

FEMALE LABOR SUPPLY, HUMAN CAPITAL, AND WELFARE REFORM

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Introduction

The Idea:

- ▶ Welfare benefits can affect:
 - ▶ Returns to education
 - ▶ Accumulation of human capital
 - ▶ savings
- ▶ Due to:
 - ▶ Wealth effect
 - ▶ Insure against shocks
- ▶ Will affect long term labour supply

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Research Questions:

- ▶ Effect of incentives on the labor supply of women
- ▶ How human capital evolve over the life-cycle depending on interaction between education, employment, and working hours
- ▶ Impact of taxes and welfare benefits and their role in redistribution, insurance, and incentives

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Key difference to literature:

- ▶ Allow for savings as they are the main channel for (self) insurance in an economy with incomplete insurance and credit markets

Introduction

Data:

British Household Panel Survey (BHPS) from 1991 to 2008

Model Assumptions

- ▶ At the start of life cycle women choose between three education levels: (secondary, high school, and university)
 - ▶ Consider implied costs vs. expected return and volatility of choice
- ▶ After completion, make period- by-period decision on employments and savings based on wages, preferences and family structure
- ▶ Wages depend on education and experience
 - ▶ Experience accumulate/ depreciate depending on work FT/PT or not at all
- ▶ Individuals are ex ante heterogeneous

Data and Reduced form analysis

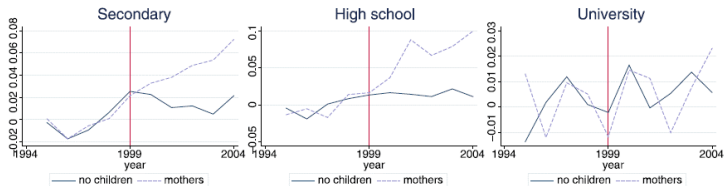


Figure: Effect of the 1999-2002 reform on female labor force participation

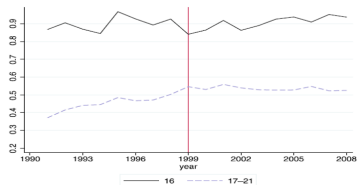


Figure: Trend in educational participation by age group

Model Outline

- ▶ At age 17, a woman chooses between leaving education with a secondary degree , completing high school or university
- ▶ Women enter to the labor market at the age of 19 if completed high school or less and at age of 22 if university graduated
- ▶ Then model consumption and labor supply choices (FT/ PT/ unemployment)
- ▶ Women retire at age 60 and live another 10 years from the accumulated savings
- ▶ Except for university loans, households cannot borrow
- ▶ In every period, a woman may have a child (upto 43 years), get married or divorced
- ▶ Wages depend on actual experience (FT/ PT/ out of work)

Women's decision problem

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

Subject to budget constraint

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

Where

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

Female Human Capital Earnings Dynamics

Female wage process including the distribution of all shock is education specific

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

$$\ln w_t = \ln w_t^m - \xi_t$$

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

$$v_t = \rho_s v_{t-1} + \zeta_t$$

Where

$\ln w_t^m$: Observed hourly wage rate

$\ln w_t$: wage rate on which individual decisions are based

e_t : experience

v_t : individual productivity process (AR(1) process with normally distributed innovations ζ_t)

Educational Choice

The Model:

The Optimal choice on education:

$$s = \operatorname{argmax}_{s \in \{1, 2, 3\}} \{W_s(X_{17}) - B_s(X_{17})\}, \quad \text{S.t.} \quad a_{19} = a_{17} = 0, \quad \text{And} \quad a_{22} = -(1+r)^2 c_{19} - (1+r)c_{20} - c_{21} - D \quad \text{if} \quad s = 3.$$

B_s measures the utility cost of investment

$$B_s(X_{17}) = \pi_{1s} f_1 + \pi_{2s} f_2 + \pi_{3s} y_p + \varpi_s.$$

y_p is the liquidity shock to parental income, (f_1, f_2) are continuous parental background factors

ϖ_s unobserved utility cost of education; normally distributed with variance σ^2

W_s is the discounted expected value of lifetime utility of s

$$W_s(X_{17}) = \begin{cases} E[V_{19}(X_{19}) | X_{17}, s], & \text{if } s = 1, 2, \\ E \left[\max_{c_{19}, c_{20}, c_{21}} \left\{ \sum_{t=19}^{21} \beta^{t-19} u(c_t, F; \theta, Z_{17}) \right. \right. \\ \quad \left. \left. + \beta^{22-19} V_{22}(X_{22}) \right\} \middle| X_{17}, s \right], & \text{if } s = 3, \end{cases}$$

