

Social Norms and Fertility

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Low fertility in East Asian societies

- ▶ The demographic transition experienced by East Asian societies over the past few decades has been distinctive and drastic.
- ▶ Relative to other regions, East Asian societies have experienced much faster fertility declines, and currently have the lowest fertility levels in the world.
- ▶ In 2016, total fertility rates (TFRs) in South Korea, Hong Kong, Taiwan, Macau, and Singapore are 1.25, 1.19, 1.12, 0.94, and 0.82, respectively; they rank 220th–224th in terms of TFR among 224 countries and territories (columns (1)–(2) in Table 1).

Economic growth and fertility in East Asian societies

- ▶ Between 1960 and 2016, the Four Asian Tigers—Hong Kong, Singapore, South Korea, and Taiwan—experienced an average annual growth rate of GDP per capita of 7.5%.
- ▶ Meanwhile, educational attainment in these four societies has also increased substantially. Between 1960 and 2015, the average number of schooling years increased from 2.77 to 12.53 for women, and increased from 5.48 to 12.76 for men.
- ▶ The neoclassical economic theory of fertility suggests that these socioeconomic changes in East Asian societies have increased the opportunity cost of raising children, and have thus lead to a rapid decline in fertility (Becker and Barro, 1988; Doepke, 2004; Galor and Weil, 1996).
- ▶ However, one may have difficulty reconciling the following three facts about marriage and fertility in East Asian societies.

Table 1: Marriage and fertility rates across countries/regions.

Countries/regions	TFR ^a	Rank/#224 ^b	Marriage rate ^c		Childlessness rate ^d	
			Men	Women	Married	Single
	(1)	(2)	(3)	(4)	(5)	(6)
East Asian						
China	1.60	182	0.945	0.949	0.011	0.978
Japan	1.41	210	0.680	0.727	0.064	0.977
South Korea	1.25	220	0.830	0.839	0.029	0.982
Hong Kong	1.19	221	0.813	0.748	0.036	0.920
Taiwan	1.12	222	0.834	0.907	0.034	0.932
Macau	0.94	223	0.907	0.808	N.A.	N.A.
Singapore	0.82	224	0.831	0.763	0.046	0.980
Average	1.19		0.834	0.820	0.037	0.962
Western						
UK	1.88	139	0.627	0.633	0.108	0.433
U.S.	1.87	143	0.623	0.626	0.121	0.398
Canada	1.60	183	0.621	0.630	0.139	0.644
Finland	1.75	162	0.532	0.554	0.070	0.490
Spain	1.49	199	0.694	0.713	0.103	0.691
Italy	1.43	208	0.708	0.745	0.125	0.325
Average	1.67		0.634	0.650	0.111	0.496
Developing						
Average	3.07		0.803	0.681	0.054	0.423

Notes. Data sources and variable definitions are provided in appendix Table D1.

Three stylized facts on marriage and fertility in East Asian societies

Fact 1: Despite having the lowest fertility levels, marriage rates in East Asian societies are among the highest in the world.

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

Fact 3: In contrast, very few single women have any children.

Three stylized facts on marriage and fertility in East Asian societies

- ▶ Columns (3)–(4) in Table 1 show that among East Asians aged 45–49, 83.4% of men and 82.0% of women are married.
- ▶ In contrast, among their counterparts in a number of western societies, 63.4% of men and 65.0% of women are married.
- ▶ Marriage rates in East Asia are also higher than in developing countries where 80.3% of men and 68.1% of women are married.¹

¹The developing countries comprise the 36 developing countries studied by [Baudin et al. \(2020\)](#).

Three Stylized Facts on Marriage and Fertility in East Asian Societies

- ▶ Column (5) in Table 1 shows that around 2015, the average childlessness rate for married women in East Asian societies was 3.7%, which was much lower than the rate in the selected western societies (11.1%), and slightly lower than the rate in developing countries (5.4%).
- ▶ Column (6) in Table 1 shows that around 2015, the average childlessness rate for single women in East Asian societies was 96.2%, which was substantially higher than the rates in the selected western societies (49.6%) and developing countries (42.3%).

Puzzling

- ▶ These three facts are puzzling because high marriage rates and low childlessness rates of married mothers usually imply high total fertility ($\partial F/\partial m > 0$ and $\partial F/\partial c^M < 0$). Moreover, married women's and single women's fertility decisions do not exhibit such sharp differences in most other societies ([Baudin et al. \(2015, 2020\)](#)).
- ▶ Decomposing 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 (extensive margin)
- n^M (n^S): average fertility of married (single) mother (intensive margin)

Divergence of intensive and extensive margins of fertility

- ▶ These facts imply that in conjunction with the demographic transition, the extensive and intensive margins of fertility have diverged—while the extensive margin (the probability of having a child) has hardly changed, the intensive margin (completed fertility of mothers) has undergone a significant transformation.
- ▶ To fully understand the marriage and fertility patterns in East Asian societies, we must consider marriage decisions and fertility decisions simultaneously, and distinguish between the extensive margin and the intensive margin of fertility.

