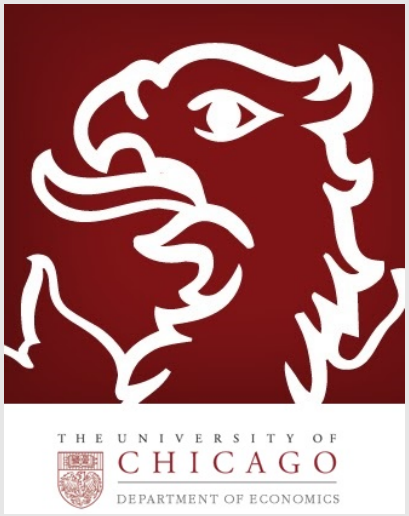

Life-cycle Decisions

Female vs. Male

Econ 350

The University of Chicago, Economics

January 15, 2014

Outline

Objective

1. Objective: compare two models of life-cycle decisions
   - One model for females, one for males
   - "Females Model": Keane and Wolpin (2010)
   - "Males Model": Keane and Wolpin (1997)
2. Learn about modeling decisions
3. Understand the main features of female and male "life-cycle" or career decisions

Outline

Motivation: Females

1. Large differences in economic and demographic characteristics of majority (white) versus minority (black and Hispanic) women
2. NLSY79 in 1990 (Ages 25 to 33):
   - Mean schooling years: white 13.4; black 12.8; Hispanic 12.1
   - Percent Married: white 65%; black 32%; Hispanic 55%.
   - Children: white 1.2; black and Hispanic 1.7
   - Employment: white 74%, black 66%, Hispanic 67%
   - AFDC previous year: white 4%, black 20%, Hispanic, 11%

Motivation: Males

1. Analyze the "life-cycle" or career decisions of a core sample of white men

Outline

Research Question and Approach: Females

- Model labor supply, marriage markets, preference heterogeneity, and the welfare system to answer:
  1. How much of observed minority-majority differences in behavior can be attributed to differences in labor market, marriage opportunities, and preferences?
  2. How do welfare system effects augment the differences minority-majority differences?
  3. How will the new cohorts that grow up under the new welfare system (TANF) behave compared to older cohorts?

Research Question and Approach: Males

- Combine extensions to the basic Roy (1951) model in Heckman and Sedlaeck (1985) and Willis (1986) to assess self-selection in three dimensions - schooling, work, and occupational choice, as well as understand
  1. Human capital investment
  2. School attendance
  3. Work
  4. Occupational choices
  5. Future work decisions
  6. Wage patterns

Outline

Model Basics: Females

- $j = 1, \ldots, J$ defines the types of women
- At each time a each women j decides to:
  1. work (if she gets an offer), h_a^p, h_a^f
  2. attend school, s_a
  3. marry (remain married) (if someones proposes), m_a
  4. become pregnant (if fecund), p_a
  5. government help (if eligible)
- Life span: 14 to 62 (fecund stage: 14 to 45)
- Utility depends on:
  1. Past and current choices
  2. Number of children, N_a
  3. Consumption, C_a
  4. Completed level of Schooling, S_a

Utility and BC: Females

$$
\begin{aligned}
U_a^j &= U_a\left(C_a, S_a, m_a, p_a, g_a, h_a^p, h_a^f; \varepsilon_a, \mathbf{1}(type = j), \Omega_a^a\right) \\
c_a &= y_a^o(1-m_a)(1-z_a) + \left[y_a^o + y_a^m\right] m_a \tau_a^m \\
&+ \left[y_a^o + y_a^z \tau_a^z\right] z_a + \beta_1 g_a - \left[\beta_3 \left(\mathbf{1}(S_a \geq 12)\right)\right] \\
&+ \beta_4 \left(\mathbf{1}(S_a \geq 16)\right)
\end{aligned}
$$

Job Offers and Wages: Females

- Probabilities of receiving full and part-time job offers: π^{wp}, π^{wf}
- Earnings: $y_a^o = 500 w_a^p h_a^p + 1000 w_a^f h_a^f$
- Hourly wage: $\ln w_a^k = r^k + \Psi_a(\cdot) + \varepsilon_a^w$, for $k = p, f$ and where r^k is the rental rate and $\Psi_a(\cdot)$ is human capital stock
- Marriage:
  1. offers of marriage depend on age and welfare status, π_a^m
  2. offers to continue marriage depend on age and marriage current duration
- Husband's human capital (conditional on marriage offer): drawn from a distribution that depends on woman's race/ethnicity, schooling, age, state of residence, type, Psi_a^m
- After marriage, husband's earnings are $\ln y_a^m = \mu^m + \Psi_{0a}^m + \varepsilon_a^m$

