The Marriage Market, Labor Supply and Education Choice

Presentation for the Family Inequality Network Workshop

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Motivation

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  - Education subsidies affect education take up, labor but also marital decisions
  - EITC has labor supply effects, and may affect ex-ante education decisions and marital decisions
- We setup a framework for addressing these policy issues by linking education, marital and labor supply decisions
- We will take this framework to the data to quantify the effects and test the model
Research questions

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- What is the role of human capital for marriage and how is it affected by incentives in the labour market?
- What are the marital returns to education and how relevant are they for education choices?
- How do welfare policies affect intrahousehold allocations, the marriage market and education choices?
- Can welfare policies be targeted to influence child outcomes and tackle inequality?
Model overview

- Three stages in life
  - Education choice
  - Marriage decisions under uncertainty
  - Labour supply and intra-household allocation of consumption to parents and children (public good)
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  - Labour supply and intra-household allocation of consumption to parents and children (public good)
- Value of marriage: risk sharing and public consumption
- Education has returns in the labour and marriage markets
Related literature

▶ Endogenous intrahousehold allocations: Iyigun and Walsh, 2007
▶ Evidence on the impact of targeted interventions on intrahousehold allocations: Duflo, 2003, Attanasio and Lechene, 2010
Main components of the model

- Three period model

  Pre-marital education investments determined by their expected returns in the labour and marriage markets

  Frictionless marriage market with assortative matching by human capital under uncertainty about earnings

  Full commitment

  Assignments are stable: no man or woman would prefer to be in a different match

  Collective model of household decision

  The sharing rule is determined by the marriage market equilibrium

  We rule-out divorce at this stage
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The model
Third period: preferences in couples

- We adopt a quasi-linear specification with risk aversion that implies transferable utility

\[ U^C_j = \frac{1}{\eta+1} \left[ c_j (k+1) + \alpha C_j (k+1)(L_j)^{\gamma C_j} \right]^{\eta+1} \quad Married \]

\[ U^S_j = \frac{1}{\eta+1} \left[ c_j + \alpha S_j (L_j)^{\gamma S_j} \right]^{\eta+1} \quad j = m, f \quad Single \]

- \( k \) is the public good, \( c \) is private consumption, \( L \) is leisure
- Wealth effects on public consumption but not on leisure
- Private and public consumption are complements: dominates some degree of complementarity between leisure and public consumption as \( L \) capped
The model
Third period: earnings

- Wages are revealed at this point, not earlier

\[
\ln w_m = \ln W_m + \ln H_m(s_m, \theta_m) + \ln(e_m)
\]

\[
\ln w_f = \ln W_f + \ln H_f(s_f, \theta_f) + \ln(e_f)
\]

- Human capital \( H_j \) is predetermined, the random shocks \( e_j \) finally reveal labour market productivity

- Individuals would want to match on wages but they actually match on human capital \( H_j \)
The model
Third period: household problem

- Transferable utility implies that at this stage the Pareto frontier is linear in individual utilities, for all prices and incomes.
- Thus determining labour supply and total household consumption is given by the solution to the sum of utilities

\[
\max_{c,k,L_m,L_f} \quad c(k+1) + \alpha c_m (k+1) (L_m)^{\gamma c_m} + \alpha c_f (k+1) (L_f)^{\gamma c_f}
\]

\[
s.t. \quad c + P_k k + w_m L_m + w_f L_f = (w_m + w_f) T + y^C
\]

where \( P_k \) is the price of the public good and \( y^C \) represents transfers or unearned income.

- Total consumption is \( c = c_m + c_f \)
- Individual consumptions are determined as a function of labour income and the pre-agreed transfer (full commitment).
The model
Third period: decisions

- Solve explicitly for leisure

\[ L_j = \left( \frac{w_j}{\alpha C_j \gamma C_j} \right)^{1/(\gamma C_j - 1)} \]

- And for public consumption

\[ k = \frac{y^C + (w_m + w_f) T + \alpha_{Cm} (1 - \gamma Cm) (L_m)^{\gamma Cm} + \alpha_{Cf} (1 - \gamma Cf) (L_f)^{\gamma Cf} - P_k}{2P_k} \]

- Unearned income increases public consumption
- And so do earnings, at least if high enough
- This leads to assortative matching
The model
Third period: decisions

▶ In marriage, he gets $\rho(w_m, w_f)$ and she gets $y^C - \rho(w_m, w_f) - P_k k$

▶ Realised individual consumptions are

\[ c_m = w_m(T - L_m) + \rho(w_m, w_f) \]
\[ c_f = w_f(T - L_f) - \rho(w_m, w_f) - P_k k + y^C \]

▶ Contingent transfers under full commitment
The model
Third period: indirect utility

