Social Norms and Fertility

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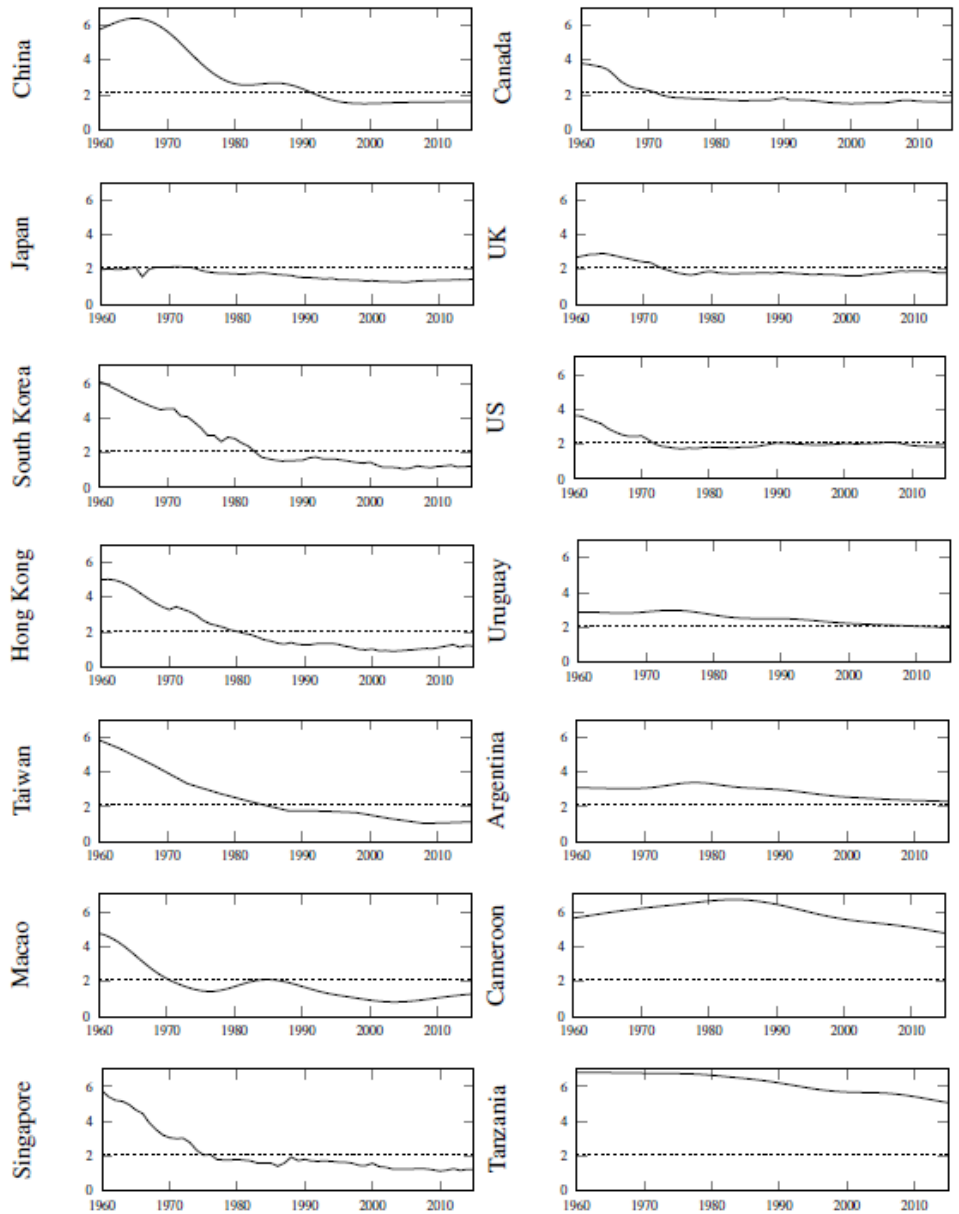
Fertility Changes over the Past 50 Years



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

Countries/regions	TFR	Rank /#224	Marriage Rate		Childlessness Rate		GDP per capita (USD)
			Men	Women	Married	Single	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
East Asian							
China	1.60	182	0.900	0.922	0.007	0.983	8,123
Japan	1.41	209	0.840	0.853	0.034	0.984	38,972
South Korea	1.26	220	0.920	0.861	0.016	0.989	27,539
Hong Kong	1.19	221	0.908	0.898	0.026	0.951	43,741
Taiwan	1.13	222	0.873	0.839	0.019	0.979	24,577
Macau	0.95	223	0.925	0.845	N.A.	N.A.	74,017
Singapore	0.83	224	0.859	0.789	0.042	0.985	52,963
Average	1.20		0.890	0.858	0.024	0.979	38,562
Western							
Canada	1.60	183	0.662	0.650	0.093	0.262	42,348
US	1.87	143	0.694	0.654	0.118	0.389	57,638
UK	1.88	142	0.684	0.681	0.108	0.433	40,412
Average	1.78		0.680	0.662	0.105	0.361	46,799
Developing							
Uruguay	1.80	150	0.686	0.649	0.060	0.670	15,221
Argentina	2.26	93	0.705	0.662	0.070	0.740	12,440
Cameroon	4.64	21	0.887	0.727	0.170	0.220	1,375
Tanzania	4.77	18	0.814	0.686	0.040	0.200	878
Average	3.37		0.773	0.681	0.085	0.458	7,479