Welfare System: Females

- The welfare system is time and state particular

$$b_t^s\left(N_{at}^{18}, y_{at}^o, y_{at}^z\right) = \begin{cases} b_{0t}^s + b_{1t}^s N_{at}^{18} - b_{3t}^s \beta_2 y_{at}^z z_{at}, & y_{at}^o < y_{at}^{s1}(\cdot) \\ b_{2t}^s + b_{4t}^s N_{at}^{18} - b_{3t}^s & \\ \times \left[y_{at}^o - y_{at}^{s1} + \beta_2 y_{at}^z z_{at}\right], & y_{at}^{s1}(\cdot) < y_{at}^o < y_{at}^{s2}(\cdot) \\ 0, & \text{otherwise} \end{cases}$$

- The parameters that define the welfare system evolve according to a VAR

$$\mathbf{b}_t^s = \lambda^s + \Lambda^s \mathbf{b}_{t-1}^s + \mathbf{u}_t^s \tag{1}$$

- (1) is estimated outside the model with simulated data

Dynamic Problem: Females

$$V_a(\Omega_a) = \begin{cases} \max_{l \in \mathcal{L}} U_a^j + \delta \mathbb{E}\left(V_{a+1}(\Omega_{a+1} | l \in \mathcal{L}, \Omega_a)\right), & a < A \\ U_A^j, & a = A \end{cases}$$

- The value of option $l \in \mathcal{L}$ depends on the current state space: Ω_A, which includes residence, the WS rule parameters, preference shocks, husband's earnings shocks, parental income shocks, labor market, marriage, and parental co-residence opportunities
- Solution: set of "Emax's" for all $l \in \mathcal{L}$ and all elements in Ω_a

Model Basics: Males

- $k = 1, \ldots, J$ defines the types of men (by human capital at age 16)
- At each age a individuals choose among five mutually exclusive, exhaustive alternatives ($m = 1, \ldots, 5$):
  1. Blue collar job
  2. White collar job
  3. Military job
  4. Go to school
  5. Engage in household production
- Per period reward:

$$R(a) = \sum_{m=1}^{5} R_m(a) d_m(a)$$

where $R_m(a)$ is the per period reward in the m_{th} alternative and $d_m(a)$ indicates the choice of the m_{th} alternative

Utility: Males

- For $m = 1, 2, 3$:

$$\begin{aligned} R_m(a) &= w_m(a) \\ &= r_m \exp[e_m(16) + e_{m1} g(a) + e_{m2} x_m(a) \\ &- e_{m3} x_m^2 + \epsilon_m(a)] \end{aligned}$$

- For $m = 4, 5$:

$$\begin{aligned} R_4(a) &= e_4(16) - tc_1 \mathbf{1}[g(a) \geq 12] - tc_2 \mathbf{1}[g(a) \geq 16] + \epsilon_4(a) \\ R_3(a) &= e_5(16) + \epsilon_4(a) \end{aligned}$$

- Rental rate of human capital, r_m; completed schooling years, $g(a)$; work experience, $x_m(a)$; skill endowment, $e_m(16)$; college/grad school costs, tc_1, tc_2; skill technology shock, $\epsilon_m(a)$

Dynamic Problem: Males

$$V(\mathbf{S}_a) = \begin{cases} R_m(\mathbf{S}_a) + \delta \mathbb{E}\left[V((S(a+1))|d_m(a), \mathbf{S}(a)\right], & a < A \\ R_m(\mathbf{S}_a), & a = A \end{cases}$$

- The value of option m depends on the current state space, $\mathbf{S}_a$; endowment at age 16 (occupation and type particular), $\mathbf{e}(16)$; completed schooling years, g_a; experience in each (labor) occupation, $\mathbf{x}(a)$; skill technology shocks (occupation particular), $\epsilon(a)$
- Solution: set of "Emax's" for $m = 1, \ldots, 5$ and all elements in $\mathbf{S}_a$

Model Extension: Males

- Extensions to fit the data adequately:
  1. Skill technology functions:
     - Occupation particular skill depreciation
     - First year experience effect
     - Age effects
     - High School and College graduation effects
  2. Mobility and search costs:
     - Direct monetary job-finding cost (when unemployed in previous period)
     - Additional monetary job-finding cots (no occupational specific experience)
  3. Non-pecuniary rewards for civilian workers (additive parameter)
  4. Consumption value of school attendance (function of age)
  5. Reentry costs to high school and post-secondary school
  6. Remaining-at-home payoff as a function of age
  7. Psychic reward of earning high school/college diploma; psychic cost of leaving the military early

Outline

Data: Females

- NLSY79: represents the cohort of young individuals (ages 14 to 21) in 1979: $12,686$ total observations
- $6,000$ women (nationally representative sample plus over-sample of poor white, blacks, and Hispanics)
- Data on all decisions available in very high frequency
- Period decision: trade-off between information precision and computational burden
  - 6 months from 14 to 45
  - 1 year from 45 to 62
- Restrict sample to U.S. states with largest sample representations: CA, MI, NY, NC, OH

Choice Distribution by Age: Females

Table 1 KW(2010) goes here.

