The Autumn of Patriarchy

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October 15, 2024

Preliminary

Abstract

This paper develops a unified model that explains the transition from patriarchal societies, featuring high fertility, dual parenthood, and large gender gaps, to egalitarian ones, featuring low fertility, rising single parenthood, and narrow gender gaps. Based on the model, I propose and empirically test a novel Impossible Trinity hypothesis: high fertility, dual parenthood, and gender income equality cannot coexist. I also show that factor-neutral technological changes raise the opportunity cost of having children, sowing seeds of the inevitable demise of patriarchy – the pace of which could differ across countries due to social norms.

JEL classification: D13, J11, J12, J13, J16

Keywords: patriarchy, fertility, gender equality, family structure

"...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

1. Introduction

After dominating human society for an uncountable number of years, patriarchy has been tailing off in recent decades. Amidst the multifaceted transition towards a more egalitarian society (Folbre 2021), three key trends have received most of the attention: fertility rates have been falling, marriage and dual parenthood have been declining, and gender gaps in income and wealth have been converging.

This paper develops a unified framework that links and accounts for all the trends mentioned above. In particular, I study an overlapping generations (OLG) economy where males and females make marriage, fertility, and labor supply decisions. The model has three features. First, individual optimization and the marriage market clearing condition pin down the equilibrium levels of fertility, marriage rate, and transfers within marriage. Second, the gender income gap is governed by the prevailing gender gaps in human capital and female labor supply. Lastly, marriage rates affect the evolution of gender-specific human capital across generations.

The model incorporates a new fact established by the recent empirical literature: marriage, an institution to share income and specialize in childcare, has differential impacts on the human capital of boys relative to girls. Quoting Wasserman (2020), "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." This differential sensitivity channel implies that the rise of single parenthood has profound implications for future gender gaps in human capital, and hence marriage, fertility, and labor supply decisions.

Based on the model, I propose a novel Impossible Trinity hypothesis: high fertility, dual parenthood, and gender income equality cannot coexist. For any pair, I prove that achieving them necessarily implies the opposite of the third. Therefore, while each one of the three outcomes could be a desirable policy goal, policymakers cannot have them all and need to make trade-offs.

I empirically test the Impossible Trinity hypothesis using data from an unbalanced panel of countries between 1970 and 2014. I divide countries into high fertility, dual parenthood, and gender income equality groups. Then, I plot the Venn diagram to inspect their intersections. I find that less than 2% of the observations achieved high fertility, dual parenthood, and gender income equality jointly. This finding supports the Impossible Trinity hypothesis, underscoring the inherent conflicts among the three outcomes.

Lastly, I study the demise of patriarchy. I show that factor-neutral technological changes raise the opportunity cost of children and thus simultaneously trigger the declines of fertility, dual parenthood, and gender income gaps. The pace and direction of the transition, e.g., the speed at which dual parenthood diminishes, vary across countries due to social norms.

Related Literature

This paper is closely related to the literature on family economics and gender economics, especially the large body of papers that study historical changes in fertility (Guinnane 2011), marriage (Stevenson and Wolfers 2007), and gender gaps (Goldin 2014).[1]

This paper makes three contributions to the literature. First, while past papers propose distinct theories for each trend or study at most two trends at the same time (e.g., Regalia and Rios-Rull 2001, Santos and Weiss 2016, Greenwood et al. 2016), I propose a unified model that knits all three facts together and show that they can be driven by the same underlying force.

Second, by taking a holistic approach, I propose and empirically test the Impossible Trinity hypothesis, a novel and central conjecture that links the scattered fields in the literature. The hypothesis also points out an important boundary for policymakers: while each one of high fertility, dual parenthood, and gender income equality could be a desirable policy goal, policymakers can achieve at most two of the three.

Third, I show that factor-neutral technological growth can simultaneously gener-

[1] Also see Greenwood et al. (2017) for an excellent review.

ate falling fertility, marriage, and gender income gaps. This mechanism complements existing channels that rely on factor-biased technological changes, such as the skill-biased technical change that favors child quality over child quantity (Galor and Weil 2000, Fernandez-Villaverde 2001), the household appliance revolution that favors single household over married ones (Greenwood et al. 2023), and structural transformation that favors the labor market prospects of women over men (Ngai and Petrongolo 2017).

