
Secondary	0.15	0.49	0.36	839
	(0.012)	(0.017)	(0.017)	
High school	0.08	0.43	0.49	853
	(0.010)	(0.017)	(0.017)	
University	0.03	0.41	0.56	404
	(0.008)	(0.024)	(0.025)	

[a]Based on BHPS data for 2002. Standard errors in parentheses under estimates.

TABLE IV

ASSETS BY EDUCATION[a]

	Financial Assets			Housing		
	Proportion	Net Assets (£1,000)		Proportion	For Owners (£1,000)	
Education	Positive	Average	[p10, p90]	Owners	Value	[p10, p90]
Secondary	0.58	3.0	[−1.9, 8.3]	0.69	127.4	[51.9, 225, 6]
High school	0.74	4.9	[−2.9, 16.1]	0.82	158.7	[57.0, 287.7]
University	0.82	9.9	[−5.1, 28.2]	0.85	206.2	[75.0, 379.1]

[a]BHPS data. Values in 1,000s British pounds, 2008 prices. Excludes private and public pension wealth. Financial assets net of debts, includes zeros. Gross house values. [p10, p90] in columns 3 and 6 stands for inter-decile range.

TABLE V

DIFFERENCE-IN-DIFFERENCES EMPLOYMENT REGRESSIONS FOR LONE MOTHERS VERSUS SINGLE WOMEN[a]

	(1) Secondary	(2) High School	(3) University
1999 compared to 2002—Before and after all WFTC reforms			
Impact on employment	0.040***	0.055***	−0.005
Standard error	(0.012)	(0.015)	(0.016)
Pooled sample 1995–2004			
Impact on employment	0.0411**	0.0474*	−0.0095
	(0.0178)	(0.0266)	(0.0341)
Lone-mothers × pre-reform linear trend	0.0015	−0.0086	−0.0105
	(0.0040)	(0.0067)	(0.0087)
N	24,648	8,113	5,088

[a]Data from the Labour Force Survey. Standard errors in parentheses. Top panel: two period differences in differences comparing pre-reform employment (1999) to post-reform (2002) for treatment (lone mothers) and comparison group (single women with no children). Lower panel: pooled regression for 1995–2004, including pre-reform differential trend between lone mothers and single childless women. All regressions include a full set of dummies for time, age, and age of youngest child and an indicator for being a single mother. Impact on employment is coefficient on lone-mother × post-reform. ***, **, * indicates statistical significance at 1%, 5%, and 10%, respectively.

TABLE VI

PLACEBO EFFECTS ON EMPLOYMENT BASED ON PRE-WFTC REFORM DATA[a]

	Secondary Education				High School				University			
After Period:	1996	1997	1998	1999	1996	1997	1998	1999	1996	1997	1998	1999
Before period												
1995	−0.004	0.000	−0.008	−0.009	0.025	−0.010	0.015	0.014	−0.035*	−0.030	−0.020	−0.035*
	(0.011)	(0.012)	(0.012)	(0.012)	(0.017)	(0.016)	(0.016)	(0.016)	(0.021)	(0.020)	(0.020)	(0.020)
1996		0.004	−0.006	−0.005		−0.032**	−0.008	−0.013		0.012	0.018	0.000
		(0.011)	(0.011)	(0.011)		(0.016)	(0.016)	(0.016)		(0.018)	(0.019)	(0.019)
1997			−0.009	−0.007			0.026*	0.024			0.008	−0.013
			(0.011)	(0.011)			(0.015)	(0.016)			(0.017)	(0.017)
1998				0.002				−0.003				−0.017
				(0.011)				(0.015)				(0.017)

[a]Data from the Labour Force Survey. Standard errors in parentheses. Difference-in-differences estimates compare lone mothers with single women with no children (treatment and comparison groups) in pairs of years before and after pseudo-treatment. Linear probability model of employment including time and single mother dummy and single mother dummy x post pseudo reform, the coefficient of which is the pseudo impact reported. Other covariates included dummies for age and age of youngest child. Each coefficient is from a separate regression. **, * indicates statistical significance at 5% and 10%, respectively.

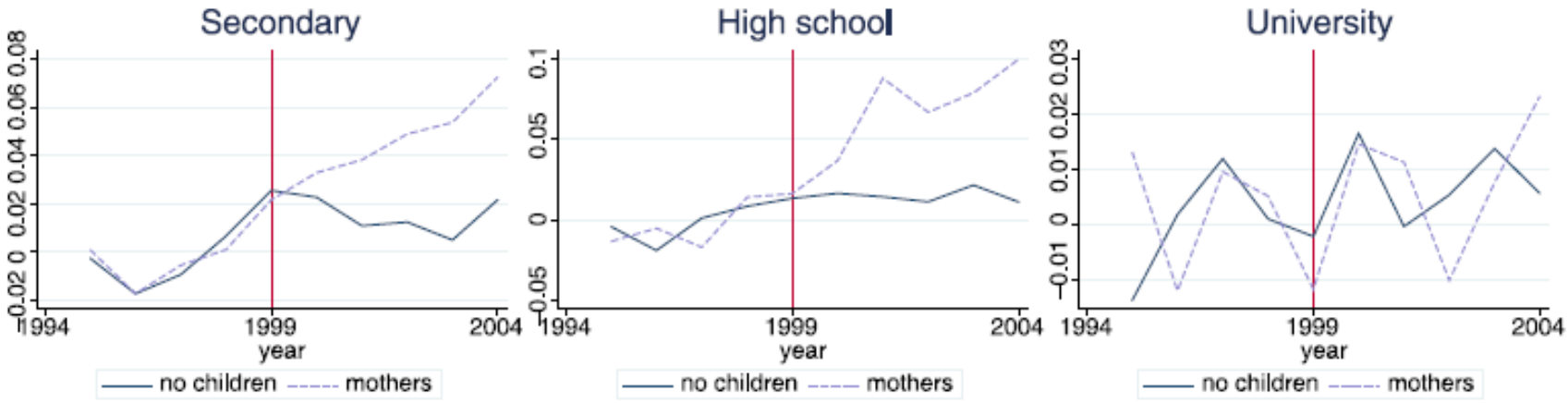

FIGURE 3.—Effects of the 1999–2002 reforms on female labor force participation. Notes: The dotted line represents the participation rate of single mothers, who were affected by the reform. The solid line represents the participation rate of single women without children, who were not affected by the tax credit changes. We normalize the participation rate of both groups to average zero pre-reform. The actual participation rates in 1999 for each of the education groups in ascending order of education are 0.87, 0.94, 0.95 for singles with no children and 0.41, 0.65, and 0.80 for lone mothers. The x-axis is year. The vertical line shows the last pre-reform year, 1999.