Estimated Monthly Benefits: Females

Table 2 KW(2010) goes here.

Data: Males

- NLSY79: represents the cohort of young individuals (ages 14 to 21) in 1979: $12,686$ total observations
- Focus on core white males who reach 16 years between 1977-1981
- Period decision: one schooling year
  - Age span, 16 to 26 years old (follow up to 1988)

Choice Distribution by Age: Males

Table 1 KW(1997) goes here.

Choice-State Combinations, Males

Table 3 KW(1997) goes here.

Average Real Wages: Males

Table 4 KW(1997) goes here.

Outline

Estimation Approach: Females

- Usual estimation approach of DCDP models: simulated conditional likelihood
- Issues in this context:
  - Requires conditional probability agent makes observed choice at t given Ω_a at t
  - Lack of complete histories of employment, schooling, and welfare for most cohorts back to age 14
  - Unobserved initial conditions and unobserved state variables pose DCCP estimation problems (Heckman, 1981)
  - Need to integrate over distribution of unobserved elements: intractably complex
  - Estimate based on unconditional simulation of the likelihood function based on the (realistic) assumption that all outcome variables have measurement error (Keane and Wolpin, 2001)

Estimation Approach: Males

- Simulated conditional likelihood
- "Easy" to write and calculate the likelihood function:

$$\Pr\left(c(16),\ldots,c(\bar{a})|g_n(16)\right) = \sum_{k=1}^{K}\prod_{a=16}^{\bar{a}}\pi_{k|g(16)}L_{nk}$$

with

$$L_{nk} = \Pr\left(c_n(a)|g_n(16), \text{type=k}\right)$$

where $k = 1,\ldots,K$ and $n = 1,\ldots,N$ index types and individuals, respectively. $\pi_{k|g_n(16)}$ are type proportions, and $c_n(a)$ is a choice-reward combination

Model Fit and External Validation: Females

- Keane and Wolpin (2007) studies this extensively:
  - Within sample fit: captures features of the data well (choice frequencies and welfare use for each group in each state over the life cycle)
  - External Validation: outperforms MNL with less parameters (202 vs 240) in external validation exercises:
    - Forecast behavior of women in TX
    - What happens if estimation states adopt TX's welfare system?

Model Fit and External Validation: Males

- Within-sample: Figures 1-5 evidence satisfactory within-sample fit, which is confirmed through tests (Table 5)
- External validation: model frequency predictions coincide with CPS choice frequencies (Table 10)

Model Fit and External Validation (contd 1), Males

Figures 1-5 KW(1997) goes here.

Model Fit and External Validation (contd 2): Males

Table 10 KW(1997) goes here.

Outline

Behavior by Type: Females

Table 3 KW(2010) goes here

Variance Explained by Initial Conditions: Females

Table 4 KW(2010) goes here

Behavior by Type: Males

Table 11 KW(1997) goes here

Type Proportions by Initial Conditions: Males

Table 9 KW(1997) goes here

Family Background: Males

Table 13 KW(1997) goes here

Outline

Counter-factual Exercises: Females

1. Equate wage offers, welfare stigma, and parent schooling of blacks and Hispanics to that of whites
2. Welfare experiments for "type 6" black, Hispanic, and white women
3. Increase the wage rate for "type 6" black, Hispanic, and white women
4. Introduction of EITC:
   - Unexpected in 2004 for "type 6" women
   - Fully adjusted (in Ω_{14}) in 2004 for "type 6"

Equating Opportunities for Blacks: Females

Table 5A KW(2010) goes here.

Equating Opportunities for Hispanics: Females

Table 5B KW(2010) goes here.

Welfare Experiments and Wage Increase for Blacks (contd): Females

Table 6A KW(2010) goes here.

Welfare Experiments and Wage Increase for Blacks (contd): Females

Table 6A (contd) KW(2010) goes here.

Welfare Experiments and Wage Increase for Hispanics (contd): Females

Table 6B KW(2010) goes here.

Table 6B (contd) KW(2010) goes here.

Welfare Experiments and Wage Increase for Whites (contd): Females

Table 6C KW(2010) goes here.

Welfare Experiments and Wage Increase for Whites (contd): Females

Table 6C (contd) KW(2010) goes here.

Introduction of EITC: Females

Table 7 (contd) KW(2010) goes here.

Counter-factual Exercises: Males

1. The impact of college tuition subsidies on school attainment and inequality

Effects of a College Subsidy: Males

Table 14 KW(1997) goes here.

Effects of a College Subsidy (contd): Males

Table 15 KW(1997) goes here.