The Autumn of Patriarchy

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October 10, 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 (Galor and Weil 2020, Greenwood et al. 2002)
  2. Declining marriage / dual parenthood (Stevenson and Wolfers 2007)
  3. Declining gender (income) gaps (Goldin 2014, Ngai and Petrongolo 2017)
- Existing researches
  - → Propose distinct theories for each phenomenon
  - → Study two phenomenons together, sometimes using the third as the exogenous driving force (Santos and Weiss 2016, Greenwood et al. 2016)
- This paper: develop a unified model to endogenize all three trends

This paper

- A 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
- Prove and test a novel hypothesis: The Impossible Trinity of
  1. High fertility
  2. High marriage / dual parenthood
  3. Low gender income gap
- Rising factor-neutral technology A_t can generate the transition from patriarchal to egalitarian societies, complementary to previous channels
  - $\rightarrow$ Skill-based technical change favoring quality over quantity
  - $\rightarrow$ Household appliance revolution favoring single parenthood
  - $\rightarrow$ Structural changes favoring women

Model Setup

Basic setup

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

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

  where $\rho > 1$ following Greenwood et al. (2005)
- Homogenous human capital within gender $h_t^{♂}$ and $h_t^{♀}$
- Human capital gap is defined as

$$\Gamma_t^h = \frac{h_t^{♂}}{h_t^{♀}} \tag{2}$$

Marriage and fertility – men

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

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

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

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

  → α_t is an endogenous object

  → After marriage, husbands want n_t^m as high as possible

Marriage and fertility – single women

- Single female solve single females solve

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

subject to budget and time constraints

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

Marriage and fertility – married women

- Women receive idiosyncratic taste shock on marriage $\tau \sim J(\tau)$
- Wives need to balance fertility and consumption

$$V_t^{♀,m}(\tau) = \max_{c_t^{♀,m}, l_t^m, n_t^m} \quad \tau \cdot u(c_t^{♀,m}, n_t^m) \tag{6}$$

subject to budget and time constraints

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

- Within marriage, fertility is subject to veto

Aggregate quantities

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

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

  - → Average hours worked per female is

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

  - → Gender income gap

$$\Gamma_t^y = \frac{y_t^{\male}}{y_t^{\female}} = \frac{\Gamma_t^h}{l_t^{\female}} \tag{9}$$

Human capital dynamics

- Evolution of human capital

$$h_{t+1}^{\female} = (h_t^{\female})^{\theta} \qquad \theta \in (0,1) \tag{10}$$

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

  where $Z > 1$ is a constant

- 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)

Endogenous technological growth

- Endogenous technological growth

$$\frac{A_{t+1} - A_t}{A_t} = B \cdot A_t^{-\lambda} \cdot (1 + l_t^{\female})^{\eta} \tag{12}$$

- Female labor force participation contributes to innovation
- This part is not essential for The Impossible Trinity, but helps to explain the speedy transition

Model Characterization

Marriage market equilibrium

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

$$V_t^{♂,m} = u((1-\alpha_t)A_t h_t^{♂}, n_t^m) = u(A_t h_t^{♂}, 0) = V_t^{♂,s} \Longrightarrow \alpha_t(n_t^m) \qquad (13)$$

- On the other hand, n_t^m is a function of α_t from married women's utility maximization $\Longrightarrow n_t^m(\alpha_t)$
- Lemma 1: For given A_t, there exists a unique solution (n_t^m, α_t)
- Lemma 2: n_t^m and α_t both decline in A_t when $\rho > 1$

Marriage threshold

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

$$1 = \frac{V_t^{♀,s}}{V_t^{♀,m}(\tau_t^*)} \tag{14}$$

$$\mathcal{M}_t = 1 - J(\tau_t^*) \tag{15}$$

- Lemma 3: The threshold τ^* can be characterized as

$$\tau_t^* = \frac{1}{1 + \alpha_t \Gamma_t^h} \tag{16}$$

where $\alpha_t \Gamma_t^h$ gives the "transfer potential"

The Impossible Trinity

Steady-State Relationships

- Relationships between n_t, $\mathcal{M}_t$, and Γ_t^y in the steady state

$$\mathcal{M} = 1 - J\left(\frac{1}{1+\alpha\Gamma^h}\right) \tag{17}$$

$$l^{\female} = 1 - \chi n \tag{18}$$

$$\Gamma^y = \frac{\Gamma^h}{l^{\female}} \tag{19}$$

$$\Gamma^h = h^{\male} = Z^{\frac{1}{1-\theta}} \cdot \mathcal{M}^{\frac{\theta}{1-\theta}} \tag{20}$$