Confucianism and two social norms

- ▶ In studying marriage and fertility decisions, the sociology and demography literature acknowledges the strong influence of two social norms associated with Confucianism ([Greenhalgh, 1985](#); [Qian and Sayer, 2016](#); [Fuwa, 2004](#); [Raymo et al., 2015](#)).

Norm 1: unequal gender division of childcare

Norm 2: stigma attached to out-of-wedlock births

- ▶ Although legal and political institutions in East Asia have evolved substantially over the past few decades, these two norms still remain significant ([Raymo et al., 2015](#)).

Social norm on unequal gender division of housework

Table 2: Weekly hours spent on housework by gender.

Year	China		Japan		South Korea		Hong Kong		Taiwan		Developing	
	1991	2012	2001	2011	2004	2014	2002	2013	2004	2017	2000	2010
(a) Women	26.2	25.4	25.6	25.6	24.6	24.3	23.1	18.9	16.7	17.2	33.0	32.5
(b) Men	5.3	5.0	5.7	5.4	5.1	5.5	7.7	5.6	3.7	4.0	10.1	11.2
(a)/(a+b)	0.83	0.84	0.82	0.83	0.83	0.82	0.75	0.76	0.82	0.81	0.75	0.76

Year	UK		U.S.		Canada		Finland		Spain		Italy	
	2001	2015	2003	2015	2005	2016	2000	2010	2003	2010	2003	2014
(a) Women	24.9	21.3	27.8	26.7	27.3	24.5	26.6	25.5	34.4	31.8	36.8	34.3
(b) Men	13.7	11.7	16.6	16.5	16.8	16.1	16.8	17.6	11.3	14.5	12.3	14.1
(a)/(a+b)	0.65	0.64	0.63	0.62	0.62	0.60	0.61	0.59	0.75	0.69	0.75	0.71

Notes. Housework consists of unpaid domestic and care work. Data sources are provided in appendix Table D1.

- ▶ On average, women in Japan, South Korea, Hong Kong, Taiwan, and China are responsible for 80% of the housework, which is 20 percentage points higher than their counterparts in the U.S., the UK, Canada, and Finland. The proportion of housework borne by women in East Asia is also higher than that borne by their counterparts in developing countries.

Social norm on unequal gender division of housework

Table 3: Proportion of childcare borne by wives by couple's education.

Wife's education	Husband's education				
	6—	9	12	14	16+
0 and 6 (no/primary school)	0.802	0.876	0.794	N.A.	N.A.
9 (middle school)	0.880	0.870	0.840	N.A.	N.A.
12 (high school)	0.883	0.910	0.866	0.850	0.858
14 (2-year college)	N.A.	N.A.	0.849	0.802	0.830
16+ (4-year college or above)	N.A.	N.A.	0.826	0.815	0.804

Notes. Childcare includes the following activities: physical care for children (feeding, getting the child ready for bed, bathing, etc.), reading to children, playing with children, providing medical care to children, providing home care to sick children, helping with homework or teaching children, picking up and dropping off children, and attending parent-teacher conferences. The sample consists of married households with a wife aged 20-40 from the pooled sample of 2004, 2009, and 2014 KTUS. If the number of observations is less than 10, we do not report the share (N.A.). The pattern remains robust for different types of households and different types of childcare activities (Appendix A.1).

- ▶ Data from the Korean Time Use Survey (KTUS) show that the gender division of housework within a married household in South Korea does not systematically vary across couples' education levels (Table 3).

Social stigma attached to out-of-wedlock births

- ▶ Out-of-wedlock births have historically been stigmatized in both eastern and western societies ([Akerlof et al., 1996](#); [Dommaraju and Jones, 2011](#); [Ochiai, 2011](#); [Fernández-Villaverde et al., 2014](#); [Raymo et al., 2015](#)).
- ▶ However, events over the past century—industrialization, economic development, and in particular the advent of female contraception and the legalization of abortion—have led to a gradual acceptance of out-of-wedlock births in western societies ([Akerlof et al., 1996](#); [Fernández-Villaverde et al., 2014](#)).

Social stigma attached to out-of-wedlock births

- ▶ In modern East Asian societies, by contrast, childbearing outside of marriage is still stigmatized ([Dommaraju and Jones, 2011](#); [Ochiai, 2011](#); [Raymo et al., 2015](#)).
- ▶ Column (6) of Table 1 shows that almost no single women have any children in East Asian societies; In addition, of all OECD countries, Japan and South Korea have the lowest proportions of birth outside marriage—2.3% and 1.9% in 2015, respectively; the average proportion for the remaining 33 OECD countries for which data are available is 41.5%.

