Demographic Transition and Development

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Demography

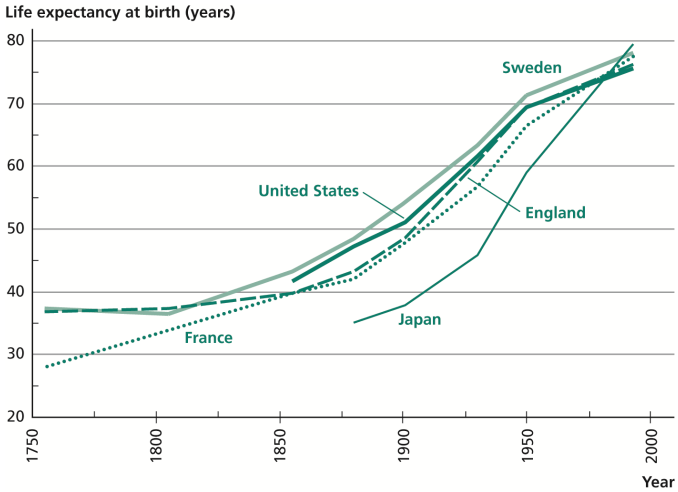
American Heritage Dictionary 2006, p. 483:

Demography = the study of population size, growth and age structure (fertility, mortality, and immigration) that lead to population change.

Mortality

Let's briefly talk about mortality and then move to fertility.

Life Expectancy in Developed Countries



Source: David Weil "Economic Growth" (2012)

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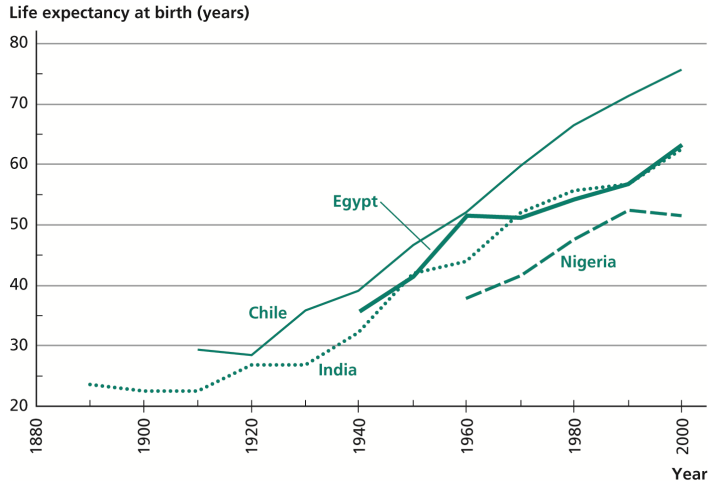


Source: David Weil "Economic Growth" (2012)

Life Expectancy vs. GDP, Cross Country Data

Source: David Weil "Economic Growth" (2012)

Research Questions

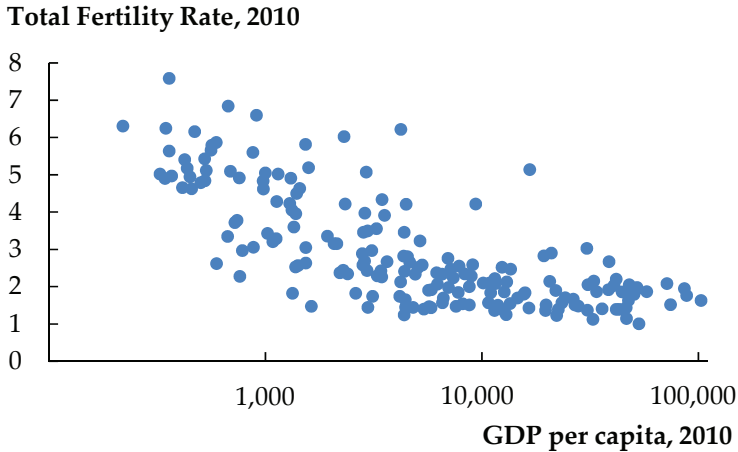
- Why has mortality declined over time? (or is this a question for medical researchers?)
- Does development lead to technological progress in medicine and therefore lower mortality?
- Do mortality/morbidity decreases lead to higher GDP/growth?
  - higher incentive to accumulate human/physical capital if one lives longer.
  - higher ability to acquire HK if one is less sick as a child.
  - or could higher mortality be a good thing, as fewer people share same resources?

Large and Exciting Literature on Mortality and Growth

- Lorentzen, McMilland and Wacziarg (J Econ Growth 2008) argue that "adult mortality explains almost all of Africa's growth tragedy."
- Acemoglu and Johnson (JPE 2007) find no evidence that increases in life expectancy raised economic performance in post-1950 data.
- Hazan (Ecmta 2009) documents that people use increases in life-expectancy mostly as leisure (rather than working more years), hence it is not clear why an increase in longevity would raise the incentive to accumulate human capital.
- Young (QJE 2005) and Voigtlaender & Voth (Restud 2013) argue that *increases* in mortality can raise standards of living for survivors (Young make the argument in the context of HIV in Africa and V&V for the Black Death in Europe).
- large micro literature documenting how declines in mortality/morbidity raise standard of living: Miguel and Kremer (Econometrica 2004), Bleakley (QJE 2007), Jayachandran (QJE 2009), see Bleakley (A.R.E. 2010) for an excellent survey.

