Estimating the Importance of the Supply Side

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Martha J. Bailey
Demand and "Supply"

Demand
- Preferences
- Prices
- Income

Supply
- Things that affect the marginal cost of averting births

Births

Education
- "Development"
- "Culture"

Family Planning Policy
Demand and Supply of Children

- Births averted = Reproductive potential - children
  - Adding uncertainty strengthens these conclusions

Demand for Children

Country 1

B1, B2

Demand for Children

Country 2

B1, B2

MC of Averting Births: No Family Planning Program

MC of Averting Births: Family Planning Program
Implications

• We don’t observe both curves. We only observe price-quantity equilibria
  – Did childbearing change due to supply, demand, or both?

• Supply and demand move together:
  – Demand for children/births averted and family planning programs are closely intertwined
    – Areas with different ideas about children/demand for children tend to use contraception more, build more family planning centers, etc.
Empirical Problems

• Cross-sectional (cross-country, cross-state, cross-county) correlations confound differences in the demand for children with differences in the “supply” of births
  – Locations desiring fewer adopt progressive policies

• Differences-in-differences may confound changes in the demand (leading to a policy change, e.g.) with the effect of the policy change (endogenous policy change)
  • Reverse causality
  • Simultaneity
The Debate over Family Planning

• Supply-side ("family planning gap")
  – Westoff (1975: 579): "the entire decline in births within marriage across the decade of the 'sixties' can be attributed to the improvement in the control of fertility".
  – Robey, Rutstein, and Morris (1993:62): state that "differences in contraceptive prevalence explain about 90 percent of the variation in fertility rates" and "fertility levels have dropped most sharply where family planning has increased most dramatically"

• Demand-side ("desired children view")
  – Becker (1981:143): “The ‘contraceptive revolution’ ... ushered in by the pill has probably not been a major cause of the sharp drop in fertility in recent decades”
  – Pritchett (1994:3): “the challenge of reducing people’s fertility is the challenge of reducing people’s fertility desires”
Theoretical Conceptualization
Quality-Quantity Model 1

• Household maximization problem is given by
  \[ U(n,q,s) \text{ s.t. } \pi_c qn + \pi_s s = l \]

• \( n \) is the number of children
• \( q \) is the “quality” of children,
• \( c = qn \) is the quality units of children
• \( s \) is parents’ standard of living
• \( \pi \) full price for each commodity
• \( l \) is total household lifetime income
Quality-Quantity Model 2

• Under standard assumptions, that optimality implies,

\[ \frac{U_n}{U_q} = \frac{q}{n} \]

• Marginal rate of substitution between the number of children and child quality depends on the optimal choice of q and n (shadow price of child quality is dependent on n)

• Posit that the income elasticity of quality > income elasticity of child quantity
Adding the Supply Side 1

• Household maximization problem is given by
  \[ U(n,q,s) \text{ s.t. } \pi_c qn + \pi_A (N-n) + \pi_s s = 1 \]

• where \( n=N-A \): \( N \) is natural fertility (childbearing in the absence of any contraception or effort to reduce childbearing and is fixed by nature) and \( A \) is the number of births averted.

• Averting births has a non-zero, constant marginal cost for averting a birth, \( \pi_A \)

• Note: \( \pi_A = 0 \) simplifies to the standard model
Adding the Supply Side 2

• Under standard assumptions, optimality implies,

\[ \frac{U_n}{U_q} = \frac{\pi_c q - \pi_A}{\pi_c n} \]

• Almost the same as previous optimality condition except that \( \pi_A \) acts to reduce the price of child quantity

• Intuition: nature’s subsidy to childbearing
  • Family planning reduces the relative price of child quality, e.g. investing in children
Empirical Importance of Supply
Research Design

• Randomly assign stork deliveries?
• Randomly assign preferences, prices income?
• Technology shock to supply side?
  – Pill: appears at the peak of the baby boom 😞
  – Abortion: more promising, but appears after Vietnam fertility notch
• “DIS-couragement design”=price increase
  – Indirect effect of policies
  – Obsolete, 90 year old policies activated by technology shock
Identifying the Effect of “Supply”

