Did Improvements in Household Technology Cause the Baby Boom? Evidence from Electrification, Appliance Diffusion, and the Amish

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Overview

- **Main questions**:
  - The literature is still seeking consensus on the cause of the baby boom.
  - This paper tests whether the growth in productivity of household technology was really a cause of the baby boom, a result found by Greenwood et al. (2005).

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- **Approach**:
  - Present time series evidence that the rise in modern household technologies predated the baby boom by several decades.
  - Examine the county-level correlations between fertility and adoption of modern household technologies.
  - Study fertility rates of the Amish, a group known for their rejection of modern technologies.

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- **Results**:
  - Ultimately the authors reject the causal link between household technological innovation and the baby boom.

Time Series Motivation

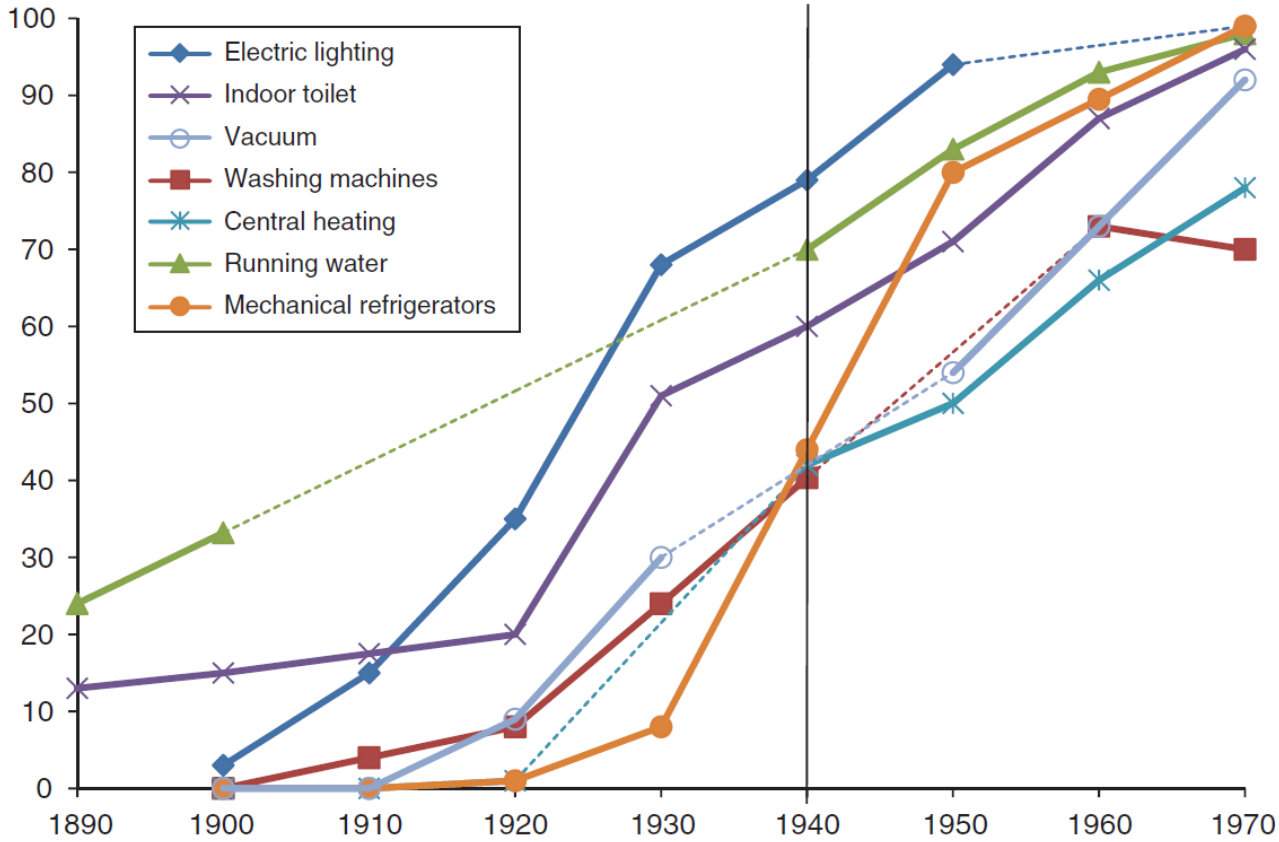

FIGURE 2. PROPORTION OF HOUSEHOLDS WITH MODERN HOUSEHOLD TECHNOLOGY, 1890–1970

Key Takeaway: though different Census years ask about different technologies, the overwhelming trend is that the rise in modern household technology adoption began as early as 1900.