What we do in this paper

- ▶ We document stylized facts about East Asian societies, and extend the model in [Baudin et al. \(2015\)](#) to explain these facts, and quantitatively evaluate the importance of the two social norms in marriage and fertility decisions.
- ▶ To quantify the effects of the social norm of unequal gender division of childcare, we relax the standard assumption that the wife's labor inputs and the husband's labor inputs are perfect substitutes ([Becker, 2009](#); [Baudin et al., 2015](#)).
- ▶ Specifically, we introduce a home production function in the form of constant elasticity of substitution (CES) for childcare service. This general home production function allows us to distinguish between the labor division governed by the social norm (i.e., unequal gender division of childcare) from the optimal labor division between a husband and a wife.

What we do in this paper

- ▶ To quantify the effects of the social stigma of out-of-wedlock births on marriage and fertility decisions, we allow the marginal utility of having children to differ between single and married households in our model.
- ▶ We then introduce a new source of childlessness that is exclusive to single women—social-stigma-driven childlessness—in addition to the natural sterility, poverty-driven, and opportunity-cost-driven childlessness examined in the literature ([Baudin et al., 2015](#); [Gobbi, 2018](#)).

Main results

- ▶ We find that the social norm of unequal gender division of childcare plays a significant role in the low fertility rates, especially for highly educated women. However, the social stigma attached to out-of-wedlock births has modest effects on the childlessness rate for single women.
- ▶ Our results show that the tension between the persistent gender ideology and the rapid socioeconomic development is the main driving force behind the unique marriage and fertility patterns in East Asian societies.

Contributions

- 1 Literature on the consequences of culture and social norms on individual and household behaviors ([Fernández and Fogli, 2006](#); [Fernández and Sevilla Sanz, 2006](#); [Fernández and Fogli, 2009](#); [Bertrand et al., 2015, 2016](#); [Hwang, 2016](#))
 - ▶ We contribute to this literature by quantitatively evaluating the significant role of social norms in accounting for the unique marriage and fertility patterns in East Asian societies.

Contributions

2 Literature on demographic transition:

- ▶ Prior studies have attributed the decline in fertility to economic development ([Galor and Weil, 2000](#); [Franck and Galor, 2015](#)); women's labor force participation ([Willis, 1973](#)); the gender wage gap ([Galor and Weil, 1996](#)); and investments in children's human capital ([Becker et al., 1990](#)).
- ▶ We find that although these factors are still important in determining the timing and speed of the demographic transition, the persistent social norm of unequal gender roles is a critical factor in East Asian societies, where Confucian culture still prevails.

Contributions

- 3 Literature on women's burden of childcare, women's careers, and low fertility rates:
- ▶ [Feyrer et al. \(2008\)](#) investigate female labor force participation, females' share of total childcare time, and fertility in high-income countries. [De Laat and Sevilla-Sanz \(2011\)](#) find that men's participation in home production relieves the tension between female labor force participation and child births. [Doepke and Kindermann \(2019\)](#) employ a bargaining framework with imperfect commitment between spouses to explain the negative relationship between fertility and females' share of childcare.
 - ▶ We study the effects of females' burden of childcare on marriage and fertility in a cooperative framework.

Model

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.

Model setup

- ▶ **Preference of an individual:** $u(c_i^J, n) = \ln(c_i^J) + \ln(\nu + \epsilon^J n)$
 - ▶ c_i^J : consumption of individual of gender i and marital status $J = (M$ [married], S [single])
 - ▶ n : number of children
 - ▶ $\nu > 0$: preference parameter
- ▶ $\epsilon^J > 0$ is a preference parameter that determines marginal utility of having children by marital status.
 - ▶ If $\epsilon^S < \epsilon^M$, marginal utility of having children is higher for the married than singles.

Model setup

- ▶ **Preference of the household (collective model):**

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

where

$$\theta(w_f, w_m) \equiv \frac{1}{2}\theta + (1 - \theta)\frac{w_f}{w_f + w_m}$$

Model setup

- ▶ **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:** $\mu^S \neq \mu^M$

Model setup: 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

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

, where ϕ is a variable cost of each child.

Characterization

Household decisions

Maximize

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

subject to the budget constraints:

$$b_m(c_m^S) = c_m^S - (1 - \delta_m)w_m - a_m + \mu^S \leq 0,$$

$$b_f(c_f^S, n) = c_f^S + \frac{\phi}{A^S}w_f n - (1 - \delta_f)w_f - a_f + \mu^S \leq 0,$$

$$b(c_f^M, c_m^M, n) = c_f^M + c_m^M + \frac{\phi}{A^M}(\zeta_1 w_m + \zeta_2 w_f)n - w_m - w_f - a_f - a_m + \mu^M \leq 0.$$

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

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

Cost minimization for married couples with n children

- ▶ Let $\alpha = l_f / (l_f + l_m)$ be the proportion of the wife's labor l_f in the total amount of household labor in childcare.
- ▶ The optimal proportion of time spent on childcare by the wife, denoted by α^* , strictly decreases in her relative wage. That is, $\partial \alpha^* / \partial (w_f / w_m) < 0$.
- ▶ When $w_m = w_f$, $\alpha^* = 0.5$.

