Social Norms and Fertility

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Fertility Changes over the Past 50 Years

- China
- Canada
- Japan
- UK
- South Korea
- US
- Hong Kong
- Uruguay
- Taiwan
- Argentina
- Macao
- Cameroon
- Singapore
- Tanzania
Three Stylized Facts

**Fact 1:** Whereas the marriage rates of East Asian Societies are among the highest in the world, their total fertility rates are among the lowest.

**Fact 2:** Whereas their total fertility rates are among the lowest, almost all married women have at least one child.

**Fact 3:** By contrast, almost no single women have any children in East Asian societies.
### Marriage and Fertility Rates across Countries/Regions

<table>
<thead>
<tr>
<th>Countries/regions</th>
<th>TFR</th>
<th>Rank</th>
<th>Marriage Rate</th>
<th>Childlessness Rate</th>
<th>GDP per capita (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(#224)</td>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Married</td>
</tr>
<tr>
<td>East Asian</td>
<td></td>
<td></td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>China</td>
<td>1.60</td>
<td>182</td>
<td>0.900</td>
<td>0.922</td>
<td>0.007</td>
</tr>
<tr>
<td>Japan</td>
<td>1.41</td>
<td>209</td>
<td>0.840</td>
<td>0.853</td>
<td>0.034</td>
</tr>
<tr>
<td>South Korea</td>
<td>1.26</td>
<td>220</td>
<td>0.920</td>
<td>0.861</td>
<td>0.016</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1.19</td>
<td>221</td>
<td>0.908</td>
<td>0.898</td>
<td>0.026</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1.13</td>
<td>222</td>
<td>0.873</td>
<td>0.839</td>
<td>0.019</td>
</tr>
<tr>
<td>Macau</td>
<td>0.95</td>
<td>223</td>
<td>0.925</td>
<td>0.845</td>
<td>N.A.</td>
</tr>
<tr>
<td>Singapore</td>
<td>0.83</td>
<td>224</td>
<td>0.859</td>
<td>0.789</td>
<td>0.042</td>
</tr>
<tr>
<td>Average</td>
<td>1.20</td>
<td></td>
<td>0.890</td>
<td>0.858</td>
<td>0.024</td>
</tr>
<tr>
<td>Western</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>1.60</td>
<td>183</td>
<td>0.662</td>
<td>0.650</td>
<td>0.093</td>
</tr>
<tr>
<td>US</td>
<td>1.87</td>
<td>143</td>
<td>0.694</td>
<td>0.654</td>
<td>0.118</td>
</tr>
<tr>
<td>UK</td>
<td>1.88</td>
<td>142</td>
<td>0.684</td>
<td>0.681</td>
<td>0.108</td>
</tr>
<tr>
<td>Average</td>
<td>1.78</td>
<td></td>
<td>0.680</td>
<td>0.662</td>
<td>0.105</td>
</tr>
<tr>
<td>Developing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>1.80</td>
<td>150</td>
<td>0.686</td>
<td>0.649</td>
<td>0.060</td>
</tr>
<tr>
<td>Argentina</td>
<td>2.26</td>
<td>93</td>
<td>0.705</td>
<td>0.662</td>
<td>0.070</td>
</tr>
<tr>
<td>Cameroon</td>
<td>4.64</td>
<td>21</td>
<td>0.887</td>
<td>0.727</td>
<td>0.170</td>
</tr>
<tr>
<td>Tanzania</td>
<td>4.77</td>
<td>18</td>
<td>0.814</td>
<td>0.686</td>
<td>0.040</td>
</tr>
<tr>
<td>Average</td>
<td>3.37</td>
<td></td>
<td>0.773</td>
<td>0.681</td>
<td>0.085</td>
</tr>
</tbody>
</table>
Decomposing the total fertility $F$

$$F = m(1 - c^M)n^M + (1 - m)(1 - c^S)n^S$$

- $m$: marriage rate;
- $c^M$ ($c^S$): childlessness rates of married (single) women
- $n^M$ ($n^S$): average fertility of married (single) women

$\partial F/\partial m > 0$ and $\partial F/\partial c^M < 0$: not in line with Facts 1 and 2. Fact 3 also appears puzzling, as fertility decisions of married women contrast sharply with those of single women.

