The Autumn of Patriarchy

Anson Zhou

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Motivation

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

Gabriel García Márquez, *The Autumn of the Patriarch*

- Patriarchy is in decline, most notably:
  1. Declining fertility (Guinnane 2011) data
  2. Declining marriage / dual parenthood (Stevenson and Wolfers 2007) data
  3. Declining gender (income) gaps (Goldin 2014) data
- Existing researches
  - → Propose distinct theories for each phenomenon
  - → Study two at a time (Regalia and Rios-Rull 2011, Greenwood et al. 2016)

This paper

- This paper: develop a unified model to endogenize all three trends
  1. Marriage as an institution to share the costs of raising children
  2. Women shoulder more childcare responsibilities
- Prove a novel hypothesis: The Impossible Trinity of (1) high fertility, (2) high marriage rates, and (3) gender income equality
- Test the hypothesis and establish data support
- 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)

Roadmap

- A static model
- The Impossible Trinity
- A dynamic model
- Conclusion

Setup and Characterization

A Static Model

Basic setup

- Total factor productivity A_t
- Individual of equal mass 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 $\rho > 1$ so that $u(c, 0)$ is well-defined
- Homogeneous 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

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

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

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

  → α_t is an endogenous object

- After marriage, husbands want n_t^m as high as possible
  → Will talk about the sharing of childcare burden later

Marriage and fertility – single women

- Single female solves

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

subject to budget and time constraints

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

- Simple consumption-fertility trade-off through endogenous labor supply

Marriage and fertility – married women

- Wives need to balance fertility and consumption

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

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 $\Longrightarrow$ females determine fertility
- Women receive idiosyncratic taste shock of marriage relative to being single $\tau \sim J(\tau)$ (i.e., other considerations of marriage)

Aggregate quantities

- Let $\mathcal{M}_t$ denote the share of women that choose to get married
  - → Aggregate fertility rate n_t and share of children with both parents

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

$$\mathcal{D}_t = \frac{\mathcal{M}_t \cdot n_t^m}{n_t} \tag{8}$$

  - → Average hours worked per female is

$$l_t^{♀} = \mathcal{M}_t \cdot l_t^m + (1 - \mathcal{M}_t) \cdot l_t^s = 1 - \chi n_t \tag{9}$$

  - → Gender income gap

$$\Gamma_t^y = \frac{y_t^{♂}}{y_t^{♀}} = \frac{\Gamma_t^h}{l_t^{♀}} \tag{10}$$

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

$$V_t^{\male,m} = u((1-\alpha_t)A_t h_t^{\male}, n_t^m) = u(A_t h_t^{\male}, 0) = V_t^{\male,s} \Longrightarrow \alpha_t(n_t^m) \tag{11}$$

- On the other hand, n_t^m is a function of α_t from married women's utility maximization $\Longrightarrow n_t^m(\alpha_t)$
- A fixed-point problem of (α_t, n_t^m)

Determination of α_t and n_t^m

- Lemma 1: For given A_t, there exists a unique solution (n_t^m, α_t)

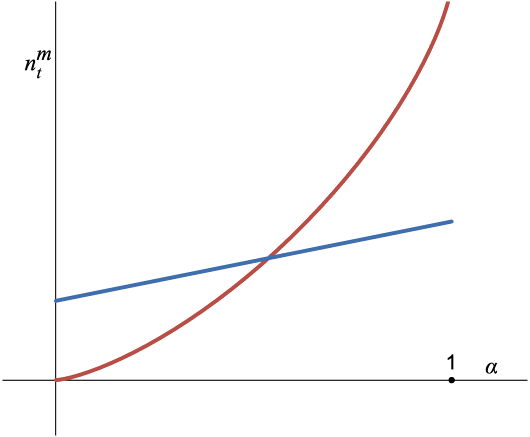


Figure 1: $n_t^m(\alpha_t)$ (blue) and $\alpha_t(n_t^m)$ (red)

Marriage threshold

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

$$\mathcal{M}_t = 1 - J(\tau_t^*) \tag{12}$$

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

$$\tau_t^* = \frac{1}{1 + \alpha_t \Gamma_t^h} \tag{13}$$

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

- Lemma 2 also implies that $\mathcal{D}_t$ is monotonically increasing in $\mathcal{M}_t$