FIGURE 4.—Trend in educational participation by age group. Notes: The top line is the school participation rate of those who are 16 and for whom attendance is compulsory. The lower line represents participation in post-compulsory schooling for ages 17–21. The x-axis is year.

Defining the outcome variable as a dummy for attendance in post-compulsory schooling (PC_{it}), we run the regression

$$PC_{it} = \text{Time dummies} + \alpha_1 f_1 + \alpha_2 f_2 + \alpha_3 \ln(EY_C) + \alpha_4 \ln(EY_{HS}) + \alpha_5 \ln(EY_U) + u_{it}.$$

TABLE VII

THE EFFECT OF EXPECTED INCOME ON POST-COMPULSORY SCHOOLING[a]

	(1)	(2)	(3)	(4)
$\ln(EY_C)$	−0.8572**	−0.8794**	−0.8823**	−1.0943**
	(0.3758)	(0.3800)	(0.3839)	(0.5136)
$\ln(EY_{HS})$				0.2616
				(0.6440)
$\ln(EY_U)$				0.0362
				(0.4279)
f_1	0.1028***	0.1042***	0.1118***	0.1138***
	(0.0108)	(0.0123)	(0.0283)	(0.0289)
f_2	0.0119	−0.0030	−0.0031	−0.0040
	(0.0093)	(0.0102)	(0.0218)	(0.0209)
$f_1 \times t$		0.0001	0.0015	0.0016
		(0.0021)	(0.0041)	(0.0041)
$f_2 \times t$		−0.0053***	−0.0055*	−0.0054*
		(0.0018)	(0.0031)	(0.0031)

TABLE VII

THE EFFECT OF EXPECTED INCOME ON POST-COMPULSORY SCHOOLING[a]

	(1)	(2)	(3)	(4)
$f_1 \times t \times$ post-ref			−0.0217*	−0.0216*
			(0.0123)	(0.0123)
$f_2 \times t \times$ post-ref			0.0230**	0.0229**
			(0.0115)	(0.0115)
$f_1 \times$ post-ref			0.0445	0.0443
			(0.0657)	(0.0656)
$f_2 \times$ post-ref			−0.0632	−0.0638
			(0.0478)	(0.0484)
Time dummies	Yes	Yes	Yes	Yes
		Treatment effect		
Average effect	−0.012**	−0.012**	−0.012**	−0.012**
St. error	(0.0052)	(0.0052)	(0.0053)	(0.0054)
Changes in expected income by education group comparing 1999 to 2002 $\Delta \ln(\overline{EY_C}) = 0.014$, $\Delta \ln(\overline{EY_{HS}}) = 0.010$, $\Delta \ln(\overline{EY_U}) = 0.004$				
N	1,033			

4. Model

- We assume that utility is intertemporally separable, and that instantaneous utility depends on consumption per adult equivalent, female labor supply, family background, family circumstances, and preferences for work.

- Her instantaneous utility is nonseparable between consumption and leisure.

- At age t, it is given by

$$(1) \qquad u(c_t, l_t; \theta, Z_t) = \frac{(c_t/n_t)^{\mu}}{\mu} \exp\{U(l_t, \theta, Z_t)\},$$

- n is the equivalence scale
- c is total family consumption
- l is female labor supply and assumes three possible values: not working (O), working parttime (P), and working full-time (F).

- U is specified as follows:

$$U(l_t, \theta, Z_t) = \begin{cases} 0, & \text{if } l_t = \text{O (Out of work)}, \\ \theta_l + Z_t'\alpha(l_t), & \text{if } l_t = \text{P or F (Part time or full time)}, \end{cases}$$

$$\text{where} \quad \alpha(l_t) = \alpha_{\text{F}} + \alpha_{\text{P}} \times \mathbf{1}(l_t = \text{P}),$$

where Z_t is a subset of the woman's characteristics.

At any age t during working life, the woman's decision problem can be written as

$$V_t(X_t) = \max_{\{c_\tau, l_\tau\}_{\tau=t,\ldots,\bar{t}}} \mathrm{E}\left\{ \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} u(c_\tau, l_\tau; \theta, Z_\tau) \middle| X_t \right\}$$

subject to the Budget constraint,

- Expectation E is taken over all future random events conditional on the available information X_t
- β is the discount factor
- V_t is the optimum value of discounted present and future utility
- $\bar{t}$ is 10 years after retirement and the family lives off its savings during the retirement period

Budget Constraint. The budget constraint is described in terms of the asset evolution equation

$$(2)\qquad \begin{cases} a_{t+1} = (1+r)a_t + h_t w_t + m_t \tilde{h}_t \tilde{w}_t - T(l_t, X_t) \\ \qquad\qquad - Q\left(t^k, h_t, \tilde{h}_t, m_t\right) - c_t, \\ a_{t+1} \geq \underline{a}_s, \\ \quad \text{with initial and terminal conditions: } a_0 = 0 \text{ and } a_{\bar{t}+1} = 0, \end{cases}$$

- r is the risk-free interest rate
- $(w, \tilde{w})$are the hourly wage rates of wife and husband
- $\left(h, \bar{h}\right)$ are the working hours of wife and husband (respectively 0, 18, and 38 hours corresponding to O, P, and F for women, and 0 and 40 corresponding to O and F for men)
- $\underline{a}_s$ represents the borrowing limit

$$Q(t^k, h_t, \tilde{h}_t, m_t) = \begin{cases} h_t \times \mathrm{CC}_h, & \text{if } d_{\mathrm{cc}} = 1 \text{ and } t^k \leq 5 \text{ and} \\ & (\tilde{h}_t = 40 \text{ or } m_t = 0), \\ 18 \times \mathrm{CC}_h, & \text{if } d_{\mathrm{cc}} = 1 \text{ and } 5 < t^k \leq 10 \text{ and} \\ & h_t = 38 \text{ and } (\tilde{h}_t = 40 \text{ or } m_t = 0), \\ 0, & \text{all other cases,} \end{cases}$$

where CC_h is the constant per-hour rate, which we set to a number obtained from the data.