Social norm on intrahousehold division of childcare

- ▶ When the social norm applies, the proportion of time spent on childcare by the wife, α , is no longer a choice variable for the household, but it is exogenously set to the value of α' as dictated by the social norm.
- ▶ The husband's labor and the wife's labor following α' are respectively denoted by $l_m(\alpha')$ and $l_f(\alpha')$:

$$l_m(\alpha') = \zeta_1 \frac{1}{AM} \phi n, \quad (1)$$

$$l_f(\alpha') = \zeta_2 \frac{1}{AM} \phi n, \quad (2)$$

, where

$$\begin{aligned} \zeta_1 &= 1 / \{ [(\alpha' / (1 - \alpha'))^\psi + 1]^{1/\psi} \} \\ \zeta_2 &= \alpha' / \{ (1 - \alpha') [(\alpha' / (1 - \alpha'))^\psi + 1]^{1/\psi} \} \end{aligned} \quad (3)$$

Cost of social norm on unequal gender division of childcare

- ▶ Denote $C(\alpha^*)w_m l_m(\alpha^*) + w_f l_f(\alpha^*)$ as the cost of childcare when spouses follow the optimal division rule α^* . Similarly, $C(\alpha') = w_m l_m(\alpha') + w_f l_f(\alpha')$ is the cost when spouses follow the social norm.
- ▶ We define $C(\alpha') - C(\alpha^*)$ as the cost of the social norm when households deviate from the optimal gender division of childcare. The cost of the social norm has the following property:

$$\frac{\partial [C(\alpha') - C(\alpha^*)]}{\partial w_f} \Big|_{\alpha' > \alpha^*} > 0 \quad (4)$$

- ▶ The cost of the social norm increases with w_f , when $\alpha' > \alpha^*$. As women's education increases relative to men's in modern societies, the wages of women (w_f) increase, pushing up the cost of the social norm.

Marriage decision: single males

- Single men have three options once they are randomly matched with a possible spouse in the marriage market: (i) single with no children; (ii) married with no children; and (iii) married with children. The value functions are, respectively,

$$V_m^S \equiv \{ \max \ln(c_m^S) + \ln(\nu) \quad s.t \quad b_m(c_m^S) \leq 0 \}$$

$$V_m^{M,N} \equiv \{ \max \ln(c_m^M) + \ln(\nu) \quad s.t \quad b(c_f^M, c_m^M, 0) \leq 0 \}$$

$$V_m^{M,Y} \equiv \{ \max \ln(c_m^M) + \ln(\nu + \epsilon^M n) \quad s.t \quad b(c_f^M, c_m^M, n) \leq 0 \}$$

- Men choose to marry with the randomly matched partner if and only if

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

Marriage decision: single females

- ▶ Single women have four options once they are randomly matched with a possible spouse in the marriage market: (i) single with no children; (ii) single with children; (iii) married with no children; and (iv) married with children. The value functions are, respectively,

$$V_f^{S,N} \equiv \{ \max \ln(c_f^S) + \ln(\nu) \quad s.t \quad b_f(c_f^S, 0) \leq 0 \}$$

$$V_f^{S,Y} \equiv \{ \max \ln(c_f^S) + \ln(\nu + \epsilon^S n) \quad s.t \quad b_f(c_f^S, n) \leq 0 \}$$

$$V_f^{M,N} \equiv \{ \max \ln(c_f^M) + \ln(\nu) \quad s.t \quad b(c_f^M, c_m^M, 0) \leq 0 \}$$

$$V_f^{M,Y} \equiv \{ \max \ln(c_f^M) + \ln(\nu + \epsilon^M n) \quad s.t \quad b(c_f^M, c_m^M, n) \leq 0 \}$$

- ▶ Women choose to marry with the randomly matched partner 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 (social sterility): $c(n = 1) < \hat{c}$
3. Opportunity-cost-driven
4. Social-stigma-driven sterility childlessness

Social-stigma-driven sterility

- ▶ One type of childlessness that is exclusive to single women is driven by the social stigma on out-of-wedlock births
- ▶ The condition for social-stigma-driven childlessness is given by

$$\begin{aligned}V_f^S(n \geq 1 | \epsilon^S = \epsilon^M, w_f, a_f) &> V_f^S(n = 0 | \epsilon^S = \epsilon^M, w_f, a_f), \\V_f^S(n = 0 | \epsilon^S < \epsilon^M, w_f, a_f) &\geq V_f^S(n \geq 1 | \epsilon^S < \epsilon^M, w_f, a_f), \\c_f^S &\geq \hat{c}.\end{aligned}$$

- ▶ Consider a single woman who prefers having children in the absence of the social stigma (i.e., $\epsilon^S = \epsilon^M$). If she chooses not to have any children in the presence of the social stigma (i.e., $\epsilon^S < \epsilon^M$), we call this type of childlessness social-stigma-driven childlessness.