Puzzling

Decomposing the total fertility F

$$F = m(1 - c^M)n^M + (1 - m)(1 - c^S)n^S \tag{1}$$

- 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)

East Asian	China		Japan		South Korea		Hong Kong		Taiwan	
Year	1991	2012	2001	2011	2004	2014	2002	2013	1995	2004
Wife (hours/week) (a)	26.2	25.4	21.4	21.5	20.71	20.79	19.80	15.60	21.28	16.68
Husband (hours/week) (b)	5.3	5.0	4.51	4.20	3.90	4.69	6.60	4.80	5.38	3.73
(a)/(a+b)	0.83	0.84	0.83	0.84	0.84	0.82	0.75	0.76	0.80	0.82
Western and Developing	US		UK		Canada		Argentina		Tanzania	
Year	2003	2015	2001	2005	2005	2010	2005	2013	2006	2014
Wife (hours/week) (a)	19.30	18.71	21.50	18.00	22.80	23.30	24.11	34.10	21.20	23.80
Husband (hours/week) (b)	12.10	12.20	12.80	10.09	14.40	14.90	8.80	11.79	7.20	6.39
(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

	Husband					
Wife	0	6	9	12	14	16+
0 (no schooling)	0.871	0.730	0.899	N.A.	N.A.	N.A.
6 (primary school)	0.824	0.832	0.884	0.884	N.A.	N.A.
9 (middle school)	N.A.	0.850	0.903	0.935	0.837	0.926
12 (high school)	N.A.	0.778	0.890	0.905	0.917	0.895
14 (some college)	N.A.	N.A.	N.A.	0.891	0.881	0.877
16 (four-year college and more)	N.A.	N.A.	N.A.	0.852	0.937	0.872

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 $i = (m$ [male], f [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**: $u(c_i^J, n) = ln(c_i^J) + ln(\nu + \epsilon^J n)$
  - c_i^J: consumption of individual of gender i and marital status $J = (M$ [married], S [single])
  - n: number of children
  - $v > 0$: preference parameter
- $\epsilon^J > 0$ **is a preference parameter that determines marginal utility of having children**
  - ϵ^M (ϵ^S): marginal utility for married (single) women

Household decisions

- **Labor endowment**
  - Married: 1 unit
  - Single: $1 - \delta_i$ unit
- **Childless**
  - Natural sterility: χ and ζ 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

$$L^M(l_m, l_f) = A^M \left({l_m}^{\psi} + {l_f}^{\psi} \right)^{\frac{1}{\psi}}$$

  $\psi < 1$ implies l_m and l_f are **im**perfect substitutes
- Production function for single mothers: $L^S = A^S l_f$
- Amount of childcaring service for raising n children

$$F(n) = \phi n$$

  ϕ is a variable cost of each child

Cost minimization for married couples with n children

$$\min_{l_m, l_f} w_m l_m + w_f l_f \tag{2}$$

s.t.

$$A^M ({l_m}^{\psi} + {l_f}^{\psi})^{\frac{1}{\psi}} = \phi n \tag{3}$$

$$0 \leq l_m \leq 1, \quad 0 \leq l_f \leq 1 \tag{4}$$

First order conditions lead to

$$\left(\frac{l_m}{l_f}\right) = \left(\frac{w_m}{w_f}\right)^{\frac{1}{\psi - 1}} \tag{5}$$

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

- Optimal fraction: $\alpha^* = \frac{l_f^*}{l_f^* + l_m^*}$
- $\frac{\partial \alpha^*}{\partial (\frac{w_f}{w_m})} < 0$. 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 α'

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

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

where ζ_1 and ζ_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. $\frac{\partial[C(\alpha')-C(\alpha^*)]}{\partial\psi}|_{\alpha',\alpha^*} < 0$. The cost increases when ψ, the degree of substitutability between l_f and l_m, decreases for a given pair of (α', α^*).
2. $\frac{\partial[C(\alpha')-C(\alpha^*)]}{\partial\alpha^*}|_{\psi<1,\alpha'>\alpha^*} < 0$. The cost decreases with α^* 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 (α^*), and thus the cost increases.

Household decisions

Budget constraints

$$\begin{aligned} b_m\left(c_m^S\right) &= c_m^S - (1-\delta_m) w_m - a_m + \mu^S \leq 0, \\ b_f\left(c_f^S, n\right) &= c_f^S + \frac{\phi}{A^S} w_f n - (1-\delta_f) w_f - a_f + \mu^S \leq 0, \\ b\left(c_f^M, c_m^M, n\right) &= c_f^M + c_m^M + \phi\left(\zeta_1 w_m + \zeta_2 w_f\right) n - w_m - w_f - a_f - a_m + \mu^M \leq 0. \end{aligned}$$

Maximize

$$U\left(c_f^M, c_m^M, n\right) = \theta(w_f, w_m) u\left(c_f^M, n\right) + [1 - \theta(w_f, w_m)] u\left(c_m^M, n\right) \quad (8)$$

where

$$\theta\left(w_f, w_m\right) \equiv \frac{1}{2}\underline{\theta} + (1 - \underline{\theta}) \frac{w_f}{w_f + w_m} \quad (9)$$