Theory and Evidence

The Impossible Trinity

Model-implied relationships

- The Impossible Trinity: high n_t, high $\mathcal{M}_t$, and low Γ_t^y cannot co-exist
- Relationships between n_t, $\mathcal{M}_t$, $l_t^{♀}$, and Γ_t^y:

$$\mathcal{M}_t = 1 - J\left(\frac{1}{1+\alpha_t \Gamma_t^h}\right) \tag{14}$$

$$l_t^{♀} = 1 - \chi n_t \tag{15}$$

$$\Gamma_t^y = \frac{\Gamma_t^h}{l^{♀}} \tag{16}$$

Case 1: High fertility and dual parenthood

- With high fertility, labor supply is low

$$l_t^{\female} = 1 - \chi n_t$$

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

$$\mathcal{M}_t = 1 - J\left(\frac{1}{1 + \alpha_t \Gamma_t^h}\right)$$

- Gender income gap is necessarily high

$$\Gamma_t^y = \frac{\Gamma_t^h}{l_t^{\female}}$$

- Traditional patriarchal societies

Case 2: High fertility and gender income equality

- With high fertility, labor supply is low

$$l_t^{♀} = 1 - \chi n_t$$

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

$$\Gamma_t^y = \frac{\Gamma_t^h}{l_t^{♀}}$$

- When Γ_t^h is very low, $\mathcal{M}_t$ is low

$$\mathcal{M}_t = 1 - J\left(\frac{1}{1 + \alpha_t \Gamma_t^h}\right)$$

- Nordic countries

Case 3: Dual parenthood and gender income equality

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

$$\mathcal{M}_t = 1 - J\left(\frac{1}{1+\alpha_t \Gamma_t^h}\right)$$

- To achieve low gender income gap, $l_t^{♀}$ needs to be very high

$$\Gamma_t^y = \frac{\Gamma_t^h}{l_t^{♀}}$$

- To achieve very high $l_t^{♀}$, fertility needs to be very low

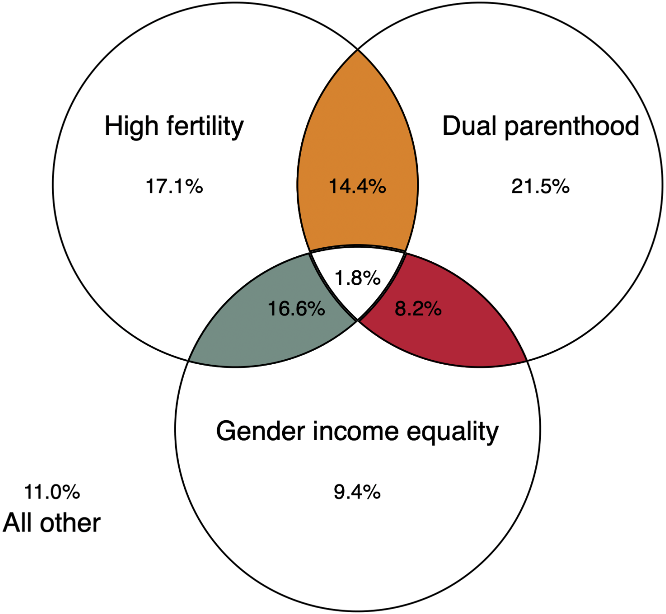
$$l_t^{♀} = 1 - \chi n_t$$

Discussions

- Takeaway: Even though each of the three could be a desirable policy goal, policymakers cannot have them all and need to make trade-offs
  - $\rightarrow$ Policies that change χ:
    1. Raising χ reduces Γ^y, but dampens n_t
    2. Lowering χ raises n_t, but boosts Γ^y
  - $\rightarrow$ Policies that change $J(\cdot)$ could raise $\mathcal{M}_t$, but there is another tension between $\mathcal{M}$ and Γ^y from human capital formation
- In fact, countries may 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, 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$_{it} < 17.2\%$



examples TFR=2

The Autumn of Patriarchy

A Dynamic Model

Human capital dynamics

- Evolution of gender-specific human capital

$$h^{♀}_{t+1} = (h^{♀}_t)^{\theta} \cdot (\mathcal{M}_t)^{\psi^{♀}} \tag{17}$$

$$h^{♂}_{t+1} = Z \cdot (h^{♂}_t)^{\theta} \cdot (\mathcal{M}_t)^{\psi^{♂}} \tag{18}$$

  where $Z > 1, \theta \in (0, 1)$ and more importantly, $\psi^{♂} > \psi^{♀} > 0$

- 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)