- Indirect utilities are given by
  \[ V_m^C = \frac{1}{\eta+1}(\rho (k+1) + \Theta_m)^{\eta+1} \]
  \[ V_f^C = \frac{1}{\eta+1}(y^C - \rho (k+1) + \Theta_f)^{\eta+1} \]

- where \( \Theta_j \) is a function of wages for \( j = m, f \)
The model
Second Period - Sharing rule

- Equilibrium in the marriage market determines the Pareto weight, $\mu$
- Then the sharing rule is the solution to Pareto maximisation problem
  \[
  \max_{\rho} \int \frac{1}{\eta + 1} (\rho (k + 1) + \Theta_m)^{\eta+1} + \mu (y^C - \rho (k + 1) + \Theta_f)^{\eta+1}) f(e) de
  \]
- The solution gives the contingent transfer
  \[
  \rho (w_m, w_f) = \frac{\mu \frac{1}{\eta} (y^C + \Theta_f) - \Theta_m}{\left(1 + \mu \frac{1}{\eta}\right) (k + 1)}
  \]
  where $\mu$ is a function of $(H_m, H_f)$
The model
Second period - matching and the surplus

- The surplus $S$ of marriage can be defined as the sum expected indirect utilities
- Using the surplus we can establish conditions for positive assortative matching, i.e. $\frac{\partial^2 S}{\partial H_f \partial H_m} > 0$
- Positive assortative matching holds for our specification of preferences
The model
Second Period - Remaining Single

- A proportion of individuals remain single
- This is endogenous and depends on human capital, marriage market conditions and preferences for marriage

\[ d_j = 1 \left( EV_j^C > EV_j^S + \varepsilon_j \right) \]

where \( (EV_j^C, EV_j^S) \) are the expected indirect utilities of marrying and remaining single
The model
First Period - Education choice

- Given the expected value of marrying and remaining single, we can define the lifetime expected utility as a function of human capital
- Human capital is a function of innate ability and education, $H_j(\theta_j, s_j)$
- Education is endogenously chosen to maximise

$$EV_j(H_j(s, \theta)) = P \times EV_j^C(H_j(s, \theta)) + (1 - P) \times EV_j^S(H_j(s, \theta)) - C_s(s)$$

and $P$ is the probability of selecting into marriage
The model
Equilibrium in the marriage market

- Under positive assortative matching, the assignment of men and women can be expressed as an increasing function $H_m = \phi(H_f)$.
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- The sharing rule determines the education decision, and thus the distribution of human capital
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- In turn this determines who marries who, $\phi(H_f)$
- Equilibrium is characterised by the sharing rule that ensures that the two sides of the market have the same size
The model

Solution

- Computationally, this problem amounts to solve a fixed point problem to determine the sharing rule
- However, the problem is not a contraction mapping
- We have computed the solution in a discrete grid in human capital and approximate it parametrically outside the grid
- For the specifications we have worked with, convergence is achieved quickly
Simulations

- Preliminary simulations to demonstrate some properties of the model and illustrate some policy impacts

- We consider two alternative policy frameworks
  - In the first, there is no unearned income
  - In the second, married couples receive a subsidy equivalent to 40% of the earnings of women in the 1st decile of the earnings distribution (2 monetary units)

- Take given distribution of human capital: not yet solving for the education decision
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Simulations
Specifications

▶ Wages (estimated from the BHPS)

\[ \ln w_m = 2.33 + \ln h_m \times \ln e_m \quad Males \]

\[ \ln w_m = 2.07 + \ln h_m \times \ln e_m \quad Females \]

where

\[ \ln h_m \sim N(0,0.20) \quad \ln e_m \sim N(0,0.30) \quad Males \]

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- Mean shock to marriage drawn from extreme value distribution

- Other utility parameters
  - Curvature on leisure: 0.5 to everyone
  - Coefficient on leisure: 2.5 for married women, 1.5 to others
  - Risk aversion coefficient: -1.3
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Simulations

Men and women in the marriage market
Simulations

Pareto weights

![Graph showing Pareto weights for HC with and without unearned income.](image-url)
Simulations

Leisure demand

![Graph showing the distribution of leisure time for different productivity couples for men and women. The x-axis represents the percentile HC distribution and the y-axis represents the % time. The graph shows three lines for each gender, representing low, medium, and high productivity couples.](image-url)
Simulations

Public consumption

No unearned income

Unearned income

- low productivity couple
- medium productivity couple
- high productivity couple
Simulations

Gradient of expected value of human capital

![Graph showing simulations for men and women with and without unearned income.](image-url)
Moving forward

- Allow for education decisions
- Take the model to the data by defining the empirical framework more clearly
- Extend model to understand the impact of targeted interventions
- And to allow for divorce (distant future)