- The female wage process including the distribution of all shocks is education-specific (indexed by s).
- It is given by

$$\ln w_t^m = b_{s,0} + b_{s,1}x_1 + b_{s,1}x_2 + (\gamma_{s,0} + \gamma_{s,1}x_1 + \gamma_{s,2}x_2)\ln(e_t + 1) + v_t + \xi_t, \quad (3)$$

$$\ln w_t = \ln w_t^m - \xi_t, \quad (4)$$

$$e_t = e_{t-1}(1 - \delta_s) + g_s(l_{t-1}), \quad (5)$$

$$v_t = \rho_s v_{t-1} + \zeta_t, \quad (6)$$

- $\ln w_t^m$ is the observed hourly wage rate
- ξ is i.i.d. normal measurement error
- $\ln w_t$ is the wage rate on which individual decisions are based
- e_t is experience

- We assume men in couples either work fulltime or are ($\tilde{l} = F$) out of work ($\tilde{l} = O$) .
- Their hourly wage and employment are exogenous and are given by

$$(7) \qquad \text{Prob}\left[\tilde{l}_t = \text{F} | X_t\right] = \begin{cases} \text{Prob}\left[\tilde{\nu}_{1t} > b_1(t, \tilde{s}_t, \tilde{l}_{t-1})\right], & \text{if } m_{t-1} = 1, \\ \text{Prob}\left[\tilde{\nu}_{0t} > b_0(t, \tilde{s}_t)\right], & \text{if } m_{t-1} = 0, \end{cases}$$

$$(8) \qquad \ln \tilde{w}_t^m = \tilde{b}_{\tilde{s}} + \tilde{\gamma}_{\tilde{s}} \ln(t - 18) + \tilde{v}_t + \tilde{\xi}_t, \quad t > 18,$$

$$(9) \qquad \ln \tilde{w}_t = \ln \tilde{w}_t^m - \tilde{\xi}_t,$$

$$(10) \qquad \tilde{v}_t = \tilde{\rho}_{\tilde{s}} \tilde{v}_{t-1} + \tilde{\zeta}_t,$$

- $\ln \widetilde{w}_t^m$ is measured log wage
- $\widetilde{w}_t$ is the log wage that matters for decisions
- $\tilde{\xi}$ is taken to be an i.i.d. normal measurement error

- The probability that a new child arrives depends on the age and education of the woman, whether she has other children and the age of the youngest child, and whether she is married (described by m).
- It is given by

$$(11) \qquad \text{Prob}\left[t^k = 0 | t, s, k_{t-1}, t^k_{t-1}, m_{t-1}\right].$$

The transition probability is given by

$$(12) \qquad \text{Prob}[m_t, \tilde{s}_t | t, s, m_{t-1}, \tilde{s}_{t-1}, k_{t-1}],$$

where $\tilde{s}_{t-1}$ ($\tilde{s}_t$) is only observed if $m_{t-1} = 1$ ($m_t = 1$).

The optimal choice of education is defined by

$$s = \underset{s \in \{1,2,3\}}{\operatorname{argmax}} \{W_s(X_{17}) - B_s(X_{17})\},$$

where B_s measures the utility costs of the investment, defined as

$$B_s(X_{17}) = \pi_{1s} f_1 + \pi_{2s} f_2 + \pi_{5s} y_p + \varpi_s.$$

- y_p is the liquidity shock to parental income (after removing all observed information on permanent family characteristics when the woman is 16 years old)
- (f_1, f_2) are the continuous parental background factors, which capture permanent family heterogeneity and are discretized as described before to enter the rest of the model
- $\bar{\boldsymbol{\omega}}_s$ is the unobserved utility cost of education *s*, assumed to be normally distributed with variance $\boldsymbol{\sigma}_s^2$
- W_s is the discounted expected value of lifetime utility if the woman chooses education level s

It is given by

$$W_s(X_{17}) = \begin{cases} \mathrm{E}\left[V_{19}(X_{19}) \mid X_{17}, s\right], & \text{if } s = 1, 2, \\ \mathrm{E}\left[\max\limits_{c_{19}, c20, c_{21}} \left\{ \sum\limits_{t=19}^{21} \beta^{t-19} u(c_t, \mathrm{F}; \theta, Z_{17}) \right. \right. \\ \quad \left. \left. + \beta^{22-19} V_{22}(X_{22}) \right\} \middle| X_{17}, s \right], & \text{if } s = 3, \end{cases}$$

where Z_{17} summarizes the relevant information for the instantaneous utility

Optimization i therefore subject to the budget constraint

$$a_{19} = a_{17} = 0,$$
$$a_{22} = -(1+r)^2 c_{19} - (1+r)c_{20} - c_{21} - D \quad \text{if} \quad s = 3.$$

5. Estimation

The estimates $\widehat{\Theta}$ are defined by

$$(13) \qquad \hat{\Theta} = \underset{\Theta}{\operatorname{argmin}} \left\{ \sum_{k=1}^{K} \left[\left(M_{kN}^{d} - M_{ks}^{m}(\Theta) \right)^2 / \operatorname{Var}\left(M_{kN}^{d} \right) \right] \right\},$$

where the sum is over the K moments, M_{kn}^{d} denotes the kth data moment estimated over N observations, and $M_{ks}^{m}(\Theta)$ represents the kth simulated moment evaluated at parameter value Θ over s simulations.

