

EC555: Family Macroeconomics

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A New Era in the Economics of Fertility

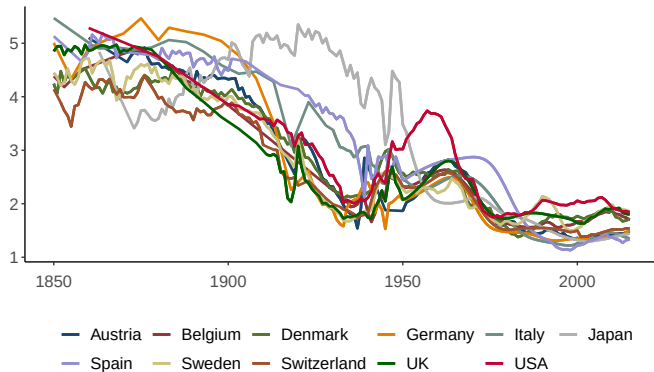
Starting with **Becker (NBER 1960)**, the first generation of economic models of fertility successfully accounted for earlier regularities of fertility behavior in high-income countries.

Our survey: **Doepke, Hannusch, Kindermann, and Tertilt (Handbook of the Economics of the Family 2023)**: the economics of fertility has entered a **new era**:

- **The basic facts of fertility in high-income countries have changed.**
- **The mechanisms emphasized by first-generation models of fertility have lost relevance.**
- **New mechanisms and factors are essential to account for the new facts of fertility behavior.**

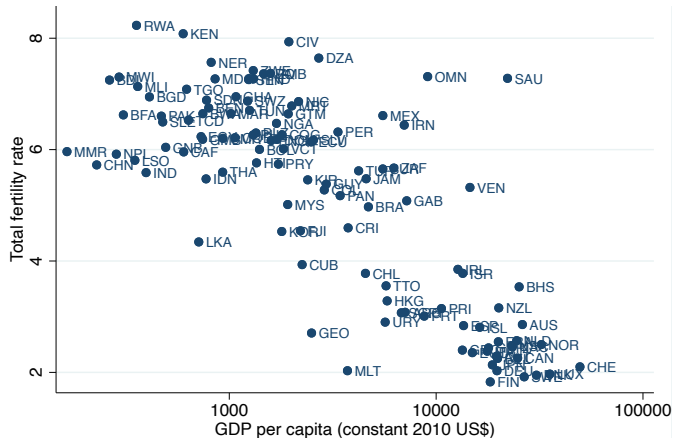
Fertility Used to Decline in Income: Over Time

Total fertility rates since 1850



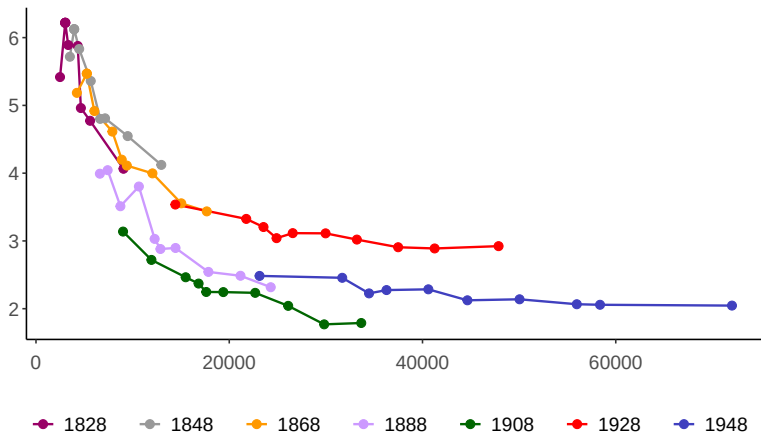
Fertility Used to Decline in Income: Across Countries

Fertility and income across countries in 1970



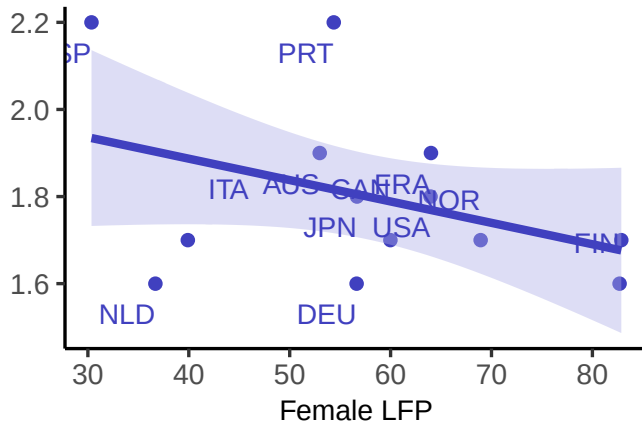
Fertility Used to Decline in Income: Within Countries

Children ever born by income, selected US cross-sections



Fertility Used to Decline in Women's LFP: Across Countries

Fertility and women's LFP across OECD economies in 1980



Two Old Big Ideas

Main challenge in the first phase of the economics of fertility: How to explain the negative income-fertility relationship?

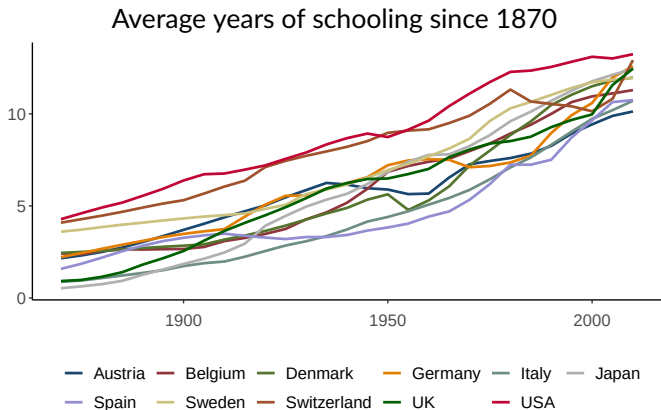
Two main ideas to meet this challenge:

- **The quantity-quality tradeoff.**
- **Women's opportunity cost of time.**

The Quantity-Quality Tradeoff

Parents care about both their number of children and child “quality,” which in practice usually means children’s human capital.