Opportunity-cost-driven childlessness

- ▶ Even in the absence of the social stigma, a woman whose consumption is above \hat{c} may choose to be childless because of the high opportunity cost associated with a high wage rate w_f :
- ▶ The condition for opportunity-cost-driven childlessness is given by:

$$\begin{aligned} V_f^M(n \geq 1 | w_f, a_f) &\leq V_f^M(n = 0 | w_f, a_f), \\ c_f^M &\geq \hat{c}. \end{aligned}$$

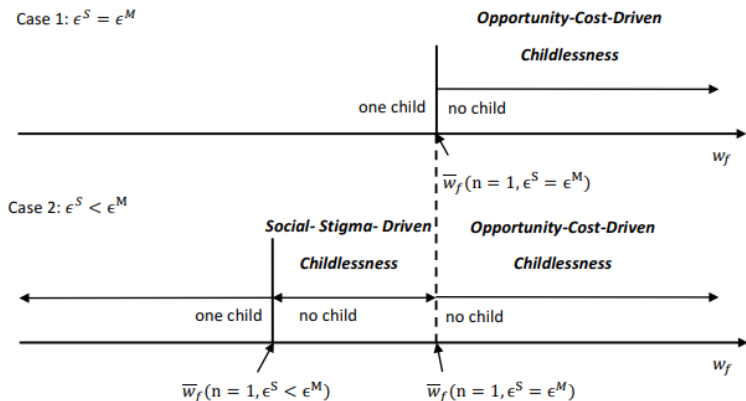
for married women and

$$\begin{aligned} V_f^S(n \geq 1 | \epsilon^S = \epsilon^M, w_f, a_f) &\leq V_f^S(n = 0 | \epsilon^S = \epsilon^M, w_f, a_f), \\ c_f^S &\geq \hat{c}. \end{aligned}$$

for single women.

Decomposition of childlessness for single women

- The following graph illustrates how a single woman's childlessness depends on her wage (w_f), when her non-labor income (a_f) is high enough so that $c \geq \hat{c}$ (i.e., no poverty-driven childlessness).



Estimation

Estimation

South Korea's censuses and household surveys

17 parameters

- ▶ 7 are estimated directly from the data.
- ▶ 10 parameters are estimated using the SMM.

Parameters estimated directly from the data

- ▶ Returns to schooling (ρ) and gender wage gap (γ) from the Mincer regression $w_e = \gamma z \exp(\rho e)$.
- ▶ Social norm on intrahousehold division of childcare (α') from the average proportion of time spent by a wife on childcare.
- ▶ Elasticity of substitution parameter in home production (ψ) based on the following equation:

$$\ln\left(\frac{l_m}{l_f}\right) = \frac{1}{\psi - 1} [\ln(w_m) - \ln(w_f)]. \quad (5)$$

- ▶ Economies of scale in marriage (μ^S/μ^M) from the ratio of the mean household-maintenance-goods cost for single households to that for married households.
- ▶ The productivity of home production for single households relative to that for married households (A^S/A^M) from the model implication:

$$\frac{A^S}{A^M} = \frac{l_f^M(\alpha')}{l_f^S} \frac{1}{\zeta_2}. \quad (6)$$

- ▶ Natural sterility rate: $\chi_f = \chi_m = 0.05$.

Simulated Method of Moments

- ▶ The remaining ten parameters are estimated using SMM by minimizing the distance between empirical and simulated moments. The objective function is

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

- ▶ d : 30 empirical moments
 - ▶ 28 based on the 20% sample of the 2015 South Korean census: marriage rates by gender, completed fertility and childless rates for married women, by 7 educational categories (Table 4).
 - ▶ 1 based on Single Parent Family Status Survey (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 by education

Table 4: Marriage rates and fertility from the 2015 South Korean census.

Education level	e	Observations	Childless-	Completed	Marriage	
			ness rate	fertility of mothers	rate	
			Married	Married	Women	Men
No schooling	0	58,924	0.0379	3.204	0.874	0.657
Primary school	6	360,291	0.0229	2.765	0.975	0.893
Middle school	9	430,244	0.0281	2.323	0.971	0.900
High school	12	1,119,923	0.0303	2.081	0.962	0.911
2-year college	14	214,148	0.0309	2.013	0.922	0.916
4-year college	16	461,163	0.0314	1.983	0.920	0.944
Master's or doctoral	18	106,299	0.0484	1.928	0.847	0.968
All		2,750,992	0.0294	2.246	0.953	0.914

Notes. Completed fertility is the number of children of mothers aged 45–70, and the childlessness rate is the proportion of women aged 45–70 who do not have children. The years of schooling that correspond to each education level are denoted as *e*. Data source is the 20% sample of the 2015 South Korean population and housing census.