$\underline{\theta}/2$: the lower bound of the negotiation power of spouses

Marriage decision: single males

Value functions

$$\begin{aligned} V_m^S &\equiv \left\{\max\ ln(c_m^S) + ln(\nu) \quad s.t \quad b_m\left(c_m^S\right) \leq 0\right\} \\ V_m^{M,N} &\equiv \left\{\max\ ln(c_m^M) + ln(\nu) \quad s.t \quad b\left(c_f^M, c_m^M, 0\right) \leq 0\right\} \\ V_m^{M,Y} &\equiv \left\{\max\ ln(c_m^M) + ln(\nu + \epsilon^M n) \quad s.t \quad b\left(c_f^M, c_m^M, n\right) \leq 0\right\} \end{aligned}$$

Marriage if and only if

$$\left[\chi_m + (1-\chi_m)\chi_f\right] V_m^{M,N} + (1-\chi_m)(1-\chi_f) V_m^{M,Y} \geq V_m^S$$

Marriage decision: single females

Value functions

$$
\begin{aligned}
V_f^{S,N} &\equiv \left\{\max\ \ln(c_f^S) + ln(\nu) \quad s.t \quad b_f\left(c_f^S, 0\right) \leq 0\right\} \\
V_f^{S,Y} &\equiv \left\{\max \ln(c_f^S) + ln(\nu + \epsilon^S n) \quad s.t \quad b_f\left(c_f^S, n\right) \leq 0\right\} \\
V_f^{M,N} &\equiv \left\{\max \ln(c_f^M) + ln(\nu) \quad s.t \quad b\left(c_f^M, c_m^M, 0\right) \leq 0\right\} \\
V_f^{M,Y} &\equiv \left\{\max \ln(c_f^M) + ln(\nu + \epsilon^M n) \quad s.t \quad b\left(c_f^M, c_m^M, n\right) \leq 0\right\}
\end{aligned}
$$

Marriage if and only if

$$
\left[\chi_f + (1-\chi_f)\chi_m\right] V_f^{M,N} + (1-\chi_f)(1-\chi_m) V_f^{M,Y} \geq \chi V_f^{S,N} + (1-\chi) V_f^{S,Y}
$$

Four types of childlessness

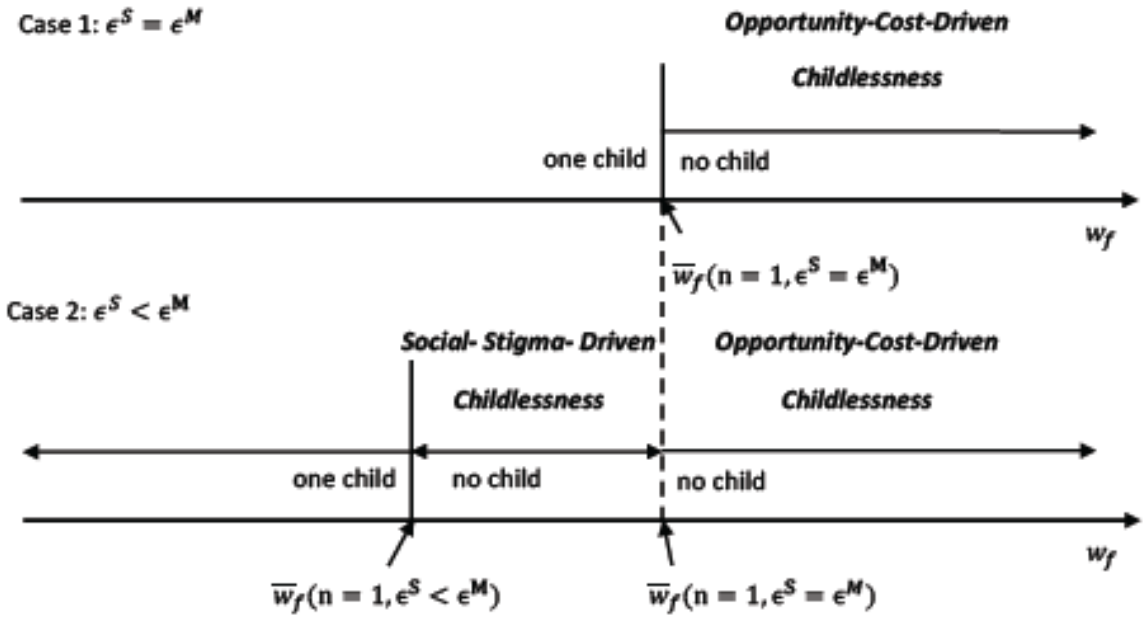
1. Natural sterility
2. Poverty-driven sterility: $c(n = 1) < \hat{c}$
3. Social-stigma-driven sterility
4. Opportunity-cost-driven childlessness

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 paramters

1. 6 are estimated directly from the data
2. 11 parameters are estimated using SMM