Time Series Motivation

Not only is there an absent boom of household technology aligning with the baby boom, there is also no relative boom in household productivity during this period

- There is significant market wage growth plot
- The price index for consumer durables jumps dramatically plot

Cross-Sectional County Evidence

- Data: Panel of 3,000 counties for 1940, 1950, and 1960
  - Household technology level (share of housing units with refrigerators, washing machines, modern stoves, and electrical lighting)
  - Fertility rate (infants per 1,000 women ages 15-44)
  - Various demographic and economic controls
- Empirical Strategy:

$$F_{j(s)} = \tau A_{j(s)} + \beta X_{j(s)} + \sum_{k=1}^{49} \gamma_k \mathbb{1}(k = s) + \varepsilon_{j(s)}$$

where $j(s)$ is county j in state s,
A is the household technology adoption rate,
X is a set of covariates,
and they include state fixed effects.

Cross-Sectional County Evidence

TABLE 2—CROSS-SECTIONAL REGRESSIONS OF FERTILITY ON APPLIANCES IN US COUNTIES, 1940–1960

Dependent variable: General fertility rate	(1)	(2)	(3)
Panel A. 1940			
Percent with refrigerator	−0.689	−0.665	0.017
	[0.056]	[0.067]	[0.050]
Observations	3,034	3,034	3,034
R^2	0.34	0.50	0.63
Percent with modern stove	−0.428	−0.410	0.029
	[0.034]	[0.038]	[0.034]
Observations	3,034	3,034	3,034
R^2	0.31	0.48	0.63

Cross-Sectional County Evidence

Panel B. 1950			
Percent with refrigerator	−0.402	−0.483	−0.401
	[0.056]	[0.057]	[0.104]
Observations	3,031	3,031	3,031
R^2	0.14	0.39	0.48
Percent with modern stove	−0.193	−0.246	0.004
	[0.036]	[0.033]	[0.049]
Observations	3,031	3,031	3,031
R^2	0.07	0.35	0.47

Cross-Sectional County Evidence

Panel C. 1960			
Percent with washing machine	−0.132	−0.284	0.068
	[0.141]	[0.167]	[0.069]
Observations	3,022	3,022	3,022
R^2	0.01	0.29	0.44
Percent with modern stove	−0.230	−0.433	−0.309
	[0.105]	[0.081]	[0.113]
Observations	3,022	3,022	3,022
R^2	0.02	0.32	0.45
State fixed effects	No	Yes	Yes
Economic and demographic controls	No	No	Yes

Cross-Sectional County Evidence

Key Takeaway: county-level analysis with detailed data on household technology adoption allows the authors to control for observable demographic and economic characteristics. Ultimately the results show negative, or zero, correlation between modern household technology and fertility rates.

The authors include various robustness checks to these results, each coming to a similar conclusion:

- First-Differenced specification of the regression results
- Use electrification as a proxy for technological adoption results
- Use completed fertility as the dependent variable results

The Amish Baby Boom

- Do we observe households that did not adopt productivity boosting technology?
  - Yes! **The Old Order Amish** Photo
  - (1) No electricity/minimal appliance use; (2) integrated in market economy

The Amish Baby Boom

- Do we observe households that did not adopt productivity boosting technology?
  - Yes! **The Old Order Amish** Photo
  - (1) No electricity/minimal appliance use; (2) integrated in market economy
- Did the Amish have lower birthrates during the Baby Boom?
  - No! Similar increase in fertility.
  - Evidence from genealogical records (existing literature) and census data (Bailey & Collins)