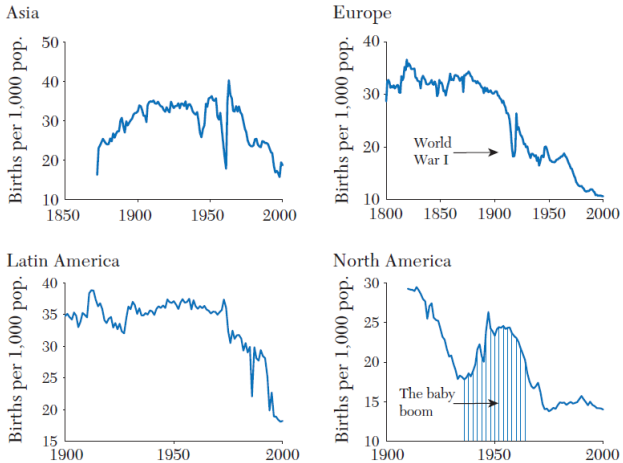
Fertility and Population Growth

Cross-country data: Fertility and per capita GDP



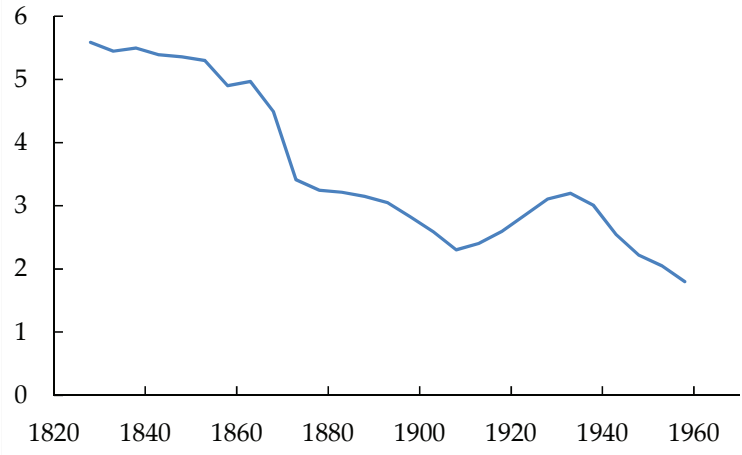
Source: Doepke and Tertilt (2016)

Demographic Transitions around the World



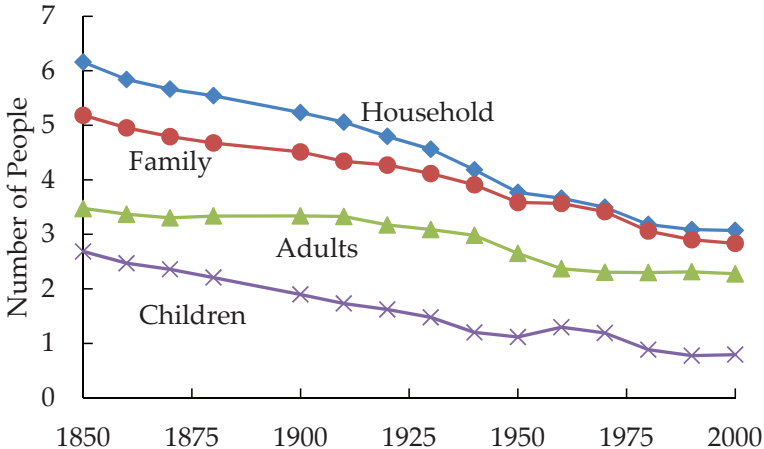
Source: Greenwood, Guner and Vandenbroucke (JEL 2017)

Fertility Decline over Time (United States)



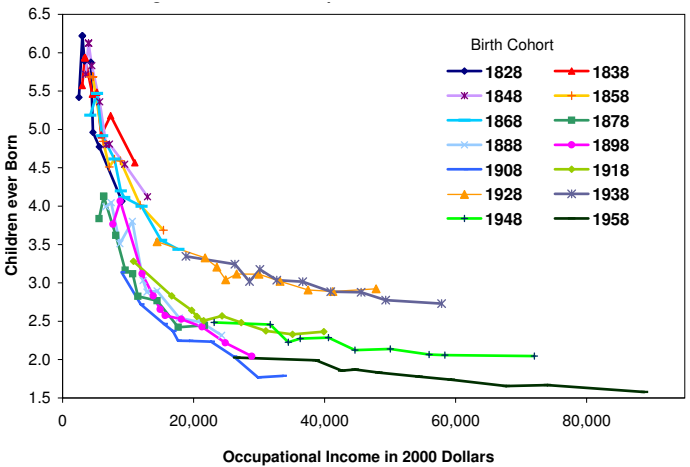
Source: Jones and Tertilt (2008)

Also, Dramatic Decline in Household Size



Source: Salcedo, Schoellmann, and Tertilt (2012)

Fertility Cross Section over Time (United States)



Source: Jones and Tertilt (2008)

Theories of the Demographic Transition

- Historians/demographers/sociologists often talk about the importance of birth control and later marriages. But ...
- Demographers emphasize the decline in infant and child mortality. However, Doepke (J Pop Econ, 2005) shows that most models predict an increase in the number of surviving children as mortality falls. Since net reproduction rates declined in most countries, other factors must be responsible.
- Increasing opportunity cost of time through increases in female labor force participation? Timing is off.
- Old age security hypothesis (Caldwell 1976, Boldrin, de Nardi and Jones, 2005).
- Increasing returns to human capital (e.g. Galor and Weil, AER 2000), e.g. because technological progress in manufacturing (requiring skills) was faster than in agriculture (Greenwood and Seshadri, AER P&P 2002).

Toy Model

The parent solves:

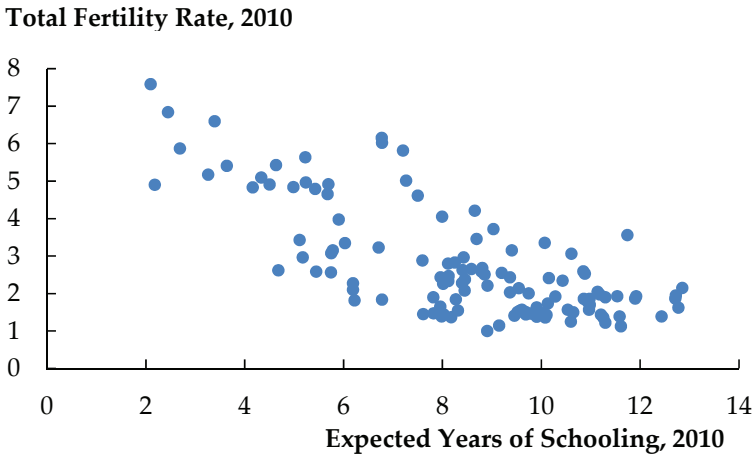
$$\begin{aligned} \max_{n,e,\ell} \quad & u(c) + \gamma^n u(n) + \gamma u(y') \\ & \ell + (\phi + e)n \leq 1 \\ & y = AH \\ & H' = (Be)^\theta H \end{aligned}$$

Assume $\gamma^n > \gamma\theta$ and $u(\cdot) = \log(\cdot)$.

$$\frac{H'}{H} = \left(B \frac{\gamma\theta\phi}{\gamma^n - \gamma\theta} \right)^\theta .$$

- Assume $\theta \uparrow$ over time, model can explain demographic transition.
- Fertility falls as education (schooling) increases.