The rest of the paper is organized as follows: Section 2 presents the unified model; Section 3 proposes and tests the Impossible Trinity hypothesis; Section 4 discusses the demise of patriarchy, and Section 5 concludes.

2. Model

I study a two-period overlapping generations economy with t to denote time.

Individuals are indexed by gender $g \in \{♂, ♀\}$. For each gender, the utility from consumption c^g and fertility n is given by

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

where $\rho > 1$ following Jones and Schoonbroodt (2010).

Within each gender, I assume that individuals have the same amount of human capital within each generation denoted by $h_t^{♂}$ and $h_t^{♀}$ respectively. Thus, the gender gap in human capital at time t is defined as

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

Labor is the only productive factor in the economy. Therefore, $h_t^{♂}$ and $h_t^{♀}$ also determines wages. I use A_t to denote total factor productivity (TFP) at time t. In the baseline analysis, I assume that A_t is exogenously determined.

2.1 Single Individuals

Single males consume their labor income but have no children. Their utility is given by

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

where s in the superscript denotes "single."

Single females, on the other hand, can have children but do not receive any transfers or support from the absentee fathers. They choose consumption $c_t^{♀,s}$, fertility n_t^s, and labor supply n_t^s to solve

$$V_t^{♀,s} = \max_{c_t^{♀,s}, l_t^s, n_t^s} \quad u(c_t^{♀,s}, n_t^s) \tag{4}$$

subject to budget and time constraints

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

where χ is the time cost of raising each child. I follow the literature and assume that the fertility choice can be continuous, i.e., $n_t^s \in \mathbb{R}_+$.

2.2 Married Individuals

I assume that once married, husbands supply one unit of labor inelastically and are required to transfer α_t share of their income to their wives. While individuals take α_t as given, it is an equilibrium object to be characterized in Section 2.5. Husbands derive utility from their remaining income and fertility – a public good shared with their wives. Therefore, the value of marriage for males is

$$V_t^{♂,m} = u(\underbrace{(1-\alpha_t)A_t h_t^{♂}}_{\text{remaining income}}, \underbrace{n_t^m}_{\text{fertility}}). \tag{5}$$

Because after transferring α_t, husbands do not directly bear the costs of children, they prefer as much fertility n_t^m as possible.

Wives, on the other hand, need to balance fertility, consumption, and labor supply.

Married women solves

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

subject to budget and time constraints

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

where n_t^m and l_t^m are the fertility and labor supply of married women.[2] Motivated by Doepke and Kindermann (2019) where childbirth is subject to veto, wives are thus the key decision-makers regarding fertility within marriage.

2.3 Marriage Market

At the beginning of each period, I assume that each woman receives an idiosyncratic shock τ on the taste of marriage which follows a distribution $J(\tau)$. For a woman with taste shock τ, her utility from marriage becomes $\tau \cdot V_t^{\female,m}$. After receiving the shock, individuals decide whether or not to get married and the marriage market clears.

For women, it is apparent that there exists a threshold τ_t^* above which women prefer marriage over simple. The value of τ_t^* can be defined using the condition

$$V_t^{\female,m} \cdot \tau^* = V_t^{\female,s} \tag{7}$$

Therefore, imposing the marriage market clearing condition implies the equilibrium marriage rate

$$\mathcal{M}_t = 1 - J(\tau_t^*) \tag{8}$$

On the other hand, because males are homogeneous and are on the long side of the marriage market, the equilibrium imposes an indifference condition

$$V_t^{\male,m} = u((1-\alpha_t)A_t h_t^{\male}, n_t^m) = u(A_t h_t^{\male}, 0) = V_t^{\male,s} \tag{9}$$

[2] In Section 3.3, I discuss the possibilities where husbands share some of the childcare burden.

where the share of transfers α_t acts as "prices" to clear the marriage market.