The Amish Baby Boom

- Amish fertility data
  - IPUMS (1940, 1980, 1990)
  - Speaks "Pennsylvania Dutch" $\Longrightarrow$ "likely Amish"
  - 1,915 "likely Amish" women aged 35-85
- Comparison groups:
  - Farms in Indiana, Ohio, and Pennsylvania
  - All U.S. non-farm

The Amish Baby Boom

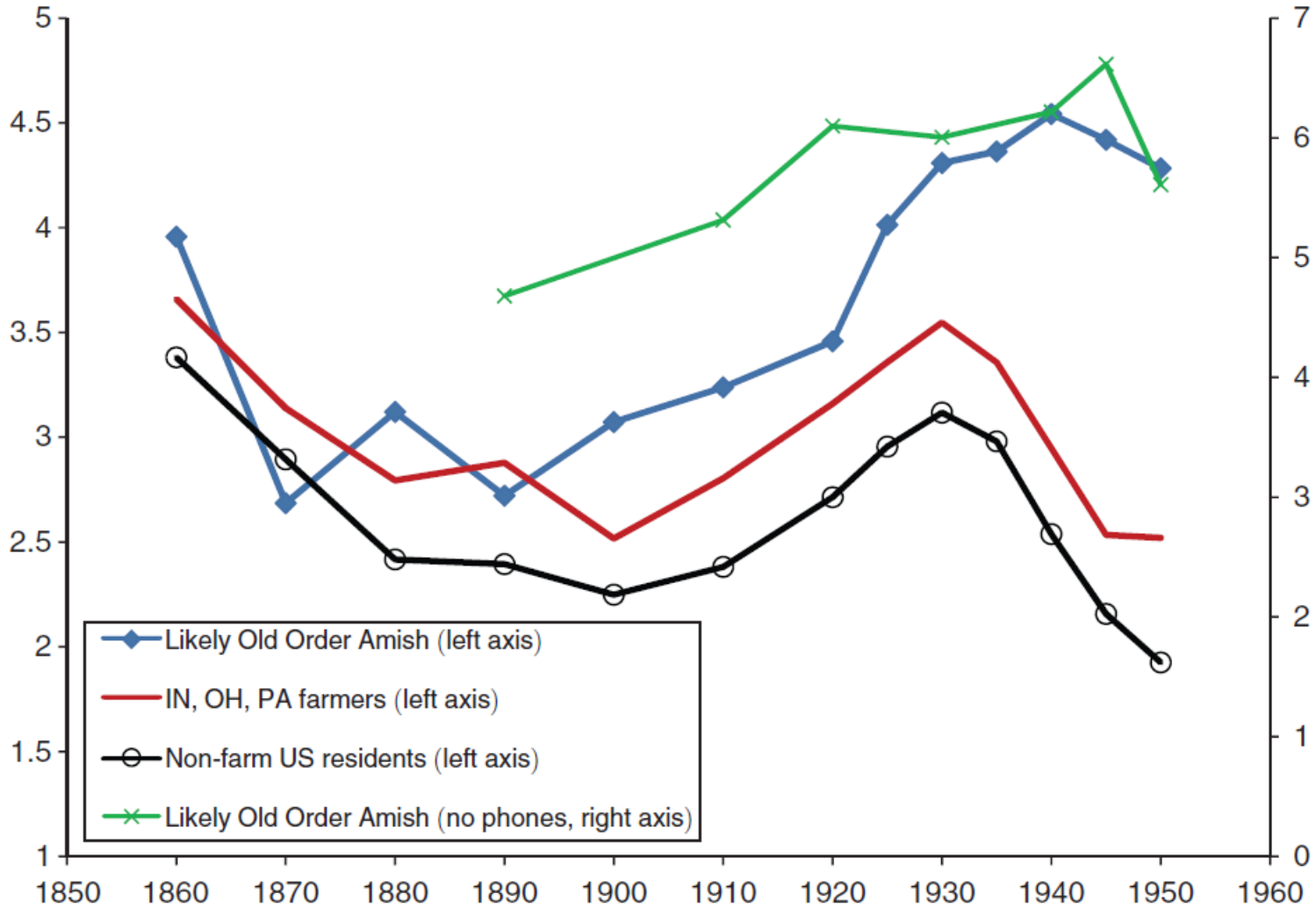

FIGURE 7. MEAN CHILDREN BORN TO LIKELY AMISH AND OTHER US WOMEN BORN 1860–1954

Theoretical considerations

- Why is GSV at odds with the empirical evidence?
  - Use the Slutsky equation for child demand
  - Shock A reduces relative prices
  - p_N, p_H: rel. prices of children and home-produced good[1]
  - $N(\cdot), H(\cdot)$: demand for children, home good

