

The Autumn of Patriarchy

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October 17, 2024

Preliminary and Incomplete

Motivation

- Drastic changes in how families are organized in the past few decades
- Transition from patriarchal to egalitarian societies featuring:
 1. Declining fertility (Guinnane 2011)
 2. Declining marriage / dual parenthood (Stevenson and Wolfers 2007)
 3. Declining gender (income) gaps (Goldin 2014)
- Existing researches
 - Propose distinct theories for each phenomenon
 - Study two at a time (Regalia and Rios-Rull 2011, Santos and Weiss 2016, Greenwood et al. 2016)
- [This paper](#): develop a [unified model](#) to endogenize all three trends

This paper

- A simple model w/ marriage, fertility, and human capital dynamics
- **New mechanism** based on empirical evidence: marriage has differential impacts on the outcomes of boys relative to girls
- Two main findings:
 1. Prove and test a novel hypothesis: **The Impossible Trinity** of (1) high fertility, (2) high marriage rates, and (3) gender income equality
 2. Rising **factor-neutral** technology A_t can generate the transition from patriarchal to egalitarian societies, complementary to previous channels
 - SBTC favoring low fertility (Fernandez-Villaverde 2000)
 - Household appliance revolution favoring singles (Greenwood et al. 2016)
 - Structural changes favoring women (Ngai and Petrongolo 2017)

Model Setup

Basic setup

- Two period overlapping generations economy
- Total factor productivity A_t
- Individual with gender $g \in \{\sigma, \varphi\}$ and preference

$$u^g(c^g, n) = \left((1 - \beta) \cdot (c^g)^{\frac{\rho-1}{\rho}} + \beta \cdot n^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}} \quad (1)$$

where $\rho > 1$ following Greenwood et al. (2005)

- Homogeneous human capital within gender h_t^σ and h_t^φ
- Human capital gap is defined as

$$\Gamma_t^h = \frac{h_t^\sigma}{h_t^\varphi} \quad (2)$$

Marriage and fertility – men

- If single, men consume their labor income but have no children

$$V_t^{\sigma,s} = u(A_t h_t^{\sigma}, 0) \quad (3)$$

- Once married, husbands work and transfer α_t share of income to wives

$$V_t^{\sigma,m} = u((1 - \alpha_t)A_t h_t^{\sigma}, n_t^m) \quad (4)$$

- α_t is an endogenous object
- After marriage, husbands want n_t^m as high as possible

Marriage and fertility – single women

- Single female solves

$$V_t^{\circ,s} = \max_{c_t^{\circ,s}, l_t^s, n_t^s} u(c_t^{\circ,s}, n_t^s) \quad (5)$$

subject to budget and time constraints

$$c_t^{\circ,s} = A_t h_t^{\circ} l_t^s \quad l_t^s = 1 - \chi n_t^s$$

Marriage and fertility – married women

- Wives need to balance fertility and consumption

$$V_t^{\varnothing,m} = \max_{c_t^{\varnothing,m}, l_t^m, n_t^m} u(c_t^{\varnothing,m}, n_t^m) \quad (6)$$

subject to budget and time constraints

$$c_t^{\varnothing,m} = \underbrace{\alpha_t A_t h_t^{\varnothing}}_{\text{transfer from husband}} + \underbrace{A_t h_t^{\varnothing} l_t^m}_{\text{own labor income}}, \quad l_t^m = 1 - \chi n_t^m$$

- Within marriage, fertility is subject to veto
- Women receive idiosyncratic taste shock of marriage relative to being single $\tau \sim J(\tau)$

Aggregate quantities

- Let \mathcal{M}_t denote the share of women that choose to get married
→ Aggregate fertility rate n_t is given by

$$n_t = \mathcal{M}_t \cdot n_t^m + (1 - \mathcal{M}_t) \cdot n_t^s \quad (7)$$

- Average hours worked per female is

$$l_t^{\circ} = \mathcal{M}_t \cdot l_t^m + (1 - \mathcal{M}_t) \cdot l_t^s = 1 - \chi n_t \quad (8)$$