With marriage rate $\mathcal{M}_t$ defined, the model also gives expressions for other aggregate variables. For example, aggregate fertility rate n_t is given by

$$n_t = \mathcal{M}_t \cdot n_t^m + (1 - \mathcal{M}_t) \cdot n_t^s \tag{10}$$

Average hours worked per female is

$$l_t^{♀} = \mathcal{M}_t \cdot l_t^m + (1 - \mathcal{M}_t) \cdot l_t^s = 1 - \chi n_t \tag{11}$$

The average income of females is

$$y_t^{♀} = A_t \cdot h_t^{♀} \cdot l_t^{♀}$$

which leads to a simple expression of the gender income gap

$$\Gamma_t^y = \frac{y_t^{♂}}{y_t^{♀}} = \frac{\Gamma_t^h}{l_t^{♀}} \tag{12}$$

2.4 Human Capital Dynamics

To close the model, I turn to the dynamics of gender-specific human capital.

To be consistent with the homogeneity of human capital within genders, I assume that the gender-specific human capital follows the law of motion specified as

$$h_{t+1}^{♀} = (h_t^{♀})^{\theta} \tag{13}$$

$$h_{t+1}^{♂} = Z \cdot (\mathcal{M}_t \cdot h_t^{♂})^{\theta} \tag{14}$$

where $\theta \in (0, 1)$ and $Z > 1$ are constants.

The production functions (13) and (14) are motivated by a large empirical literature that has documented that growing up in a family without biological married parents leads to more adverse consequences for boys than for girls (e.g., see Bertrand and Pan

2013, Autor et al. 2019, Wasserman 2020, Reeves 2022, and Frimmel et al. 2024).

While Equations (13) and (14) assume that only boys are affected by marriage rates $\mathcal{M}_t$ while girls are not, the qualitative predictions of the model are unchanged if I adopt a more general formulation

$$h_{t+1}^{♀} = ((1-\lambda^{♀})h_t^{♀} + \lambda^{♀}(\mathcal{M}_t \cdot h_t^{♂}))^{\theta}$$

$$h_{t+1}^{♂} = ((1-\lambda^{♂})h_t^{♀} + \lambda^{♂}(\mathcal{M}_t \cdot h_t^{♂}))^{\theta}$$

and the condition $\lambda^{♀} < \lambda^{♂}$ holds, i.e., boys have larger exposures to the married fathers' human capital.

Furthermore, I adopt Galton's approach to the intergenerational transmission of human capital for analytical and aggregation simplicity. As pointed out by Mulligan (1999), explicit modeling of parental human capital investment decisions, e.g., following Becker and Tomes (1979), often yields similar predictions.

2.5 Model Solution

In this section, I characterize the properties of the model.

First, the indifference condition of males in the marriage market (9) implicitly defines α_t as a function of n_t^m:

$$(1-\beta) \cdot (A_t h_t^{♂})^{\frac{\rho-1}{\rho}} \left[1 - (1-\alpha_t)^{\frac{\rho-1}{\rho}}\right] = \beta \cdot (n_t^m)^{\frac{\rho-1}{\rho}} \tag{15}$$

When $\rho > 1$, using the implicit function theorem on Equation (15) reveals that the function $\alpha_t(n_t^m)$ is a strictly increasing and convex function. It takes the value of 0 when $n_t^m = 0$, and shifts up when A_t rises.

On the other hand, the first-order condition of married women gives the optimality condition where n_t^m is a function of α_t:

$$n_t^m \cdot \left[\left(\frac{(1-\beta)A_t h_t^{♀}}{\beta}\right)^{\rho} + A_t h_t^{♀}\chi\right] = (1 + \alpha_t \Gamma_t^h) A_t h_t^{♀} \tag{16}$$

Equation (16) indicates that $n_t^m(\alpha_t)$ is an increasing and linear function. It takes a strictly positive value when $\alpha_t = 0$ and shifts down when A_t rises.

Taking the properties of $\alpha_t(n_t^m)$ and $n_t^m(\alpha_t)$ together generates the first lemma.

Lemma 1: For given A_t, there is a unique solution of (α_t, n_t^m).

Proof: See Appendix.

Second, by comparing $V_t^{♀,s}$ and $V_t^{♀,m}$, Lemma 2 provides a condition for the marriage threshold τ_t^*.

Lemma 2: The marriage threshold $\tau_t^* = 1/(1 + \alpha_t \Gamma_t^h)$.

Proof: See Appendix.