$$\frac{dN(p_N, p_H, I)}{dA} = \underbrace{\left[\frac{dN^C}{dp_N} - \frac{dN}{dI}N(\cdot)\right]\frac{dp_N}{dA}}_{\text{Positive}} + \underbrace{\left[\frac{dN^C}{dp_H} - \frac{dN}{dI}H(\cdot)\right]\frac{dp_H}{dA}}_{\text{Ambiguous}}$$

- Are children and home goods compliments or substitutes?

[1] Or "child quality"

Rebuttal from Greenwood et al.

In 2015, GSV respond to Bailey & Collins (2011):[2]

1. Early adopters of technology wealthier $\Longrightarrow$ lower fertility
2. Augment GSV model with tech. adoption decision
   - Now consistent with BC's evidence
3. Amish use more technology than BC suggest
   - Washing machines in particular
   - Non-participation in WWII

[2] Greenwood, J., Seshadri, A., & Vandenbroucke, G. (2015). Measurement without theory, once again. *Journal of Demographic Economics*, 81(3), 317-329.

Appendix

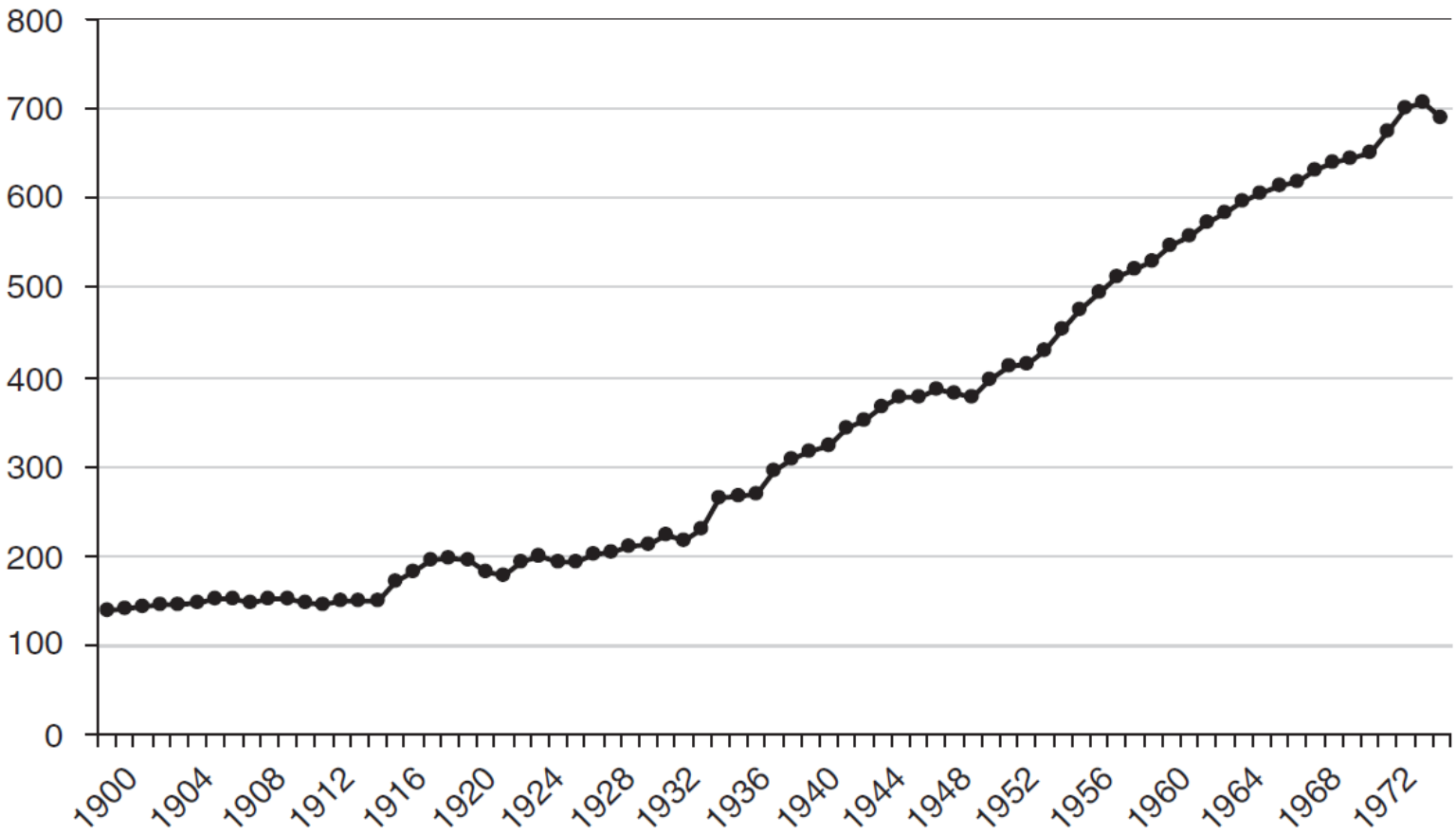

FIGURE 3. REAL WAGE INDEX (1860 = 100)