Channel 1: Rising opportunity costs of children

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

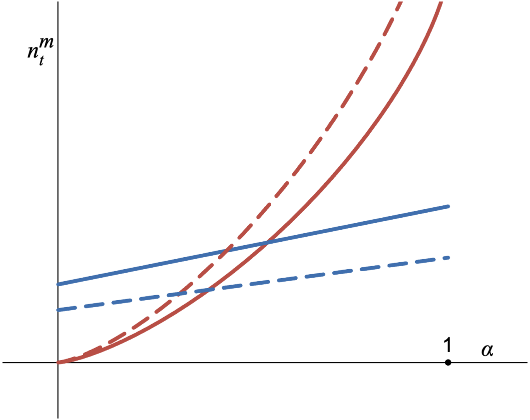


Figure 2: $n_t^m(\alpha_t)$ (blue) and $\alpha_t(n_t^m)$ (red)

Dynamic interactions between Γ^h and $\mathcal{M}$

- From marriage market equilibrium

$$\mathcal{M}_t = 1 - J\left(\frac{1}{1+\alpha_t\Gamma_t^h}\right)$$

- From human capital dynamics

$$\Gamma_{t+1}^h = Z \cdot (\Gamma_t^h)^\theta \cdot (\mathcal{M}_t)^{\psi^{♂}-\psi^{♀}}$$

which implies in steady-state

$$\Gamma^h = Z^{\frac{1}{1-\theta}} \cdot (\mathcal{M}_t)^{\frac{\psi^{♂}-\psi^{♀}}{1-\theta}} \Longrightarrow \frac{d\Gamma^h}{d\mathcal{M}} > 0 \tag{19}$$

Channel 2: Declining α_t triggers a spiral

- Lemma 4: Declining α_t reduces long-run $\mathcal{M}$ and Γ^h

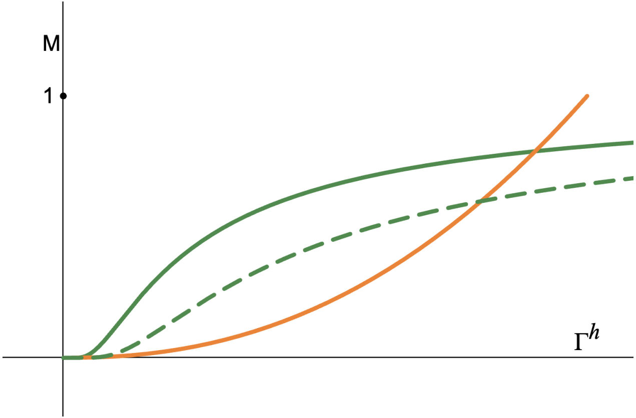


Figure 3: $\mathcal{M}(\Gamma^h; \alpha)$ (green) and $\Gamma^h(\mathcal{M})$ (orange)

The autopsy of patriarchy

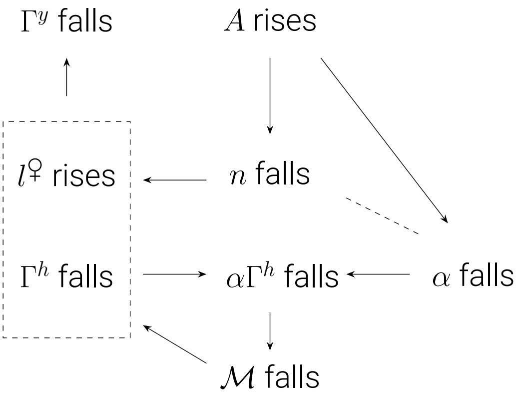
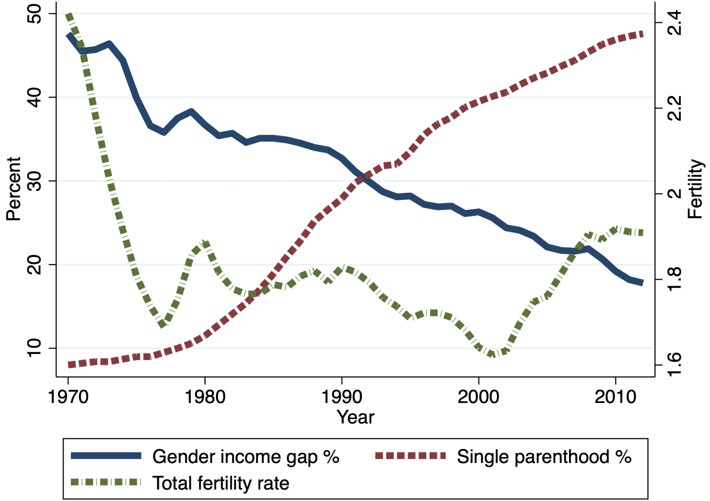