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

Female wage equation and experience accumulation

		Education		
		Secondary (1)	High School (2)	University (3)
(1)	Intercept ($b_{s,0}$)	5.406 (0.030)	5.547 (0.038)	6.949 (0.071)
(2)	Increment: high factor 1 ($b_{s,1}$)	0.005 (0.040)	0.018 (0.038)	0.061 (0.066)
(3)	Increment: high factor 2 ($b_{s,2}$)	0.014 (0.036)	-0.186 (0.031)	0.045 (0.048)
(4)	Mean hourly wage rate at 25	7.19 (0.050)	8.64 (0.067)	10.55 (0.317)
Returns to experience				
(5)	Baseline ($\gamma_{s,0}$)	0.152 (0.006)	0.229 (0.009)	0.306 (0.011)
(6)	Increment: high factor 1 ($\gamma_{s,1}$)	0.054 (0.009)	0.014 (0.009)	-0.002 (0.010)
(7)	Increment: high factor 2 ($\gamma_{s,2}$)	-0.002 (0.008)	0.029 (0.008)	-0.006 (0.008)
(8)	Mean value of the coefficient on experience	0.16 (0.008)	0.25 (0.012)	0.30 (0.014)
Distribution of unobserved productivity				
(9)	Autocorrelation coefficient: ρ_ϵ	0.925 (0.006)	0.916 (0.006)	0.880 (0.008)
(10)	St. deviation of innovation in productivity: $\sqrt{\text{Var}(\zeta_\epsilon)}$	0.125 (0.005)	0.154 (0.005)	0.139 (0.005)
(11)	Mean of initial productivity for type I: $E(v_{0i} \text{type I})$	0.140 (0.011)	0.111 (0.028)	0.306 (0.015)
(12)	St. deviation initial productivity: $\sqrt{\text{Var}(v_{0i})}$	0.145 (0.012)	0.202 (0.015)	0.223 (0.016)
Human capital dynamics				
(13)	While in part-time work: $g_s(P)$	0.150 (0.015)	0.096 (0.022)	0.116 (0.013)
(14)	Depreciation rate: δ_s	0.081 (0.008)	0.057 (0.008)	0.073 (0.009)

Model fit and Implications for behavior: Wages and Employment

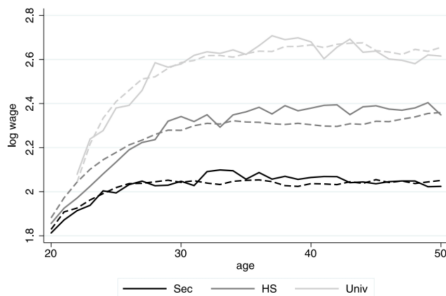


Figure: Mean log wage rates for working women over the life-cycle by education

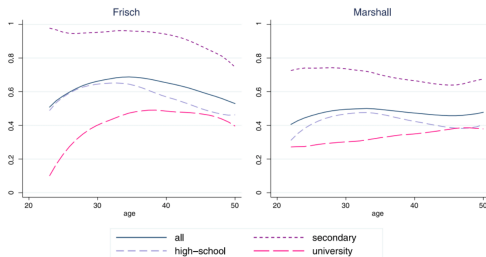
- ▶ Higher the level of education, steeper the wage profile
- ▶ Flattening out in the later periods of life cycle
 - ▶ Increasing prevalence of part time work
 - ▶ Part time workers have very low return to experience
 - ▶ Will only be able to avoid human capital depreciation

Elasticity of labour supply

ELASTICITIES OF LABOR SUPPLY^a

	Frisch			Marshall		
	Extensive		Intensive Elasticity	Extensive		Intensive Elasticity
	Elasticity	Derivative		Elasticity	Derivative	
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

^aCalculations 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.



The Role of Savings

To show how behavioral responses can be distorted by ignoring assets:

- ▶ Re-estimated the model shutting down any borrowings or savings
 - ▶ Force people to live off their current income (including any welfare payments)
- ▶ Loss of fit is significant for the proportions moving in and out of work
 - ▶ Reason:
 - ▶ In the absence of savings, employment becomes the only way to smooth the consumption
 - ▶ Distorts the accumulation of experience
 - ▶ Not fit wage profiles well as before
 - ▶ For university graduates, the simulated profiles over estimate observed wage growth beyond age 40
 - ▶ Marshallian elasticities are higher
 - ▶ Specially for single mothers and single women with no children
Because of missing husband's income, which can provide some diversification and smoothing of shocks

Long run effects of tax and benefits

Effect of tax credits

		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						

Conclusions and Future developments

Conclusion

- ▶ High Frisch and Marshallian elasticities, but below 1 , except for mothers with pre-school children
strong responses from this group to work incentives
- ▶ Tax credits induce many low education mothers into work, but do not affect their wages and employment in the long run, beyond the time they receive subsidies
- ▶ Tax credit discourage educational attainments

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Future Developments

- ▶ The model does not deal with macro economic growth and fluctuations
- ▶ The model only considers the youngest child, relax to include all the dependant children
- ▶ Investment in education need to be decided at the age of 17, re-entry to full time education is not allowed, relax to allow re-entry

Thank you!