

# Son Preference, Fertility, and Family Structure

## Evidence from Reproductive Behavior among Nigerian Women

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## Motivation

- Extensive literature on **parental preferences over a child's gender** with evidence of strong son preference in Asian countries
- **Sub-Saharan Africa** often referred to as a continent with low or absent preference for sons
- Yet, Anderson and Ray (2010) provide a **decomposition of missing women by age** in terms of **excess female deaths** and find that:
  - *`as a proportion of the total female population, the **number of missing women is largest in sub-Saharan Africa**, and the absolute numbers are comparable to those for India and China'*

## This paper

- 1 Uses individual-level data for Nigeria to analyze son preference in fertility decisions in a high-fertility context where little is known about parental gender preferences
- 2 Explores how son preference interacts with traditional institutions
  - Child fostering and polygyny as alternative mechanisms through which the desire for own biological sons can be satisfied

## Research questions

### ① Fertility preferences

- Does realized (and desired) fertility differ between women with first-born son and daughter?

### ② Birth spacing

- Does the sex composition of earlier-born children affect the length of the birth interval?

### ③ Child fostering

- Do households respond asymmetrically to an excess of biological sons and daughters in fostering patterns?

### ④ Marital outcomes

- Is there an association between the sex of the first-born and polygyny (and other marital outcomes)?

## Data

- Nigeria Demographic and Health Survey (DHS) 2008
- Fertility history, birth intervals, household composition, resident children, children living elsewhere
- Women age 15–49 with at least one child ever born
- Consider all biological children ever born
- Total fertility rate is 5.9 (Census 1991), 5.7 (NDHS 2008)
- Sex ratio at birth (fraction of male births): 0.513

► sum stats

## Fertility regressions

$$y_{i,t,r} = \beta_1(\text{firstborngirl})_i + \gamma X_{i,t,r} + \gamma_t + \alpha_r + \delta_r t + \chi_e t + \epsilon_{i,t,r} \quad (1)$$

- with  $i$  mother, born in year  $t$ , resident in region  $r$
- $y_{i,t,r}$  is: # children ever born; prob. desiring more children; prob. using contraception
- $X_{i,t,r}$ : individual & household controls ► controls
- Ident. ass: *conditional* on obs charact., sex    1st-born is random

⇒ **Male-preferring fertility stopping behavior if**

- $\beta_1 > 0$  for realized and desired fertility
- $\beta_1 < 0$  for the use of contraceptives

**Table:** The effect of first-born girl on fertility outcomes and preferences

dep. var.	# children ever born ols	=1 wants more children probit	=1 using contraceptives probit
	(1)	(2)	(3)
first-born girl	0.073*** (0.025)	0.024** (0.010)	-0.011** (0.005)
Observations	17589	17499	17589
R-squared (or Pseudo)	0.706	(0.282)	(0.224)
Percent effect	1.7	3.8	6.5
Mean first-born boy	4.33	0.64	0.17

Robust standard errors adjusted for clustering at the household level in parentheses. All married women aged 15–49 in first union. Using survey weights. Includes birth year and region fixed effects, mother's religion and ethnicity, region and ethnicity-specific trends, 7 five-year age groups dummies, mother and partner's age (and square), 6 region dummies, ethnicity, religion, urban dummy, and a wealth index. The # of children ever born is added in columns (3) to (6). \*\*\*, \*\*, and \* indicate significance at 1%, 5% and 10% levels.

## Birth spacing, medical research findings

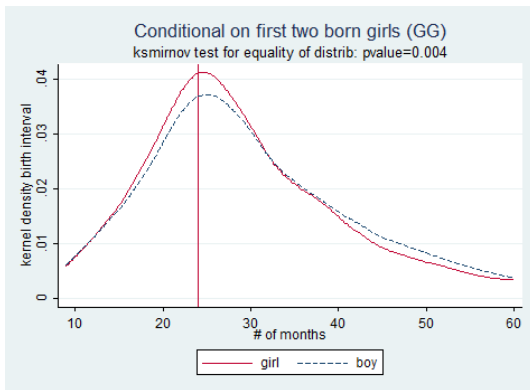
- Birth spacing refers to the time interval (# months) between births
- Short birth intervals (<24 months) associated with poor child and maternal health outcomes:
  - **Children** 1.5 times less likely to survive the first week of life, and 2.4 times more likely to survive to age 5
  - **Mothers** 1.3 times less likely to avoid anemia, and 2.5 times less likely to survive childbirth



## Birth spacing

- Is there an association between the length of birth intervals and the sex composition of earlier-born children?
- Analyze the average birth interval:
  - how long the mother waits to have another child *after* the realization of the sex of the previous child

Figure: Distribution of length of birth interval after a girl or boy



Subsample of women with at least three children ever born. Excludes intervals for births after the fourth. Kolmogorov-Smirnov test for the equality of distribution calculated for range of interval 0-60 months.