As returns to human capital go up, families choose to have fewer children and invest more in education.



Women's Opportunity Cost of Time

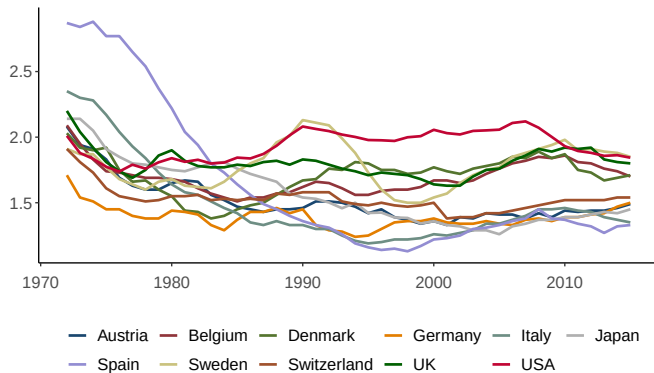
Time cost of raising children used to be borne primarily by the mother.

The gender wage ratio w_f/w_m then matters for fertility: The better women's labor market opportunities, the higher women's labor supply and the lower the fertility rate.

Matches historical facts on relationship between the gender wage gap, women's labor force participation, and fertility.

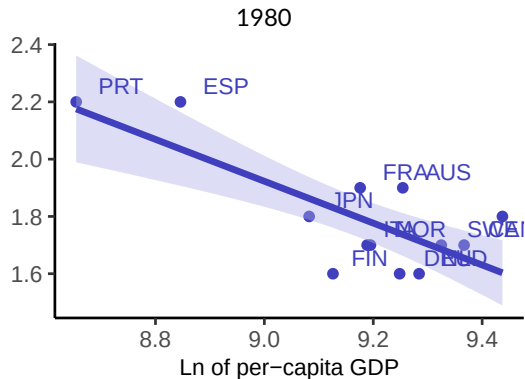
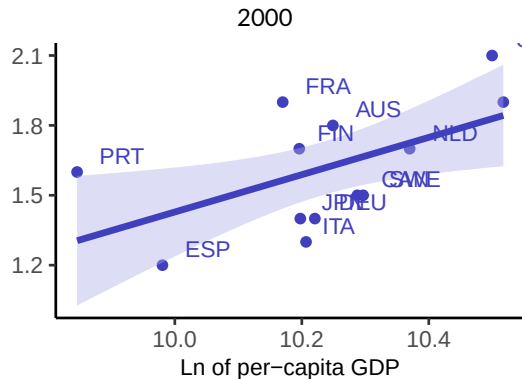
Fertility No Longer Universally Declines in Income

Total fertility rates since 1970



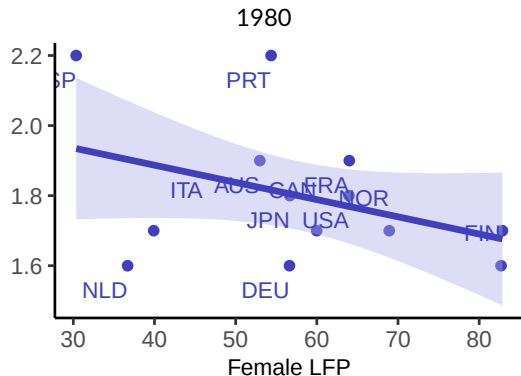
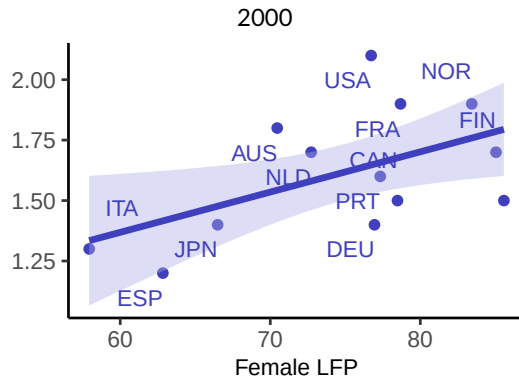
Fertility No Longer Universally Declines in Income

Fertility and GDP per capita across OECD countries



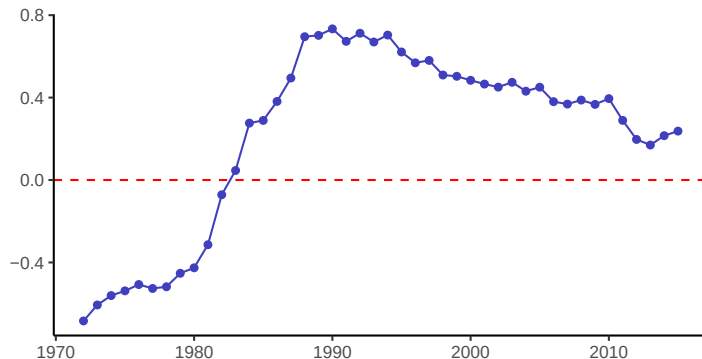
Fertility No Longer Universally Declines in Women's LFP

Fertility and women's LFP across OECD countries



Fertility No Longer Universally Declines in Women's LFP

Cross-country correlation between fertility and women's LFP



Based on Ahn and Mira (JPopE 2002).

Some Reasons Why the Old Mechanisms Have Lost Force

- Public schooling and child-labor laws:
→ **Quantity-quality tradeoff less relevant.**
- Marketization of childcare:
→ **Time costs and women's wages less relevant.**
- Birth control and infertility treatments:
→ **Delayed fertility becomes viable option.**

New Idea: Career versus Family

The main theme in recent literature on fertility in demography, sociology, and economics:

The ease of combining a career and a family for women has become a key driver of fertility decisions.