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Appendix

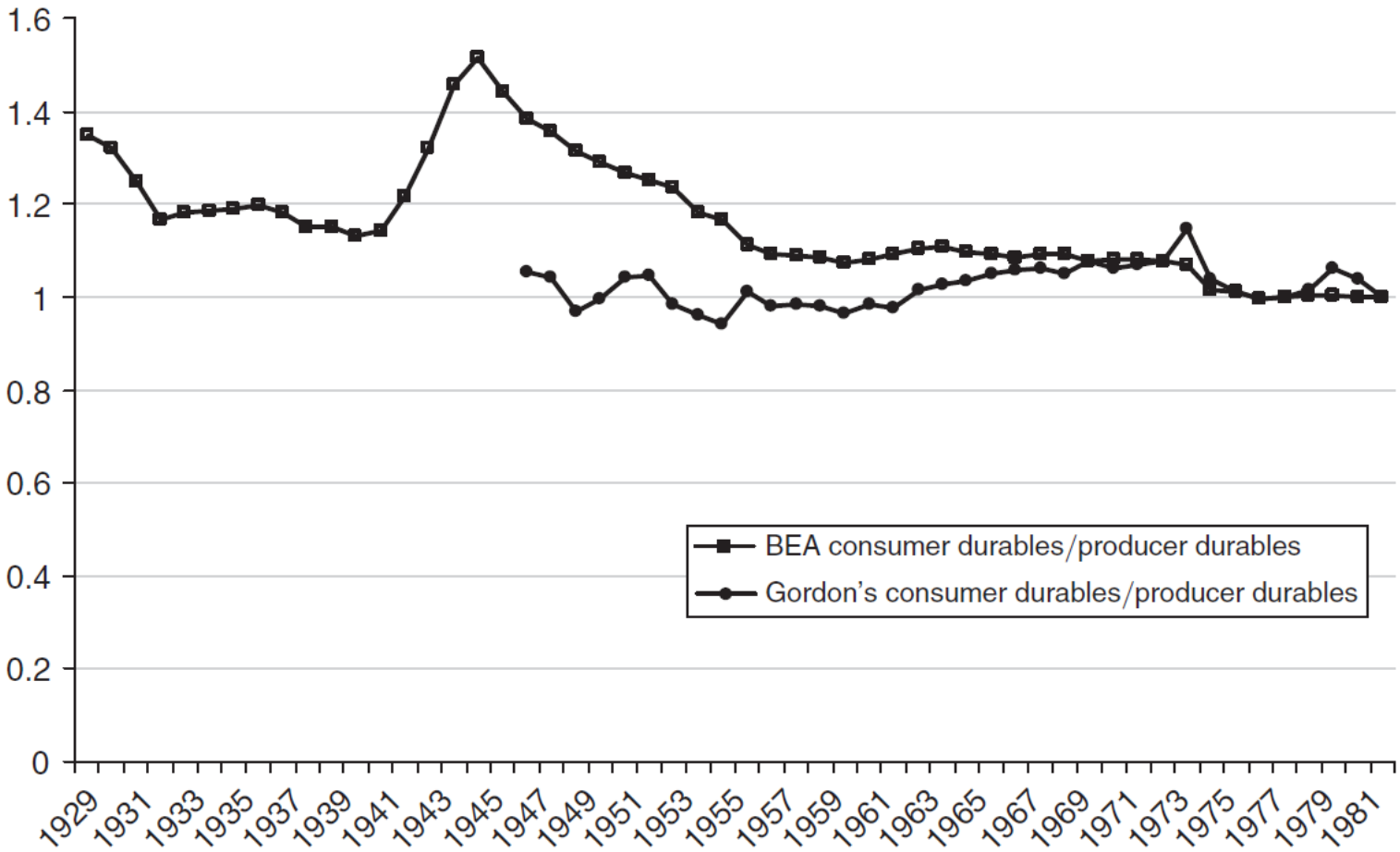

FIGURE 4. CONSUMER DURABLE PRICES RELATIVE TO PRODUCER DURABLE PRICES, 1982 = 1

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Appendix

TABLE 3—DIFFERENCED REGRESSIONS OF FERTILITY ON APPLIANCES IN US COUNTIES, 1940–1960

Dependent variable: Change in general fertility rate	(1)	(2)	(3)
Panel A. Refrigerators, 1940–50			
Δ percent with refrigerator	−0.007	−0.214	−0.101
	[0.099]	[0.089]	[0.094]
Observations	3,023	3,023	3,023
R^2	0.00	0.20	0.28
Panel B. Modern stoves, 1940–60			
Δ percent with modern stove	−0.231	−0.298	−0.088
	[0.052]	[0.047]	[0.049]
Observations	2,990	2,990	2,990
R^2	0.04	0.29	0.42
Panel C. Modern stoves, 1950–60			
Δ percent with modern stove	−0.201	−0.185	−0.044
	[0.035]	[0.043]	[0.053]
Observations	2,990	2,990	2,990
R^2	0.04	0.16	0.24
State fixed effects	No	Yes	Yes
Economic and demographic controls	No	No	Yes

Appendix

TABLE 4—REGRESSIONS OF PERIOD FERTILITY ON ELECTRICAL SERVICE, 1940–1950

Dependent variable: General fertility rate	(1)	(2)	(3)
Panel A. Fertility cross section, 1940			
