Real Wage and Labor Supply in a Quasi Life-cycle Framework: A Macro Compression by Swedish National Transfer Accounts (1985-2003)

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CENTRE FOR ECONOMIC DEMOGRAPHY

Background

- Population ageing
- Challenge: the growing per worker cost of providing a given age-vector of per capita benefits (Lee and Edwards, 2001)
- One of the Solutions: Increase Labor Supply

Some OECD Stats

For Sweden 2000-11

- Continous Decline in Youth LFP
- 65+ remain constantly at 10%

Scientific Background

- Constant Elasticity of Substitution in Overlapping Generation Model
- Little consensus on estimated elasticity
- The equivalence: Estimated and calibrated parameters
- A vector of life-cycle parameter

Research Questions

- How have age-profiles of real wage and labor supply evolved overtime?

- How does the labor supply response to real wage vary over the life-cycle?

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Theory predictions on wage differentials over age

- Efficiency wage hypothesis (Yellen, 1984)
- The shirking model (Calvo, 1979)

-> Wage-productivity discrepancy

- Uneven pay schedule between the young and old workers w.r.t productivity (Skirbekk, 2003).
- Such pay schedual is pareto efficient w/h mandatory retirement (Lazear, 1981)
- More time for senior to bid up wage (Harris and Bengt, 1982)
- Union attach great weight on old workers (Pissarides, 1989)

Theory predictions on Labor supply w.r.t wage

- Static Model
- Individual Labor Supply Curve
- Inter-temporal Substitution Hypothesis

A life-cycle labor supply function

- Max U in the form of

$$\frac{1}{1-1/\gamma}(c_x^{1-1/\rho}+\alpha l_x^{1-1/\rho})^{\frac{1-1/\gamma}{1-1/\rho}}$$

s.t. $a_x r_x + w_x(1-l_x) - c_x$

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A life-cycle labor supply function

- After ..., we get,

$$\ln(N_x) = \ln(N_{x-1}) - (\frac{1-\bar{N}}{\bar{N}})\gamma \ln(1+r_x) + (\frac{1-\bar{N}}{\bar{N}})\gamma \left(\frac{\rho + \alpha^{\rho}\gamma}{\gamma + \alpha^{\rho}\gamma}\right) \ln\left(\frac{w_x}{w_{x-1}}\right)$$

$$\ln(N_x) = \ln(N_{x-1}) - \beta_1 \ln(1+r_x) + \beta_2 \ln\left(\frac{w_x}{w_{x-1}}\right)$$

- Assuming α=1, we get,

$$\frac{\rho}{\gamma} = \frac{2\beta_2}{\beta_1} - 1$$

Hypothesis

Hypothesis 1: If $\frac{\beta_2}{\beta_1} > 1$*, substitution effect dominates within period, and intratemporal elasticity outweighs intertemporal elasticity of labor supply w.r.t wage increase, i.e* $\frac{\rho}{\gamma} > 1$.

Hypothesis 2: If $\frac{1}{2} < \frac{\beta_2}{\beta_1} < 1$*, substitution effect dominates within period, but intratemporal elasticity is outweighed by intertemporal elasticity of labor supply w.r.t wage increase, i.e* $0 < \frac{\rho}{\gamma} < 1$.

Hypothesis 3: If $0 < \frac{\beta_2}{\beta_1} < \frac{1}{2}$*, income effect dominates within period, but intratemporal elasticity is outweighed by intertemporal elasticity of labor supply w.r.t wage increase, i.e* $-1 < \frac{\rho}{\gamma} < 0$.

Hypothesis 4: If $\frac{\beta_2}{\beta_1} < 0$*, income effect dominates within period, and intratemporal elasticity outweighs intertemporal elasticity of labor supply w.r.t wage increase, i.e* $\frac{\rho}{\gamma} < -1$.

Hypothesis 5: If $\frac{\beta_2}{\beta_1} = 1, i.e. \beta_2 = \beta_1$*, intratemporal elasticity equals intertemporal elasticity of labor supply w.r.t wage increase, i.e* $\frac{\rho}{\gamma} = 1$.

