Mortality, Fertility and Contraception across Countries

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Fertility Transition

- Fertility rates in Africa, Asia, and Latin America exceeded 5 per woman in 1950s. Birth control was limited to small groups.
- Nearly all developing countries have entered the fertility transition.
- No more than 2.5 children on average, a 50% reduction since the 50s. (Exception SSA: $6 7 \downarrow 4 5$.)

Why?

"a number of issues are still actively debated, but there is wide agreement on two general points. The first is that a decline in couples' desired family size is an essential precondition for the fertility transition to take place ... The second point of general agreement is that a rise in contraceptive use by couples (including abstinence) is the main proximate determinant of fertility decline in most contemporary societies."

- Bongaarts and Casterline (2018)

standard economic theories "appear sufficient to explain major declines in fertility, and simple and sufficiently effective birth control methods have been available to produce these declines." (Becker, 1991)

- Pritchett (1994):
 - 83% of cross-country variation in the *level* of the TFR explained by differences in reported desired fertility (DHS + World Fertility Surveys)



Figure: Pritchett (1994)

Supply Matters

Not true of *changes* in desired and actual TFR (Lam, 2011):

- 196 DHS surveys covering 62 countries, 1986-2018
- Desired fertility fell by an average of 0.040 births per year, TFR by 0.068 births
- $\blacksquare \sim 41\%$ of the average decline in the TFR must have been due to better ways to attain fertility target
- Gunther and Harttgen (2016): One desired child → one additional birth. But level of unwanted births has stayed at 2 across African countries in last 20 yrs.
- In equilibrium family planning programs affect the demand for children – desired fertility – by affecting real and perceived cost of contraceptives.

Supply-side Evidence

- Cochrane and Guilkey (1995): availability of contraceptives through family planning programs was important for Tunisia's fertility decline
- Miller (2009): family planning explains less than 10% of Colombia's fertility decline
- Miller and Babiarz (2016): effect of family planning programs can be substantial
- Munshi and Myaux (2006): strong evidence of social learning about contraceptives and their effectiveness. No fertility.

This paper

Simple model of desired fertility and fertility control choice.

- Couples face an exogenous child mortality and care about the number of surviving progeny (net fertility, NFR). When child mortality is relatively high, they may leave fertility to chance or use traditional methods of birth control that are low cost but inefficient.
- As child mortality drops, they switch to higher cost but more efficient methods.
- Higher costs mainly psychological (sociocultural barriers to accessing and using FP methods, unspoken social norms).
- Higher income has similar effect if substitution effect dominates.
- Test using DHS data.

Model

Unitary household decision problem

$$\max V(c, n, q) = \ln c + \gamma \{\theta \ln(\phi n) + (1 - \theta) \ln q\} - \Gamma^{j}(n)$$

subject to

$$\begin{array}{rcl} c & = & (1 - \tau \phi n) \, v - \delta \phi n - \phi n x, & 0 \leq n \leq \eta < 1/(\tau \phi) \\ q & = & a (1 + x)^{\sigma}, & a > 0, \, \sigma \in (0, 1) \end{array}$$

and choice of contraception method j.

Model

• 2 strategies $j \in \{1, 2\}$

- 1. Readily-available and known *traditional* method (periodic abstinence, withdrawal, folkloric methods)
- More efficient, but "costlier", modern method (pill, IUD, injectable, diaphram, condom, sterilization, lactational amenorrhea)
- Utility cost

$$\Gamma^{j} \equiv \Gamma(e_{j}) = \alpha_{j} + \lambda_{j} \left(\frac{\eta - n}{\eta}\right)^{2}, \ 0 \leq n < \eta$$

• Assume $0 < \lambda_2 < \lambda_1$ and $0 = \alpha_1 < \alpha_2$

Testable Predictions

Demand for children

- Both gross and net fall with higher child survival, the former more.
- Lower for parents who invest in childrens human capital.
- May rise or fall with household income depending on whether "Malthusian" or "modern" household
- Depends on $(\alpha_1, \lambda_1, \alpha_2, \lambda_2)$
- \blacksquare Demand for contraception depends on how much household wants to lower fertility below η
 - Anything that lowers the demand for children will increase the use of contraception, demand for modern methods.
 - Richer households more likely to adopt modern methods: lower demand, lower marginal cost of switching
 - Lower cost of adopting modern method will increase usage of modern.