Fertility and Schooling: Cross-country Data



Source: Doepke and Tertilt (2016)

Basic Mechanism Present in Many Papers

- Human capital, fertility and growth (Becker, Murphy and Tamura, 1990)
- Malthusian stagnation to growth (Galor and Weil, 2000)
- . . . and mortality (Soares, 2005)
- Agriculture and urbanization (Greenwood and Seshadri, 2012)
- Differential fertility and growth (De la Croix and Doepke, 2003)
- Explaining international fertility differences (Manuelli and Seshadri, 2009)

Focus on parents vs. children in 1-gender models.

Taking the Family More Seriously

- Family: Husband, wife, sons, daughters
- Fathers and mothers may disagree about investment in children (bargaining in family becomes important)
- Men and women may enter differently in production
- Mothers and fathers may enter differently in human capital transmission
- Families may have a son preference
- Public vs. private consumption in family

Model with Additional Family Features

Each married couple solves the following problem

$$
\begin{aligned}
\max_{e_f, e_m, c} \quad & \lambda_f[u(c) + \gamma_f u(y')] + (1 - \lambda_f)[u(c) + \gamma_m u(y')] \\
s.t. \quad & c = A(\ell_f H_f)^{\alpha} H_m^{1-\alpha} \\
& \ell_f + e_f + e_m \leq 1 \\
& H_f' = (Be_f)^{\theta} H_f^{\beta} H_m^{1-\beta} \\
& H_m' = (Be_m)^{\theta} H_f^{\beta} H_m^{1-\beta} \\
& y' = A(H_f')^{\alpha} (H_m')^{1-\alpha}
\end{aligned}
$$

All children marry.

Equilibrium Growth Rate

$$1 + g = \left\{ \frac{B[\lambda_f \gamma_f + (1 - \lambda_f)\gamma_m]\theta}{\alpha + [\lambda_f \gamma_f + (1 - \lambda_f)\gamma_m]\theta} (1 - \alpha)^{1-\beta} \alpha^{\beta} \right\}^{\theta}$$

Observations:

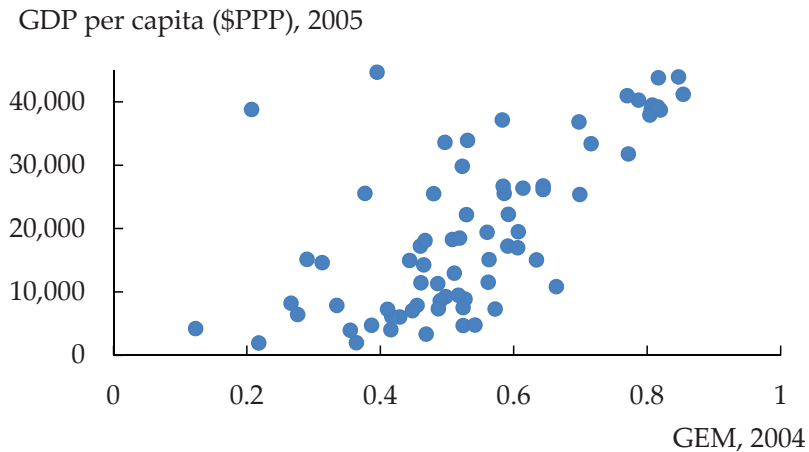
- Growth rate increases in returns to education (θ).
- Growth increases in the weight parents put on children (γ).
- Assuming $\gamma_f > \gamma_m$, then growth increases in female bargaining power (λ_f).
- Growth is hump-shaped in α and β.

Applications

- From brawn to brain: declining gender wage gap key force in fertility decline and growth (Galor and Weil, AER 1996).
- Polygyny lowers capital stock and increases fertility (Tertilt, JPE 2005).
- Improved allocation of talent across gender (and ethnic groups) accounts for 40% of growth over 1960-2010 period in US (Hsieh, Hurst, Jones, Klenow, Econometrica 2019).
- Doepke and Tertilt (JEG 2019): non-cooperative model of the family to show that transfers to women may reduce growth, in a model with endogenous division of labor.
- Higher female bargaining power (λ) $\rightarrow$ growth $\uparrow$ likely key force for the evolution of women's rights (Doepke and Tertilt, QJE 2009)