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Data

- Labor Income (YL) from National Transfer Accounts Sweden 1985-2003
- LFP and Employment Rate from SCB
- $wage = YL/(LFP \times EMPL)$
- Age groups: 16-19, 20-24, 25-34, 35-44, 45-54, 55-59, and 60-64

Method

- Lee-carter model: Describe the changing age profiles overtime
- Age-specific time series analysis: examine differences in labor supply responses to wage over life-cycle

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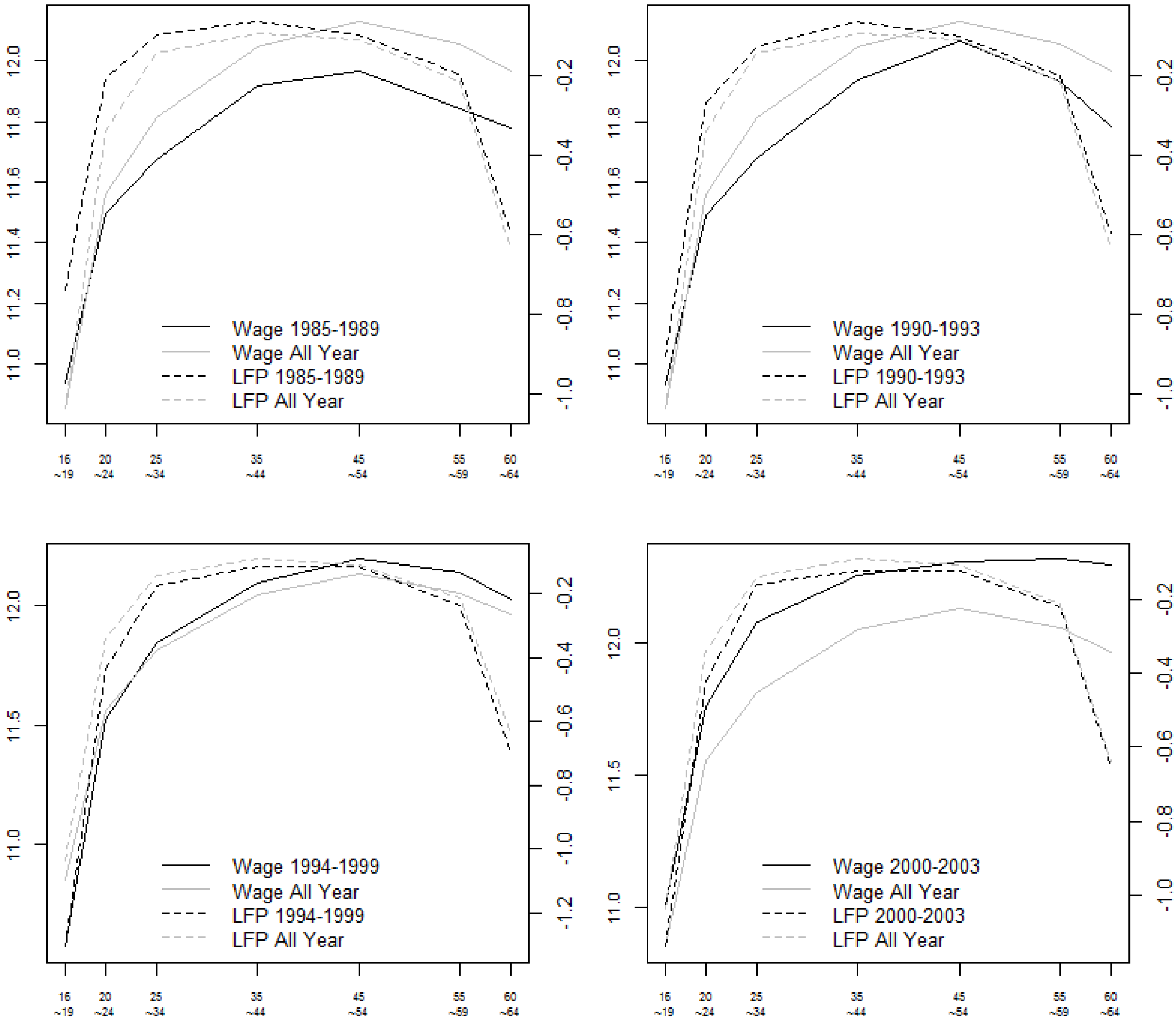
Results: Changing age profiles