Parameters Estimated Directly from the Data

1. γ, ρ

$$w_e = \gamma z \exp(\rho e) \tag{17}$$

2. α'
3. ψ

$$ln(\frac{l_m}{l_f}) = \frac{1}{\psi - 1}[ln(w_m) - ln(w_f)] \tag{18}$$

4. μ^S/μ^M
5. $\chi_f = \chi_m = 0.05$

Parameters Estimated Directly from the Data

Panel A: a priori information

Description	Parameter	Value	Source	Comparison to Literature			
				Baudin *et al.* (2015)	Baudin *et al.* (2018)		
					Mean	Min	Max
Return to schooling	ρ	0.0764	2000 SLCTE	0.092	0.05	0.05	0.05
Gender wage gap	γ	0.770	2000 SLCTE	0.869	0.794	0.67	0.88
Fraction childcare provided by women	α'	0.780	1999 KTUS	0.524	0.754	0.506	0.974
Elasticity parameter	ψ	0.385	1999 KTUS	1.0	1.0	1.0	1.0
Ratio of good costs: singles vs. married	μ^S/μ^M	0.733	2000 HIE	1.0	1.0	1.0	1.0
Natural sterility parameter	$\chi_f = \chi_m$	0.005	-	0.0121	0.01	0.01	0.01

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

			Childlessness rate	Completed fertility of mothers	Marriage rate	
Education level	e	Observations	Married	Married	Women	Men
1. No school	0	15,501	0.0155	4.516	0.985	0.959
2. Primary school	6	60,322	0.0119	3.507	0.993	0.973
3. Middle school	9	52,015	0.0156	2.604	0.990	0.974
4. High school	12	85,074	0.0180	2.275	0.979	0.980
5. Some college	14	11,925	0.0218	2.160	0.958	0.986
6. 4-year college	16	27,426	0.0170	2.174	0.956	0.988
7. Master's	18	4,782	0.0268	2.051	0.883	0.986
8. PhD	20	1,618	0.0348	2.013	0.831	0.989
All		258,663	0.0156	2.899	0.983	0.979

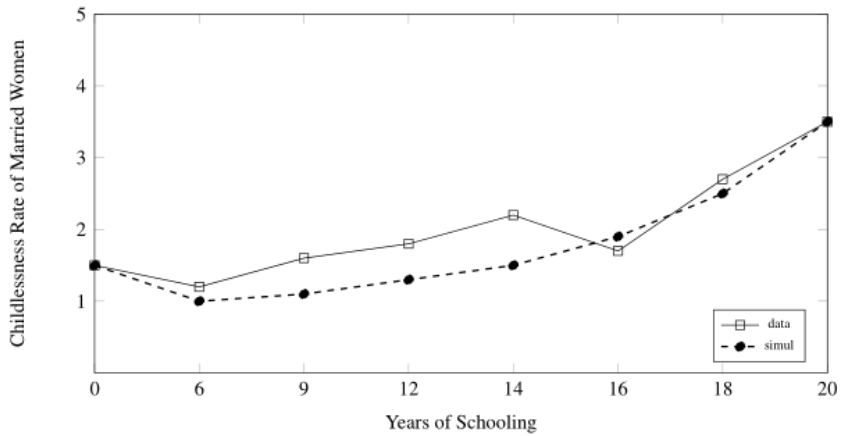
SMM Estimates

Panel B: Parameters estimated by SMM

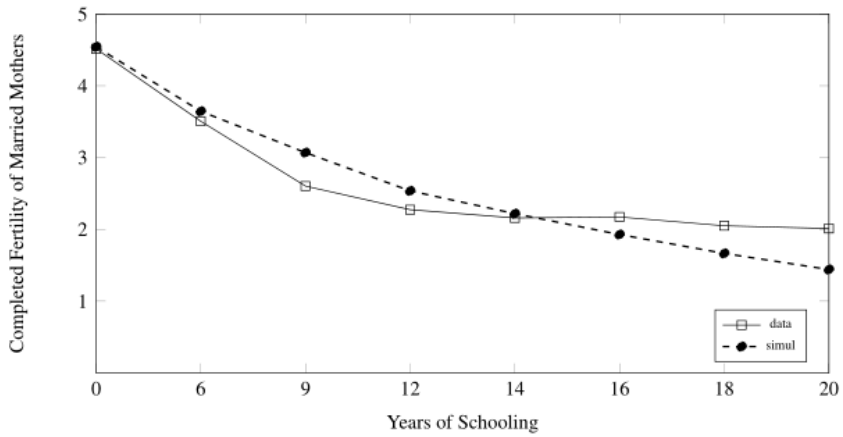
Description	Notation	Value	s.e.	Comparison to Literature			
				Baudin *et al.* (2015)	Baudin *et al.* (2018)		
					Mean	Min	Max
Mean of non-labor income	m_a	0.234	0.0044	0.435[a]	0.302	0.042	0.533
Standard deviation of non-labor income	σ_a	0.333	0.0108	0.247	0.111	0.034	0.220
Goods cost to support a household (married)	μ^M	0.343	0.0434	0.272	0.302	0.042	0.533
Minimum consumption level to procreate	$\hat{c}$	0.200	0.0212	0.399	0.342	0.099	0.521
Preference parameter	ν	7.646	0.0477	9.362	9.518	6.367	10.967
Time cost of being single (men)	δ_m	0.100	0.0118	0.256	0.141	−0.031	0.367
Time cost of being single (women)	δ_f	-0.034	0.0073	0.077	0.080	−0.051	0.272
Bargaining parameter	$\underline{\theta}$	0.232	0.0464	0.864	0.545	0.002	0.996
Productivity for home production (single)	A^S	1.916	0.0369	1.0	1.0	1.0	1.0
Variable cost of raising a child[b]	ϕ	0.524	0.0068	0.206	0.188	0.154	0.206
Social norm of stigma	ε^S	0.854	0.0154	1.0	1.0	1.0	1.0