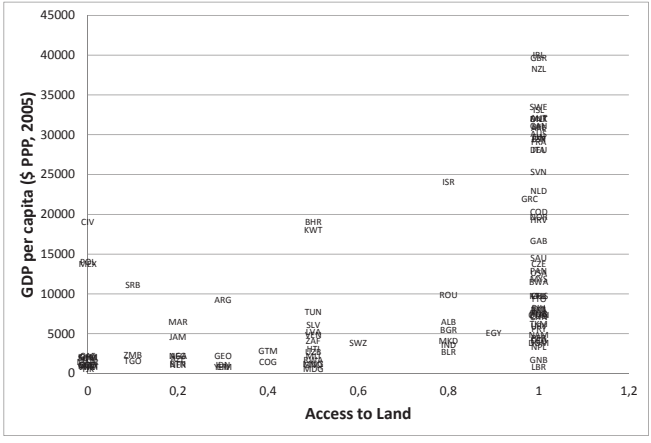
A Closer Look at Gender and Development

Female Empowerment and Economic Development



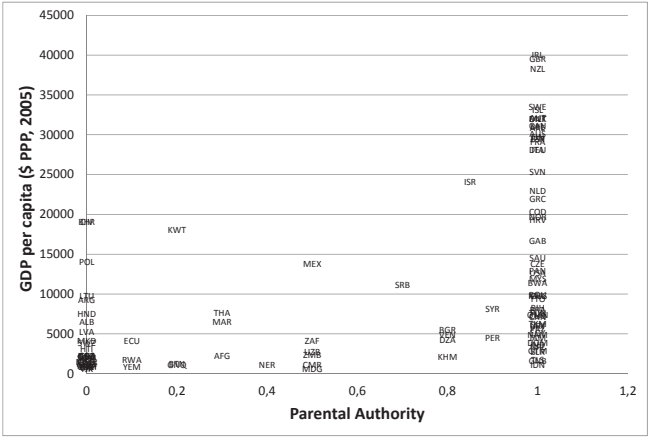
Source: Doepke and Tertilt (2016)

Access to Land and Economic Development



Source: Doepke, Tertilt and Voena (2012)

Equality in Child Custody and Economic Development



Source: Doepke, Tertilt and Voena (2012)

Women's Rights → Development

More property rights → higher returns → more investment

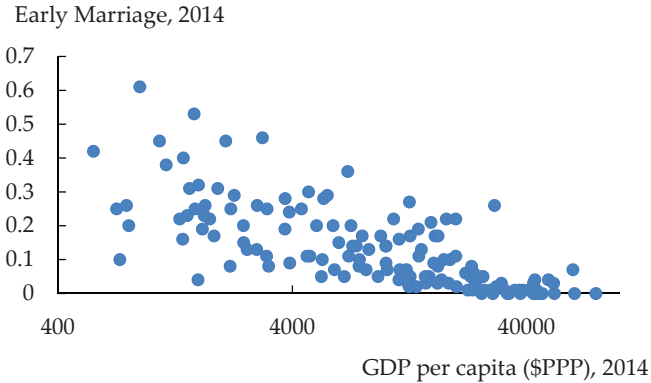
- more patenting (Khan, JEH 1996)
- more tree planting (Fortman et al, Rural Sociology 1997)
- lower fertility (Field, unpublished, 2005)
- better child health (Allendorf, World Development 2007)
- letting land fallow longer (Goldstein and Udry, JPE 2008)

Women's Rights → Development

Political rights → more/different govt expenditures (compositional effect seems larger)

- More local public health expenditures, decline in infant mortality (Miller, QJE 2008).
- More liberal voting and increase in govt expenditures (Kenny and Lott, JPE 1999).
- More social welfare spending, less military spending (Funk and Gathmann, unpublished 2008).
- Also Aidt and Dallal (PC 2008) for European countries and Abraham and Settle (PC 1999) for Switzerland.
- Female politicians: More spending on those public goods considered important by women (Duflo et al, Econometrica 2004).

Early Marriage and Development



Fraction of teenage girls (15-19 years) that has ever been married
Source: Doepke and Tertilt (2016)

Marriage Payments and Development

1. Tertilt (JPE 2005): polygyny/monogamy $\rightarrow$ brideprice/dowry $\rightarrow$ GDP
2. Gould, Moav, Simhon (AER 2008): development $\rightarrow$ increasing inequality $\rightarrow$ higher demand for child quality (over quantity) $\rightarrow$ higher demand for wife quality (over quantity) $\rightarrow$ disappearance of polygyny.
3. Du and Wei (NBER WP 2010): sex imbalance $\rightarrow$ dowries $\uparrow$ $\rightarrow$ savings $\uparrow$ $\rightarrow$ CA surplus $\uparrow$.

Note: mechanisms always involve children $\rightarrow$ need good theories of fertility choices.

The Family as Driver of Political Change

Political Economy – Endogenous Policies

During development process, all of today's rich countries went through similar reforms

- spread of democracy
- introduction of public education
- child labor laws
- welfare/social security systems
- women's rights

Big questions:

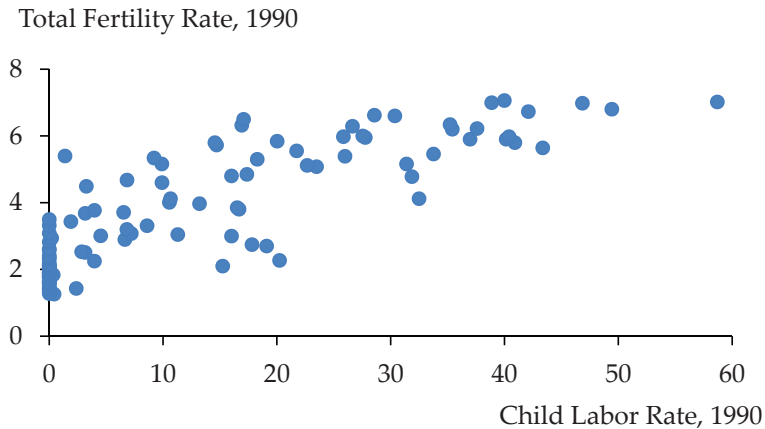
- Why did these reforms happen when they did?
- Why did they fail to happen in some countries?

Examples

- The role of capitalists in the expansion of public education (Galor and Moav, 2006)
- Workers voting for child labor bans (Doepke and Zilibotti, 2005)
- Men's incentive to vote for women's rights (Geddes and Lueck 2002, Doepke and Tertilt 2009)

All examples argue that technological change (e.g. increasing importance of education)
$\rightarrow$ led to changes in the family
$\rightarrow$ that make reforms desirable
$\rightarrow$ which in turn increases output/growth.

High Fertility and High Child Labor Rates go Hand in Hand



Source: Doepke and Tertilt (2016)

Evolution of Women's Rights

(based on Doepke and Tertilt, QJE 2009)

The Question

- In developed countries, drastic change in (married) women's rights over the last 200 years.
  - Divorce law
  - Child custody law
  - Married women's property law
- At least initially, increase in female rights was voluntary sharing of power by men.
- Why did men decide to share power with women?