We should endogenize simultaneously the marriage decision ($m$) and fertility decisions at both the extensive margins ($c^M$ and $c^S$) and intensive margins ($n^M$ and $n^S$) to explain the three facts.
Confucianism and Two Social Norms

**Norm 1:** unequal gender division of childcare

**Norm 2:** stigma attached to out-of-wedlock births
Time Spent on Housework (Husband vs. Wife)

<table>
<thead>
<tr>
<th></th>
<th>East Asian</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>China</td>
<td>Japan</td>
<td>South Korea</td>
<td>Hong Kong</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Wife (hours/week) (a)</td>
<td>26.2 25.4</td>
<td>21.4 21.5</td>
<td>20.71 20.79</td>
<td>19.80 15.60</td>
<td>21.28 16.68</td>
</tr>
<tr>
<td>Husband (hours/week) (b)</td>
<td>5.3 5.0</td>
<td>4.51 4.20</td>
<td>3.90 4.69</td>
<td>6.60 4.80</td>
<td>5.38 3.73</td>
</tr>
<tr>
<td>(a)/(a+b)</td>
<td>0.83 0.84</td>
<td>0.83 0.84</td>
<td>0.84 0.82</td>
<td>0.75 0.76</td>
<td>0.80 0.82</td>
</tr>
</tbody>
</table>

|                | Western and Developing |          |          |          |
| Year           | US                     | UK       | Canada   | Argentina |
| Wife (hours/week) (a) | 19.30 18.71 | 21.50 18.00 | 22.80 23.30 | 24.11 34.10 |
| Husband (hours/week) (b) | 12.10 12.20 | 12.80 10.09 | 14.40 14.90 | 8.80 11.79 |
| (a)/(a+b)      | 0.61 0.61             | 0.63 0.64 | 0.61 0.61 | 0.73 0.74 | 0.75 0.79 |
**Fraction of Childcare Provided by a Wife by Education Levels**

<table>
<thead>
<tr>
<th>Wife</th>
<th>Husband</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (no schooling)</td>
<td>0</td>
</tr>
<tr>
<td>6 (primary school)</td>
<td>0.871</td>
</tr>
<tr>
<td>9 (middle school)</td>
<td>0.824</td>
</tr>
<tr>
<td>12 (high school)</td>
<td>N.A.</td>
</tr>
<tr>
<td>14 (some college)</td>
<td>N.A.</td>
</tr>
<tr>
<td>16 (four-year college and more)</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

N.A. indicates not available.
Model

Objectives

- Endogenize marriage and fertility simultaneously
- Distinguish between fertility and childlessness
- Incorporate the two social norms
Model setup

Heterogenous adults whose state characterized by

1. Gender $i = (m \ [\text{male}], f \ [\text{female}])$
2. Wage $w_i$
3. Non-labor income $a_i$

Two-stage decision

- **Stage 1**: Each agent randomly matched with a possible partner, decides whether or not to marry
- **Stage 2**: Each household decides how much to consume, how many children to have, regardless of marital status
Household decisions

- **Preference**: \( u(c^J_i, n) = \ln(c^J_i) + \ln(\nu + \epsilon^J n) \)
  - \( c^J_i \): consumption of individual of gender \( i \) and marital status \( J = (M \text{ [married]}, S \text{ [single]}) \)
  - \( n \): number of children
  - \( \nu > 0 \): preference parameter

- \( \epsilon^J > 0 \) is a preference parameter that determines marginal utility of having children
  - \( \epsilon^M (\epsilon^S) \): marginal utility for married (single) women
Household decisions

- **Labor endowment**
  - Married: 1 unit
  - Single: \(1 - \delta_i\) unit

- **Childless**
  - Natural sterility: \(\chi\) and \(\zeta\) denote fraction of naturally sterile men and women
  - Social sterility: \(c_f < \hat{c} \Rightarrow n = 0\)

- **Household fixed cost**: \(\mu^S \neq \mu^M\)
Home production of childcaring service

- Production function for married households
  \[ L^M(l_m, l_f) = A^M (l_m^\psi + l_f^\psi)^\frac{1}{\psi} \]

  \( \psi < 1 \) implies \( l_m \) and \( l_f \) are imperfect substitutes

- Production function for single mothers: \( L^S = A^S l_f \)

- Amount of childcaring service for raising \( n \) children
  \[ F(n) = \phi n \]

  \( \phi \) is a variable cost of each child
Cost minimization for married couples with \( n \) children

\[
\min_{l_m, l_f} w_m l_m + w_f l_f
\]

s.t.