Model Fitness

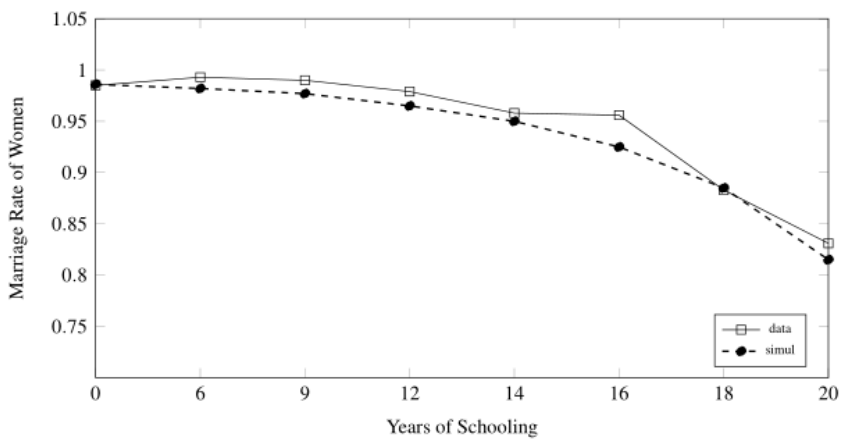
(a) Childlessness Rate of Married Women



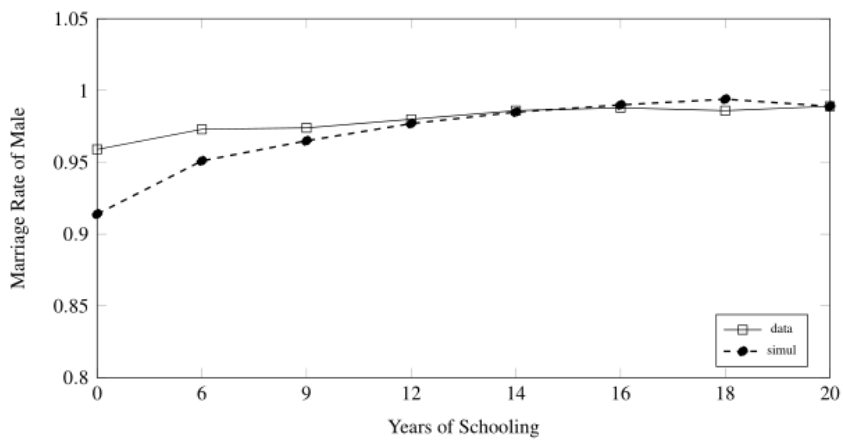
(b) Completed Fertility of Married Mothers