Model parameters

Panel A: Parameters estimated directly from the data						
Parameter	Value	SE/SD	Comparison to Literature			
			Baudin et al. (2015)	Baudin et al. (2020)		
				Mean	Min	Max
ρ	0.069	5.86e-05	0.092	0.050 ^a	0.050	0.050
γ	0.704	2.42e-04	0.869	0.786	0.670	0.880
α'	0.801	0.192	0.524	0.783	0.512	0.965
ψ	0.465	-	1	1	1	1
A^S	2.035	-	1	1	1	1
μ^S / μ^M	0.662	-	1	1	1	1
$\chi_f = \chi_m$	0.005	-	0.012	0.010	0.010	0.010

Panel B: Parameters estimated from the SMM						
Parameter	Value	SE	Comparison to Literature			
			Baudin et al. (2015)	Baudin et al. (2020)		
				Mean	Min	Max
m_a	0.296	7.49e-04	0.435 ^b	0.406	0.194	0.870
σ_a	0.273	3.69e-03	0.247	0.648	0.236	0.798
μ^M	0.680	2.96e-04	0.272	0.281	0.012	0.546
$\hat{\epsilon}$	0.190	9.34e-04	0.399	0.354	0.097	0.529
ν	6.505	9.70e-04	9.362	9.367	6.372	11.099
δ_m	0.003	8.19e-04	0.256	0.197	-0.034	0.367
δ_f	-0.080	1.27e-03	0.077	0.077	-0.057	0.278
$\frac{\theta}{\phi}$	0.225	7.78e-04	0.864	0.442	0.015	0.972
ϕ	0.399	4.26e-04	0.206	0.188	0.154	0.206
ϵ^S	0.892	1.10e-03	1.0	1.0	1.0	1.0

Notes. Panels A and B present parameters estimated directly from the data and those estimated from the simulated method of moments (SMM).

Model fitness

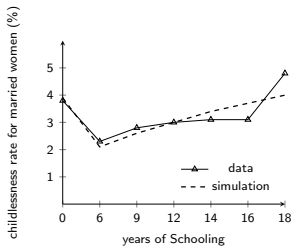


Figure 1 (a) Childlessness rates for married women

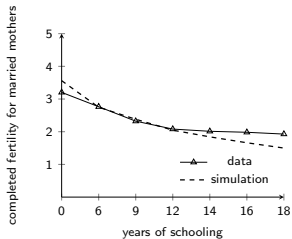


Figure 1 (b) Completed fertility for married mothers

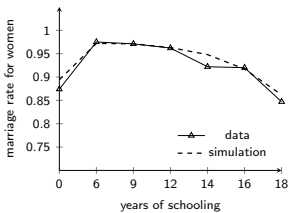


Figure 1 (c) Marriage rates for women

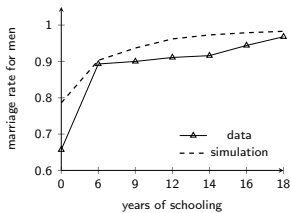


Figure 1 (d) Marriage rates for men

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. Extra value of the first child for the married
5. Assortative matching

Counterfactual

Counterfactual analyses

Two types of counterfactual analyses

1. The roles of the two social norms in marriage and fertility in South Korea
2. Implication of the pro-natal policies in the presence of social norms

Counterfactual analysis: No social norm on unequal gender division of childcare

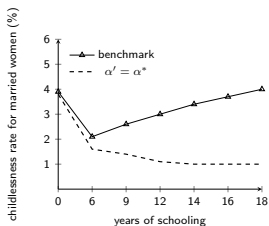


Figure 3 (a) Childlessness rates for married women

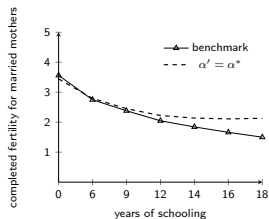


Figure 3 (b) Completed fertility for married mothers

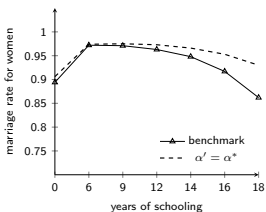


Figure 3 (c) Marriage rates for women

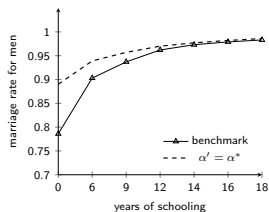


Figure 3 (d) Marriage rates for men

Counterfactual analysis: No social norm on unequal gender division of childcare

- ▶ The optimal division of childcare removes the cost of social norm, thus increasing total fertility from 2.033 to 2.261—an increase of 11.2%.
- ▶ In the absence of the social norm, South Korea's total fertility would well exceed the population replacement rate, leading to population growth.
- ▶ This increase in total fertility can be decomposed into endogenous changes in all three components of total fertility:
 - marriage rate for women increases from 0.955 to 0.968.
 - childlessness rate for married women decreases from 2.9% to 1.3%.
 - completed fertility of married mother increases from 2.192 to 2.366.