## Birth spacing regressions

$$y_{i,j,t} = \beta_1 \text{girl}_{i,j,t-1} + \sum_k \gamma_k \text{birthorder}_{i,j,t-1,k} + \alpha_j + \epsilon_{i,j,t-1} \quad (2)$$

- child  $i$ , mother  $j$ ,  $t$ : current child,  $t-1$ : preceding child
- $y_{i,j,t}$  is the birth interval in months (the time between the birth of child  $t-1$  and  $t$ ), or a dummy =1 if interval <24 months
- Estimate (2) conditional on the sex of the first one (G or B), two (GG, BB or mixed), three (GGG, BBB, or mixed) children born
- Identification with FEs requires to consider mothers with at least 3, 4, 5 children ever born
- With son preference, the length of the birth interval should be shorter after a girl is born rather than a boy:  $\beta_1 < 0$

Table: Length of birth interval (# months), conditional on the gender of earlier-born children

Women with:	3+ children	4+ children	5+children
Subsamples	first girl	girl, girl	girl, girl, girl
	(1)	(2)	(3)
girl	-0.178 (0.451)	-1.271* (0.706)	-3.664*** (1.249)
girl*dead child	0.611 (0.485)	1.238 (1.032)	2.047 (1.496)
deadch	-4.951*** (0.572)	-5.566*** (0.929)	-6.596*** (1.418)
Observations	24315	11184	4869
R-squared	0.315	0.279	0.233

- For women with all boys or mixed gender composition: No significant difference in the interval

## Child fostering

- Analysis of fostering decisions [at the household level](#); 22% of households involved in fostering
- [Child-labor](#) hypothesis for fostering:
  - Households with an imbalance of biological girls or boys tend to send/receive a child [to achieve a balanced gender structure](#) thus maximizing hh's productivity
  - If [non-biological girls \(boys\)](#) are [substitutes for biological daughters \(sons\)](#), household should [respond symmetrically to the imbalance of girls or sons](#) in fostering decisions
- Focus on children age 6{14 (included), and exclude hh's with no children age 6{14

Table: Household fostering-in: foster child, girl, or boy

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var:	foster child	foster girl	foster boy	foster child	foster girl	foster boy
# biol. sons	-0.007*** (0.002)	-0.005*** (0.002)	-0.001 (0.001)			
# biol. daughters	-0.011*** (0.002)	-0.007*** (0.002)	-0.004*** (0.001)			
more biol. sons				0.013** (0.005)	<b>0.010**</b> (0.005)	0.003 (0.003)
more biol. daughters				0.005 (0.005)	0.004 (0.005)	<b>-0.000</b> (0.003)
(omitted: same number of sons and daughters)						
Observations	12477	12477	12477	12477	12477	12477
Pseudo R-squared	0.042	0.042	0.046	0.037	0.038	0.044

Probit estimates, marginal effects reported. Robust standard errors adjusted for clustering at the village level in parentheses. Using survey weights. All controls and fixed effects included. \*\*\*, \*\*, and \* indicate significance at 1%, 5% and 10% levels. The dependent variables are dummies for whether the household hosts at least one foster child, girl or boy, where a foster child is defined as being a resident child whose parents are alive and live elsewhere. Other controls include region fixed effects, urban dummy, wife (or woman head if female headed household) religion and ethnicity, year(eing)-(ea)354ducivatiod andeahe head andr(eing5(we/vbles)-352((o)29(r)ing5ea)39(oman)-354(hiex,he household and a dummd for bhohe household head andfemale headed househo, re chi0(r(ea)354an)-ve0(r)-354(b)-29(o)2rn,reif

Table: Household fostering-out: biol. child, daughter or son living elsewhere

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var:	child elsewhere	daughter elsewhere	son elsewhere	child elsewhere	daughter elsewhere	son elsewhere
# biol. sons	<b>0.048***</b> (0.005)	-0.007 (0.005)	0.058*** (0.006)			
# biol. daughters	<b>0.062***</b> (0.005)	0.078*** (0.006)	-0.007 (0.005)			
more biol. sons				-0.015 (0.012)	-0.043*** (0.015)	0.054*** (0.011)
more biol. daughters				-0.000 (0.012)	0.064*** (0.012)	-0.044*** (0.014)
(omitted: same number of sons and daughters)						
Observations	12477	9156	9246	12477	9156	9246
Pseudo R-squared	0.083	0.072	0.063	0.068	0.061	0.058