\[
A^M (l_m^\psi + l_f^\psi)^{\frac{1}{\psi}} = \phi n
\]

\[
0 \leq l_m \leq 1, \quad 0 \leq l_f \leq 1
\]

First order conditions lead to

\[
\left( \frac{l_m}{l_f} \right) = \left( \frac{w_m}{w_f} \right)^{\frac{1}{\psi-1}}
\]

Let \( \alpha = \frac{l_f}{l_f + l_m} \) be the fraction of wife's labor in total labor

- Optimal fraction: \( \alpha^* = \frac{l^*_f}{l^*_f + l^*_m} \)
- \( \frac{\partial \alpha^*}{\partial \left( \frac{w_f}{w_m} \right)} < 0 \). When \( w_m = w_f \), \( \alpha^* = 0.5 \).
Social norm on intrahousehold division of childcare

Husband and wife’s labor inputs dictated by the social norm $\alpha'$

\[
l_m(\alpha') = \zeta_1 \frac{1}{A^M} \phi n \tag{6}
\]

\[
l_f(\alpha') = \zeta_2 \frac{1}{A^M} \phi n \tag{7}
\]

where $\zeta_1$ and $\zeta_2$ are constants.
The Cost of Social Norm on Unequal Gender Division of Childcare

Let $C(\alpha') = w_m l_m(\alpha') + w_f l_f(\alpha')$, $C(\alpha^*) = w_m l_m(\alpha^*) + w_f l_f(\alpha^*)$

**The cost**: $C(\alpha') - C(\alpha^*)$

1. $\frac{\partial [C(\alpha') - C(\alpha^*)]}{\partial \psi} |_{\alpha', \alpha^* < 0} < 0$. The cost increases when $\psi$, the degree of substitutability between $l_f$ and $l_m$, decreases for a given pair of $(\alpha', \alpha^*)$.

2. $\frac{\partial [C(\alpha') - C(\alpha^*)]}{\partial \alpha^*} |_{\psi < 1, \alpha' > \alpha^* < 0} < 0$. The cost decreases with $\alpha^*$ when $l_m$ and $l_f$ are imperfect substitutes in producing childcare and $\alpha' > \alpha^*$. As women’s education increases relative to men’s in modern societies, their optimal fraction of time spent on childcare decreases ($\alpha^*$), and thus the cost increases.
Household decisions

Budget constraints

\[
\begin{align*}
b_m (c^S_m) &= c^S_m - (1 - \delta_m) w_m - a_m + \mu^S \leq 0, \\
b_f (c^S_f, n) &= c^S_f + \frac{\phi}{A_S} w_f n - (1 - \delta_f) w_f - a_f + \mu^S \leq 0, \\
b (c^M_f, c^M_m, n) &= c^M_f + c^M_m + \phi (\zeta_1 w_m + \zeta_2 w_f) n - w_m - w_f - a_f - a_m + \mu^M \leq 0.
\end{align*}
\]

Maximize

\[
U (c^M_f, c^M_m, n) = \theta (w_f, w_m) u (c^M_f, n) + [1 - \theta (w_f, w_m)] u (c^M_m, n) \quad (8)
\]

where

\[
\theta (w_f, w_m) \equiv \frac{1}{2} \theta + (1 - \theta) \frac{w_f}{w_f + w_m} \quad (9)
\]

\(\theta/2\) : the lower bound of the negotiation power of spouses
Marriage decision: single males

Value functions

\[ V^S_m \equiv \{ \max \ln(c^S_m) + \ln(\nu) \quad s.t \quad b_m(c^S_m) \leq 0 \} \]
\[ V^{M,N}_m \equiv \{ \max \ln(c^M_m) + \ln(\nu) \quad s.t \quad b(c^M_f, c^M_m, 0) \leq 0 \} \]
\[ V^{M,Y}_m \equiv \{ \max \ln(c^M_m) + \ln(\nu + \epsilon^M_n) \quad s.t \quad b(c^M_f, c^M_m, n) \leq 0 \} \]

Marriage if and only if

\[ [\chi_m + (1 - \chi_m)\chi_f] V^{M,N}_m + (1 - \chi_m)(1 - \chi_f) V^{M,Y}_m \geq V^S_m \]
Marriage decision: single females