6. Parameter Estimates

TABLE VIII

FEMALE WAGE EQUATION AND EXPERIENCE ACCUMULATION[a]

		Education		
		Secondary (1)	High School (2)	University (3)
(1)	Intercept ($b_{s,0}$)	5.406	5.547	6.949
		(0.030)	(0.038)	(0.071)
(2)	Increment: high factor 1 ($b_{s,1}$)	0.005	0.018	0.061
		(0.040)	(0.038)	(0.066)
(3)	Increment: high factor 2 ($b_{s,2}$)	0.014	−0.186	0.045
		(0.036)	(0.031)	(0.048)
(4)	Mean hourly wage rate at 25	7.19	8.64	10.55
		(0.050)	(0.067)	(0.317)
		Returns to experience		
(5)	Baseline ($\gamma_{s,0}$)	0.152	0.229	0.306
		(0.006)	(0.009)	(0.011)
(6)	Increment: high factor 1 ($\gamma_{s,1}$)	0.054	0.014	−0.002
		(0.009)	(0.009)	(0.010)
(7)	Increment: high factor 2 ($\gamma_{s,2}$)	−0.002	0.029	−0.006
		(0.008)	(0.008)	(0.008)
(8)	Mean value of the coefficient on experience	0.16	0.25	0.30
		(0.008)	(0.012)	(0.014)

TABLE VIII

FEMALE WAGE EQUATION AND EXPERIENCE ACCUMULATION[a]

		Education		
		Secondary (1)	High School (2)	University (3)
		Distribution of unobserved productivity		
(9)	Autocorrelation coefficient: ρ_s	0.925	0.916	0.880
		(0.006)	(0.006)	(0.008)
(10)	St. deviation of innovation in productivity: $\sqrt{\text{Var}(\zeta_s)}$	0.125	0.154	0.139
		(0.005)	(0.005)	(0.005)
(11)	Mean of initial productivity for type I: $\text{E}(v_{0s}\|\text{type I})$	0.140	0.111	0.306
		(0.011)	(0.028)	(0.015)
(12)	St. deviation initial productivity: $\sqrt{\text{Var}(v_{0s})}$	0.145	0.202	0.223
		(0.012)	(0.015)	(0.016)
		Human capital dynamics		
(13)	While in part-time work: $g_s(\text{P})$	0.150	0.096	0.116
		(0.015)	(0.022)	(0.013)
(14)	Depreciation rate: δ_s	0.081	0.057	0.073
		(0.008)	(0.008)	(0.009)

TABLE IX

ESTIMATES OF PREFERENCE PARAMETERS—FUNCTION U IN EQUATION (1)[a]

		Coeff. (1)	St. Error (2)	Coeff. (3)	St. Error (4)
		Utility Parameters			
		All Employment α_F		Part-Time Employment α_P	
(1)	Singles, no children: Sec	0.344	(0.011)	−0.269	(0.009)
(2)	Singles, no children: HS	0.412	(0.013)	−0.315	(0.012)
(3)	Singles, no children: Univ	0.555	(0.014)	−0.382	(0.012)
(4)	Married, no children: Sec	0.226	(0.013)	−0.154	(0.009)
(5)	Married, no children: HS	0.222	(0.011)	−0.156	(0.008)
(6)	Married, no children: Univ	0.276	(0.013)	−0.180	(0.010)
(7)	Single mothers: Sec	0.375	(0.010)	−0.161	(0.006)
(8)	Single mothers: HS	0.330	(0.019)	−0.142	(0.015)
(9)	Single mothers: Univ	0.372	(0.016)	−0.184	(0.066)
(10)	Married mothers: Sec	0.226	(0.011)	−0.168	(0.009)
(11)	Married mothers: HS	0.233	(0.012)	−0.180	(0.009)
(12)	Married mothers: Univ	0.282	(0.015)	−0.212	(0.012)
(13)	Child aged 0–2	0.156	(0.010)	−0.095	(0.008)
(14)	Child aged 3–5	0.093	(0.010)	−0.067	(0.009)
(15)	Child aged 6–10	0.047	(0.008)	−0.027	(0.007)
(16)	Partner working	−0.077	(0.009)	0.066	(0.007)
(17)	High background factor 1	0.002	(0.007)	0.000	(0.005)
(18)	High background factor 2	0.006	(0.006)	0.001	(0.005)
		Unobserved Heterogeneity in Cost of Work			
		Full-Time Employment θ_F		Part-Time Employment θ_P	
(19)	Type I	−0.193	(0.006)	−0.093	(0.005)
(20)	Type I: probability	0.361 (0.005)			

TABLE X

ESTIMATES OF PREFERENCES FOR EDUCATION AND PROBABILITY OF POSITIVE CHILDCARE COSTS IF WORKING[a]

	High School		University	
	Coeff. (1)	St. Error (2)	Coeff. (3)	St. Error (4)
(1) Intercept	−0.053	(0.025)	0.682	(0.015)
(2) Background factor 1	0.227	(0.012)	0.363	(0.014)
(3) Background factor 2	0.009	(0.022)	0.299	(0.011)
(4) Parental liquidity shock when aged 16	0.305	(0.158)	0.695	(0.036)
(5) St. deviation unobserved utility cost of education ($\sqrt{V\varpi_s}$)	1.579	(0.093)	1.015	(0.183)
(6) Probability of positive childcare costs	0.576 (0.014)			

[a]Residual parental income constructed from regression of parental income on all long-term background characteristics when the woman is 16 years old.