Probit estimates, marginal effects reported. Robust standard errors adjusted for clustering at the village level in parentheses. Using survey weights. \*\*\*, \*\*, and \* indicate significance at 1%, 5% and 10% levels. The dependent variables are three dummies equal to one if at least one biological child, son or daughter of the household head lives elsewhere. Other controls include region fixed effects, urban dummy, wife (or woman head if female headed household) religion and ethnicity, years of education and age of the male head and his wife/ves (or woman head), a wealth index, household land ownership, a dummy for polygynous household head and female headed household, # children ever born, # of daughters and sons alive age 0–5, # of household members older than 15 (male and female).

## Marital outcomes

- Anecdotal evidence: **infertility** and **sex composition of earlier-born children** affect **husband's decision to marry another woman**
- Explore whether polygyny and other marital outcomes are associated with the sex of earlier born children



- For polygyny, the effect is **specific to first-rank wives**, while no effect of last-rank or higher order wives

## Conclusions

- Son preference affects fertility behavior and has potential negative consequences for women's and child health through birth spacing
- Moreover, it affects the way people participate in traditional social institutions and is associated with important aspects of women's life, such as polygyny and living arrangements

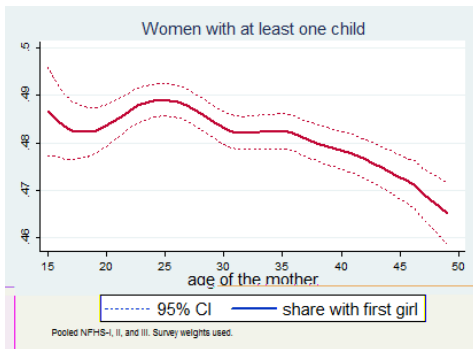
## Conclusions

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- Moreover, it affects the way people participate in traditional social institutions and is associated with important aspects of women's life, such as polygyny and living arrangements
- Related work:
  - Son preference and maternal survival in India [▶ related work](#)

## Related work: son preference and maternal survival

- I conduct a similar study using 3 waves of the India NFHS
- Compare age structure and health outcomes of women with daughters versus sons
  - ▶ mother's age
  - ▶ anemia
  - ▶ weight-for-height
- **Fertility channel:**
  - Son preference  $\Rightarrow$  fertility-risky behavior  $\Rightarrow$  maternal mortality
- Women with first-born daughter have higher fertility, tend to space births less  $\rightarrow$  higher risk of dying because of maternal depletion
- Better off women more likely to survive the birth of girls: selected
- Maternal mortality as an unintended consequence of son preference

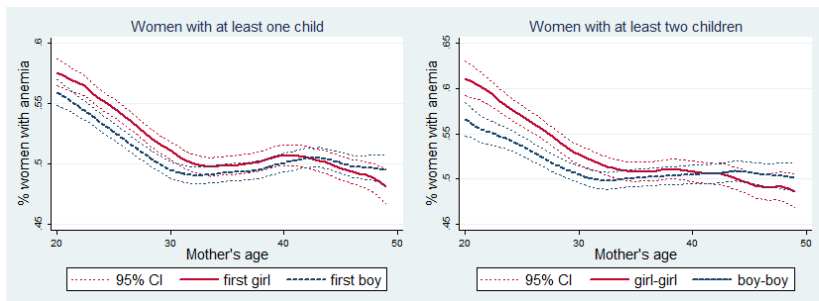
Figure: Share of women with **rst-born girl** by **mother's age**



- Fewer women above 25-30 with **rst-born girl**, especially among uneducated and in rural areas

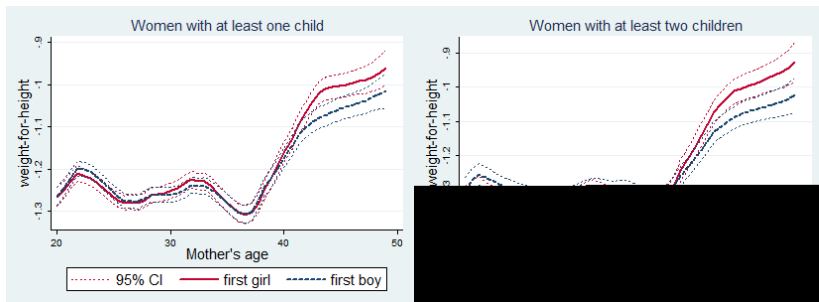
# Health Indicators (1)