Value functions

\[
V_{f}^{S,N} \equiv \{ \max \ln(c_f^S) + \ln(\nu) \quad s.t \quad b_f(c_f^S, 0) \leq 0 \}
\]
\[
V_{f}^{S,Y} \equiv \{ \max \ln(c_f^S) + \ln(\nu + \epsilon^S n) \quad s.t \quad b_f(c_f^S, n) \leq 0 \}
\]
\[
V_{f}^{M,N} \equiv \{ \max \ln(c_f^M) + \ln(\nu) \quad s.t \quad b(c_f^M, c_m^M, 0) \leq 0 \}
\]
\[
V_{f}^{M,Y} \equiv \{ \max \ln(c_f^M) + \ln(\nu + \epsilon^M n) \quad s.t \quad b(c_f^M, c_m^M, n) \leq 0 \}
\]

Marriage if and only if

\[
[\chi_f + (1 - \chi_f)\chi_m] V_{f}^{M,N} + (1 - \chi_f)(1 - \chi_m) V_{f}^{M,Y} \geq \chi V_{f}^{S,N} + (1 - \chi) V_{f}^{S,Y}
\]
Four types of childlessness

1. Natural sterility
2. Poverty-driven sterility: $c(n = 1) < \hat{c}$
3. Social-stigma-driven sterility
4. Opportunity-cost-driven childlessness
Social-stigma-driven sterility

\[ V_f^S(n \geq 1 | \epsilon^S = \epsilon^M, w_f, a_f) > V_f^S(n = 0 | \epsilon^S = \epsilon^M, w_f, a_f), \quad (10) \]

\[ V_f^S(n = 0 | \epsilon^S < \epsilon^M, w_f, a_f) \geq V_f^S(n \geq 1 | \epsilon^S < \epsilon^M, w_f, a_f), \quad (11) \]

\[ c_f^S \geq \hat{c}. \quad (12) \]
Opportunity-cost-driven childlessness

For married women

\[ V_f^M(n \geq 1|w_f, a_f) \leq V_f^M(n = 0|w_f, a_f), \quad (13) \]
\[ c_f^M \geq \hat{c}. \quad (14) \]

For single women

\[ V_f^S(n \geq 1|\epsilon^S = \epsilon^M, w_f, a_f) \leq V_f^S(n = 0|\epsilon^S = \epsilon^M, w_f, a_f), \quad (15) \]
\[ c_f^S \geq \hat{c}. \quad (16) \]
Estimation

South Korea’s censuses and household surveys

17 parameters

1. 6 are estimated directly from the data

2. 11 parameters are estimated using SMM
Parameters Estimated Directly from the Data

1. \( \gamma, \rho \)

\[ w_e = \gamma z \exp(\rho e) \]  \hspace{1cm} (17)

2. \( \alpha' \)

3. \( \psi \)

\[ \ln\left(\frac{l_m}{l_f}\right) = \frac{1}{\psi - 1}[\ln(w_m) - \ln(w_f)] \]  \hspace{1cm} (18)

4. \( \mu^S/\mu^M \)

5. \( \chi_f = \chi_m = 0.05 \)
### Parameters Estimated Directly from the Data

#### Panel A: *a priori information*

<table>
<thead>
<tr>
<th>Description</th>
<th>Parameter</th>
<th>Value</th>
<th>Source</th>
<th>Comparison to Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to schooling</td>
<td>$\rho$</td>
<td>0.0764</td>
<td>2000 SLCTE</td>
<td></td>
</tr>
<tr>
<td>Gender wage gap</td>
<td>$\gamma$</td>
<td>0.770</td>
<td>2000 SLCTE</td>
<td>0.092 0.05 0.05 0.05</td>
</tr>
<tr>
<td>Fraction childcare provided by women</td>
<td>$\alpha'$</td>
<td>0.780</td>
<td>1999 KTUS</td>
<td>0.524 0.754 0.506 0.974</td>
</tr>
<tr>
<td>Elasticity parameter</td>
<td>$\psi$</td>
<td>0.385</td>
<td>1999 KTUS</td>
<td>1.0 1.0 1.0 1.0</td>
</tr>
<tr>
<td>Ratio of good costs: singles vs. married</td>
<td>$\mu^s/\mu^M$</td>
<td>0.733</td>
<td>2000 HIE</td>
<td>1.0 1.0 1.0 1.0</td>
</tr>
<tr>
<td>Natural sterility parameter</td>
<td>$\chi_f = \chi_m$</td>
<td>0.005</td>
<td>-</td>
<td>0.0121 0.01 0.01 0.01</td>
</tr>
</tbody>
</table>
Simulated Method of Moments

\[
f(p) = [d - s(p)][W][d - s(p)]'
\]