7. Model Fit and Implications for Behavior

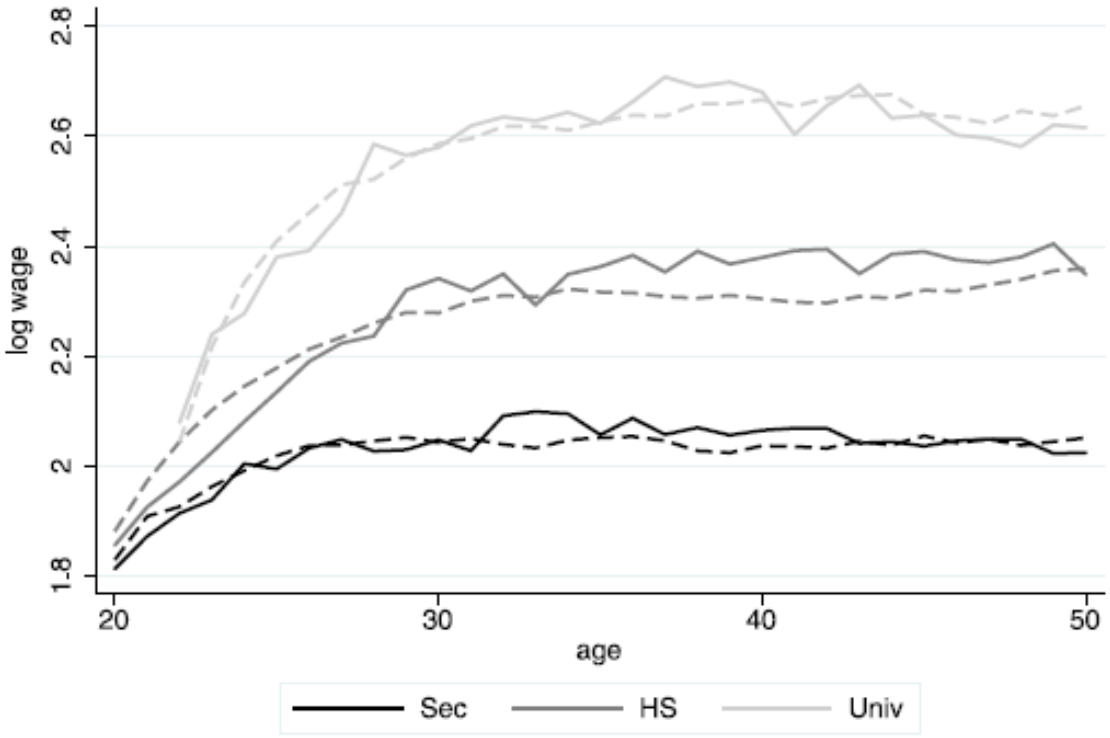

FIGURE 5.—Mean log wage rates for working women over the life-cycle by education: data versus model. Notes: BHPS versus simulated data, in solid and dashed lines, respectively. 2008 prices.

FIGURE 6.—Distribution of log wage rates for working women over the life-cycle by education: data versus model. Notes: BHPS versus simulated data. 2008 prices. All curves smoothed using kernel weights and a bandwidth of 2 years.

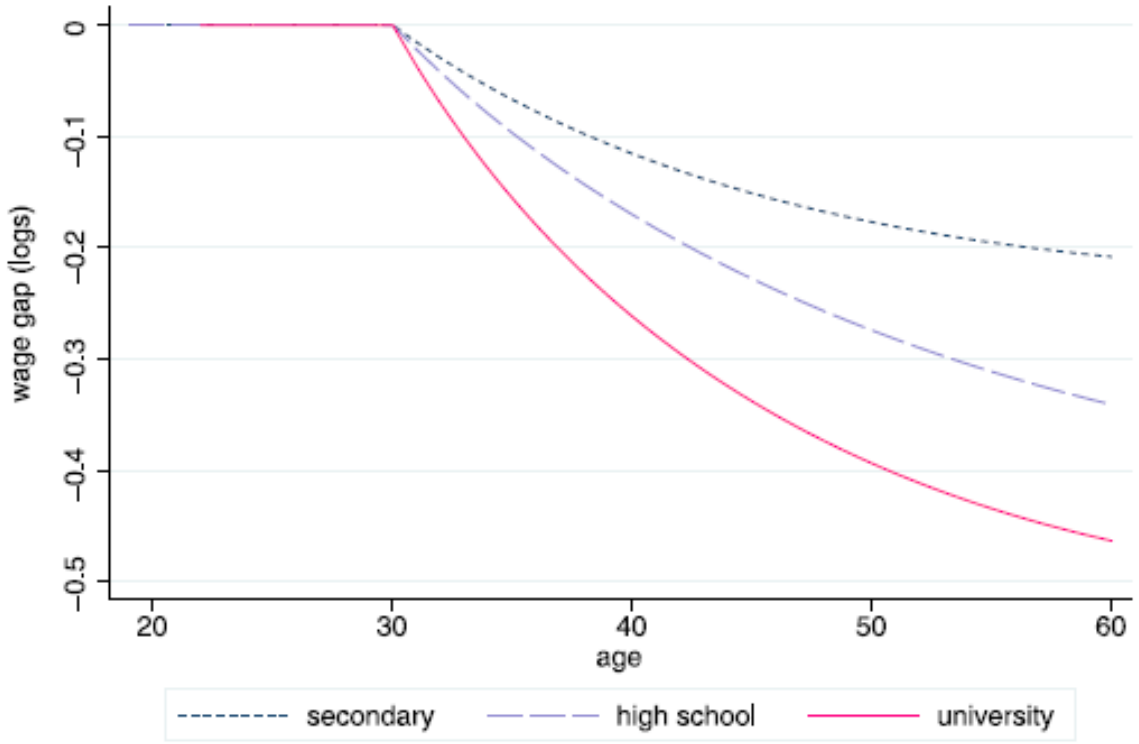

FIGURE 7.—Experience gap for women in part-time work from the age of 30; by education. Notes: All values in log wage units. Curves represent difference in accumulated experience between women taking part-time work from the age of 31 onwards as compared to taking full-time work over the same period, all conditional on full-time employment up to the age of 30.

TABLE XI

THE EFFECT OF OBSERVED PART-TIME AND NON-WORK PATTERNS ON WAGES AT 50[a]

	No Part-Time Penalty	No Penalty for not Working *and* no Part-Time Penalty
Secondary (%)	5.3	10.5
High school (%)	7.0	12.5
University (%)	7.7	14.3

[a]The first column shows the effect on wages at 50 if the amount of experience gained from part-time work is the same as that of full-time work; the second column cancels, in addition, the experience cost of not working. The pattern of part-time work and full-time work is kept fixed at what actually happens.

FIGURE 8.—Female employment rates over the life-cycle and by time to/since childbirth: data versus model. Notes: BHPS versus simulated data, in solid and dashed lines, respectively. Lines by time to/since childbirth in the bottom panel are smoothed using kernel weights and a bandwidth of 2 years.