Women's and men's aspirations have converged (e.g., Goldin (AER 2006)).

In the past, substantial variation within and across countries in women's life plans.

Today, most women in high-income countries aspire to both a family and career—just like most men.

It then matters how easy it is to combine career and family.

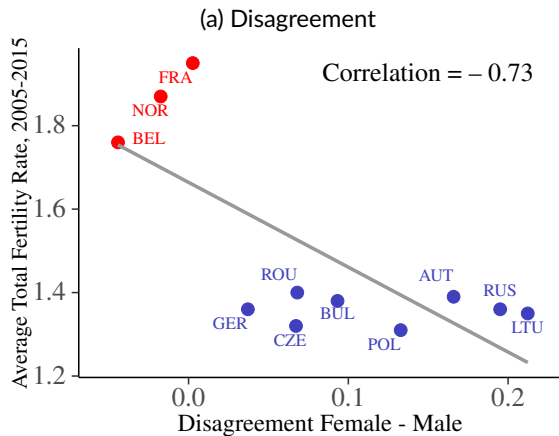
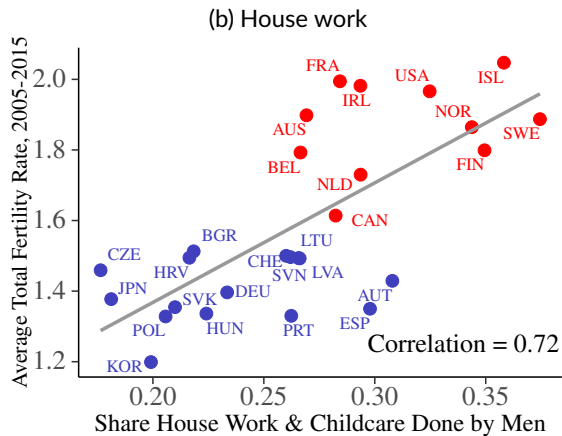
New Idea: Career versus Family

Factors that determine how easy it is to combine the two:

- Family policy.
- Social norms.
- Labor market frictions.
- Fathers' contributions to childcare and intra-household bargaining.

Doepke, Kindermann, and Leitloff (WP 2026): Bargaining frictions can account for reversal of fertility-LFP relationship.

Disagreement and Distribution of House Work Matter for Fertility



Data Suggest Veto Model for Bargaining over Fertility

Regress birth outcome on constant, SHE YES/HE NO, SHE NO/HE YES, and AGREE (stated fertility intentions of each partner):

	Couples with ...		
	no children	one child	two children
SHE YES/HE NO	0.02 (0.04)	0.13*** (0.04)	0.06*** (0.02)
SHE NO/HE YES	0.05 (0.03)	−0.04* (0.02)	0.03* (0.02)
AGREE	0.24*** (0.02)	0.27*** (0.02)	0.30*** (0.03)

Gender and Generations Survey; see [Doepke and Kindermann \(AER 2019\)](#).

Model of Couples

- Couples with preferences

$$u(c_g, n) = c_g + v(n) \quad g \in \{f, m\}$$

- Child costs for each partner g :

$$d(w_f, w_m, p, n) = d_f(w_f, w_m, p, n) + d_m(w_f, w_m, p, n)$$

- Household budget constraint:

$$c_f + c_m = (1 + \alpha) [w_m + w_f - d(w_f, w_m, p, n)]$$

Timing and Bargaining Assumptions

- Timing:

1. fertility decision n : veto model
2. allocation of consumption c_f and c_m

- Assumptions:

- **no commitment** to future consumption allocation in stage 1
- Nash bargaining with equal weights in stage 2
- stage 2 outside option is **non-cooperation** (Lundberg and Pollak (JPE 1993))

$$\bar{u}_g(w_f, w_m, p, n) = w_g - d_g(w_f, w_m, p, n) + v(n)$$

The Consumption Allocation

$$C_f = \underbrace{w_f}_{\text{ex-ante outside option}} - \underbrace{\frac{d(w_f, w_m, p, n)}{2}}_{\text{equal share of child cost}} + \underbrace{\frac{\alpha}{2} [w_m + w_f - d(w_f, w_m, p, n)]}_{\text{share of cons. surplus}}$$

$$C_m = \underbrace{w_m}_{\text{ex-ante outside option}} - \underbrace{\frac{d(w_f, w_m, p, n)}{2}}_{\text{equal share of child cost}} + \underbrace{\frac{\alpha}{2} [w_m + w_f - d(w_f, w_m, p, n)]}_{\text{share of cons. surplus}}$$

The Consumption Allocation

$$C_f = \underbrace{w_f}_{\text{ex-ante outside option}} - \underbrace{\frac{I(w_f, w_m, p, n)}{2}}_{\text{bargaining loss}} - \underbrace{\frac{d(w_f, w_m, p, n)}{2}}_{\text{equal share of child cost}} + \underbrace{\frac{\alpha}{2} [w_m + w_f - d(w_f, w_m, p, n)]}_{\text{share of cons. surplus}}$$

$$C_m = \underbrace{w_m}_{\text{ex-ante outside option}} + \underbrace{\frac{I(w_f, w_m, p, n)}{2}}_{\text{bargaining gain}} - \underbrace{\frac{d(w_f, w_m, p, n)}{2}}_{\text{equal share of child cost}} + \underbrace{\frac{\alpha}{2} [w_m + w_f - d(w_f, w_m, p, n)]}_{\text{share of cons. surplus}}$$