(c) Marriage Rate of Women



(d) Marriage Rate of Men



Robustness

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

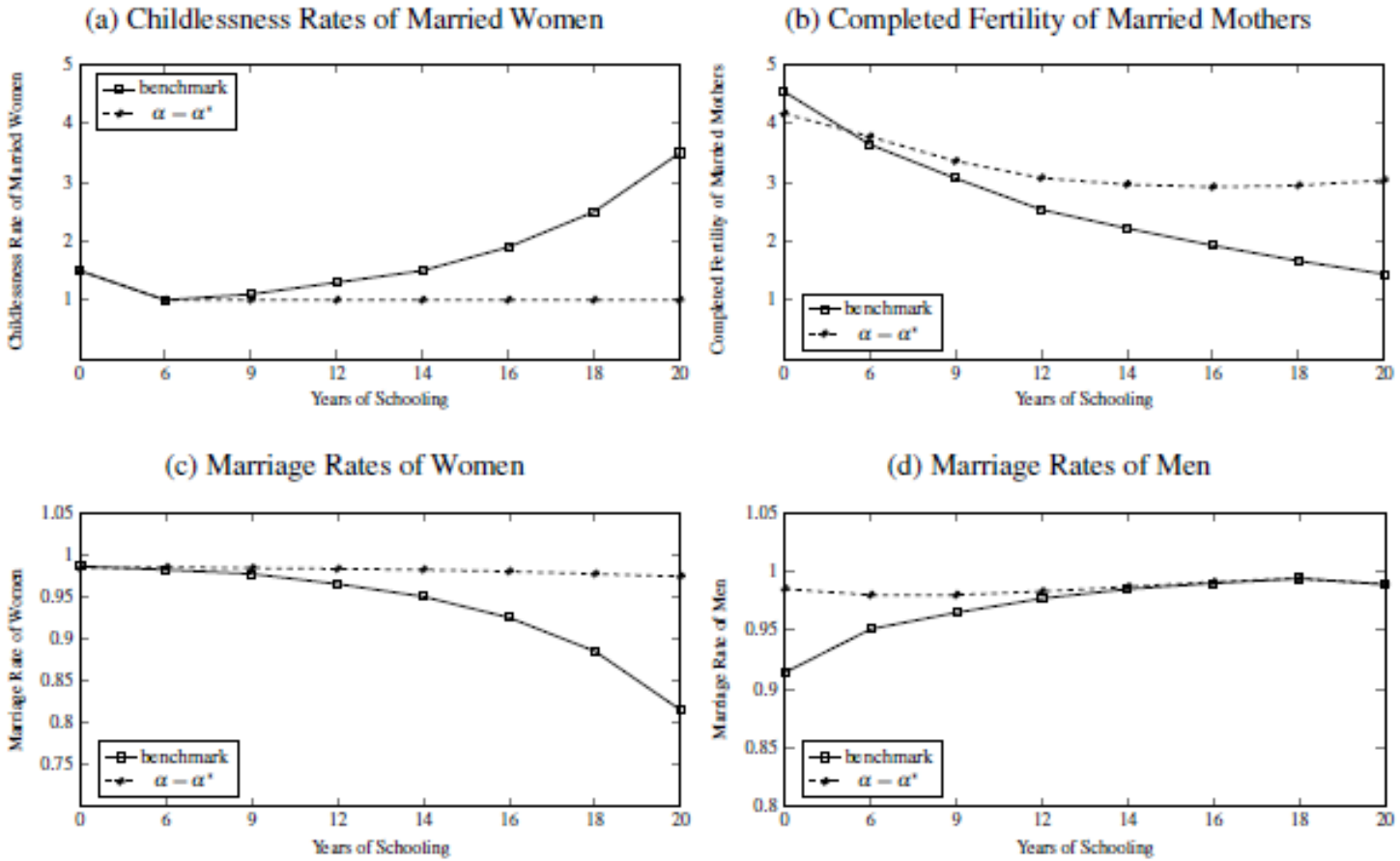
Counterfactual analyses

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

Childlessness Rate of Single Women			Completed Fertility of Single Mothers	
Women's Education	Benchmark	$\varepsilon^S = \varepsilon^M = 1$	Benchmark	$\varepsilon^S = \varepsilon^M = 1$
	(1)	(2)	(3)	(4)
0	0.697	0.437	1.389	1.455
6	0.974	0.909	1.071	1.204
9	0.996	0.980	1.000	1.071
12	1.000	0.997	0.0	1.000
14	1.000	0.999	0.0	1.000
16	1.000	1.000	0.0	0.0
18	1.000	1.000	0.0	0.0
20	1.000	1.000	0.0	0.0
Average	0.982	0.954	1.290	1.324

Counterfactual analysis: Using US Parameters

1. the gender wage gap (γ)

2. the preference parameter that determines the utility of remaining childless (ν)

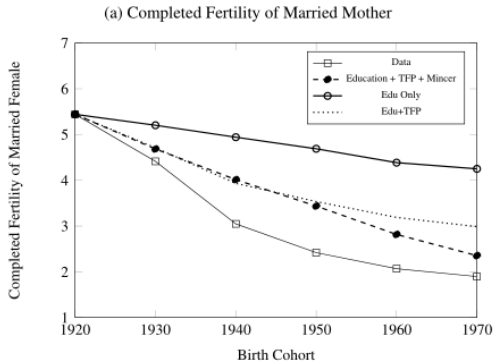
3. the parameter that determines a wife's bargaining power for consumption ($\underline{\theta}$)

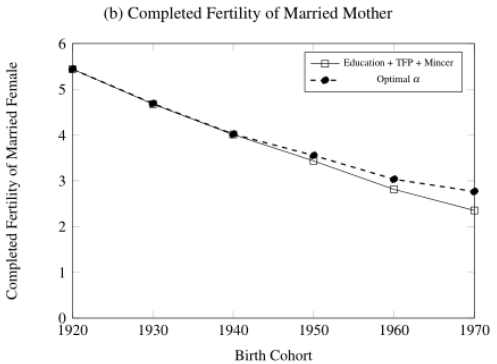
Explaining the Three Facts about Marriage and Fertility

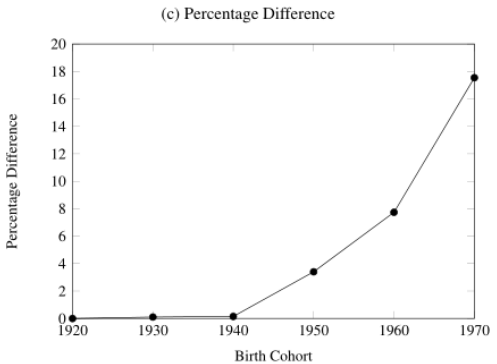
1. High Marriage Rates
2. Low Total Fertility for Married Mothers
3. Low Childlessness Rates for the Married
4. High Childlessness for Single Women