Empirics

- Angeles (2010): CMR instrumental in fertility reductions across developing countries since 1960 (UN data)
- Canning *et al.* (2013): *CMR* → *TFR* effect amplified by social spillovers (DHS)
- DHS data:
 - Married women 20-35 years
 - Fertility, contraception history for past 60 months, under-5 child health
 - CMR data from World Bank to identify countries with at least 50% drop in mortality since 1990. Exclude sub-Saharan Africa (HIV). Compare with less than 50% sample?
 - 58 surveys across 11 countries (1993-2017): Armenia, Bangladesh, Bolivia, Colombia, Egypt, Ethiopia, Indonesia, Jordan, Nepal, Peru, Turkey

Survival & Fertility Trends



SQC

Demand Side Factors

 $n_{icrt} = \beta_1 \phi_{crt} + \beta_2 x_{icrt} + \beta_3 \Gamma_{icrt} + \alpha_c + \alpha_t + \varepsilon_{icrt}$

- Key factors: CMR, quantity-quality tradeoff, income
- Fertility: # of children even born + 1 if respondent pregnant
- Net fertility: # of children alive + 1 if pregnant
- CMR: based on birth and death of children reported for previous five years, at the regional level.
- Child quality proxied by vaccination: x = 1, if all WHO-recommended vaccinations were completed
- Income: education, electricity
- Household fertility may affect home environment and child care → CMR. Instrument by share of households with improved water and sanitation facilities.

Fertility

	(1)	(2)	(3)	(4)
Dependent variable	fertility	fertility	fertility	fertility
Child survival rate	-9.099***	-7.911***	-8.877***	-7.912***
	(0.238)	(0.226)	(0.285)	(0.271)
Child investment	-0.341***	-0.308***	-0.332***	-0.301***
	(0.006)	(0.006)	(0.008)	(0.008)
Husband education (years)	-0.070***	-0.016***	-0.061***	-0.015***
	(0.001)	(0.001)	(0.001)	(0.001)
Education (years)		-0.099***		-0.085***
		(0.001)		(0.001)
Has electricity	-0.316***	-0.232***	-0.274***	-0.210***
	(0.011)	(0.010)	(0.013)	(0.012)
Age	0.182***	0.182***	0.200***	0.199***
	(0.001)	(0.001)	(0.001)	(0.001)
Rural	0.284***	0.173^{***}	0.249^{***}	0.165^{***}
	(0.008)	(0.008)	(0.011)	(0.010)
Hindu			-0.272***	-0.271***
			(0.020)	(0.019)
Buddhism			-0.379***	-0.384***
			(0.044)	(0.043)
Christian			-0.022	0.006
			(0.027)	(0.026)
Catholic			-0.305***	-0.290***
			(0.029)	(0.028)
Other			-0.049	-0.047
			(0.056)	(0.055)
Constant	6.660***	5.724***	6.005***	5.282***
	(0.211)	(0.200)	(0.251)	(0.240)
Observations	195,046	194,990	116,536	116,484
R-squared	0.401	0.438	0.432	0.458
year FE	yes	yes	yes	yes
country FE	yes	yes	yes	yes
Standard errors are clustered in cluster level				
*** p<0.01, ** p<0.05, * p<0.1				

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Fertility IV

	(1)	(2)	(3)	(4)
Dependent variable	fertility	fertility	fertility	fertility
Child survival rate	-18.258***	-15.997***	-15.602***	-14.262***
	(0.781)	(0.733)	(0.877)	(0.844)
Child investment	-0.318***	-0.290***	-0.312***	-0.283***
	(0.006)	(0.006)	(0.008)	(0.008)
Husband education (years)	-0.066***	-0.016***	-0.058***	-0.015***
	(0.001)	(0.001)	(0.001)	(0.001)
Education (years)		-0.093***		-0.080***
		(0.001)		(0.001)
Has electricity	-0.270***	-0.195***	-0.249***	-0.188***
	(0.011)	(0.011)	(0.013)	(0.012)
Age	0.178***	0.179***	0.195***	0.195***
	(0.001)	(0.001)	(0.001)	(0.001)
Rural	0.214^{***}	0.119***	0.189^{***}	0.114***
	(0.009)	(0.009)	(0.012)	(0.011)
Hindu			-0.239***	-0.239***
			(0.022)	(0.021)
Buddhism			-0.330***	-0.337***
			(0.044)	(0.042)
Christian			-0.018	0.010
			(0.027)	(0.026)
Catholic			-0.259***	-0.248***
			(0.030)	(0.029)
Other			-0.016	-0.018
			(0.057)	(0.057)
Constant	15.272***	13.671***	13.003***	11.820***
	(0.764)	(0.715)	(0.840)	(0.808)
Observations	182,469	182,416	109,195	109,146
R-squared	0.363	0.405	0.395	0.424
year FE	yes	yes	yes	yes
country FE	yes	yes	yes	yes
Standard errors are clustered in cluster level				
*** p<0.01, ** p<0.05, * p<0.1				