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Result: Elasticity of labor supply w.r.t wage

Table 2: Estimation of Equation (14) by 2SLS (with Restriction: $\theta_{x,3} = \theta_{x,4}$)

VARIABLES	All Age	16-19	20-24	25-34	35-44	45-54	55-59	60-64
	$\ln(N_{x,t})$							
$\ln\left(\frac{w_{x,t}}{w_{x,t-1}}\right)$	0.667***	0.283*	0.350*	0.401***	0.310	-0.0313	-0.0541	-0.937*
	(0.171)	(0.154)	(0.183)	(0.0971)	(0.234)	(0.0847)	(0.250)	(0.474)
$\ln(1 + r_t)$	-0.592***	-1.515*	-0.734***	-0.352***	-0.312*	-0.0315	-0.177	0.282
	(0.106)	(0.712)	(0.211)	(0.0756)	(0.149)	(0.0608)	(0.158)	(0.641)
$\ln(N_{x,t-1})$	1.183***	0.955***	1.033***	1.154***	1.162***	0.915***	0.848***	0.496*
	(0.0713)	(0.0648)	(0.0574)	(0.0751)	(0.132)	(0.157)	(0.157)	(0.256)
Constant	-2.785**	0.583	-0.409	-2.127*	-2.253	1.160	1.958	6.288*
	(1.087)	(0.780)	(0.743)	(1.037)	(1.845)	(2.127)	(2.010)	(3.176)
Observations	18	18	18	18	18	18	18	18
R-squared	0.967	0.941	0.965	0.962	0.934	0.777	0.787	0.768
F-test (p-value)	0.0995	0.864	0.752	0.674	0.650	0.0226	0.108	0.300
$\frac{\rho}{\gamma}$	1.254	-0.627	-0.0476	1.277	0.989	-2.986	-1.611	-7.648
	(0.369)	(0.327)	(0.588)	(0.532)	(0.923)	(7.646)	(3.264)	(12.31)

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Result: Elasticity of labor supply w.r.t wage

Table 3: Estimation of Equation (14) by 2SLS (with Restriction: $\theta_{x,2} = \theta_{x,3} = \theta_{x,4}$)

	All Age	16-19	20-24	25-34	35-44	45-54	55-59	60-64
VARIABLES				$\ln(N_{x,t})$				
$\ln\left((1+r_t)\frac{w_{x,t-1}}{w_{x,t}}\right)$	-0.575***	-0.432***	-0.516***	-0.366***	-0.313**	-0.0153	-0.228	1.175**
	(0.102)	(0.125)	(0.137)	(0.0699)	(0.138)	(0.0559)	(0.159)	(0.502)
$\ln(N_{x,t-1})$	1.160***	0.960***	1.047***	1.138***	1.162***	0.842***	0.947***	0.293
	(0.0615)	(0.0676)	(0.0577)	(0.0672)	(0.108)	(0.120)	(0.146)	(0.258)
Constant	-2.434**	0.472	-0.609	-1.901*	-2.264	2.145	0.679	8.775**
	(0.938)	(0.812)	(0.745)	(0.927)	(1.511)	(1.635)	(1.863)	(3.200)
Observations	18	18	18	18	18	18	18	18
R-squared	0.966	0.931	0.960	0.961	0.934	0.768	0.756	0.702
F-test (p-value)	0.511	0.145	0.206	0.595	0.990	0.471	0.174	0.0656

Conclusion

- Youth labor supply: ISH dominates
- Old age labor supply: intra-temporal and income effect dominate
- Reconsidering the pay schedule w.r.t. labor supply, is it optimal?
- Policy implication: reforms of tax, social security as well as union policy should target on adjusting the pay schedule, i.e. increase net income for the young, lower it for the old
- Scientific implication: the array of life-cycle parameters is needed for OLG modeling

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