• #1: Unmarried, late adolescents:
  – Goldin and Katz (JPE, 2002), Bailey (QJE, 2006), etc.
  – “Early Legal Access to the Pill”: legal consent between 18 and 21 for birth cohorts of 1939-1956

• #2: Married women: Bailey (AER, 2010)
  – 1957: Idiosyncratic language in Comstock laws passed in the 1800s “activated” by technology shock
  – 1965: *Griswold v. Connecticut* “invalidates” statutes

• #3: Poorer women: Bailey (AEJ-AE, 2012)
  – County-level, federal funding “shocks” between 1965 and ~1974
Identification Strategy #1: ELA to Pill varies by state and birth cohort

  – History: “Early legal access” to the Pill=Legal consent (without parents) before age 21
  – Economics: reduction in the price of averting births during a critical period for human capital investment/marriage; move to a less constrained equilibrium
To be “TREATED” with early legal access, women are unmarried, born 1940-1956
Identification Strategy #1:
ELA to Pill varies by state and birth cohort

\[ P(AFB_{sc} \leq a) = F(X'_{sc} \beta + \tau ELA_{sc} + f_s + g_c) \]

Threats to identification: unobservable that
- varies within cohort (c) across states (s)
- varies within state (s) across cohort (c)

\[ Y_{asc} = X'_{asc} \beta + \sum_k \delta^k ELA_{sc} 1(a=k) + f_s + g_c + h_{c+a} + \{f_{as} + g_{ac}\} + \epsilon_{asc} \]

Threats to identification with bracketed term:
unobservable that varies within state-cohort (sc) across ages or varies within cohort-age (ca) across states

Threats to identification without bracketed term:
- varies by cohort (ca)
- varies by age-state (sa)
## Identification Strategy #1

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Mean dependent variable(^a)</th>
<th>1 = In the labor force</th>
<th>March CPS</th>
<th>June CPS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>ELA to pill × 21–25</td>
<td>0.605</td>
<td>0.003</td>
<td>0.005</td>
<td>−0.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.006]</td>
<td>[0.006]</td>
<td>[0.008]</td>
</tr>
<tr>
<td>ELA to pill × 26–30</td>
<td>0.580</td>
<td>0.039</td>
<td>0.042</td>
<td>0.040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.007]</td>
<td>[0.006]</td>
<td>[0.009]</td>
</tr>
<tr>
<td>ELA to pill × 31–35</td>
<td>0.640</td>
<td>0.016</td>
<td>0.019</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.006]</td>
<td>[0.006]</td>
<td>[0.009]</td>
</tr>
<tr>
<td>ELA to pill × 36–40</td>
<td>0.711</td>
<td>−0.002</td>
<td>0.002</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.007]</td>
<td>[0.006]</td>
<td>[0.010]</td>
</tr>
<tr>
<td>ELA to pill × 41–44</td>
<td>0.752</td>
<td>−0.006</td>
<td>−0.003</td>
<td>−0.007</td>
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<tr>
<td></td>
<td></td>
<td>[0.008]</td>
<td>[0.008]</td>
<td>[0.012]</td>
</tr>
</tbody>
</table>

**Fixed effects**
- R, Y, C \(^b\)
- RxYear \(^c\)
- RxYear \(^c\)
- RxYear \(^c\)
- S, Y, C, SxYear \(^d\)

**Age of majority states**
- X

**Abortion controls\(^e\)**
- X
- X

**First birth before 22\(^f\)**
- Yes

**Observations**
- 733419
- 733419
- 245943
- 733419
- 103972

**Log likelihood**
- −454635
- −454359
- −150263
- −454341
- −59671
What happened to married women, women with children?
Identification Strategy #2: Comstock laws + technology shock

• Bailey (2010)

• History:
  – 1957: Idiosyncratic language in Comstock laws passed in the 1800s “activated” by technology shock
  – 1965: *Griswold v. Connecticut* “invalidates” statutes

• Economics:
  – Reduction in the price of averting births concentrated among married women in states without sales bans
Timeline

1879: Connecticut passed very restrictive state Comstock law

1965: Connecticut statute enjoined by *Griswold*

1960: 33 states had Comstock laws surviving; 24 sales bans

1965-1971: 21 revise sales bans; more than ½ initiate state funded family planning programs
Comstock Laws c. 1960 (Table I)
Empirical Strategy