- Bargaining loss for mother

$$I(w_f, w_m, p, n) = d_f(w_f, w_m, p, n) - d_m(w_f, w_m, p, n)$$

The Fertility Decision

- $I(w_f, w_m, p, n) \geq 0 \Rightarrow$ mother is pivotal for fertility decision
- Optimum number of children:

$$v'(n^*) = \frac{1}{2} \left[\underbrace{\frac{\partial I(w_f, w_m, p, n^*)}{\partial n}}_{\text{marginal bargaining loss}} + \underbrace{(1 + \alpha) \frac{\partial d(w_f, w_m, p, n^*)}{\partial n}}_{\text{marginal effective child cost}} \right].$$

Linking Bargaining Loss to the Marginal Child Penalty

- Goods costs $\psi(n)$ and time costs $\phi(n) = F(t_f, \tau, n)$
- Time cost can be
 - provided by mothers at price $w_f \rightarrow t_f$
 - bought on the market at price $p \rightarrow \tau$
- All monetary costs are shared equally between partners

The Marginal Child Penalty and Fertility

- Individual cost of children:

$$\begin{aligned}d_f(w_f, w_m, p, n) &= w_f t_f(w_f, w_m, p, n) + 0.5 [p\tau(w_f, w_m, p, n) + \psi(n)] \\d_m(w_f, w_m, p, n) &= 0.5 [p\tau(w_f, w_m, p, n) + \psi(n)]\end{aligned}$$

- Mother's bargaining loss is equal to child penalty:

$$l(w_f, w_m, p, n) = w_f t_f(w_f, w_m, p, n)$$

- Equilibrium fertility:

$$v'(n^*) = \frac{1}{2} \left[\underbrace{\frac{\partial w_f t_f(w_f, w_m, p, n^*)}{\partial n}}_{\text{marginal child penalty}} + (1 + \alpha) \underbrace{\frac{\partial d(w_f, w_m, p, n^*)}{\partial n}}_{\text{marginal effective child cost}} \right].$$

Women's LFP and Fertility

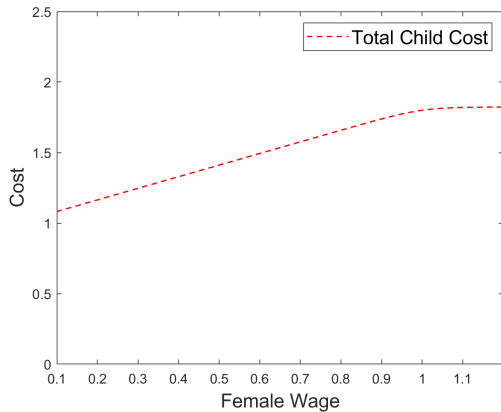
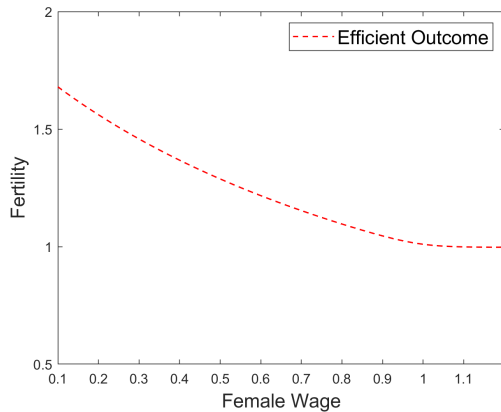
Consider a gradual improvement in women's labor market opportunities, modeled by a rise in w_f .

Two effects on fertility:

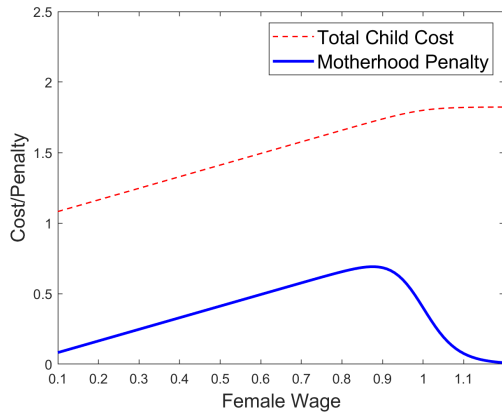
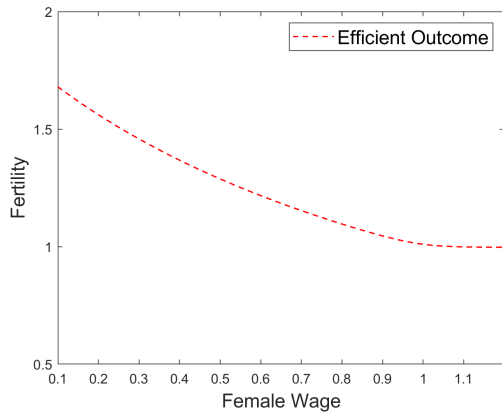
- Total cost of children $d(w_f, w_m, p, n)$ rises: **negative effect on fertility.**
- Motherhood penalty $w_f t_f(w_f, w_m, p, n)$ changes: **nonlinear effect on fertility.**

Result: **Combined effects generate reversal in relationship between women's LFP and fertility.**

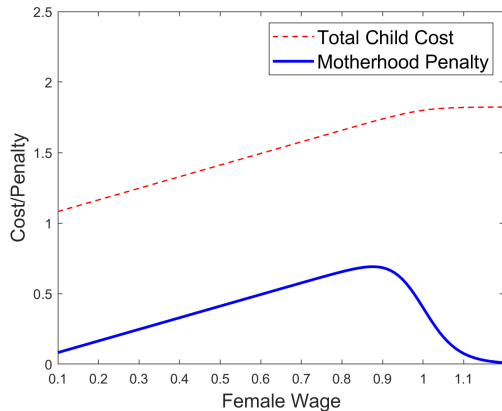
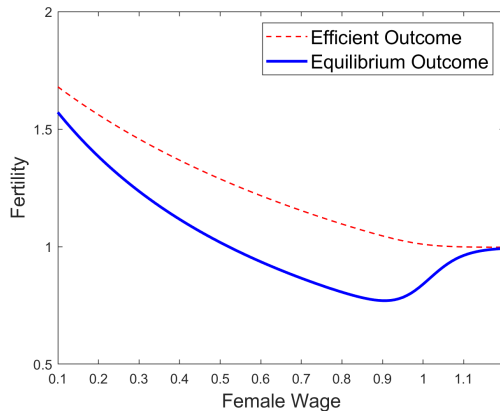
Women's LFP and Fertility