Figure: % anemic women, by age of the mother at the time of the survey



## Health Indicators (2)

Figure: Weight-for-height, by age of the mother at the time of the survey



## Summary statistics

Sample of married women 15{49 with at least one child ever born

	mean	sd	min	max	N
# children ever born	4.31	2.70	1	18	18426
wants another child	0.65	0.48	0	1	18314
contraceptives	0.17	0.37	0	1	18426
polygynous husband	0.30	0.46	0	1	18346
female head	0.09	0.29	0	1	18426
husband living in	0.90	0.30	0	1	18307
age	31.62	8.39	15	49	18426
age rst marriage	17.90	4.66	2	45	18426
age rst birth	19.50	4.48	9	44	18426
education yrs	5.03	5.36	0	22	18414
partner education yrs	6.40	5.82	0	21	18055

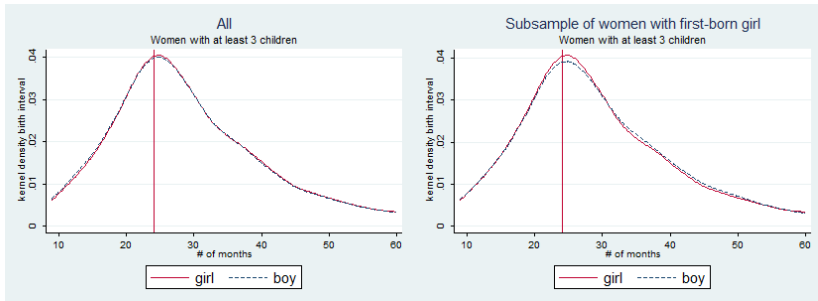


Table: Summary stats, differences

	firstB	firstG	diff	se diff	n
eduys	4.913	5.177	0.264***	(0.088)	18414
partner eduys	6.227	6.595	0.368***	(0.093)	18055
age first birth	19.430	19.583	0.153**	(0.074)	18426
age first marriage	17.820	17.992	0.172**	(0.077)	18426
age	31.648	31.587	-0.061	(0.133)	18426
partner age	41.724	41.596	-0.128	(0.172)	18123
# children ever	4.330	4.286	-0.044	(0.043)	18426
# children alive	3.553	3.546	-0.007	(0.034)	18426
durables	0.127	0.129	0.002	(0.027)	18426
urban	0.317	0.333	0.016**	(0.008)	18426

Robust standard errors adjusted for clustering at the household level in parentheses. All married women aged 15–49 in first union with at least one child. Using survey weights. \*\*\*, \*\*, and \* indicate significance at 1%, 5% and 10% levels.

Figure: Distribution of length of birth interval after a successive girl or boy



Subsample of women with at least three children ever born. Excludes intervals for births after the fourth. Kolmogorov-Smirnov test for the equality of distribution calculated for range of interval 0-60 months.

Table: Fostering, summary statistics

	mean	sd	min	max	N
at least one child 6–14 living elsewhere	0.172	0.377	0	1	21501
at least one daughter 6–14 living elsewhere	0.106	0.308	0	1	21501
at least one son 6–14 living elsewhere	0.098	0.298	0	1	21501
at least one foster child 6–14 in the hh	0.061	0.239	0	1	21501
at least one foster girl 6–14 in the hh	0.041	0.198	0	1	21501
at least one foster boy 6–14 in the hh	0.025	0.156	0	1	21501
more daughters 6–14 (# daughters > #sons)	0.240	0.427	0	1	21501
more sons 6–14 (# daughters < #sons)	0.246	0.431	0	1	21501
same number (# daughters = #sons)	0.515	0.500	0	1	21501
no biol. children age 6–14	0.398	0.490	0	1	21501
# biological children 6–14	1.417	1.562	0	14	21501
# biological daughters 6–14	0.702	0.977	0	12	21501
# biological sons 6–14	0.715	0.987	0	10	21501

2008 NDHS. Using sample weights. Excludes households in which there is no woman eligible for the woman questionnaire (age 15–49) for whom the number and sex of children is not available.

## Controls in fertility regressions

5-year age-groups, age (mother & partner) and sq., age at first marriage (and birth), yrs of education (mother & partner), whether first child (son or daughter) died, wealth index, urban, ethnicity, religion, and ethnic and region-specific time trends. [▶ back](#)