Lemma 2 indicates that the marriage threshold, and hence the marriage rate $\mathcal{M}_t$, is determined by the economic gains from marriage – a product of the gender gap in human capital Γ_t^h and men's willingness to transfer α_t. As a result, when rising A_t reduces α_t, marriage rates will also fall.

3. The Impossible Trinity

In this section, I propose and empirically test the Impossible Trinity hypothesis.

3.1 Theory

Collecting the equilibrium conditions and results from Lemma 2, the relationship between fertility n, marriage $\mathcal{M}$, female labor supply $l^{♀}$, and gender income gap Γ^y can be summarized in the following three equations:

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

$$\Gamma^y = \frac{\Gamma^h}{l^{♀}} \tag{18}$$

$$l^{♀} = 1 - \chi n \tag{19}$$

Equations (17)-(19) illustrate the key tensions in the model. In particular, (17) shows that marriage rates are higher when there are larger gender gaps in human capital. But (18) implies that large gender gaps in human capital make it difficult to achieve gender income inequality unless the female labor supply is high. However, the opportunity cost of a high female labor supply is low fertility.

The Impossible Trinity hypothesis: high fertility, dual parenthood (high marriage rate), and gender income inequality cannot coexist.

Proof: I prove the hypothesis in the context of the model by discussing three cases.

1. *High fertility and dual parenthood.* With high fertility n, female labor supply $l^{♀}$ is low from (19). To achieve a high marriage rate $\mathcal{M}$, Γ^h needs to be high from (17). Therefore, the gender income gap Γ^y is necessarily high from (18).

2. *High fertility and gender income equality.* With high fertility n, female labor supply $l^{♀}$ is low from (19). To achieve a low gender income gap Γ^y, it must be the case that Γ^h is low from (18). But a low gender gap in human capital Γ^h leads to a low marriage rate $\mathcal{M}$ from (17).

3. *Dual parenthood and gender income equality.* To achieve a high marriage rate $\mathcal{M}$, (17) implies that the gender gap in human capital Γ^h needs to be high. With high Γ^h, the only way to achieve a low gender income gap Γ^y is to have a high female labor supply $l^{♀}$. needs to be very high from (19). Therefore, fertility n needs to be very low from (19).

3.2 Empirical Results

I test the Impossible Trinity hypothesis using historical data. In particular, I collect data on (1) total fertility rates (TFR) from the United Nations, (2) the share of children born outside of marriage from the OECD database, and (3) gender gaps in median earnings from the OECD database. The resulting dataset is an unbalanced panel of 37 countries from 1970 to 2014 with 721 country-year observations in total.

I categorize observations based on sample averages.[3] Observations are labeled as

[3]I have also experimented with alternative cutoffs in defining "high fertility", "dual parenthood", and "gender income equality." The main finding remains robust.

- "high fertility" if $\text{TFR}_{it} > 1.69$,
- "dual parenthood" if out of $\text{marriage}_{it} < 31.4\%$, and
- "gender income equality" if $\text{gap}_{it} < 17.2\%$.

After labeling each observation, I plot the Venn diagram to inspect the intersections. The results are shown in Figure 1. I find that less than 2% of the observations achieved high fertility, dual parenthood, and gender income equality jointly while there are large shares of observations in all other categories. This finding supports the Impossible Trinity hypothesis, highlighting the inherent conflicts among the three outcomes.