- Gender income gap

$$\Gamma_t^y = \frac{y_t^{\sigma^{\rightarrow}}}{y_t^{\circ}} = \frac{\Gamma_t^h}{l_t^{\circ}} \quad (9)$$

Human capital dynamics

- Evolution of gender-specific human capital

$$h_{t+1}^{\text{♀}} = (h_t^{\text{♀}})^{\theta} \quad \theta \in (0, 1) \quad (10)$$

$$h_{t+1}^{\text{♂}} = Z \cdot (\mathcal{M}_t \cdot h_t^{\text{♂}})^{\theta} \quad (11)$$

- Motivated by Bertrand and Pan (2013), Autor et al. (2019, 2023), Wasserman (2020), Reeves (2022), Frimmel et al. (2024)
- “The evidence supports an emerging consensus that growing up in a family without biological married parents produces more adverse consequences for boys than for girls.” — Wasserman (2020)

Model Characterization

Marriage market equilibrium

- Men are homogeneous and are on the short side of the marriage market
- Transfer α_t makes males indifferent between single and marriage

$$V_t^{\sigma^{\nearrow},m} = u((1 - \alpha_t)A_t h_t^{\sigma^{\nearrow}}, n_t^m) = u(A_t h_t^{\sigma^{\nearrow}}, 0) = V_t^{\sigma^{\nearrow},s} \implies \alpha_t(n_t^m) \quad (12)$$

- On the other hand, n_t^m is a function of α_t from married women's utility maximization $\implies n_t^m(\alpha_t)$
- Lemma 1: For given A_t , there exists a unique solution (n_t^m, α_t)

Marriage threshold

- There exists a threshold τ_t^* above which women get married

$$\mathcal{M}_t = 1 - J(\tau_t^*) \quad (13)$$

- Lemma 2: The threshold τ^* can be characterized as

$$\tau_t^* = \frac{1}{1 + \alpha_t \Gamma_t^h} \quad (14)$$

where $\alpha_t \Gamma_t^h$ gives the “transfer potential” of males

The Impossible Trinity

Model-implied relationships

- Relationships between n , \mathcal{M} , l° , and Γ^y at time t

$$\mathcal{M} = 1 - J \left(\frac{1}{1 + \alpha \Gamma^h} \right) \quad (15)$$

$$l^{\circ} = 1 - \chi n \quad (16)$$

$$\Gamma^y = \frac{\Gamma^h}{l^{\circ}} \quad (17)$$

- Adding the relationship between Γ^h and \mathcal{M} in the steady state reinforces the mechanism

$$\Gamma^h = Z^{\frac{1}{1-\theta}} \cdot \mathcal{M}^{\frac{\theta}{1-\theta}} \quad (18)$$

Case 1: High fertility and dual parenthood

- With high fertility, labor supply is low

$$l^{\varnothing} = 1 - \chi n$$

- To achieve dual parenthood, the human capital gap cannot be too low

$$\mathcal{M} = 1 - J \left(\frac{1}{1 + \alpha \Gamma^h} \right)$$

- Gender income gap is necessarily high

$$\Gamma^y = \frac{\Gamma^h}{l^{\varnothing}}$$

- Dual parenthood reinforces the high human capital gap

$$\Gamma^h = Z^{\frac{1}{1-\theta}} \cdot \mathcal{M}^{\frac{\theta}{1-\theta}}$$

Case 2: High fertility and gender income equality

- With high fertility, labor supply is low

$$l^{\text{♀}} = 1 - \chi n$$

- For gender income gap to be low, Γ^h needs to be very low

$$\Gamma^y = \frac{\Gamma^h}{l^{\text{♀}}}$$

- When Γ^h is very low, \mathcal{M} is low

$$\mathcal{M} = 1 - J \left(\frac{1}{1 + \alpha \Gamma^h} \right)$$

- Low \mathcal{M} reinforces very low Γ^h

$$\Gamma^h = Z^{\frac{1}{1-\theta}} \cdot \mathcal{M}^{\frac{\theta}{1-\theta}}$$