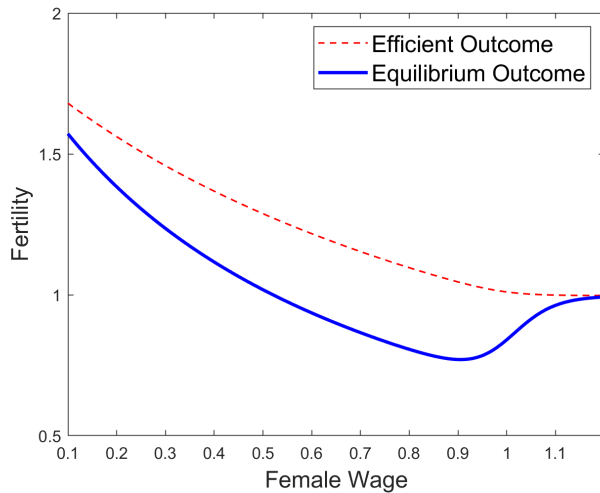
Women's LFP and Fertility



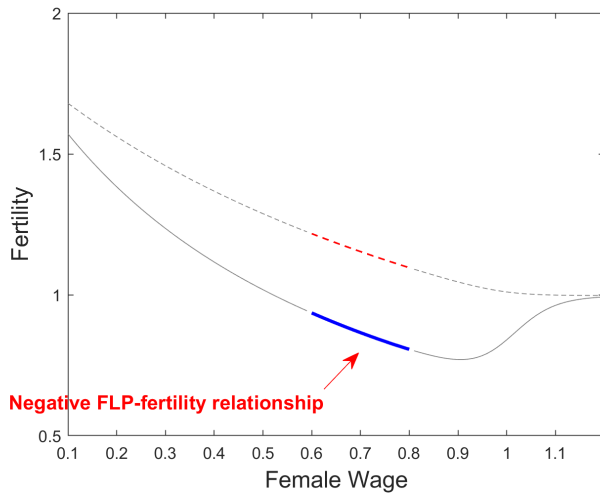
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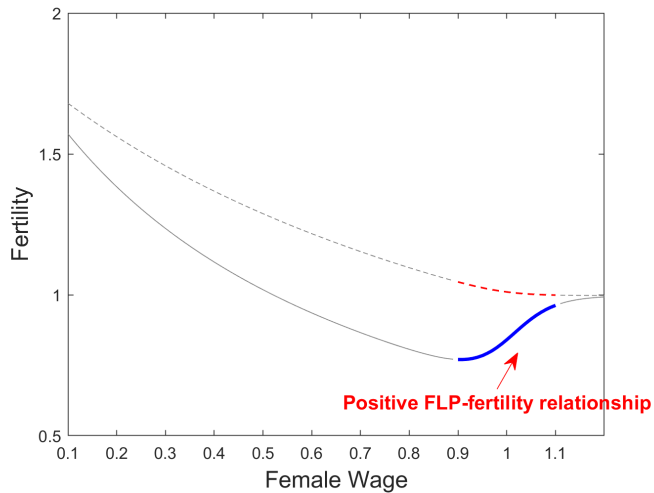
Women's LFP and Fertility



Women's LFP and Fertility



Women's LFP and Fertility



Women's LFP and Fertility

Here, women's LFP and motherhood penalty depend on women's relative wages.

Similar results if LFP and motherhood penalty driven by:

- Family policy.
- Social norms and aspirations.
- Fathers' contributions.

Summary So Far

- Bargaining creates **role for marginal child penalties** in fertility decision
- Model creates **reversal of relationship between fertility and women's LFP**
- Marginal child penalty follows **inverted U-shaped pattern**
 - Little friction in traditional societies
 - Little friction in gender-equal society
 - **High friction, and low fertility, where women want to work but child penalty is high**

Evidence on Child Penalties

- Child penalty concept popularized by Kleven, Landais, and Sørensen (AEJ: Applied 2019)
- Basic idea: event study approach

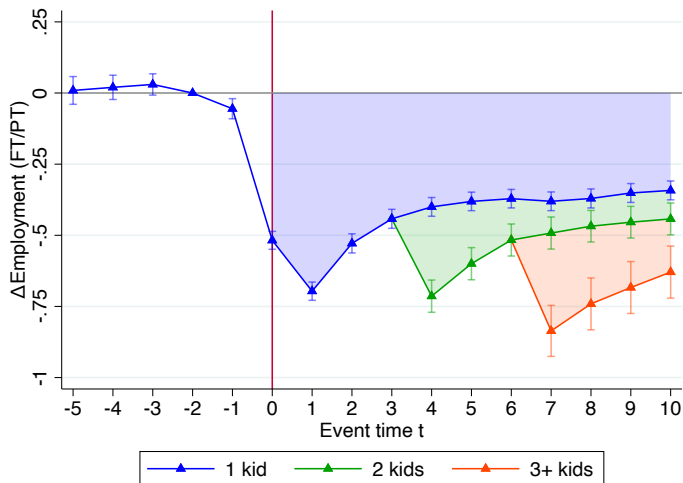
$$Y_{it} = \alpha^g \cdot D_{it}^{Event} + \beta^g \cdot D_{it}^{Age} + \gamma^g \cdot D_{it}^{Year} + \epsilon_{it}$$

- Also quasi-event study estimates computed on cross-sectional data (via matching).