The Approach

- Formal model of women's rights.
- Focus on the family:
  - Expansion of female rights started long before widespread female labor force participation.
  - Large changes in the rights of *married* women.
  - Expansion of rights coincided with changing role of family: fertility decline and rise in education.
  - Change in family-related rights *before* political rights.

The Idea

- Women's rights determine bargaining in marriage.
- Trade-off between own wife and other men's wives.
  - Men prefer own wife to have no bargaining power.
  - However, men may want daughters as well as mothers of their children's future spouses to have more power.
- Strength of motive depends on returns to education.

The Model

- Overlapping generations of men and women.
- Men and women joint in marriage: children marry other people's children.
- Utility defined over consumption c, fertility n,and children's utility.
- People are altruistic towards kids (Barro/Becker 1989).
- Endogenous growth: human capital accumulation (parents determine children's human capital).
- Decision-making in marriage: will analyze 2 regimes.
- Key assumption: mothers care more about children's welfare than fathers do.

Preferences

- Man:

$$V_m = u(c_m, c_f, n) + \gamma_m \left[\frac{V_{\text{Sons}} + V_{\text{Daughters}}}{2} \right],$$

$$u(\cdot) = \log(c_m) + \sigma \log(c_f) + \delta \log(n).$$

- Woman:

$$V_f = u(c_f, c_m, n) + \gamma_f \left[\frac{V_{\text{Sons}} + V_{\text{Daughters}}}{2} \right],$$

$$u(\cdot) = \log(c_f) + \sigma \log(c_m) + \delta \log(n).$$

- Key: Women value children more:

$$\gamma_f > \bar{\gamma} > \gamma_m.$$

Technology

- Home production function:

$$c_m + c_f = A(t_f H_f)^{\alpha}(t_m H_m)^{1-\alpha}.$$

- Accumulation of human capital:

$$H'_f = \max\{1, (Be^f)^{\theta} H_f^{\beta} H_m^{1-\beta}\},$$
$$H'_m = \max\{1, (Be^m)^{\theta} H_f^{\beta} H_m^{1-\beta}\}.$$

- Time constraints:

$$t_f + (\phi + e^f + e^m)n \leq 1,$$
$$t_m \leq 1.$$

- Assumption of specialization in child care is not crucial.
- Key parameter: Return to education θ.

Economic and Political Decisions

- Patriarchy regime: Men make decisions, women obey.

$$\max\{V_m\}$$

- Empowerment regime: Equal power and efficient bargaining.

$$\max\{V_m + V_f\}$$

- Men vote on regime (affects current and future marriages).

Results

- Low return to education (θ low)
  - Parents don't educate, and decision problem is static.
  - Political regime only affects consumption share of husbands and wives.
  - Men's incentives for sharing power are low.
- High return to education (θ high)
  - Dynasty accumulates human capital.
  - Political regime affects speed of accumulation.
  - For sufficiently high return, men prefer to share power.

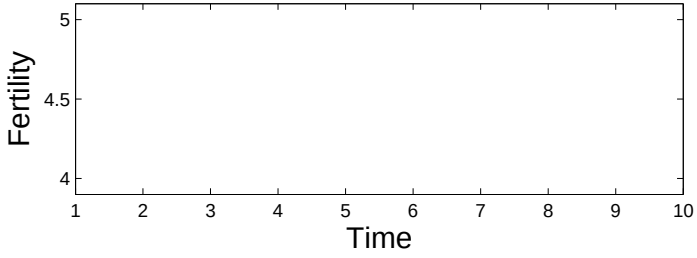
Benefits to Men from Sharing Power

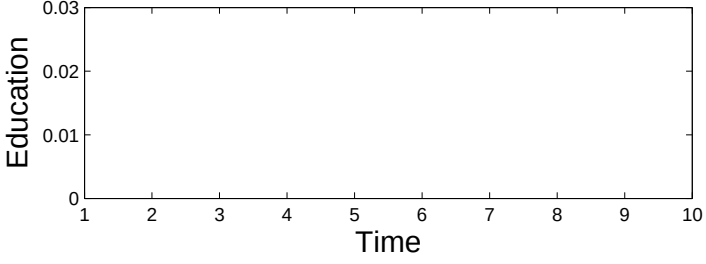
- More consumption for daughters (always present)
- "Time inconsistent preferences" (only with education)
  - Men disagree with their son-in-law about optimal resource allocation across generations.
  - More power for daughters solves this problem.
- Human capital externality (only with education)
  - Positive effect of education on children's spouses.
  - Leads to underinvestment in human capital of future sons/daughters in-law.
  - More power for all mothers mitigates this problem.

Computed Example of Transition to Power Sharing:

- Economy starts out in no-education regime.
- Return to education θ increases over a number of periods.
- In period 3, economy switches to education regime.
- In period 6, θ is sufficiently high for men to vote for power sharing.

The Outcome under Permanent Patriarchy





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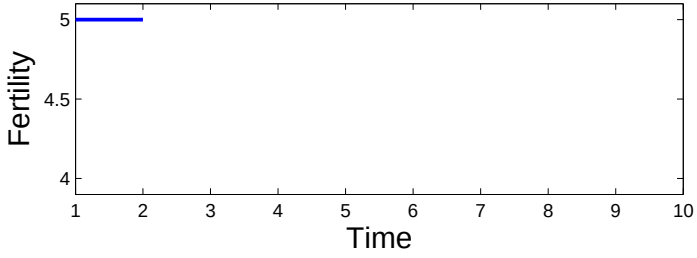