Counterfactual analysis: No social stigma attached to out-of-wedlock births

- ▶ We conduct a counterfactual experiment where the marginal utility of having a child is assumed to be the same for the married women and single women, i.e., we set $\epsilon^S = \epsilon^M = 1$.
- ▶ The childlessness rates of married women, completed fertility of married mothers, and the marriage rates for men and women in the counterfactual experiment are almost identical to those in the benchmark simulation.
- ▶ The childlessness rate of single women would decrease from 0.982 to 0.958 in the absence of the stigma.
- ▶ The modest effects are not very consistent with the conjecture: the unusually high childlessness rates of single women and the high marriage rates in East Asian societies might be related to the social stigma attached to out-of-wedlock births.

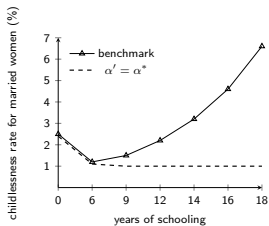
Counterfactual analysis: No social stigma attached to out-of-wedlock births

- ▶ To understand why this conjecture is incorrect, we use our structural model to conduct a decomposition of the sources of childlessness among single women.
- ▶ The childlessness rate among single women in South Korea is 98.2%, of which 2.19% is attributed to social stigma, 32.70% is attributed to poverty, and 62.82% is attributed to the high opportunity cost of raising a child.
- ▶ Women are single either because they are too poor to procreate or because having children is too costly for them due to the high opportunity cost.

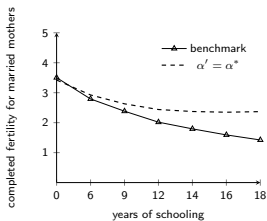
Quantitative analysis using data from Taiwan

- ▶ We estimate our model using data from Taiwan's censuses and household surveys to confirm that the quantitative results based on South Korean data hold for other East Asian societies.
- ▶ The effects of removing the social norms on marriage and fertility are also similar between South Korea and Taiwan.

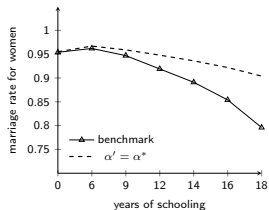
Quantitative analysis using data from Taiwan: No social norm on unequal gender division of childcare



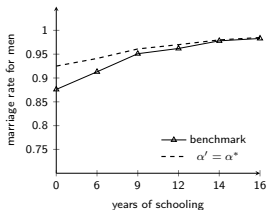
(a) Childlessness rates for married women



(b) Completed fertility for married mothers



(c) Marriage rates for women



(d) Marriage rates for men

Explaining the three facts about marriage and fertility

- ▶ High Marriage Rates (high gain from marriage, high value from having offspring)
- ▶ Low Total Fertility for Married Mothers (social norm on childcare division)
- ▶ Low Childlessness Rates for the Married (high value from having offspring)
- ▶ High Childlessness for Single Women (opportunity cost)

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: Accounting for fertility decline

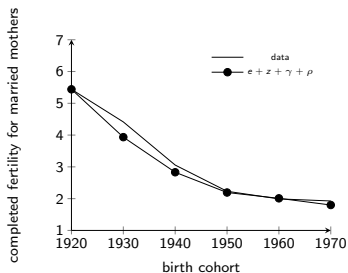


Figure 4 (a) Decline in fertility between 1920 and 1970 birth cohorts in the data and the benchmark historical simulation.

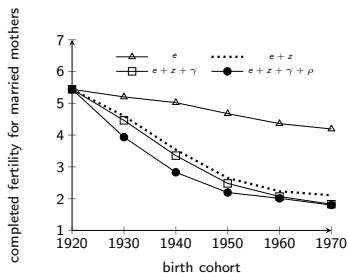


Figure 4 (b) Factors driving the decline in fertility: education (e), TFP (z), gender Wage Gap (γ), and returns to schooling (ρ).

- ▶ Across 1920–1970 cohorts, completed fertility of married mother drops from 5.443 to 1.927 according to the data, and from 5.443 to 1.800 according to the benchmark simulation ($e + z + \gamma + \rho$).
- ▶ Accounting for fertility decline between 1920 and 1970 cohorts: education: 34.3%; TFP: 57.1%; gender wage gap: 7.9%; returns to schooling: 0.7%.