- \(d\): 34 empirical moments
  - 32 based on the 2000 census: marriage rates by gender, completed fertility and childless rates for married women, by 8 educational categories
  - 1 based on SPFS: average fertility rate for single mothers
  - 1 based on the 2015 census: average childless rate for single women
- \(W = 1/d^2\)
- \(p\): Model parameters
Marriage Rates and Fertility from the 2000 South Korea Census

<table>
<thead>
<tr>
<th>Education level</th>
<th>( e )</th>
<th>Observations</th>
<th>Childlessness rate</th>
<th>Completed fertility of mothers</th>
<th>Marriage rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No school</td>
<td>0</td>
<td>15,501</td>
<td>0.0155</td>
<td>4.516</td>
<td>0.985</td>
</tr>
<tr>
<td>2. Primary school</td>
<td>6</td>
<td>60,322</td>
<td>0.0119</td>
<td>3.507</td>
<td>0.993</td>
</tr>
<tr>
<td>3. Middle school</td>
<td>9</td>
<td>52,015</td>
<td>0.0156</td>
<td>2.604</td>
<td>0.990</td>
</tr>
<tr>
<td>4. High school</td>
<td>12</td>
<td>85,074</td>
<td>0.0180</td>
<td>2.275</td>
<td>0.979</td>
</tr>
<tr>
<td>5. Some college</td>
<td>14</td>
<td>11,925</td>
<td>0.0218</td>
<td>2.160</td>
<td>0.958</td>
</tr>
<tr>
<td>6. 4-year college</td>
<td>16</td>
<td>27,426</td>
<td>0.0170</td>
<td>2.174</td>
<td>0.956</td>
</tr>
<tr>
<td>7. Master’s</td>
<td>18</td>
<td>4,782</td>
<td>0.0268</td>
<td>2.051</td>
<td>0.883</td>
</tr>
<tr>
<td>8. PhD</td>
<td>20</td>
<td>1,618</td>
<td>0.0348</td>
<td>2.013</td>
<td>0.831</td>
</tr>
<tr>
<td>All</td>
<td></td>
<td>258,663</td>
<td>0.0156</td>
<td>2.899</td>
<td>0.983</td>
</tr>
</tbody>
</table>
### Panel B: Parameters estimated by SMM

<table>
<thead>
<tr>
<th>Description</th>
<th>Notation</th>
<th>Value</th>
<th>s.e.</th>
<th>Comparison to Literature (Mean, Min, Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of non-labor income</td>
<td>$m_a$</td>
<td>0.234</td>
<td>0.0044</td>
<td>Baudin et al. (2015): 0.435, 0.302, 0.533</td>
</tr>
<tr>
<td>Standard deviation of non-labor income</td>
<td>$\sigma_a$</td>
<td>0.333</td>
<td>0.0108</td>
<td>Baudin et al. (2015): 0.247, 0.111, 0.220</td>
</tr>
<tr>
<td>Goods cost to support a household (married)</td>
<td>$\mu^M$</td>
<td>0.343</td>
<td>0.0434</td>
<td>Baudin et al. (2018): 0.272, 0.302, 0.533</td>
</tr>
<tr>
<td>Minimum consumption level to procreate</td>
<td>$\bar{\nu}$</td>
<td>0.200</td>
<td>0.0212</td>
<td>Baudin et al. (2015): 0.399, 0.342, 0.521</td>
</tr>
<tr>
<td>Preference parameter</td>
<td>$\gamma$</td>
<td>7.646</td>
<td>0.0477</td>
<td>Baudin et al. (2015): 9.362, 9.518, 10.967</td>
</tr>
<tr>
<td>Time cost of being single (men)</td>
<td>$\delta_m$</td>
<td>0.100</td>
<td>0.0118</td>
<td>Baudin et al. (2018): 0.256, 0.141, -0.0310, 0.367</td>
</tr>
<tr>
<td>Time cost of being single (women)</td>
<td>$\delta_f$</td>
<td>-0.034</td>
<td>0.0073</td>
<td>Baudin et al. (2018): 0.077, 0.080, -0.0510, 0.272</td>
</tr>
<tr>
<td>Bargaining parameter</td>
<td>$\theta$</td>
<td>0.232</td>
<td>0.0464</td>
<td>Baudin et al. (2015): 0.864, 0.545, 0.002, 0.996</td>
</tr>
<tr>
<td>Productivity for home production (single)</td>
<td>$A^S$</td>
<td>1.916</td>
<td>0.0369</td>
<td>Baudin et al. (2015): 1.0, 1.0, 1.0, 1.0</td>
</tr>
<tr>
<td>Variable cost of raising a child $b$</td>
<td>$\phi$</td>
<td>0.524</td>
<td>0.0068</td>
<td>Baudin et al. (2015): 0.206, 0.188, 0.154, 0.206</td>
</tr>
<tr>
<td>Social norm of stigma</td>
<td>$e^S$</td>
<td>0.854</td>
<td>0.0154</td>
<td>Baudin et al. (2015): 1.0, 1.0, 1.0, 1.0</td>
</tr>
</tbody>
</table>
Model Fitness