- $h^{\female} = 1$ is a normalization

Case 1: High fertility and dual parenthood

- With high fertility, labor supply is low

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

- With dual parenthood, human capital gap is high

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

- Gender income gap is necessarily high

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

Case 2: High fertility and gender income equality

- With high fertility, labor supply is low

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

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

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

- For Γ^h to be low, $\mathcal{M}$ needs to be low

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

Case 3: Dual parenthood and gender income equality

- With high $\mathcal{M}$, human capital gap Γ^h is high

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

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

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

- To achieve high $l^{\female}$, fertility needs to be low

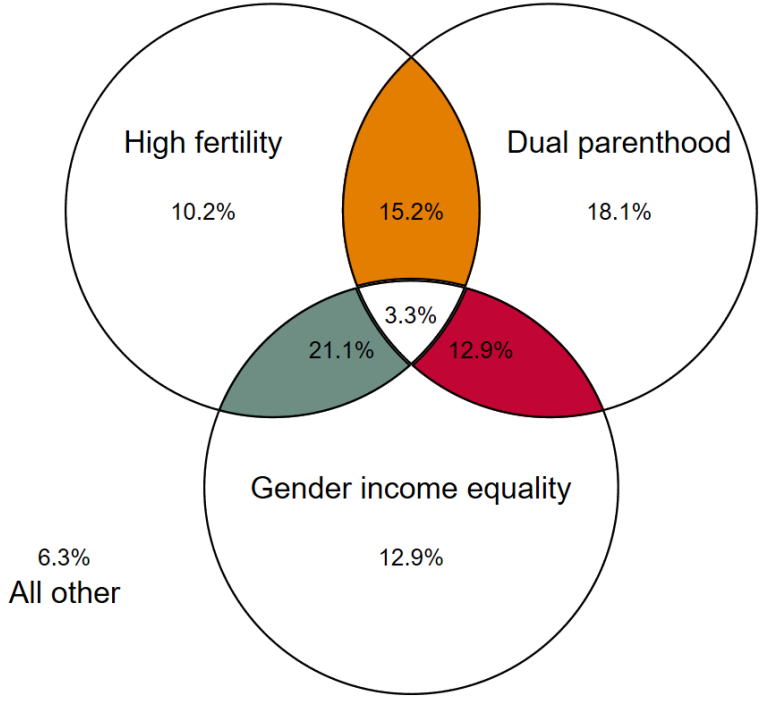
$$l^{\female} = 1 - \chi n$$

Discussions

- The impossible coexistence of
  1. High fertility
  2. High marriage / dual parenthood
  3. Low gender income gap
- But it is possible for countries to have only one, or even none of the three
- 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, 541 observations
- Grouping based on sample averages:
  - $\rightarrow$ Label as "High fertility" if $\text{TFR}_{it} > 1.726$
  - $\rightarrow$ Label as "Dual parenthood" if out of $\text{marriage}_{it} < 32.2\%$
  - $\rightarrow$ Label as "Gender income equality" if $\text{gap}_{it} < 17.8\%$


High fertility
10.2%
15.2%
Dual parenthood
18.1%
3.3%
21.1%
12.9%
Gender income equality
12.9%
6.3%
All other

Some examples

- 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)

The Autumn of Patriarchy (in progress)

Mechanism

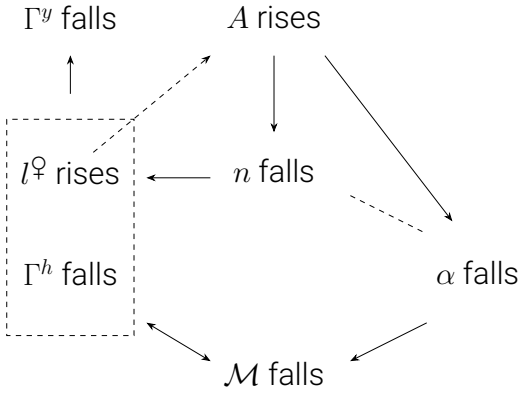


Figure 1: The demise of patriarchy

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 $\mathcal{M}$?

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 triggers 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