Money and Marriage: Implications of Wage Inequality on Marriage Outcomes

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The Decline of Marriage Rates

**Stylized facts**: from 1970 to 2000 in MSAs
Single white women rose from 15% to 32%,
men from 22% to 44%.

**Explanations**:
  - Sorting and Inequality, Fernandez, Guner, and Knowles (2005), Fernandez and Rogerson (2001)
  - Gould (2003): causal link between wage inequality & marriage rates. 30%

**Questions**:
- what does empirical estimation tell of structural changes of US marriage market?
- how much of the decline is due to rising wage inequality?
Main Results

• **Wage inequality** contributes to marriage delay

• Estimates of the matching function reveal **structural change** of U.S. marriage market:
  – Increased matching efficiency
  – Decreased elasticity of matching

• Impact of wage inequality on marriage market
  – more than 38% in our model, which was underestimated (30%) in Gould (2003)
Outline

Two-Sided Matching Model

Model Prediction: Impact of Inequality

Empirical estimation

Results and Implications
Two-sided matching Model
Structural Model of Marriage

• Two types of agents: men and women, characterized by wage earnings.
• Utility function: non-transferable and guarantees positive assortative mating
• Marriage market is characterized by arrival rates and exogenous divorce rates
• Two-sided matching: mutual agreement is required to form marriage
Optimal Policy: Reservation Value

Men:
\[ R_m(w) = 2 + \frac{\beta \lambda_m}{1 - \beta (1 - \delta)} \int_{R_m}^{\bar{w}'} (w' - R_m) f_w(w') \Delta_{w,w'} dw' \]

Women:
\[ R_w(w') = 2 + \frac{\beta \lambda_w}{1 - \beta (1 - \delta)} \int_{R_w}^{\bar{w}_w} (w - R_w) f_m(w) \Delta_{w,w'} dw \]

\( R_i \) : reservation function
\( \beta \) : time discount factor
\( \lambda \) : offer arrival rates
\( f \) : pdf of distribution function
\( \Delta \) : decision rule of other side: whether propose or not
Two-sided matching Model

Model Prediction: Impact of Inequality
Simulation: the Effect of Arrival Rates (I)

- Single ratio increases if arrival rates rise
- Larger effect if arrival rates of both genders differ
Simulation: Impact of Arrival Rates (II)

- Small male arrival rate raises the outside option — rising female single ratio

- Large male arrival rate initially raises the chance to meet — falling female single ratio
How does wage inequality affect marriage formation? Reservation function

Class 1
- men and women marry
- strong utility function - assumption

Class 2
- men and women marry
- only in the same class
- why?

Class 3
- men and women marry
- only in the same class
- why?
- assumption
How does wage inequality affect marriage formation? Classification of Marriage Market

Increasing inequality
- generates more classes with smaller size
- spreads out population distributed in each class
- causes mismatch with disproportional men and women in each class
Model Prediction: What Affects Marriage Outcomes?

- Wage Inequality
- Arrival Rates

Marriage Rates
Model Prediction: Impact of Inequality

Two-sided matching Model

Model Prediction: Impact of Inequality

Empirical estimation
Estimation: marriage market structure

- Data: IPUMS of year 1970 (form 2 metro sample) and 1980, 1990, 2000 1% sample data

- Vector of parameters
  \[ \theta = \{ \psi_t, \sigma_{\psi,t}, \eta_t \}_{t=1970,1980,1990,2000} \]
  - Matching efficiency \( \psi_{i,t} \in N(\psi_t, \sigma_{\psi,t}) \)
  - Elasticity of matching \( \eta_t \)

- Arrival rates are from the matching function
  \[
  \lambda_{m}^{i,t} = \frac{\psi_{i,t}(n_{m}^{i,t})\eta_t(n_{w}^{i,t})(1-\eta_t)}{n_{m}^{i,t}},
  \]
  \[
  \lambda_{w}^{i,t} = \frac{\psi_{i,t}(n_{m}^{i,t})\eta_t(n_{w}^{i,t})(1-\eta_t)}{n_{w}^{i,t}}.
  \]
Estimation Strategy

We aim to find $\theta$ that minimizes $d(\theta)$ the distance between sample moments and simulated moments.
1. what does empirical estimation tell of US marriage market?

<table>
<thead>
<tr>
<th>Moment</th>
<th>Year 1970</th>
<th>Year 1980</th>
<th>Year 1990</th>
<th>Year 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of Matching Efficiency</td>
<td>.11</td>
<td>.21</td>
<td>.50</td>
<td>.61</td>
</tr>
<tr>
<td>Std. err.</td>
<td>.09</td>
<td>.10</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td>Elasticity of Matching</td>
<td>.43</td>
<td>.42</td>
<td>.35</td>
<td>.30</td>
</tr>
</tbody>
</table>

During 1970-2000, there are structural changes in the U.S. marriage market
2. How much of the decline of marriage rate is explained by inequality?

<table>
<thead>
<tr>
<th></th>
<th>Standard Regression</th>
<th>$+\lambda$</th>
<th>$+\lambda^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient of Wage Inequality (Probit Regression of Female Being Single)</td>
<td>.011</td>
<td>.019</td>
<td>.025</td>
</tr>
<tr>
<td>Average % of decline explained</td>
<td>21.0%</td>
<td>37.9%</td>
<td>48.9%</td>
</tr>
</tbody>
</table>

- Effects of arrival rates & wage inequality offset each other!
- Controlling for changes of marriage market, over 38% of the decline of marriage rate is explained by inequality, compared to 30% without.
Summary

• This work provide a theory of
  – How inequality affects marriage outcomes
• Empirical estimates show
  – Structural change of marriage market
  – this change offsets the impact of inequality
  – Without controlling for this change, the impact of inequality is under-estimated
Research Plan

This paper

Labor Outcomes

Marital Choices

Work in progress
Household Behavior
Q: Impact of spousal labor supply on household unemployment durations

Why is it important?