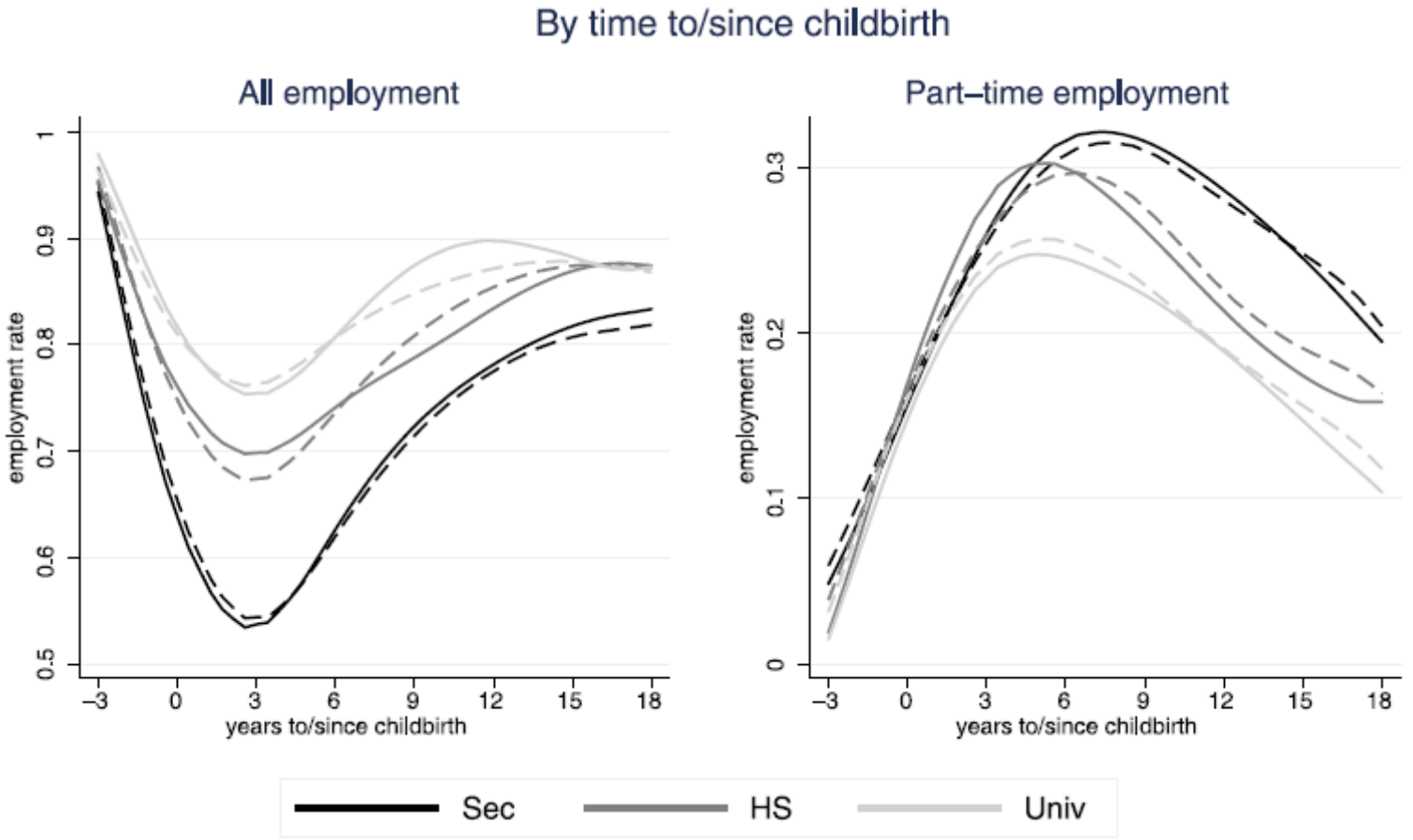

FIGURE 8.—Female employment rates over the life-cycle and by time to/since childbirth: data versus model. Notes: BHPS versus simulated data, in solid and dashed lines, respectively. Lines by time to/since childbirth in the bottom panel are smoothed using kernel weights and a bandwidth of 2 years.

TABLE XII

THE IMPACT OF THE REFORMS ON THE EMPLOYMENT RATES OF LONE MOTHERS—MODEL SIMULATIONS VERSUS DID DATA ESTIMATES[a]

		Secondary	High School	University
(1)	Estimates based on LFS data	4.0	5.5	−0.5
	St. error	(1.2)	(1.5)	(1.6)
(2)	Model simulation	5.6	5.0	1.2

[a] Row 1 displays the result from the difference-in-differences as in the top panel of Table V. Row 2 shows the results of similar calculations on simulated data from the model.

TABLE XIII

THE IMPACT OF THE REFORMS ON EDUCATION ATTAINMENT—MODEL SIMULATIONS VERSUS DATA ESTIMATES[a]

		High School	University
(1)	Estimates based on BHPS data	−0.012	−0.005
	St. error	(0.005)	(0.005)
(2)	Model simulation	−0.007	−0.005

[a] Row 1 displays the data estimates of the average impact of the 1999–2002 reforms on education attainment, as in column 4 of Table VII. Row 2 shows model predictions of the impact of the same reform under revenue neutrality.

TABLE XIV

ELASTICITIES OF LABOR SUPPLY[a]

	Frisch			Marshall		
	Extensive		Intensive	Extensive		Intensive
	Elasticity	Derivative	Elasticity	Elasticity	Derivative	Elasticity
All women	0.627	0.510	0.240	0.475	0.386	0.210
By education						
Secondary	0.914	0.675	0.327	0.689	0.509	0.280
High school	0.567	0.469	0.223	0.428	0.354	0.198
University	0.427	0.375	0.180	0.331	0.291	0.158
By family composition						
Single women with no children	0.532	0.486	0.159	0.419	0.383	0.055
Lone mothers	2.240	1.275	0.452	1.362	0.775	0.378
Women in couples, no children	0.264	0.242	0.163	0.220	0.203	0.167
Women in couples with children	0.688	0.522	0.316	0.553	0.419	0.304

[a]Calculations based on simulated data under the 1999 tax and benefit system. The derivatives in columns 2 and 5 measure the *percentage point change* in labor supply, in response to a 1% increase in net earnings. All effects are measured in the year the change in earnings occurs.