(a) Childlessness Rate of Married Women

(b) Completed Fertility of Married Mothers

(c) Marriage Rate of Women

(d) Marriage Rate of Men
Robustness

1. Social norm on the intrahousehold division of childcare ($\alpha'$)
2. Elasticity parameter in home production ($\psi$)
3. Ratio in household fixed cost between single and married households ($\frac{\mu^S}{\mu^M}$)
4. Assortative matching
Counterfactual analyses

Two types of counterfactual analyses

1. The roles of the two social norms in marriage and fertility in South Korea

2. Differences in marriage and fertility patterns between South Korea and the US
Counterfactual Analysis: No Social Norm on Unequal Gender Division of Childcare
Counterfactual Analysis: Social Stigma Attached to Out-of-Wedlock Births

<table>
<thead>
<tr>
<th>Women’s Education</th>
<th>Childlessness Rate of Single Women</th>
<th>Completed Fertility of Single Mothers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Benchmark $\varepsilon_S = \varepsilon_M = 1$</td>
<td>Benchmark $\varepsilon_S = \varepsilon_M = 1$</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>0</td>
<td>0.697</td>
<td>0.437</td>
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<tr>
<td>6</td>
<td>0.974</td>
<td>0.909</td>
</tr>
<tr>
<td>9</td>
<td>0.996</td>
<td>0.980</td>
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<tr>
<td>12</td>
<td>1.000</td>
<td>0.997</td>
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<td>14</td>
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<td>0.999</td>
</tr>
<tr>
<td>16</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>18</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>20</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Average</td>
<td>0.982</td>
<td>0.954</td>
</tr>
</tbody>
</table>
Counterfactual analysis: Using US Parameters

1. the gender wage gap ($\gamma$)

2. the preference parameter that determines the utility of remaining childless ($\nu$)

3. the parameter that determines a wife’s bargaining power for consumption ($\theta$)
Explaining the Three Facts about Marriage and Fertility

1. High Marriage Rates

2. Low Total Fertility for Married Mothers

3. Low Childlessness Rates for the Married

4. High Childlessness for Single Women

We conclude that the tension between persistent Confucianism and socioeconomic development results in three notable facts about marriage and fertility in East Asian societies.
**Historical simulation**

Total: 87.1%; education: 33.61%; TFP: 35.56%; gender gap: 17.85%
Gender Wage Gap, Optimal Division of Childcare ($\alpha$), and Social Norm Costs
Policy Experiment 1: Providing Childcare Service

\[ F(n) = (1 - \tau)\phi n, \quad \tau = 0.046 \]
Policy Experiment 2: Providing Childcare Subsidy

\[ \tau_a = 0.004, \quad 0.004/0.073 = 0.048 \]
Contributions

1. Culture/social norms and household/individual decisions
   - Fernández, 2008; Fernández and Fogli, 2006, 2009; Becker and Murphy, 2009; Bongaarts and Watkins, 1996; Munshi and Myaux, 2006; Fernández, 2013; Fernández et al., 2004; Fernández and Fogli, 2009; Burda et al., 2007; Fernández and Sevilla Sanz, 2006; Fuwa, 2004; Qian and Sayer, 2015

2. Demographic transition
   - General implications for demographic transitions in other developing or transitional economies.

3. Family decisions and macroeconomics/public finance
   - Greenwood et al., 2017; Doepke and Tertilt, 2016
Policy implications

1. Promoting social-norm revolution
   - Advocating more equal gender role
   - Financially supporting nontraditional forms of families

2. Providing regulated domestic service markets

3. Subsidizing household chores (childcare)
Thank you!