Case 3: Dual parenthood and gender income equality

- To achieve high \mathcal{M} , human capital gap Γ^h needs to be high

$$\mathcal{M} = 1 - J \left(\frac{1}{1 + \alpha \Gamma^h} \right)$$

- To achieve low gender income gap, l^{\varnothing} needs to be very high

$$\Gamma^y = \frac{\Gamma^h}{l^{\varnothing}}$$

- To achieve very high l^{\varnothing} , fertility needs to be very low

$$l^{\varnothing} = 1 - \chi n$$

- High \mathcal{M} reinforces high Γ^h

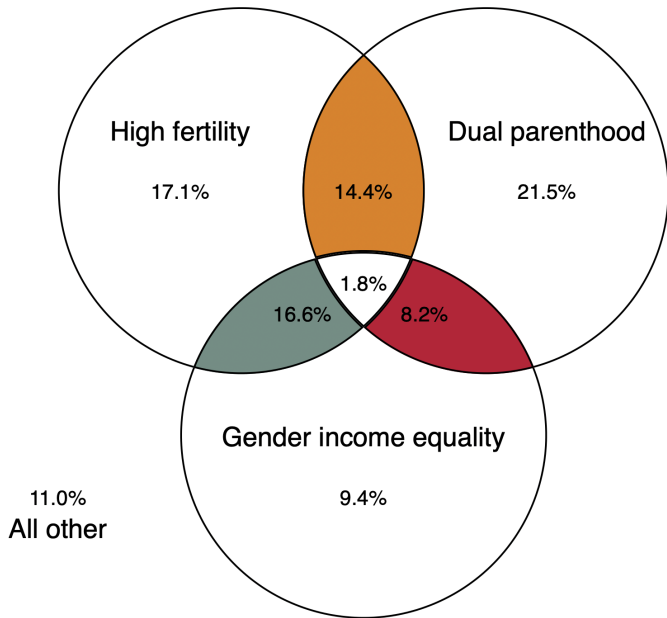
$$\Gamma^h = Z^{\frac{1}{1-\theta}} \cdot \mathcal{M}^{\frac{\theta}{1-\theta}}$$

Discussions

- The impossible coexistence of
 1. High fertility
 2. High marriage / dual parenthood
 3. Gender income equality
- But countries can have only one, or even none of the three
- Even though each of the three could be a desirable policy goal, policymakers need to make trade-offs
- What does it look like in the data?

Data source and grouping

- Fertility data from the U.N.
- Share of children born outside of marriage and gender gap in median earnings from the OECD database
- Unbalanced panel of 37 countries from 1970 to 2014, 721 observations
- Grouping based on sample averages of each variable:
 - Label as “High fertility” if $TFR_{it} > 1.69$
 - Label as “Dual parenthood” if $out\ of\ marriage_{it} < 31.4\%$
 - Label as “Gender income equality” if $gap_{it} < 17.2\%$



The Autumn of Patriarchy (incomplete)

Mechanism

- Lemma 3: When $\rho > 1$, n_t^m and α_t both decline in A_t

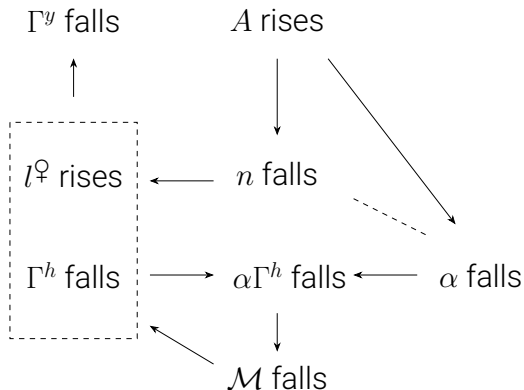
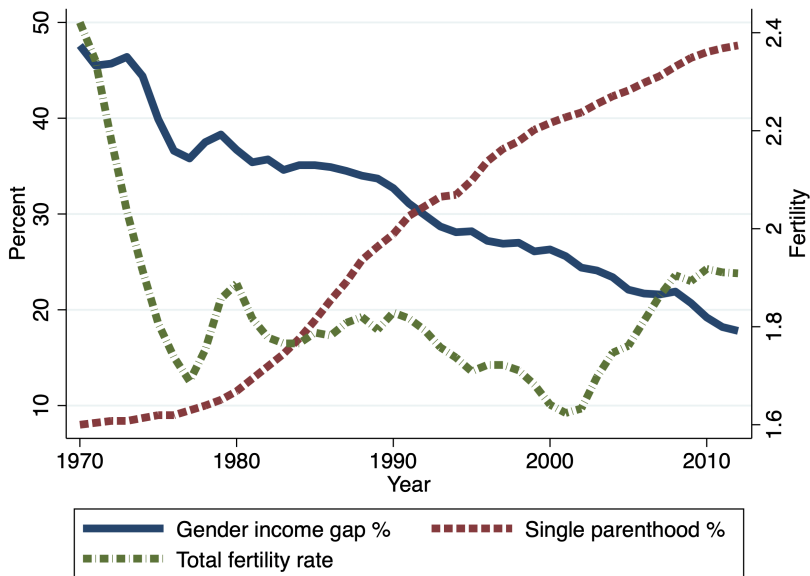