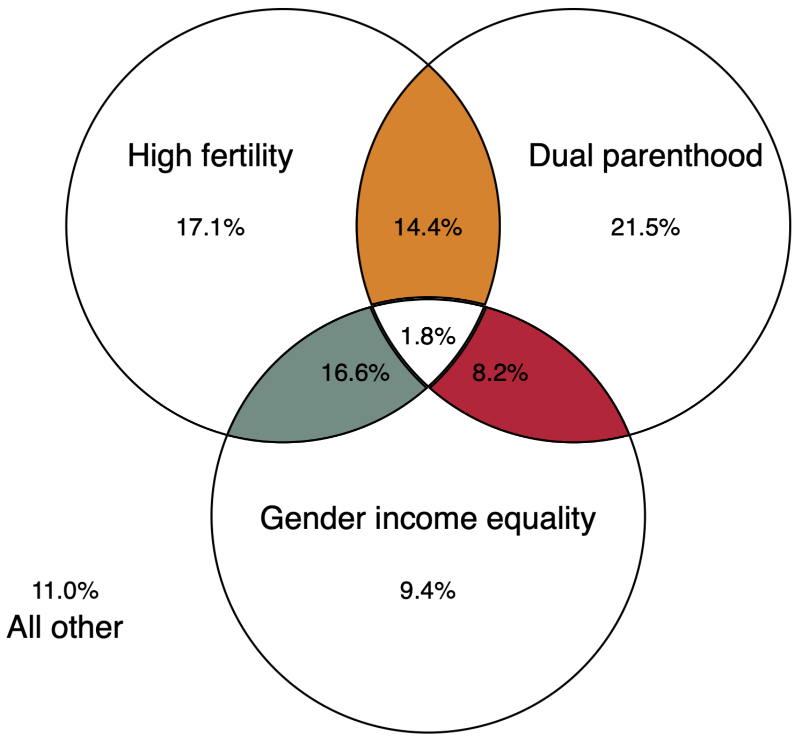

Figure 1: The Impossible Trinity in the Data

Table 1 in the Appendix gives some examples for each area of the Venn diagram. The only country that achieves high fertility, dual parenthood, and gender income equality according to our definition is Australia between 1991 to 2003. After 2003, the share of single parenthood rose sharply in Australia so it moved to the $G + F$ category.

3.3 Discussions

An imminent question here is whether gender equality in childcare responsibilities, e.g., as advertised by many recent papers such as Doepke and Kindermann (2019), could resolve the Impossible Trinity. In particular, if both men and women participate in childcare, could countries achieve high fertility while preserving dual parenthood and gender income equality?

Through the lens of the model, if both genders share the same childcare burden, then the labor supply is the same across genders. As a result, the gender income gap Γ^y entirely depends on the gender human capital gap Γ^h. But with high marriage rates $\mathcal{M}$, the gender human capital gap Γ^h is also high. Therefore, to achieve both dual parenthood and gender income equality, men need to take *more* childcare responsibilities than women. This requirement, however, could lead to two potential issues.

First, how large would the efficiency cost be for men to work less than women when their human capital is relatively higher? The efficiency cost could be even larger if women have an absolute advantage in taking care of children. Second, because men have the outside option of staying single and having no children, the amount of transfer α needs to be low for them to agree to take on more childcare responsibilities within marriage. But when α, and hence the economic gains from marriage, is low, more women would prefer to stay single.

From an empirical point of view, even though there has been a lot of progress towards a more equal sharing of childcare responsibilities, especially in many European countries, Figure 1 indicates that there hasn't been much evidence supporting it as a way out from the Impossible Trinity.

4. The Autumn of Patriarchy

This section presents the logic behind the demise of patriarchy in the model. In addition, I argue that the pace of the demise could differ across countries due to distinct social norms.

4.1 Mechanism

I first present a lemma linking fertility and within-marriage transfers to technology A_t.

Lemma 3: The levels of α_t and n_t^m are decreasing in A_t.

Proof: See Appendix.

The intuition behind Lemma 3 is simple: because consumption and fertility are substitutes in the utility function, a higher total factor productivity A raises the opportunity costs of having children and the substitution effect dominates the income effect. Therefore, n_t^m is decreasing in A. Because the amount of transfers that males are willing to pay their wives depends positively on marital fertility n^m, transfer share α also falls as A rises.

This reduction in fertility and within-marriage transfers leads to a chain reaction, as outlined in Figure 2. When α falls, there is a decline in the economic gains from marriage for women, i.e., $\alpha\Gamma^h$. As a result, the marriage rate $\mathcal{M}$ drops. Because the decline in marriage hurts boys relatively more than girls, the gender gap in human capital falls in the next generation, further dragging down the economic gains from marriage. Lastly, the female labor supply rises as fertility falls. Combined with the shrinking gender gap in human capital, the economy also experiences a converging gender income gap Γ^y.