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

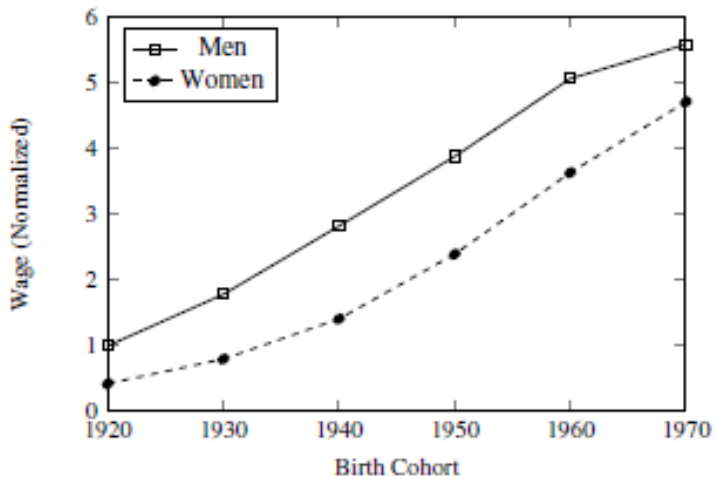


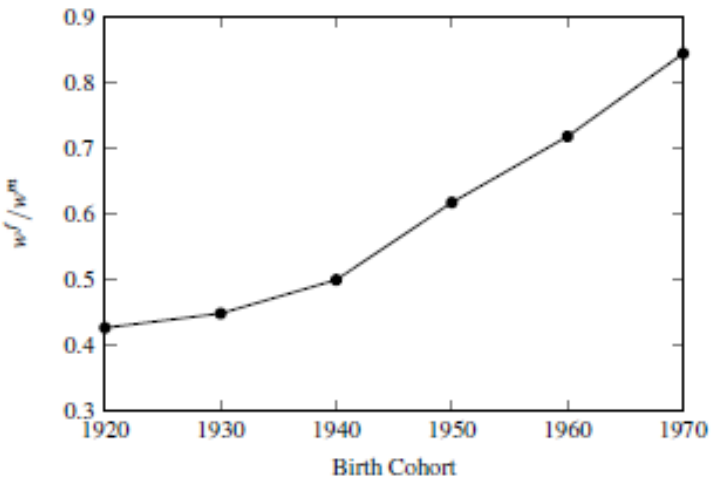




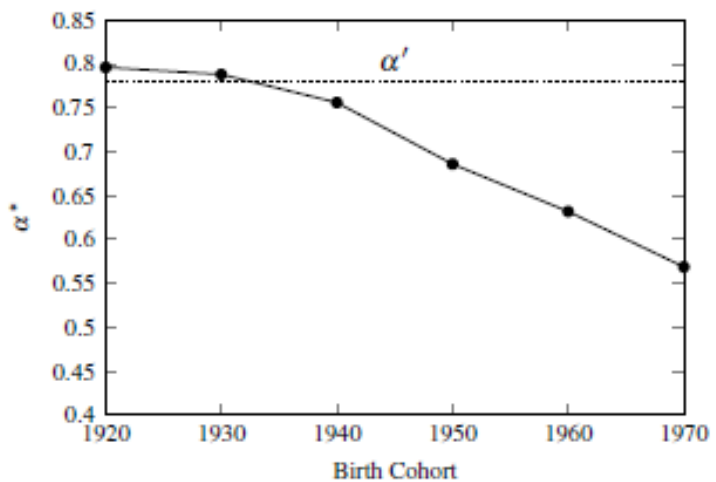
Total: 87.1%; education: 33.61%; TFP: 35.56%; gender gap: 17.85%

Gender Wage Gap, Optimal Division of Childcare (α), and Social Norm Costs

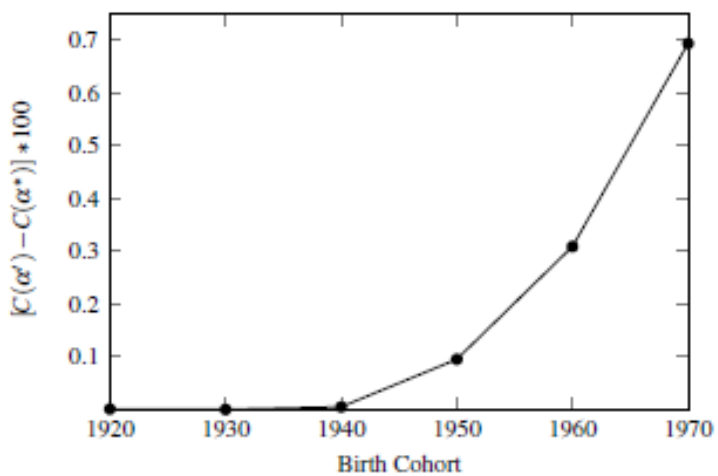




(c) Optimal Fraction of Wife's Labor in Childcare (α^*)