1900

Comstock Laws enacted

1957

FDA approves Enovid

1965

Griswold decision

Laws not effectively enforced:


2. 1965 NFS: ever used birth control before Griswold similar by legal regime
Empirical Strategy

1900
Comstock Laws enacted

1957
FDA approves Enovid

1965
Griswold decision

Laws more effectively enforced:
1. The Pill is a hazardous pharmaceutical
2. Doctors reluctant to prescribe it illegally
Empirical Strategy

1900

Comstock Laws enacted

1957

FDA approves Enovid

1965

Griswold decision

1970

Lots of policy variation
Identification Strategy #2: Comstock laws + technology shock

\[ GFR_{st} = Sales_s f'_t \tilde{\tau}_1 + Exception_s f'_t \tilde{\tau}_2 + Advertising_s f'_t \tilde{\tau}_3 + g_{rt} + X'_s \delta + \varepsilon_{st} \]

Threats to identification: unobservable that varies within region-year that affects states with sales bans (without bans) relative to other states in that region without these bans in the 1957 to 1965 period

Evidence:
1. Laws affected contraceptive sue
2. Back-of-the-envelope calculation about how differences in the failure rate may generate differences in outcomes consistent with estimates
Sales Laws and Contraceptive Use

No sales law

Sales law
Identification Strategy #2: Comstock laws + technology shock
Identification Strategy #2: Comstock laws + technology shock
Distributional Implications?

Poor versus more affluent women?
Identification Strategy #3: Funding shocks to family planning

• Bailey (2012)
  – County-level, federal funding “shocks” between 1965 and ~1974

• **History:**
  – Haphazard *timing* of federal grants
  – Uncorrelated with local demand shocks

• **Economics:**
  – Reduction in the price of averting births concentrated among poor women in counties receiving grants
Identification Strategy #3: Comstock laws + technology shock

\[ Y_{j,t} = \theta_j + \gamma s(j),t + \sum_{y=-8}^{-1} \pi_y D_j 1(t - T_j^* = y) + \sum_{y=1}^{16} \tau_y D_j 1(t - T_j^* = y) + X'_{jt} \beta + \varepsilon_{jt} \]

Threats to identification: unobservable that varies within state-year that affects counties getting grants in the same year they get one
Identification Strategy #3: Comstock laws + technology shock
Research Design and Data

• Exploit variation in when and where federal programs began from 1964 to 1973

• Link this grant information to other data:
  – Vital Statistics on natality (Bailey 2012, public data)
  – Census data on outcomes (Bailey, Malkova and McLaren, RDC)
  – 2000 census, 2005-2011 American Community Survey (Bailey 2013, public data)
Key Assumptions

1. **Excludability:** Family planning grants do not affect childbearing or children’s resources except through the proposed channels.

2. **Exogeneity:** Timing and location of federal family planning grants as good as random after accounting for other model covariates.

3. **Relevance:** Federal family planning programs meaningfully increased the use of family planning services.
Exogeneity

• Historical accounts of the “wild” operation of grant-making or “administrative confusion”

• Empirical evidence that date program began
  – Not predicted by 1960 characteristics or fertility rates
  – Not predicted 1965 NFS characteristics (e.g., social mores, sexual behavior, birth control use)

• Timing of program establishment not coincident with other War on Poverty grants
Fertility Rates and the Roll-Out of Family Planning Programs

Slope = 0.13, S.E. = 0.42

Slope = 0.11, S.E. = 0.24
1965 Characteristics and the Roll-Out of Family Planning Programs