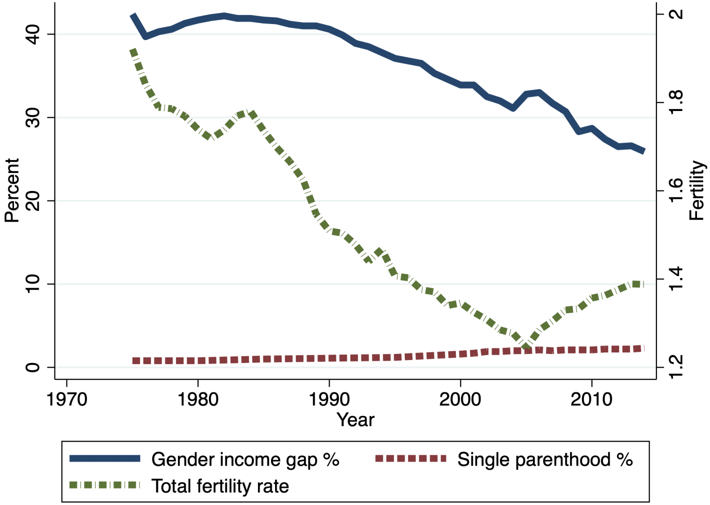
Figure 4: Mechanism

- The demise of patriarchy is inevitable
- Differences in $J(\tau)$ lead to distinct timing and patterns 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

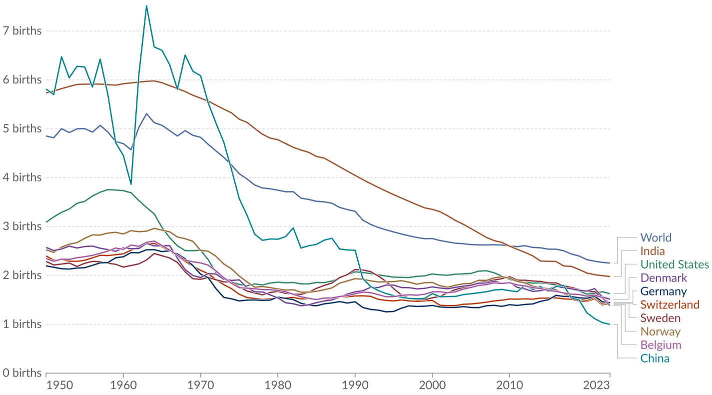
Conclusion

- 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
- Future work: a quantitative evaluation(?)

Appendix

Fertility rate: children per woman

The fertility rate[1], expressed as the number of children per woman, is based on age-specific fertility rates in one particular year.



Data source: UN, World Population Prospects (2024)

1. Fertility rate: The total fertility rate is a period metric. It summarizes fertility rates across all age groups in one particular year. For a given year, the total fertility rate represents the average number of children that would be born to a hypothetical woman if she (1) lived to the end of her childbearing years, and (2) experienced the same age-specific fertility rates throughout her whole reproductive life as the age-specific fertility rates seen in that particular year. It is different from the actual average number of children that women have. The fertility rate should not be confused with biological fertility, which is about the ability of a person to conceive. Read more: Fertility rate