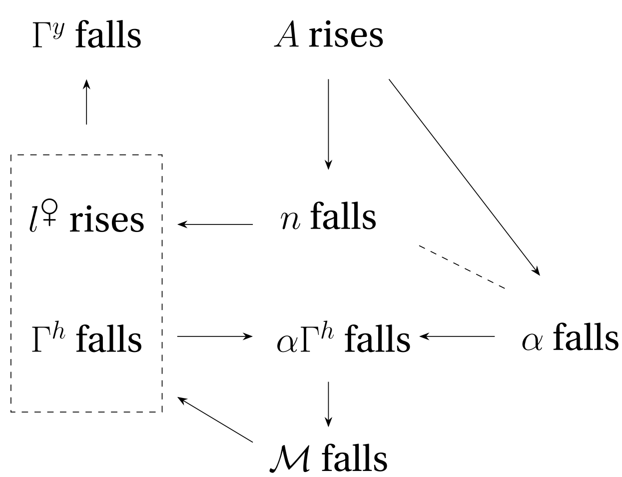

Figure 2: The Autumn of Patriarchy

The upshot of Figure 2 is that an exogenous increase in A_t can generate a transition from patriarchal to egalitarian societies. Importantly, when boys and girls are differentially sensitive to changes in marriage, one does not need factor-biased technological changes to generate declines in fertility, dual parenthood, or gender income gaps.

4.2 The Role of Social Norms

Another message from 2 is that while the demise of patriarchy is inevitable, the observed pace of changes in fertility, dual parenthood, and gender income gaps could differ a lot across countries due to the quantitative strength of each arrow.

For example, the mapping from the economics of marriage $\alpha\Gamma^h$ to marriage rates $\mathcal{M}$ depends on the distribution of idiosyncratic shocks $J(\tau)$. This distribution could vary across countries due to factors such as culture, religion, and social norms. Depending on the mass of individuals around the cutoff τ^*, responses in the marriage rate $\mathcal{M}$ could be either large or small. As a result, the strength of the feedback mechanism between $\mathcal{M}$ and Γ^h could vary dramatically across countries.

Figure 3 displays the case for the United Kingdom. As its fertility fell after the Baby Boom, single parenthood rose dramatically after the 1980s. Through the lens of the model, rising female labor supply and converging gender human capital gaps jointly contributed to the converging gender income gaps.

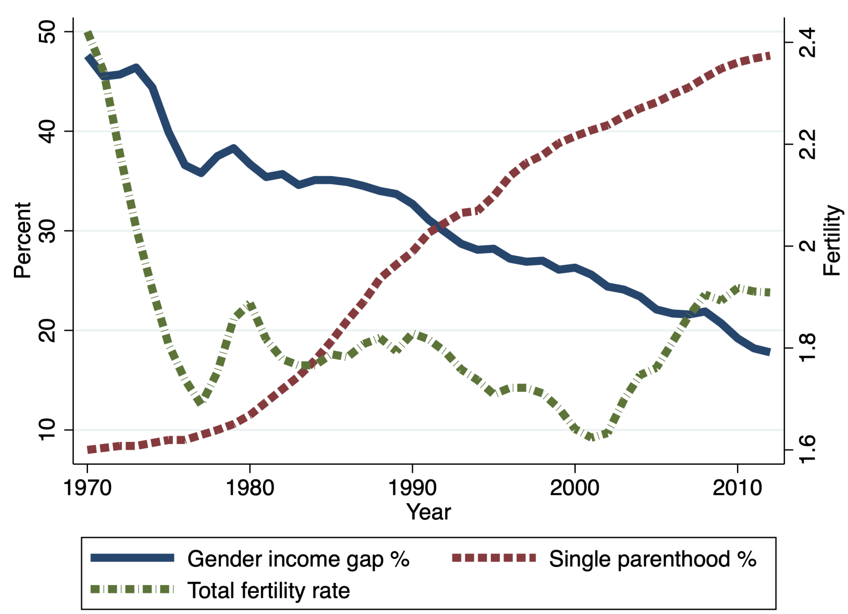

Figure 3: The Case of the U.K.

Figure 4, on the other hand, displays the case of Japan. While fertility fell dramatically during the rapid economic growth era in the 1980s, single parenthood barely rose, owing to the strong influence of the Confucius tradition that stigmatizes out-of-marriage births (Myong et al. 2021). Through the lens of the model, only the rising female labor supply contributed to the converging gender income gaps. As a result, the speed of convergence in Japan is much slower than that in the United Kingdom.