Percent with electric lights	−0.410	−0.515	−0.171
	[0.034]	[0.034]	[0.053]
Observations	3,034	3,034	3,034
R^2	0.34	0.55	0.64
Panel B. Fertility cross section, 1950			
Percent with electric lights	−0.506	−0.553	−0.375
	[0.072]	[0.047]	[0.083]
Observations	3,031	3,031	3,031
R^2	0.14	0.40	0.48
Panel C. Fertility change, 1940–1950			
Δ percent with electric lights	−0.275	−0.327	−0.182
	[0.044]	[0.042]	[0.054]
Observations	3,023	3,023	3,023
R^2	0.08	0.24	0.29
State fixed effects	No	Yes	Yes
Economic and demographic controls	No	No	Yes

Appendix

TABLE 5—REGRESSIONS OF CHILDREN-EVER-BORN ON EXPOSURE TO ELECTRICAL SERVICE

Dependent variable: Children ever born	(1)	(2)	(3)	(4)
Exposure to electricity × 100	−0.008	−0.008	−0.008	−0.008
	[0.002]	[0.002]	[0.002]	[0.002]
State of birth f.e.	No	Yes	Yes	Yes
Year of birth f.e.	No	Yes	Yes	Yes
Race and education	No	No	Yes	Yes
Husband's education	No	No	No	Yes
Observations	1,034	1,034	1,034	1,034
R^2	0.877	0.880	0.880	0.881

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Appendix

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Source: https://www.discoverlancaster.com/amish/history-beliefs/