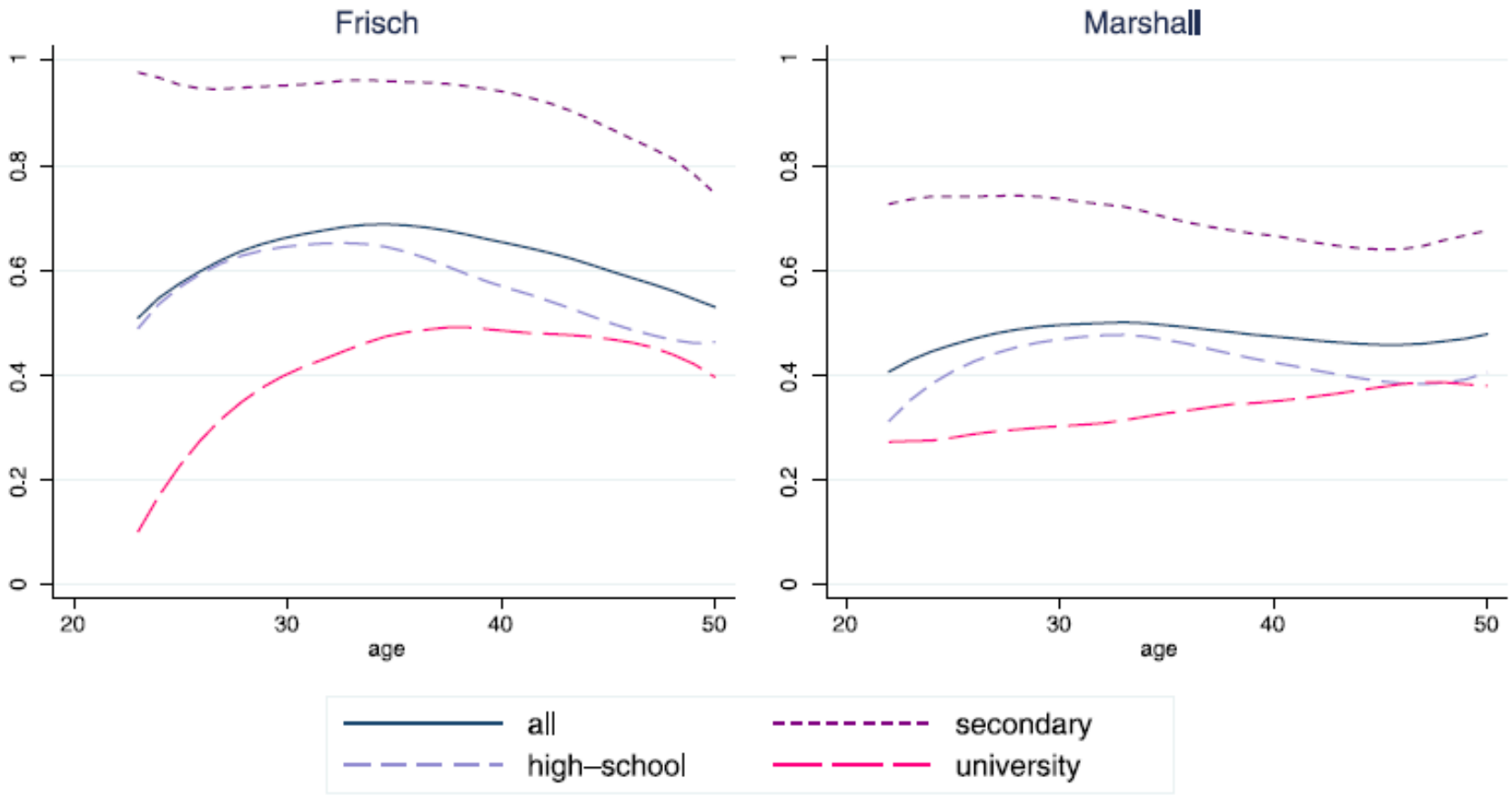

FIGURE 9.—Frisch and Marshallian elasticities over the life-cycle of women by education. Notes: Based on simulated data using the 1999 tax and benefit system.

8. The Long-run Effects of Tax and Benefit Reforms

TABLE XV

EFFECTS OF TAX CREDITS[a]

		Pre-Reform Education Choice					
		Secondary		High School		University	
		Impact on Employment: Mothers of Dependent Children (0–18)					
		Single	Married	Single	Married	Single	Married
(1)	All (pp)	20.4	−6.6	19.9	−3.6	8.5	−1.0
(2)	Full-time (pp)	9.3	−3.6	7.5	−2.4	−2.1	−1.1
(3)	Part-time (pp)	11.1	−3.0	12.3	−1.2	10.6	0.1
		Impact on Employment: Mothers of Adult Children (19+)					
(4)	All (pp)	0.4		0.3		0.0	
(5)	Full-time (pp)	0.4		−0.0		−0.2	
(6)	Part-time (pp)	−0.0		0.3		0.2	
		Impact on Education and Wages					
(7)	Education (pp)	0.84		−0.19		−0.65	
(8)	Wages: mothers of child aged 19 (%)	−0.20		0.05		−0.29	
		Impact on Assets (%)					
(9)	No children	−3.3		−2.1		−1.5	
(10)	Dependent child (0–18)	−7.2		−5.3		−2.6	
(11)	Adult child (19+)	−2.3		−1.7		−1.3	
		Impact on Lifetime Disposable Income and Welfare					
(12)	Disposable income (%)	−1.09		−0.25		−0.87	
(13)	Consumption equivalent (%)	1.97		0.76		−0.27	
(14)	Adjustment in the basic rate of Income Tax to fund reform: +0.9 pp						

TABLE XVI

EFFECTS OF TAX CREDITS ON MOTHERS WHO HAVE ALWAYS BEEN A LONE MOTHER[a]

	Secondary	High School	University
All employment when child is 19+ (pp)	−0.9	−1.0	0.0
Part-time employment when child is 19+ (pp)	0.0	0.9	0.0
Full-time employment when child is 19+ (pp)	−0.9	−1.9	0.0
Wages when child is 19 (%)	5.8	3.2	−0.2
Assets when child is 19 (%)	37.3	9.5	−0.4
Lifetime disposable income (%)	7.9	6.3	1.7

[a]Education is allowed to adjust. Educational classification fixed at the pre-reform choice. All effects are percentage points change (pp) or percent changes (%) as marked.