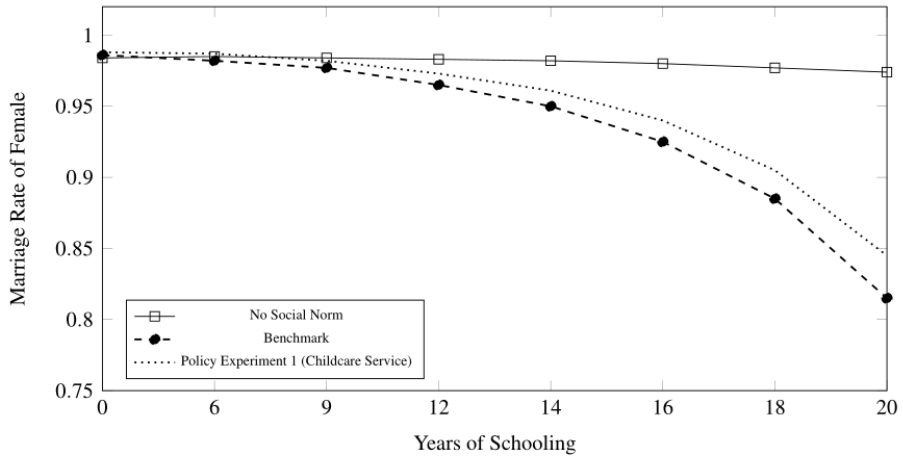


(d) Social Norm Costs over Birth Cohorts

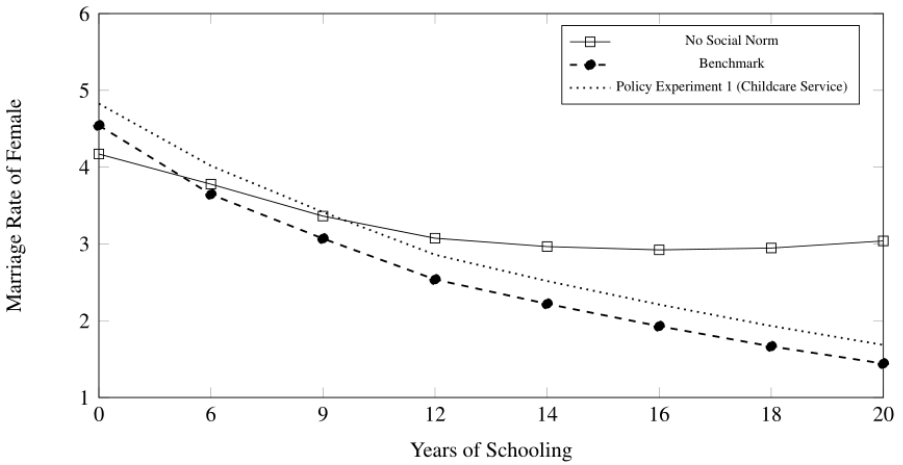


Policy Experiment 1: Providing Childcare Service

(a) Marriage Rate for Female



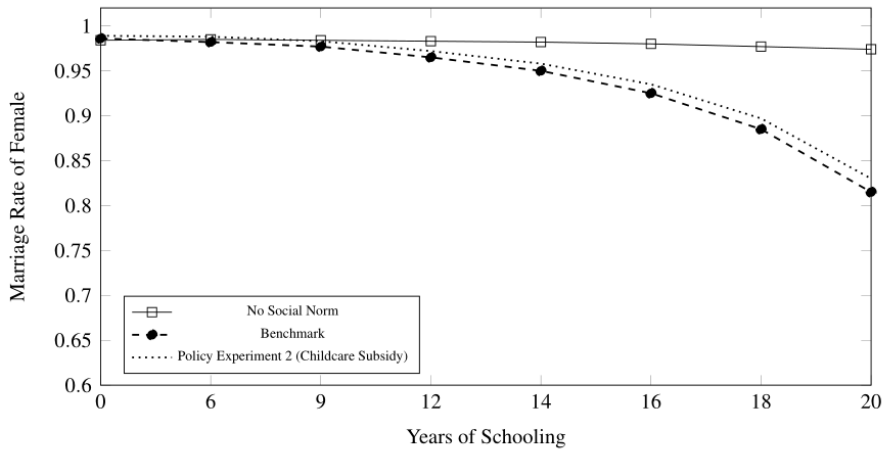
(b) Completed Fertility Rate for Married Mothers



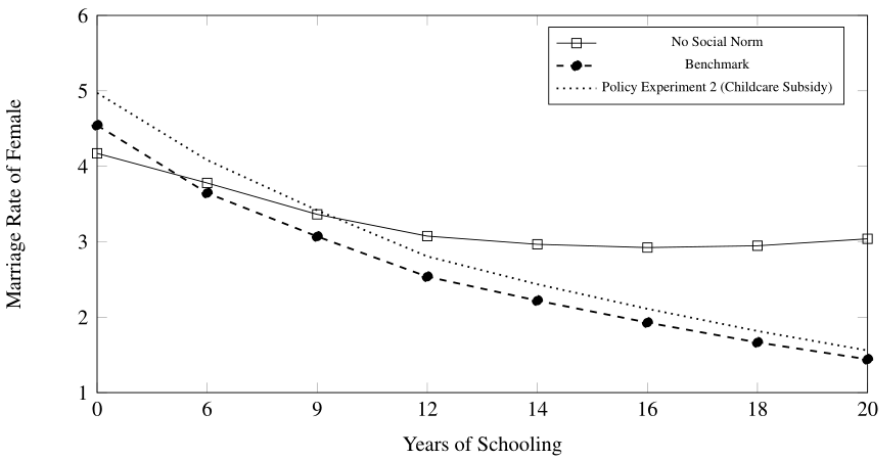
$$F(n) = (1-\tau)\phi n, \ \tau = 0.046$$

Policy Experiment 2: Providing Childcare Subsidy

(a) Marriage Rate for Female



(b) Completed Fertility Rate for Married Mothers



$$\tau_a = 0.004, \ 0.004/0.073 = 0.048$$

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
   - Franck and Galor, 2015; Galor, 2011; Galor and Mountford, 2008; Galor and Weil, 2000, Becker, 1960; Becker et al., 1990; Butz and Ward, 1979; Doepke, 2004; Heckman and Walker, 1990; Willis, 1973, De La Croix and Doepke, 2003; Galor and Weil, 1996; Lagerlöf, 2003, Barro and Becker, 1989; Becker and Barro, 1988, Galor, 2012
   - 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!