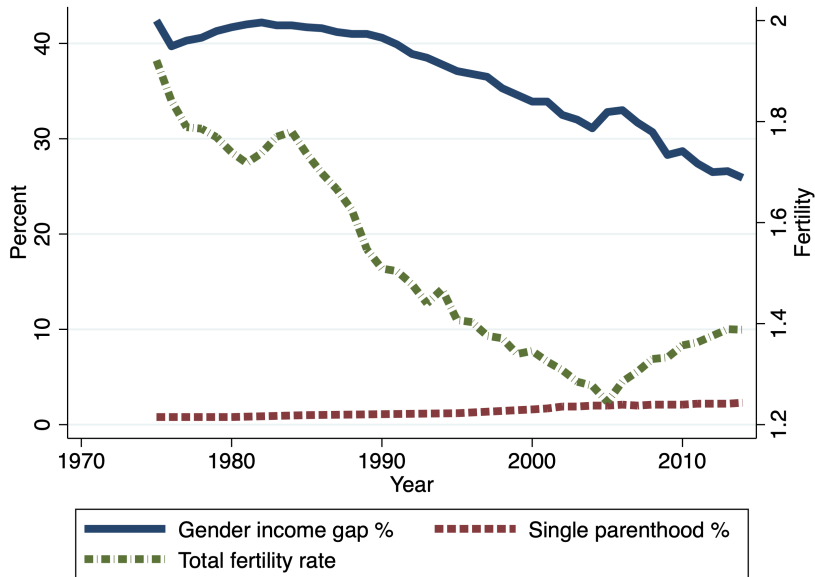
Figure 1: The demise of patriarchy

- Differences in $J(\tau)$ lead to distinct transition path across countries

The case of the U.K.



The case of Japan



Is gender equality in childcare a way out?

- If both genders share the same childcare burden, then $\Gamma^y = \Gamma^h$
- There is still a tension between \mathcal{M} and Γ^y because high $\mathcal{M} \Rightarrow$ high Γ^h
- To reconcile high \mathcal{M} with low Γ^y , men need to take **more** childcare responsibilities than women
 1. How feasible is this?
 2. Is it an efficient allocation of labor when Γ^h is high?
 3. Because men have the outside option of staying single and having no children, α needs to be low \Rightarrow low \mathcal{M} ?
- Empirically, no precedent yet

Conclusion

- A unified model of the transition from patriarchal to egalitarian societies
- Prove and test [The Impossible Trinity](#): high fertility, dual parenthood, gender income equality
- Relentless technological growth can generate the transition

“...and the bells of glory that announced to the world the good news that the uncountable time of eternity had come to an end.”

The Autumn of the Patriarch by Gabriel García Márquez

Appendix

Some examples

D – dual parenthood, G : gender income equality, F – high fertility

- None: Austria, United Kingdom 1995-2003
- Only D : Canada, Switzerland, Germany 1992-2006, Japan, South Korea
- Only G : Germany 2009-2014, Hungary, Portugal
- Only F : United States 1994-2013, Finland
- $D + G$: Greece, Italy, Poland
- $F + G$: Belgium, Norway, New Zealand, Sweden
- $F + D$: United Kingdom 1970-1994, Israel, USA 1973-1993
- $F + D + G$: Australia 1991-2003 ($F + G$ afterwards)