TABLE XVII

EFFECTS OF ASSESSING TAX CREDITS AT THE INDIVIDUAL LEVEL—INTEGRATED WITH THE 2002 TAX AND BENEFIT SYSTEM[a]

		Pre-Reform Education Choice					
		Secondary		High School		University	
		Impact on Employment: Mothers of Dependent Children (0–18)					
		Single	Married	Single	Married	Single	Married
(1)	All (pp)	−3.7	29.6	−4.3	21.6	−4.6	15.0
(2)	Full-time (pp)	−6.3	−16.2	−7.3	−19.2	−9.8	−18.0
(3)	Part-time (pp)	2.6	45.8	3.0	40.7	5.2	33.1
		Impact on Employment: Mothers of Adult Children (19+)					
(4)	All (pp)	−2.8		−2.8		−3.7	
(5)	Full-time (pp)	−8.7		−6.6		−7.3	
(6)	Part-time (pp)	5.1		3.7		3.6	
		Impact on Education and Wages					
(7)	Education (pp)	1.97		−0.82		1.15	
(8)	Wages: mothers of child aged 19+ (%)	−3.7		−5.7		−5.9	
		Impact on Assets (%)					
(9)	No children	−12.4		−11.5		−11.4	
(10)	Dependent child (0–18)	21.3		8.3		−2.8	
(11)	Adult child (19+)	6.8		0.0		−6.4	
		Impact on Lifetime Disposable Income and Welfare					
(12)	Disposable income (%)	0.22		−3.51		−6.74	
(13)	Consumption equivalent (%)	1.70		−2.14		−3.20	
(14)	Adjustment in the basic rate of Income Tax to fund reform: +8.5 pp						

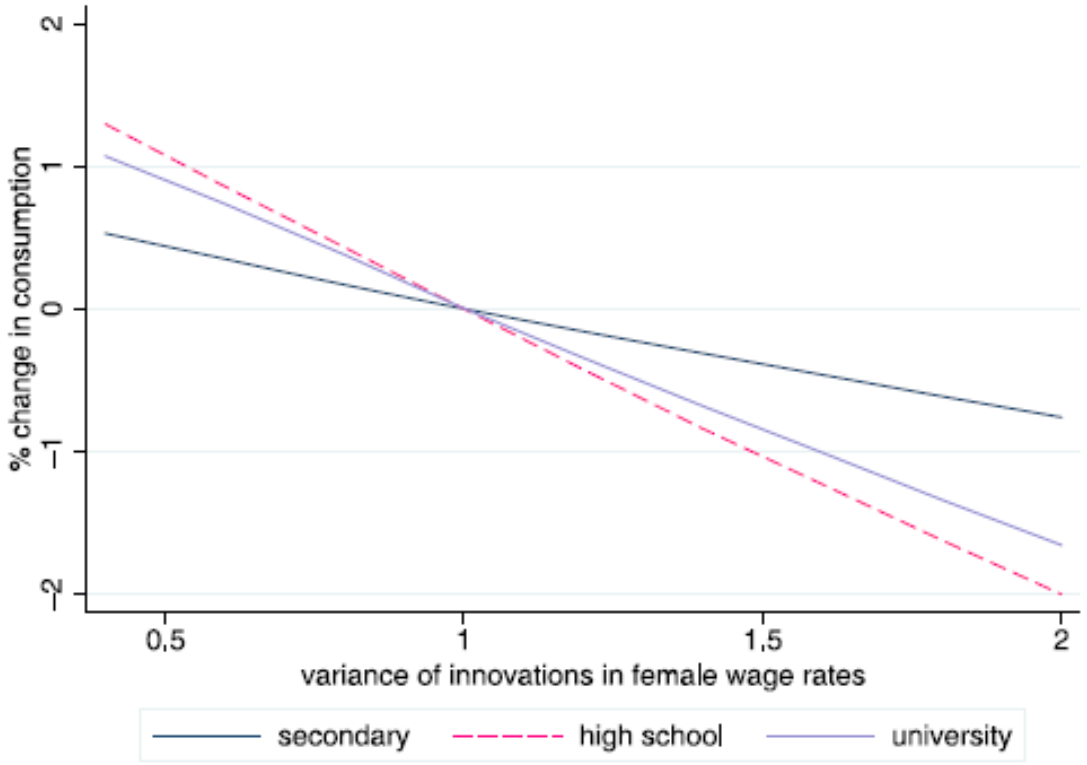

FIGURE 10.—Willingness to pay in consumption terms: value of risk by education. Notes: Based on simulated data under the 2002 tax and benefit system. The vertical axis is the percentage of consumption one is willing to give up to move from the actual variance (marked as 1) to a proportionate change as per the horizontal axis. Consumption compensation calculated at start of working life, after education.

TABLE XVIII

IMPACTS OF AN EXOGENOUS INCREASE IN PUBLIC SPENDING DISTRIBUTED THROUGH ALTERNATIVE ROUTES[a]

	Basic Tax Rate			Tax Credits Award			Income Support Award		
	Effects by Pre-Reform Education Choice								
	Sec	HS	Univ	Sec	HS	Univ	Sec	HS	Univ
(1) Lifetime gross earnings	0.19	0.13	0.10	−0.21	−0.33	−0.56	−1.28	−1.25	−0.88
(2) Lifetime disposable income	0.68	0.77	0.88	0.84	0.36	−0.24	−0.15	−0.48	−0.54
(3) Welfare (post-education)	0.48	0.63	0.45	1.38	0.78	0.77	0.72	0.32	0.30
	Overall Effects on Welfare								
(4) Pre-education		0.80			1.09			0.51	

[a]% changes. Educational classification is based on pre-reform choices. Welfare, measured in % consumption change to which it is equivalent. The values measure the impact of exogenously increasing public spending by 0.5% of total gross earnings and distributing it through a drop in the basic tax rate of 0.95 percentage points, an increase in the tax credits maximum award of £22.2 per week, and an increase in the IS award of £10.0 per week. All comparisons are against the 2002 tax and benefits system.

9. Conclusions