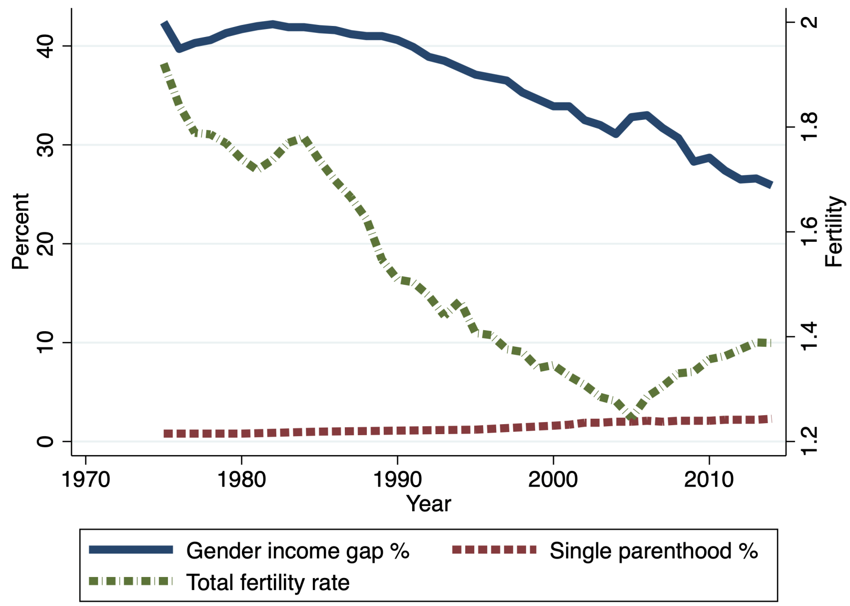

Figure 4: The Case of Japan

Undeniably, the pace of transition from patriarchy to egalitarian societies is shaped by many other factors that are not included in the model, such as structural transformation, trade, and equal rights movements. Nevertheless, the model provides a useful framework to link the trends in fertility, marriage, and gender income gaps and to make verifiable predictions.

5. Conclusion

In this paper, I present a unified model that explains the transition from patriarchal societies, featuring high fertility, dual parenthood, and large gender gaps, to egalitarian ones, featuring low fertility, rising single parenthood, and small gender gaps. Based on the model, I propose the Impossible Trinity hypothesis: high fertility, dual parenthood, and gender income equality cannot coexist. Data from an unbalanced panel of countries support the hypothesis. I also show that factor-neutral technological changes raise the opportunity cost of having children and thus kick off the transition. Lastly, I show that the pace of the transition could differ across countries due to social norms.

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Appendix

A. Proofs

Proof of Lemma 1
Define function

$$f_1(\alpha_t) = A_t h_t^{\male} \cdot \left(\frac{1-\beta}{\beta} \cdot [1-(1-\alpha_t)^{\frac{\rho-1}{\rho}}] \right)^{\frac{\rho}{\rho-1}}, \qquad \alpha \in [0,1]$$

For $\rho > 1$, $f_1(\alpha_t)$ is strictly increasing, convex, and $f_1(0) = 0$. Moreover, $n_t^m = f_1(\alpha_t)$ satisfies men's indifference condition (9).

Define function

$$f_2(\alpha_t) = \frac{(1+\alpha_t \Gamma_t^h) A_t h_t^{\female}}{\left(\frac{(1-\beta) A_t h_t^{\female}}{\beta} \right)^{\rho} + A_t h_t^{\female} \chi}, \qquad \alpha_t \in [0,1]$$

For $\rho > 1$, $f_2(\alpha_t)$ is strictly increasing, linear, and $f_2(0) > 0$. Moreover, $n_t^m = f_2(\alpha_t)$ satisfies women's optimality condition (16).