• Parity between individual search model and household level data
  – Need household job search
• Implication of unemployment insurance (UI)
  – UI “crowds-out” family self-insurance, Cullen & Gruber(03)
  – Else?

• Result 1:
  asymmetric couples’ unemployment durations
  – The more husbands earn, the longer wives search for jobs;
  – the more wives earn, the sooner husbands find jobs
Q: Impact of spousal labor supply on household unemployment durations

• Result 2: Intrahousehold bargaining (the sharing rule)
  – unemployed husbands consume only 85% of that of employment husbands,
  – suggests that employment is crucial in husbands’ bargaining within households

• Implication on Unemployment Insurance (in progress)

Future studies:
  – household taxation, marriage formation and dissolution

Thank You!
Test of constant return to scale

\[ \log \lambda_{m}^{i,t} = b_0 + b_1 e^{i,t} + b_2 \log n_{m}^{i,t} + b_3 \log \frac{n_{w}^{i,t}}{n_{m}^{i,t}}, \]

\[ = b_0 + b_1 e^{i,t} + (\alpha_t + \beta_t - 1) \log n_{m}^{i,t} + \beta_t \log \frac{n_{w}^{i,t}}{n_{m}^{i,t}} \]

\[ H_0 : \alpha + \beta = 1, \text{ or } \alpha + \beta - 1 = 0 \]

\[ H_1 : \alpha + \beta \neq 1, \]

\[ H_0 \text{ is not to be rejected since } \]

\[ \frac{\hat{b}_2 - 0}{\sigma_{\hat{b}_2}} = \frac{-0.080 - 0}{0.044} = -1.81 > -1.96, \]
### Appendix 1-1: Data

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex Ratio</td>
<td>Males age 21-35/total 21-35</td>
<td>.46</td>
<td>.49</td>
<td>.49</td>
<td>.50</td>
</tr>
<tr>
<td>Age</td>
<td>Average female age</td>
<td>27.5</td>
<td>27.9</td>
<td>28.8</td>
<td>29.0</td>
</tr>
<tr>
<td>log N</td>
<td>Mean Log Population in MSA</td>
<td>13.12</td>
<td>12.84</td>
<td>12.84</td>
<td>13.18</td>
</tr>
<tr>
<td>Marital Status of Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never Married/Single</td>
<td>% of females never married</td>
<td>.15</td>
<td>.21</td>
<td>.26</td>
<td>.32</td>
</tr>
<tr>
<td>Current Married</td>
<td>% of females currently married</td>
<td>.78</td>
<td>.67</td>
<td>.63</td>
<td>.57</td>
</tr>
<tr>
<td>Education Level(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higrad</td>
<td>High School Graduate</td>
<td>.483</td>
<td>.446</td>
<td>.354</td>
<td>.268</td>
</tr>
<tr>
<td>Somecoll</td>
<td>Some College</td>
<td>.156</td>
<td>.207</td>
<td>.310</td>
<td>.300</td>
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<tr>
<td>College</td>
<td>College Graduate</td>
<td>.127</td>
<td>.194</td>
<td>.242</td>
<td>.337</td>
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<tr>
<td>Employment Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male EmpStat</td>
<td>Males currently employed/tot</td>
<td>.929</td>
<td>.903</td>
<td>.905</td>
<td>.869</td>
</tr>
<tr>
<td>Female EmpStat</td>
<td>Females currently employed/tot</td>
<td>.463</td>
<td>.626</td>
<td>.732</td>
<td>.719</td>
</tr>
<tr>
<td>Wage ($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male µ</td>
<td>Mean Male Hourly Wage</td>
<td>15.36</td>
<td>14.30</td>
<td>14.76</td>
<td>16.70</td>
</tr>
<tr>
<td>Female µ</td>
<td>Mean Female Hourly Wage</td>
<td>9.50</td>
<td>9.25</td>
<td>10.79</td>
<td>13.06</td>
</tr>
<tr>
<td>Male σ</td>
<td>std Male Hourly Wage</td>
<td>8.98</td>
<td>12.25</td>
<td>18.66</td>
<td>26.86</td>
</tr>
<tr>
<td>Female σ</td>
<td>std Female Hourly Wage</td>
<td>6.17</td>
<td>7.69</td>
<td>10.11</td>
<td>18.78</td>
</tr>
</tbody>
</table>
Appendix 1-4: Probit Regression of Female being single

<table>
<thead>
<tr>
<th>Labor Market Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard deviation of log male hourly wage in MSA</td>
<td>.0107*</td>
<td>(.0051)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard deviation of log female hourly wage in MSA</td>
<td>- .0116*</td>
<td>(.0059)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean male hourly wage in MSA</td>
<td>-.0159**</td>
<td>(.0058)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean female hourly wage in MSA</td>
<td>.0279**</td>
<td>(.0072)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovered Marriage Market Structure</td>
<td>MSA matching efficiency $\psi_{i,t}$</td>
<td>.0917</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Arrival Rate for Women $\lambda_w$ | .0977** | (.0145) | | |

Arrival Rate Squared for Men $\lambda_m^2$ | .2655** | (.0923) | | |

Arrival Rate Squared for Women $\lambda_w^2$ | -.0999** | (.0566) | | |