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 model 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) compared to 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

   - Marriage percentages: 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

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

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

Outline

Model: Females, Basics

- $j = 1, \ldots, J$ 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 to schoo, s_a
  3. be married (if someones proposes), m_a
  4. become pregnant (if at fecund age), 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

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

Model: Females, Job Offers and Wages

- Probabilities of receiving full and part time job offers: π^{wp}, π^{wf}
- Earnings: $y_a^o = 500w_a^p h_a^p + 1000w_a^f h_a^f$
- Hourly wage: $\ln w_a^k = r^k + \Psi_a(\cdot) + \varepsilon_a^w$, for $k = p, f$ and where r^k is rental rate and $\Psi_a(\cdot)$ is human capital stock
- Marriage:
  1. offers to marry married depend on age and welfare status, π_a^m
  2. offers to continue married 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 $\ln y_a^m = \mu^m + \Psi_{0a}^m + \varepsilon_a^m$

Model: Females, Welfare System

▶ 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

Model: Females, Dynamic Problem

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

▶ 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, own 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: Males, Basics

- $k = 1, \ldots, J$ 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

Model: Males, Utility

- 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 $m = 4, 5$:

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

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

Model: Males, Dynamic Problem

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

▶ 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: Males, Model Extension

- 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 last period)
     - Additional monetary job-finding cots when 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 (ages 14 to 21) individuals 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

Table 1 KW(2010) goes here.

Table 2 KW(2010) goes here.

Data, Males

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

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 choiced at t given Ω_a at t
    - ▶ Lack of complete histories of employment, schooling, 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) extensively studies this:
  - ▶ Within sample fit: captures well features of the data (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 validations 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)

Figures 1-5 KW(1997) goes here.

Table 10 KW(1997) goes here.

Outline

1. Two Models of Life-cycle Choices

2. Motivation of the Papers

3. Research Question and Approach

4. Models

5. Data

6. Estimation

7. Results

8. Counter-factual Exercises

Behavior by Type, Females

Table 3 KW(2010) goes here

Variance explained by Initial Conditions, Females

Table 4 KW(2010) goes here

Table 11 KW(1997) goes here

Table 9 KW(1997) goes here

Table 13 KW(1997) goes here

Outline

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"

Table 5A KW(2010) goes here.

Table 5B KW(2010) goes here.

Table 6A KW(2010) goes here.

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

Table 6B KW(2010) goes here.

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

Table 6C KW(2010) goes here.

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

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

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

Table 14 KW(1997) goes here.

Effects of a College Subsidy (contd), Males

Table 15 KW(1997) goes here.