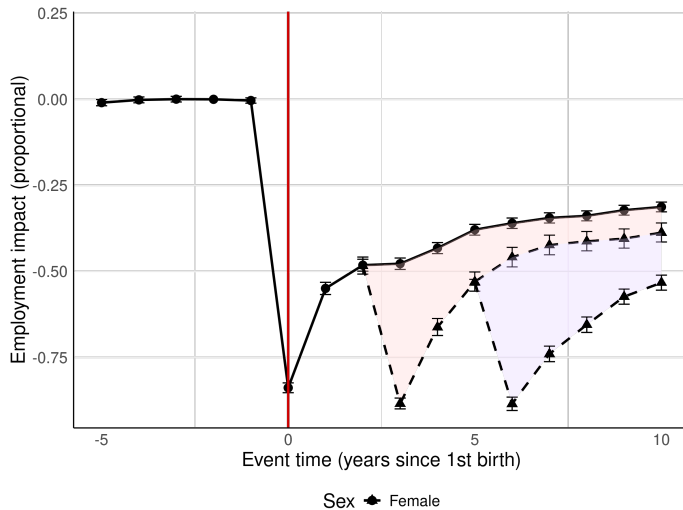
Marginal Child Penalties

- Ongoing work on estimation of marginal child penalties in panel and cross-sectional data.
- SOEP and PSID for Germany and the United States.
- LIS for quasi-event study evidence from many more countries.

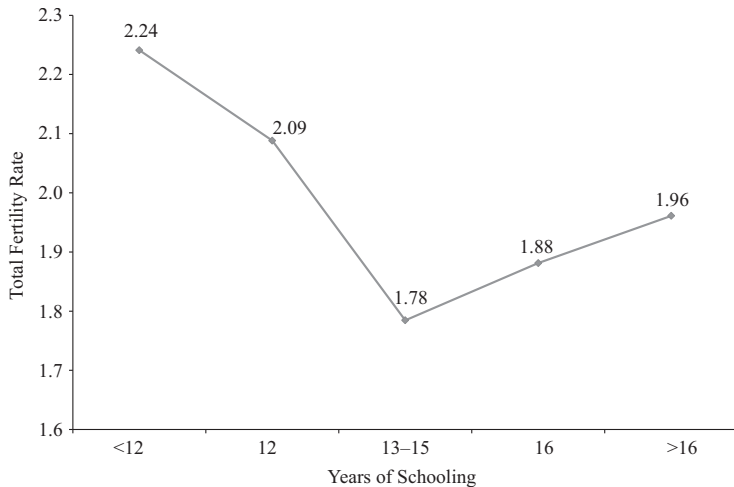
Marginal Child Penalties in Germany (SOEP)



Quasi-Event Study Estimates of Marginal Penalties in Germany (LIS)

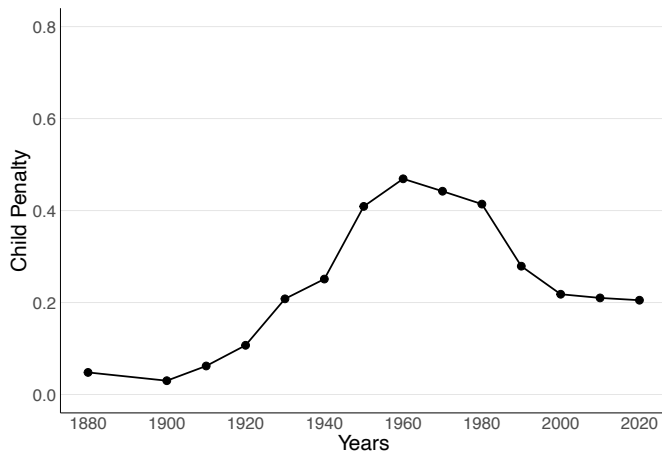


U-Shaped Fertility by Education in the US



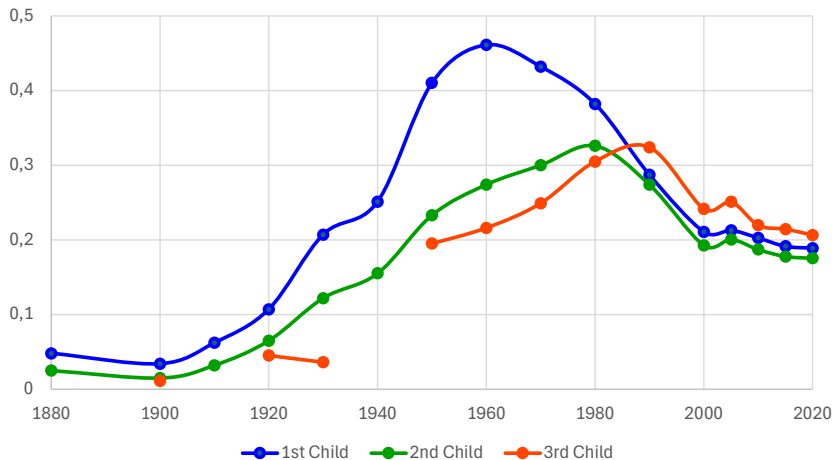
Source: Hazan and Zoabi (EJ 2015).