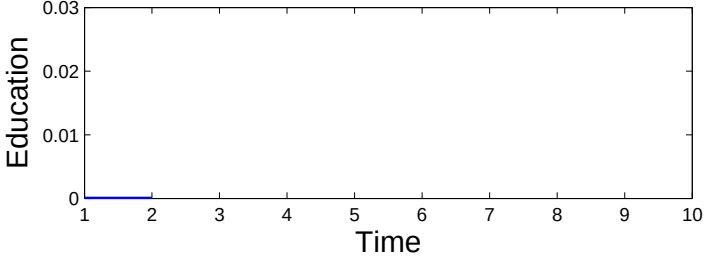

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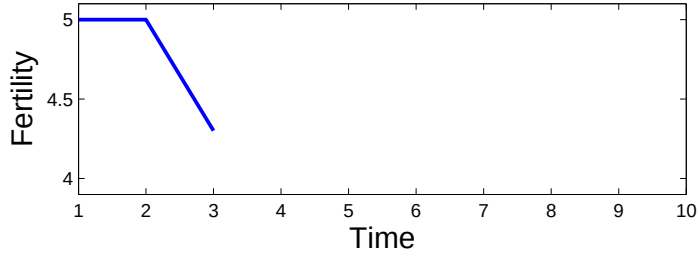

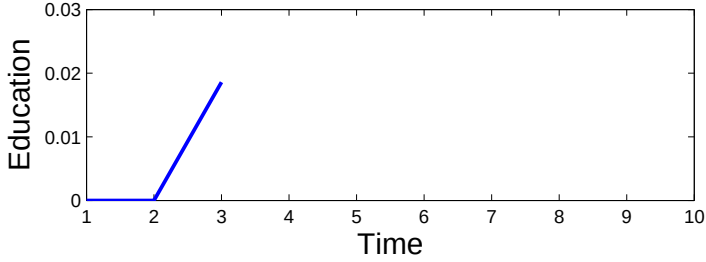

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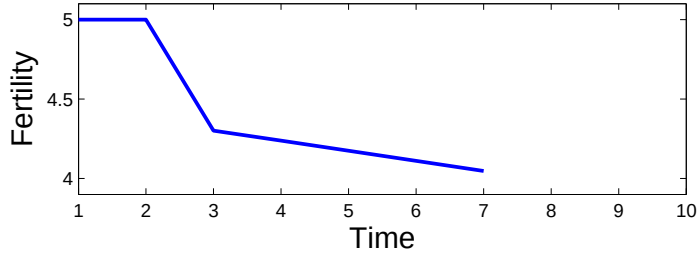

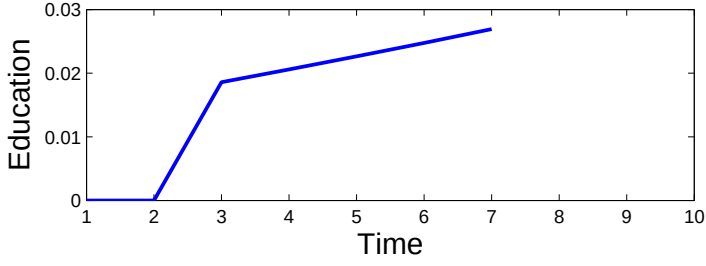

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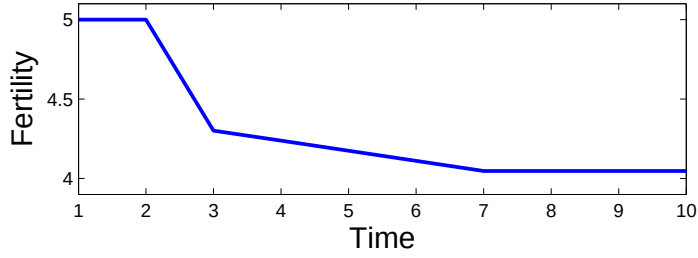
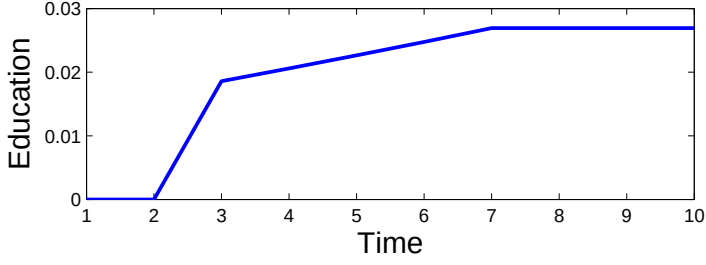
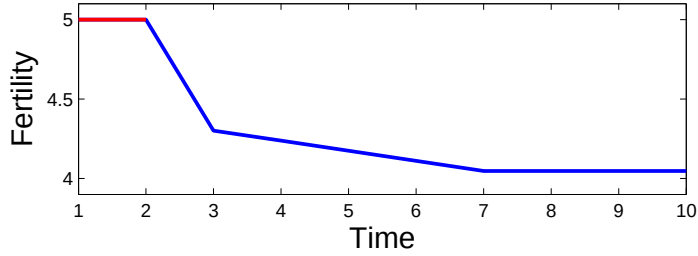
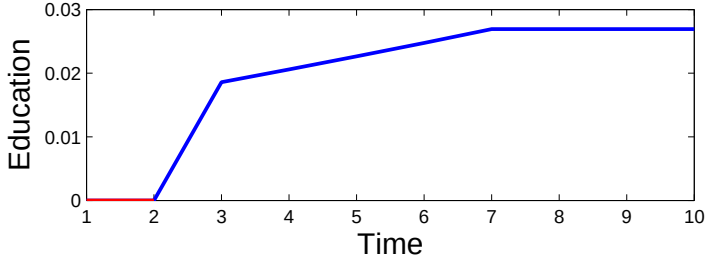




The Outcome under Optimal Female Empowerment





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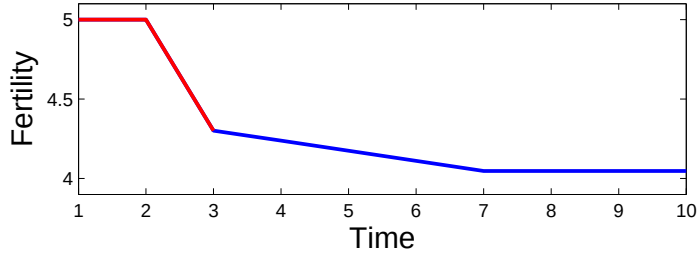

