

# The Autumn of Patriarchy

Anson Zhou

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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 phenomena 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 link all three trends

# This paper

- A model w/ marriage, fertility, and human capital dynamics
- **New mechanism** based on empirical evidence: dual parenthood 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
  - Skill-based technical change favoring quality over quantity
  - Household appliance revolution favoring single parenthood
  - Structural changes favoring women

# 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)

- Homogenous human capital within gender  $h_t^\sigma$  and  $h_t^\varphi$
- 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  $\alpha_t$  share of income to wives

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

- $\alpha_t$  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

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

subject to budget and time constraints

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

# Marriage and fertility – married women

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

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

subject to budget and time constraints

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

- Within marriage, fertility is subject to veto



# 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 human capital

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

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

where  $Z > 1$  is a constant

- **Assumption:** human capital transmission operates within gender through family ties  $\Rightarrow$  boys are more sensitive to changes in  $\mathcal{M}$  than girls
- Evidence: Autor et al. (2019), Wasserman (2020), Frimmel et al. (2024)

# Endogenous technological growth

- Endogenous technological growth

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

- 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  $\alpha_t$  makes male indifferent between single and marriage

$$V_t^{\sigma^{\rightarrow},m} = u((1 - \alpha_t)A_t h_t^{\sigma^{\rightarrow}}, n_t^m) = u(A_t h_t^{\sigma^{\rightarrow}}, 0) = V_t^{\sigma^{\rightarrow},s} \implies \alpha_t(n_t^m) \quad (13)$$

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

# Marriage threshold

- There exists a threshold  $\tau_t^*$  above which women get married

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

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

- Lemma 3: The threshold  $\tau^*$  can be characterized as

$$\tau_t^* = \frac{1}{1 + \alpha_t \Gamma_t^h} \quad (16)$$

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

# The Impossible Trinity

# Steady-State Relationships

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

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

$$l^\varnothing = 1 - \chi n \quad (18)$$

$$\Gamma^y = \frac{\Gamma^h}{l^\varnothing} \quad (19)$$

$$\Gamma^h = Z^{\frac{1}{1-\theta}} \cdot \mathcal{M}^{\frac{\theta}{1-\theta}} \quad (20)$$

- $h^\varnothing = 1$  is a normalization



# Case 1: High fertility and dual parenthood

- With high fertility, labor supply is low

$$l_{\text{♀}}^{\circ} = 1 - \chi n$$

- 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

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

- Classic patriarchal societies

## Case 2: High fertility and gender income equality

- With high fertility, labor supply is low

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

- For gender income gap to be low,  $\Gamma^h$  needs to be low

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

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

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

- Nordic countries

## Case 3: Dual parenthood and gender income equality

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

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

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

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

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

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

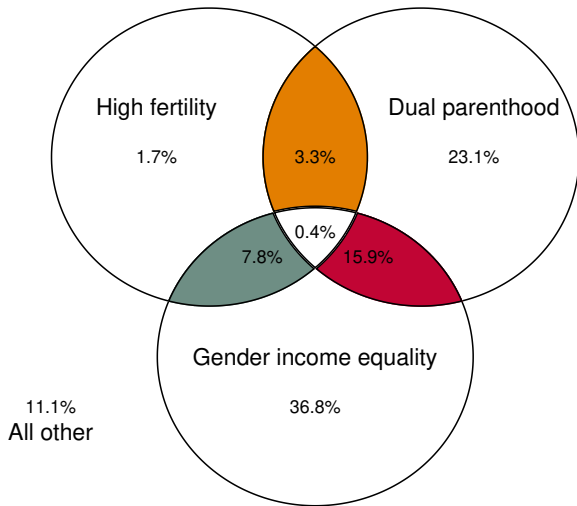
# Discussions

- 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?

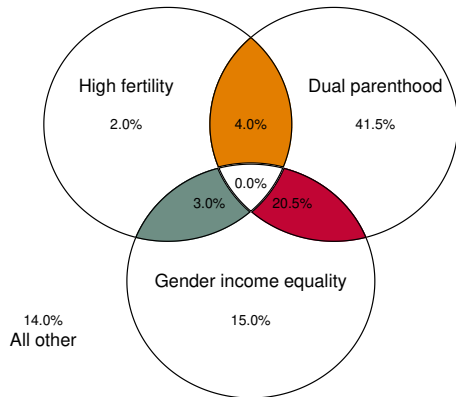
# Data source and grouping

- Fertility data from the U.N.
  - Label as “High fertility” if  $\text{TFR}_{it} > 2$
- Share of children born outside of marriage from the OECD database
  - Label as “Dual parenthood” if  $\text{share}_{it} < 30\%$
- Gender gap in median earnings from the OECD database
  - Label as “Gender income equality” if  $\text{gap}_{it} < 20\%$
- Unbalanced panel of 37 countries from 1970 to 2014, 541 observations

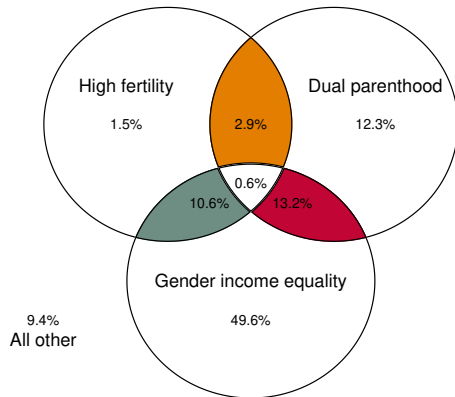
## The Impossible Trinity



### Before 2000



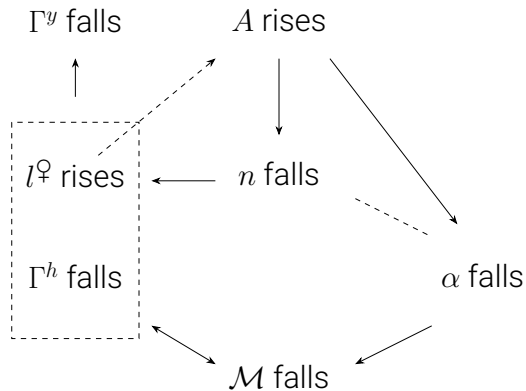
### After 2000



The Autumn of Patriarchy (in progress)



# Mechanism



*Figure 1: The demise of patriarchy*

# 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