First Child Penalty in the US over Time

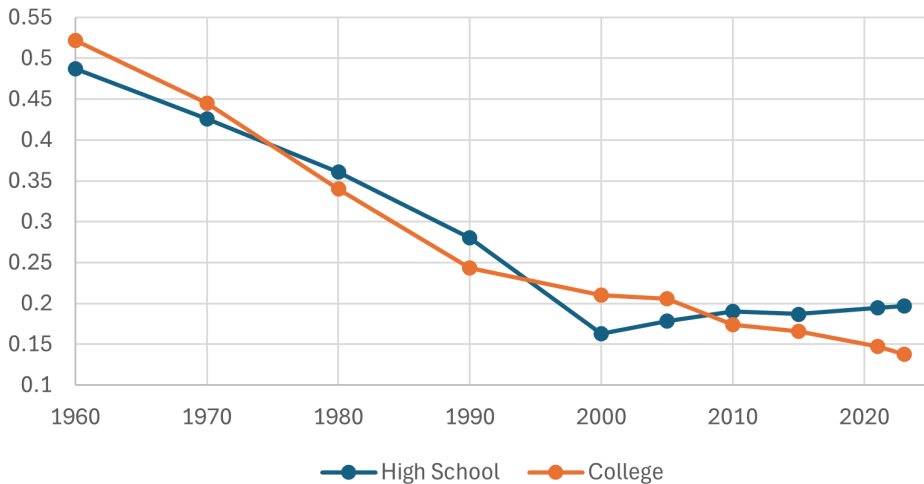


Source: Kleven, Landais, and Leite-Mariante (REStud 2025).

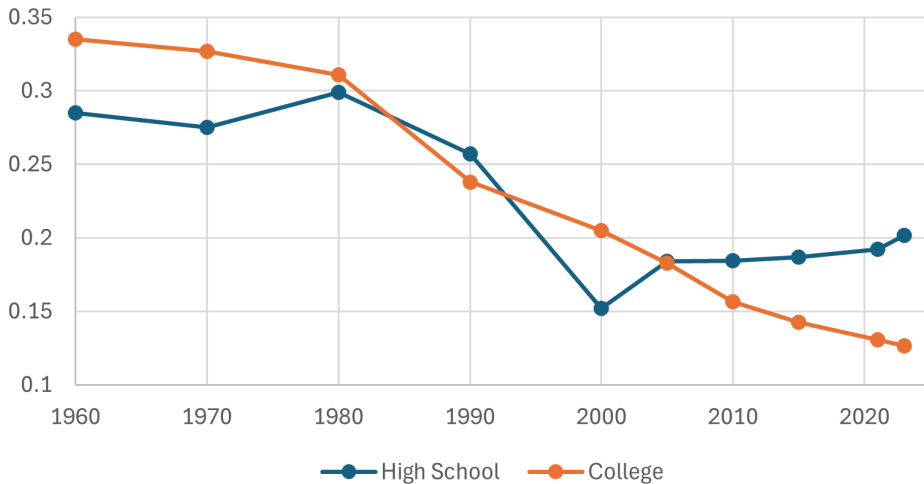
Marginal Child Penalties in the US over Time



First Child Penalty by Education in the US



Second Child Penalty by Education in the US



Summary

- Bargaining creates **role for marginal child penalties** in fertility decision
- Leads to **reversal of relationship between fertility and women's LFP** if women's labor market opportunities gradually improve
- Ongoing research on measuring marginal child penalties over time and across countries
- Ongoing research to apply model to reversal in fertility-education relationship

Status Externalities in Education and Low Fertility

Kim, Tertilt, and Yum (AER 2024): why does South Korea have a fertility rate of only 0.72 (2023)?

- Explores the role of “Education fever”: most children attend private after-school academies (*hagwons*); families spend 9.2% of income per child on education.
- **Main idea:** parents care about their children’s human capital **relative to other children**.
- A quantity-quality model with a negative externality: the standard tradeoff is amplified in equilibrium.

Evidence of Spillovers in Education Spending

- Instrument: regional curfews on late-night *hagwon* classes, which mainly reduced spending of rich families.
- Outcome: education spending of low-income or low-education families, whose children rarely attend late classes.

	Low income	Low education
Spillover β (2nd stage)	0.065 (0.014)	0.039 (0.015)
First-stage F-statistic	16.6	20.0

A 10% cut in spending by the top 15% lowers the spending share of the lower half by about 0.5 percentage points.

Model with Status Externality

Overlapping generations; parents with human capital h choose (discrete) fertility n , education spending per child x , leisure l :

$$U = b \log \left(\frac{c}{\Lambda(n)} \right) + \nu \frac{l^{1-\gamma}}{1-\gamma} + \phi(n) \log (h' - \chi \tilde{h}')$$

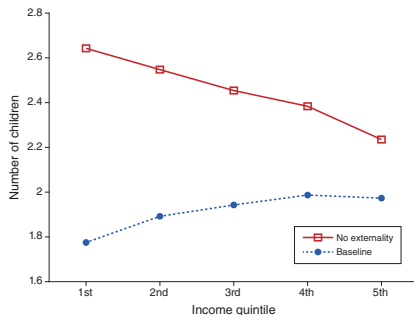
subject to

$$c + x n \leq w h (1 - \lambda n - l), \quad h' = A_h \kappa (\theta + x^\alpha).$$

- $\tilde{h}'$: benchmark human capital of other children; $\chi \geq 0$ is strength of status externality.
- Calibrated to Korean panel data (KLIPS); χ disciplined by the spillover estimate.

The Status Externality Lowers Fertility

Completed fertility by income quintile



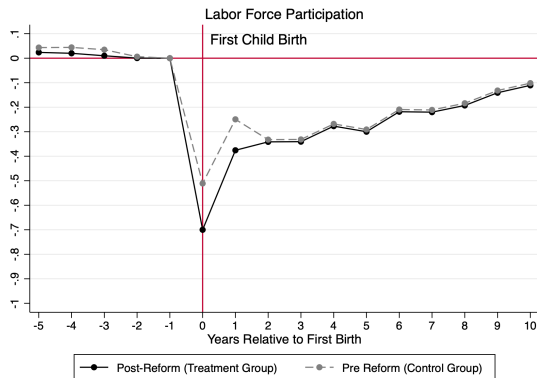
Removing the externality ($\chi = 0$):

- Fertility rises from 1.92 to 2.45 (+28%).
- Largest effect for the poor: the income elasticity of fertility turns from +0.080 to -0.114.
- Childlessness in bottom quintile falls from 5.2% to 0.2%.
- Education spending per child falls by 38–63%, most among the poor.