<table>
<thead>
<tr>
<th>Mean Dependent Variable</th>
<th>(1) Population Growth a Problem</th>
<th>(2) Ideal Number of Children</th>
<th>(3) Approve of Abortion</th>
<th>(4) Coital Frequency</th>
<th>(5) Ever Used the Pill</th>
<th>(6) When 1st Used Pill</th>
<th>(7) Surgically Sterilized</th>
<th>(8) Children Ever Born to Mother</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.80</td>
<td>3.3</td>
<td>0.39</td>
<td>6.04</td>
<td>0.22</td>
<td>772</td>
<td>0.198</td>
<td>5.1</td>
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<tr>
<td>Year Family Planning Program Established</td>
<td>-0.005</td>
<td>0.010</td>
<td>-0.001</td>
<td>0.036</td>
<td>-0.004</td>
<td>0.198</td>
<td>-0.004</td>
<td>-0.054</td>
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<tr>
<td>[0.007]</td>
<td>[0.022]</td>
<td>[0.005]</td>
<td>[0.071]</td>
<td>[0.010]</td>
<td>[0.384]</td>
<td>[0.008]</td>
<td>[0.066]</td>
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</tr>
<tr>
<td>R-squared</td>
<td>0.021</td>
<td>0.038</td>
<td>0.023</td>
<td>0.136</td>
<td>0.154</td>
<td>0.022</td>
<td>0.095</td>
<td>0.075</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean Dependent Variable</th>
<th>(9) Married Once</th>
<th>(10) Age at 1st Marriage</th>
<th>(11) Age at 1st Pregnancy</th>
<th>(12) Children Ever Born</th>
<th>(13) Husband's Income</th>
<th>(14) Catholic</th>
<th>(15) Highest Grade</th>
<th>(16) 2 Parents at 14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.87</td>
<td>20.8</td>
<td>22.3</td>
<td>2.7</td>
<td>7620</td>
<td>0.29</td>
<td>11.3</td>
<td>0.78</td>
</tr>
<tr>
<td>Year Family Planning Program Established</td>
<td>0.006</td>
<td>0.054</td>
<td>0.063</td>
<td>0.017</td>
<td>50.6</td>
<td>0.023</td>
<td>0.036</td>
<td>0.004</td>
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<tr>
<td>[0.005]</td>
<td>[0.059]</td>
<td>[0.066]</td>
<td>[0.031]</td>
<td>[157]</td>
<td>[0.016]</td>
<td>[0.104]</td>
<td>[0.006]</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.040</td>
<td>0.111</td>
<td>0.160</td>
<td>0.141</td>
<td>0.170</td>
<td>0.061</td>
<td>0.092</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Notes: Dependent variables are coded as follows by column: (1) Do you consider the growth of world population a serious problem? Yes=1, (2) What is the ideal number of children for average American family? (3) Index from three questions about whether the respondent approves of abortion if a woman is not married, for health concerns, or in the case of financial hardship. l=approve in all three cases; (4) Coital frequency in the last four weeks? (5) Have you ever used the Pill? Yes=1, (6) When did you first use the Pill? (month and year, 772 = March 1964), (7) Have you or your husband had an operation making it impossible to have (another) child? l=Yes; (8) How many children did your mother have? (9) Is this your first marriage? l=Yes; (10-11) Age in months constructed from month and year of birth and month and year of first marriage and month and year of first pregnancy end date; (12) How many live births have you had? (13) Husband’s income in nominal dollars. (14) Respondent identifies as “Roman Catholic.” (15) Highest grade attained by the respondent. (16) Did you live with both parents at age 14? l=Yes. Estimates are obtained from weighted regressions of the indicated dependent variable on the year the family planning program was established. To account for sampling design, the regressions control for size of sampled PSU, decade of respondent’s birth, and race (1=Nonwhite). Source: 1965 National Fertility Study.
Model 1: County and year effects

General Fertility Rate

Before family planning programs established, econometric model captures the evolution of fertility rates
General Fertility Rate

Model 1: County and year effects

Model 2: County + state by year effects
General Fertility Rate

Model 1: County and year effects

Model 2: County + state by year effects

Model 3: Model 2 + REIS controls + 1960 Xs interacted with trends
Summary

- Family planning grants reduces fertility rates by 2 percent within 5 years; 1.4 percent lower 15 years later

- 8 percent of the total decline in GFR from 1959 to 1974 (~1.8 million fewer births over 15 years)

- Cost per birth averted is roughly $2700
  - cf. Kearney and Levine 2007 estimate $6800

- Is this small? Not really!
  - Scaling the ITT effects by the beneficiaries implies 30-40% reduction among women who began using Pill
  - GFR among poor women fell by 20-30 percent over 10 years
  - ¾ of the 1965 gap in childbearing between poor and non-poor women
Buckles and Hungerman
Figure 1: Trend in the Teen Birth Rate

Source: Martin, et al. (2011)