Thus, $f_3(\alpha_t) = f_1(\alpha_t) - f_2(\alpha_2)$ is strictly increasing, convex, and $f_3(0) < 0$. Therefore, there are two possibilities. If $f_3(\alpha_t)$ obtains the value of zero in the domain $\alpha \in [0,1]$, i.e., interior solution, then this solution is unique. Otherwise, there is a corner solution $\alpha_t = 1$, i.e., men strictly prefer marriage over being single and are willing to transfer the entirety of their income – a theoretically possible but empirically irrelevant case.

Proof of Lemma 2
For married women, the first-order condition is

$$(1-\beta) \cdot (c_t^{\female,m})^{-\frac{1}{\rho}} = \frac{\beta \cdot (n_t^m)^{-\frac{1}{\rho}}}{A_t h_t^{\female} \chi} \Longrightarrow c_t^{\female,m} = n_t^m \cdot \left(\frac{(1-\beta) A_t h_t^{\female}}{\beta} \right)^{\rho} \tag{20}$$

Substituting (20) into the budget constraint, n_t^m satisfies

$$n_t^m \cdot \left(\frac{(1-\beta) A_t h_t^{\female}}{\beta} \right)^{\rho} = \alpha_t \Gamma_t^h A_t h_t^{\female} + A_t h_t^{\female} (1 - \chi n_t^m)$$

which is equivalent to

$$n_t^m \cdot \left[\left(\frac{(1-\beta) A_t h_t^{\female}}{\beta} \right)^{\rho} + A_t h_t^{\female} \chi \right] = (1+\alpha_t \Gamma_t^h) A_t h_t^{\female} \tag{21}$$

For single women, the first-order condition is

$$(1-\beta)\cdot(c_t^{♀,s})^{-\frac{1}{\rho}} = \frac{\beta\cdot(n_t^s)^{-\frac{1}{\rho}}}{A_t h_t^{♀}\chi} \Longrightarrow c_t^{♀,s} = n_t^s\cdot\left(\frac{(1-\beta)A_t h_t^{♀}}{\beta}\right)^{\rho} \tag{22}$$

Substituting (22) into the budget constraint, $c_t^{♀,s}$ satisfies

$$n_t^s\cdot\left(\frac{(1-\beta)A_t h_t^{♀}}{\beta}\right)^{\rho} = A_t h_t^{♀}(1-\chi n_t^s)$$

which is equivalent to

$$n_t^s\cdot\left[\left(\frac{(1-\beta)A_t h_t^{♀}}{\beta}\right)^{\rho} + A_t h_t^{♀}\chi\right] = A_t h_t^{♀} \tag{23}$$

Take the ratio between (21) and (23) gives

$$\frac{n_t^m}{n_t^s} = 1+\alpha_t\Gamma_t^h \tag{24}$$

which is independent of A_t.

On the other hand,

$$V_t^{♀,m}(\tau) = \tau\cdot n_t^m\cdot\left((1-\beta)\cdot\left(\frac{(1-\beta)A_t h_t^{♀}}{\beta}\right)^{\rho-1}+\beta\right)^{\frac{\rho}{\rho-1}} \tag{25}$$

$$V_t^{♀,s} = n_t^s\cdot\left((1-\beta)\cdot\left(\frac{(1-\beta)A_t h_t^{♀}}{\beta}\right)^{\rho-1}+\beta\right)^{\frac{\rho}{\rho-1}} \tag{26}$$

Combining (25), (26), and (24),

$$\tau^* = \frac{V_t^{♀,s}}{V_t^{♀,m}} = \frac{n_t^s}{n_t^m} = \frac{1}{1+\alpha_t\Gamma_t^h} \tag{27}$$

Proof of Lemma 3

When A_t increases, $f_1(\alpha_t)$ shifts up while $f_2(\alpha_t)$ shifts down. Therefore, $f_3(\alpha_t) = f_1(\alpha_t) - f_2(\alpha_2)$ shifts up. As a result, the interior solution, i.e., the value of α_t such that $f_3(\alpha_t) = 0$, necessarily decreases.

B. Table

D – dual parenthood, G: gender income equality, F – high fertility	
Category	Countries
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
$G + F$	Belgium, Norway, New Zealand, Sweden
$D + F$	United Kingdom 1970-1994, Israel, USA 1973-1993
$D + G + F$	Australia 1991-2003 ($G + F$ afterwards)

Table 1: Examples of Countries