Parental Leave: RDD Studies Find Small Effects

Stylized RDD estimates: employment around birth

- Large literature exploits birth-date cutoffs of leave reforms (RDD): **Lalive and Zweimüller (QJE 2009)**, **Schönberg and Ludsteck (JOLE 2014)**, **Dahl et al. (REStat 2016)**, **Kleven et al. (AEJ: Policy 2024)**.
- Typical finding: large drop in employment right after birth, but **negligible effects** on employment and earnings after about 3 years.
- Common conclusion: leave policy has little long-run impact on mothers' careers.



Source: **Bronson and Sanin (WP 2025)**.

What Does the RDD Measure?

Bronson and Sanin (WP 2025): the RDD compares women who differ in policy exposure only for **one birth**.

Exposure period	Ideal experiment		RDD	
	Treatment	Control	Treatment	Control
Before birth / early career	New	Old	Old	Old
First birth	New	Old	New	Old*
Second birth	New	Old	New	New
Third birth, etc.	New	Old	New	New

*Old policy for this birth, but anticipating the new policy for future births.

- Misses adjustments **before birth** (education, career, timing).
- Later births fall under the same policy in both groups.
- Control group **anticipates** the new policy (e.g., returns to work to qualify).

A Life-Cycle Model of Labor Supply and Fertility

Women aged 22–50 choose consumption, savings, hours (part-/full-time), and births (if married and under 40):

$$u = \frac{(c/\psi(N))^{1-\sigma_c}}{1-\sigma_c} + \beta_{i,t} \frac{(1-h)^{1-\sigma_l}}{1-\sigma_l} + \kappa(N)$$

$$w_t = a_i + b_1 \text{exper}_t + b_2 \text{exper}_t^2 + \epsilon_t, \quad \tau(wh, y) + Rs_{t-1} + PL = c + Kh + s$$

- Value of home time $\beta_{i,t}$ depends on number and age of children; childcare cost K .
- Experience: part-time counts partially; time out of work depreciates human capital, except during job-protected leave.
- Leave benefit PL : flat, replacement rate of previous earnings, or unpaid; eligibility rules.
- Marriage, divorce, and spousal income exogenous.

Calibration and Quantitative Experiment

Calibration to the UK (BHPS 1991–2008):

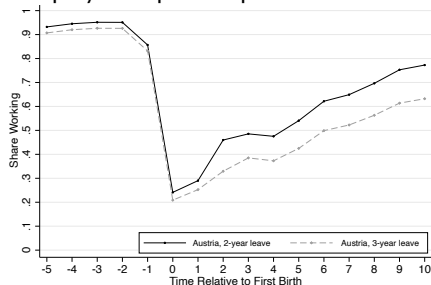
- Targets: distribution of completed fertility, age at first birth, birth spacing, employment and hours by number and age of children, wage profiles.
- Validation: imposing Swedish policy raises employment in decade after first birth by 9 pp; Austrian policy lowers it by 6 pp.

Experiment: Austria 2002 reform, leave extended from 2 to 3 years:

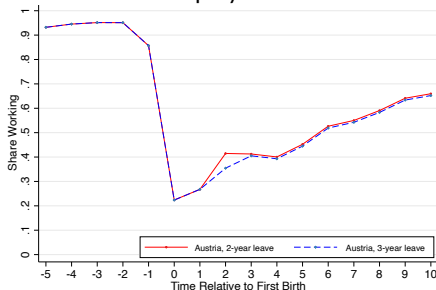
- Full effect: simulate cohorts living their whole lives under old vs. new policy.
- Simulated RDD: women expect the old policy until the reform is announced (during pregnancy); treatment and control differ only in leave for the current birth.
- Apply the RDD estimator to model-generated data and compare with the full effect.

Full Policy Effects vs. RDD Estimates

Full effect: employment pre- vs. post-reform cohorts



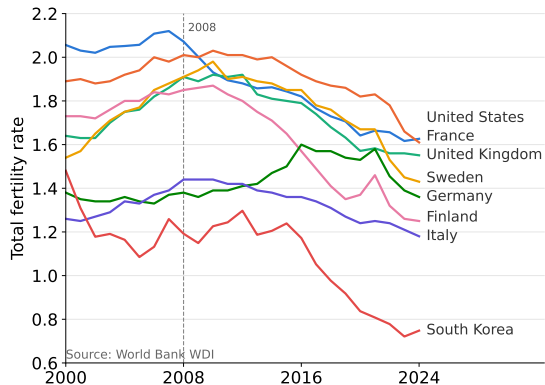
RDD effect: employment of treated vs. control



- Simulated RDD reproduces small short-run and negligible long-run effects.
- Full effect: large, **persistent** employment decline (up to 10 pp over a decade).
- RDD **control group** differs sharply from pre-reform cohorts (anticipation).

Fertility Has Fallen Again Since 2008

Total fertility rates since 2000



- **Kearney, Levine, and Pardue (JEP 2022):** US birth rate fell by 20% from 2007 to 2020; decline is broad-based, concentrated in first and second births.
- Recession explains the early drop; state-level economic and policy factors (childcare costs, rents, student debt, contraception) explain only about 6%.
- **Cohort** pattern: women born after the early 1980s have fewer children at every age.
- Conjecture: **shifting priorities**, i.e., preferences for children, life aspirations, and parenting norms.

What Is Next for the Economics of Fertility?

- **Time use data**: central to both the labor supply and child-investment margins.
- **Partnership formation and male fertility**: increasingly important margins.
- **Space and cost of housing**: clearly important, arguably neglected because of data availability.
- **Policy evaluation**: quasi-experimental estimates capture short-run responses; long-run effects of family policy require models.
- **Macroeconomic consequences** of low fertility: population aging, public pensions, and long-run growth (**Jones (AER 2022)**).