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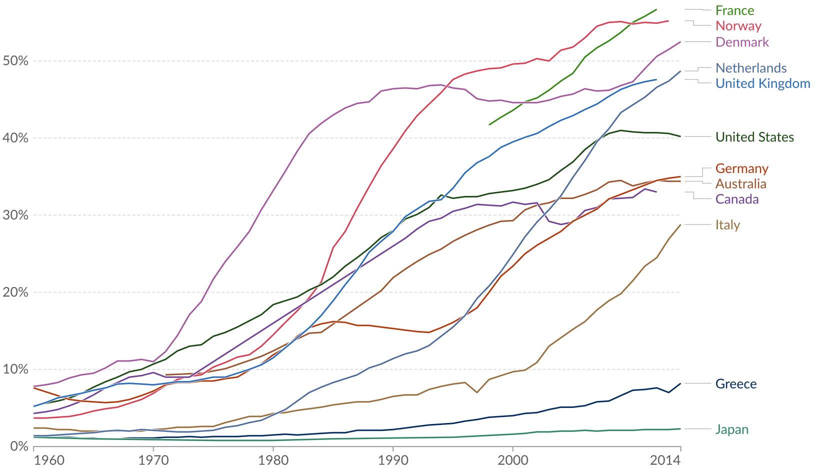
Share of children who were born outside of marriage

Share of all children born to mothers who were not married at the time of birth.



Data source: OECD Family Database

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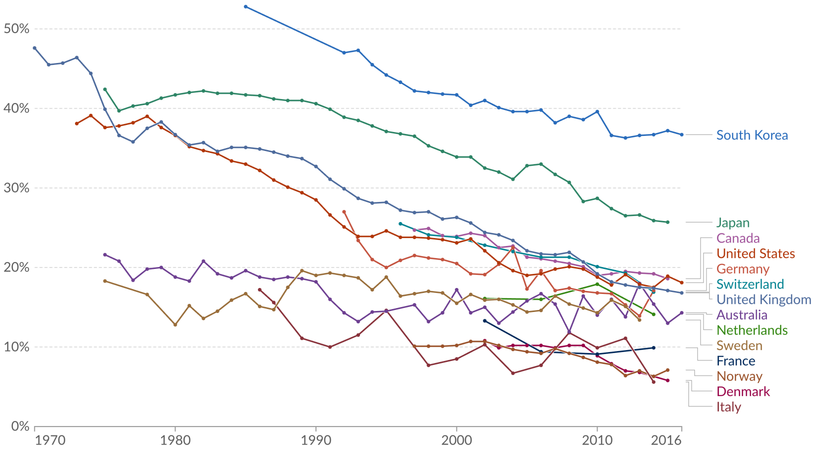
Unadjusted gender gap in median earnings, 1970 to 2016

Our World in Data

The gender wage gap is unadjusted and is defined as the difference between median earnings of men and women relative to median earnings of men. Estimates refer to full-time employees and to self-employed workers.



Data source: OECD, Gender Wage Gap (2017)

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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)

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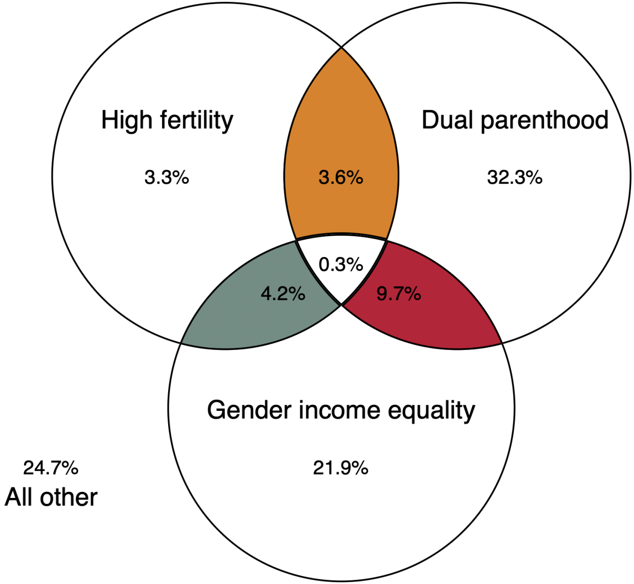
High fertility
3.3%
3.6%
Dual parenthood
32.3%
0.3%
4.2%
9.7%
Gender income equality
21.9%
24.7%
All other

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