Historical simulation: Implication of social norm of unequal division of childcare on fertility

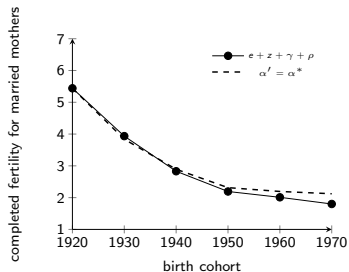


Figure 4 (c) Role of the social norm on unequal gender division of childcare ($\alpha' = \alpha^*$).

- ▶ If each couple had optimally divided childcare, completed fertility for married mothers in the 1970 birth cohort would have been 18% higher at 2.122, which is above the replacement rate.

Gender wage gap, optimal division of childcare (α), and social norm costs

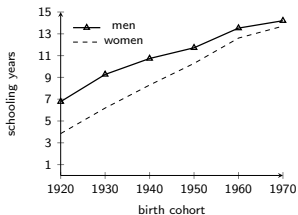


Figure 5 (a) Average schooling years of men and women

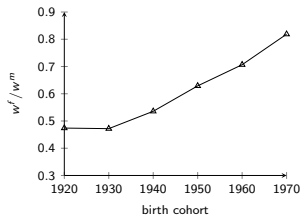


Figure 5 (b) Ratio of female wage to male wage (w^f / w^m)

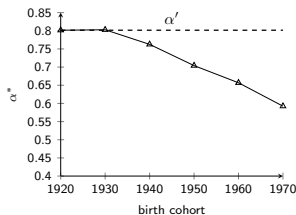


Figure 5 (c) Optimal proportion of childcare provided by wives (α^*)

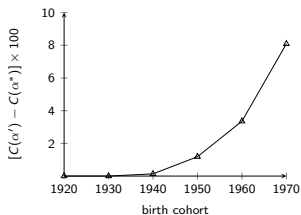


Figure 5 (d) Cost of the social norm

Explaining rapid decline in fertility over time

- ▶ Educational attainment among South Korean women increased rapidly in recent decades. The difference in the average number of schooling years decreases from 2.9 years for the 1920 cohort to 0.5 year for the 1970 cohort (Figure 5 (a)).
- ▶ Accordingly, the female wage rate, w_f , has quickly caught up with the male wage rate, w_m , over time. The ratio almost doubles from 0.474 for the 1920 cohort to 0.819 for the 1970 cohort (Figure 5 (b)).
- ▶ This implies a significant deviation of α^* from α' across the cohorts (Figure 5 (c)).
- ▶ The cost of the social norm in raising children increases across cohorts, indicating that the boom in women's education has heightened the tension between Confucian culture and socioeconomic development (Figure 5 (d)).

Policy Experiments: Childcare service/childcare subsidy

- ▶ We investigate two pro-natal policies that could potentially mitigate the negative fertility effects of this social norm.
- ▶ The first policy is for the government to share a proportion τ of childcare cost—for example, by building public childcare centers.
- ▶ The second policy is to provide households with a cash subsidy for each child, a_{sub} .
- ▶ To make total fertility be at a level that would prevailed in the absence of the social norm, we set $\tau = 0.039$ for the first policy and $a_{sub} = 0.0038$ for the second policy.

Policy Experiments: Childcare service/childcare subsidy

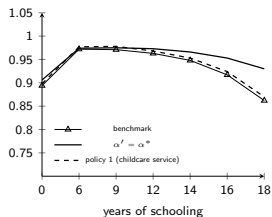


Figure 6 (a) Policy 1: marriage rates for women

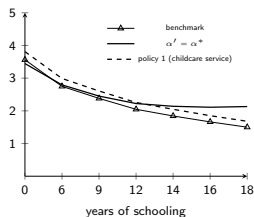


Figure 6 (b) Policy 1: completed fertility for married mothers

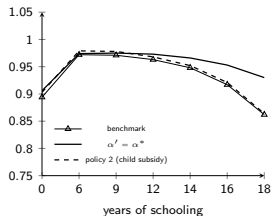


Figure 6 (c) Policy 2: marriage rates for women

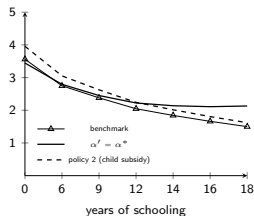


Figure 6 (d) Policy 2: completed fertility for married mothers

Policy experiments

- ▶ Although each policy increases the marriage rates and completed fertility of married mothers at all education levels, it cannot completely mitigate the role of the norm.
- ▶ Specifically, the magnitude of the effects among highly-educated women is smaller in the policy experiment than in the counterfactual experiment without the social norm.

Policy implications

- ▶ Our two policy experiments show that a government's pro-natal policies can be insufficient in boosting fertility for highly-educated women.
- ▶ For this group, the government may need to promote a social-norm revolution by advocating equal gender roles within a household. This proposal is challenging, because Confucian norms have persisted for thousands of years in East Asia.
- ▶ Also, as long as the social norm of unequal gender roles persists, pro-natal policies based on government subsidies would become less effective over time.

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