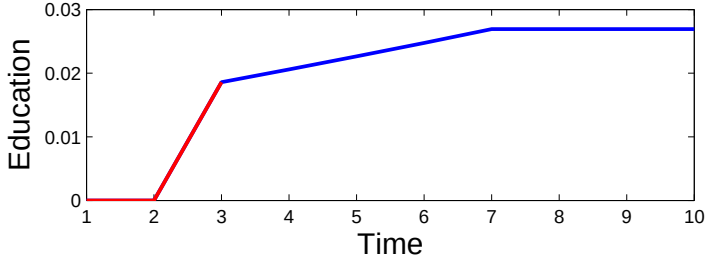

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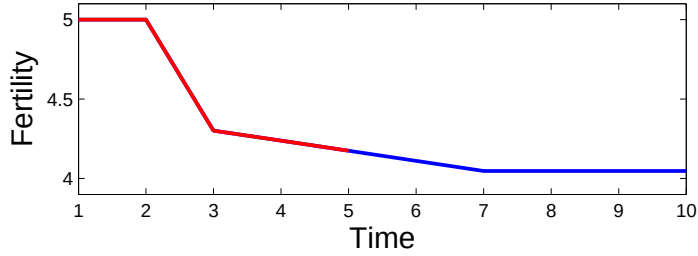

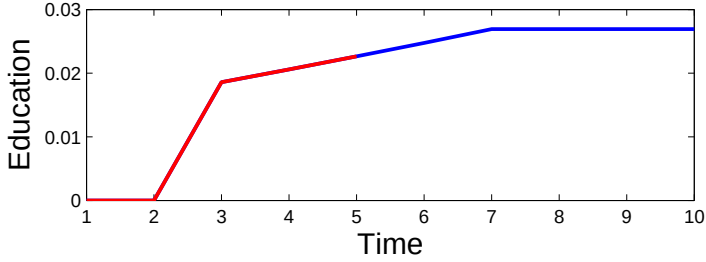

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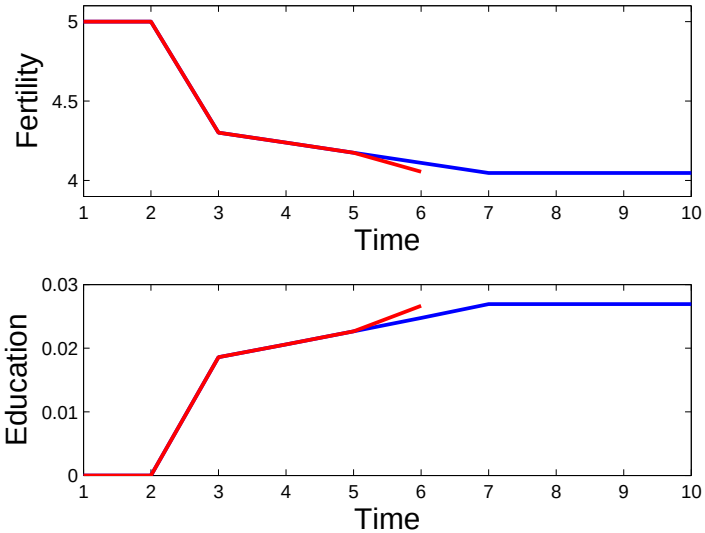

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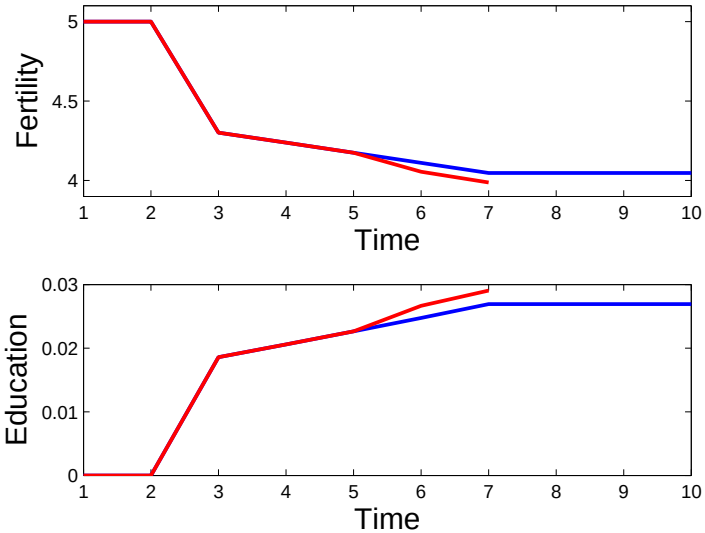

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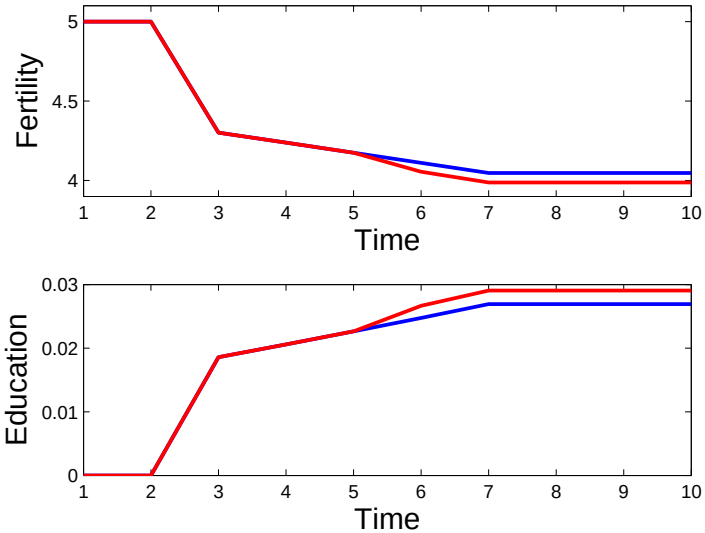


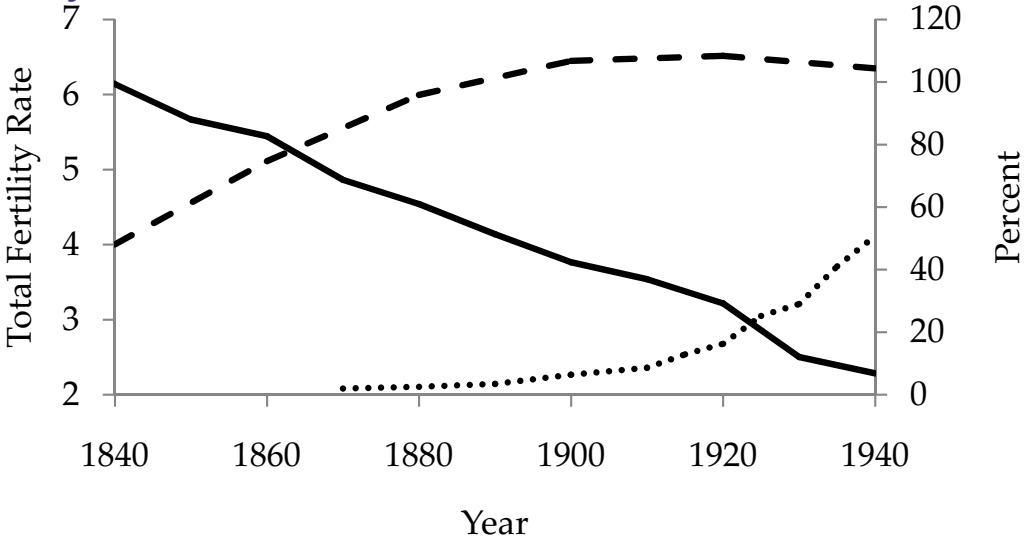
Timing Implications

- Fertility decline and rising demand for education starts before expansion of female rights.
- Once female rights are extended, fertility decline and expansion of education accelerate.

Timing of Female Empowerment in the United States

- 1769: “The very being and legal existence of the woman is suspended during the marriage."
- 1838 Iowa passes custody of infants law.
- 1838 Kentucky gives school suffrage to mothers.
- 1839: Mississippi grants women the right to hold property with their husband's permission.
- 1900: almost all states allowed divorce for cruelty.
- 1900: Every state has passed legislation granting married women some control over their property and earnings.
- 1920: 19th amendment granting all women right to vote.

Fertility and Education in the United States

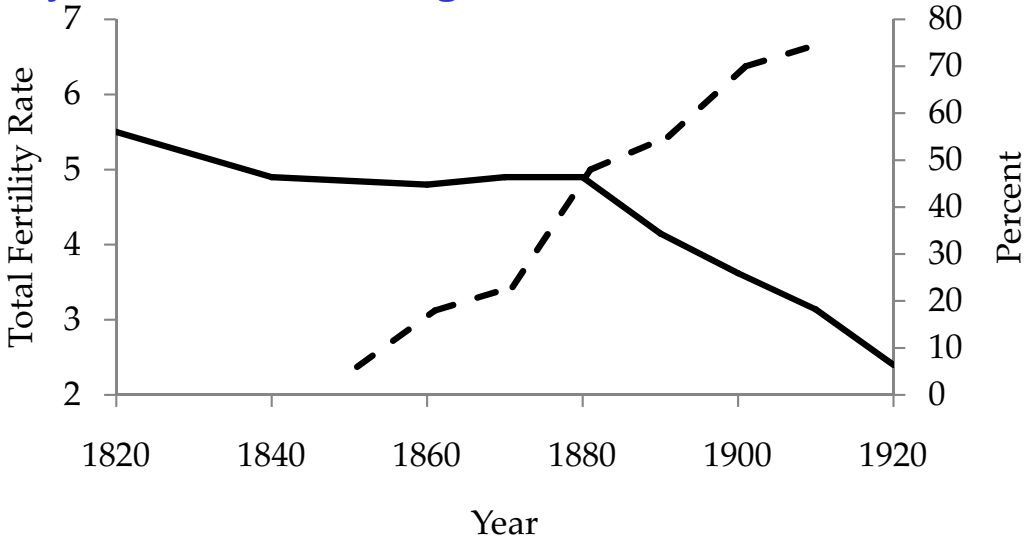


Source: Doepke and Tertilt (2009)

Timing of Female Empowerment in England

- 1839: Custody of Infants Act. Divorced and separated women can apply for their children under the age of seven.
- 1857: Matrimonial Causes Act. Women can apply for divorce, regain full property rights after divorce.
- 1870, 1882: Married Women's Property Act. Married women gain control over their earnings and property, can enter into contracts.
- 1918: Woman Suffrage Act.

Fertility and Education in England



Source: Doepke and Tertilt (2009)

Summary

- Extension of female rights is a prime example of voluntary power sharing.
- Power sharing can be generated in model with tradeoff between rights of one's own and other men's wives.
- Theory explains why rights were extended when increased importance of education changed role of the family.
- Mechanism generates demographic transition along the way.
- Two-way interaction between development and female empowerment.
- Implications for developing countries today?

Some thoughts on demography and development going forward

- Is lower population growth always better for development (and well-being)?
- Is there an optimal population size?
- How to finance pension funds if people stop having kids?
- How to evaluate policy in this context? Note that Pareto efficiency is not defined!
- Alternative concepts presented in Golosov, Jones, and Tertilt (Econometrica 2007)
- What might be reasons for too high vs. too low fertility? Knowledge externalities may be particularly important here:
  - If discovery of ideas is a function of the # of people, parents will not fully internalize that their offspring create nonrival ideas benefitting the entire economy (Chad Jones, 2020).
  - If comparison motives are important, parents may over-invest in the education of their children and thus under-invest in # of children (Kim, Tertilt, Yum 2021).

Conclusion: Families Matter for the Development Process