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Net fertility

	(1)	(2)	(3)	(4)	
Dependent variable	net fertility	net fertility	net fertility	net fertility	
Child survival rate	-5.966***	-4.946***	-5.869***	-5.070***	
	(0.210)	(0.202)	(0.250)	(0.240)	
Child investment	-0.325***	-0.296***	-0.313***	-0.287***	
	(0.005)	(0.005)	(0.007)	(0.007)	
Husband education (years)	-0.056***	-0.009***	-0.046***	-0.008***	
	(0.001)	(0.001)	(0.001)	(0.001)	
Education (years)		-0.085***		-0.070***	
		(0.001)		(0.001)	
Has electricity	-0.238***	-0.167***	-0.190***	-0.137***	
	(0.010)	(0.009)	(0.011)	(0.011)	
Age	0.161***	0.161***	0.173***	0.172***	
	(0.001)	(0.001)	(0.001)	(0.001)	
Rural	0.244^{***}	0.149***	0.200***	0.131***	
	(0.008)	(0.007)	(0.010)	(0.009)	
Hindu			-0.249***	-0.249***	
			(0.018)	(0.017)	
Buddhism			-0.298***	-0.303***	
			(0.039)	(0.039)	
Christian			0.018	0.041*	
			(0.024)	(0.023)	
Catholic			-0.237***	-0.225^{***}	
			(0.027)	(0.026)	
Other			-0.056	-0.054	
			(0.051)	(0.049)	
Constant	3.960^{***}	3.155***	3.564^{***}	2.965***	
	(0.187)	(0.179)	(0.221)	(0.213)	
Observations	195,046	194,990	116,536	116,484	
R-squared	0.378	0.413	0.407	0.431	
year FE	yes	yes	yes	yes	
country FE	yes	yes	yes	yes	
Standard errors are clustered in cluster level					
*** p<0.01, ** p<0.05, * p<0.1					

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Net fertility IV

	(1)	(2)	(3)	(4)	
Dependent variable	net fertility	net fertility	net fertility	net fertility	
Child survival rate	-14.794***	-12.860***	-13.012***	-11.914***	
	(0.705)	(0.664)	(0.806)	(0.780)	
Child investment	-0.303***	-0.279***	-0.293***	-0.270***	
	(0.006)	(0.005)	(0.007)	(0.007)	
Husband education (years)	-0.053***	-0.010***	-0.043***	-0.008***	
	(0.001)	(0.001)	(0.001)	(0.001)	
Education (years)		-0.080***		-0.065***	
		(0.001)		(0.001)	
Has electricity	-0.196***	-0.132***	-0.167***	-0.117***	
	(0.010)	(0.010)	(0.011)	(0.011)	
Age	0.158***	0.159^{***}	0.170***	0.169***	
	(0.001)	(0.001)	(0.001)	(0.001)	
Rural	0.183***	0.101***	0.146***	0.085***	
	(0.009)	(0.008)	(0.011)	(0.010)	
Hindu			-0.214***	-0.214***	
			(0.020)	(0.019)	
Buddhism			-0.252***	-0.258***	
			(0.039)	(0.038)	
Christian			0.017	0.040*	
			(0.024)	(0.023)	
Catholic			-0.200***	-0.190***	
			(0.028)	(0.027)	
Other			-0.032	-0.034	
			(0.051)	(0.050)	
Constant	12.321***	10.952***	10.873***	9.903***	
	(0.690)	(0.648)	(0.772)	(0.746)	
Observations	182,469	182,416	109,195	109,146	
R-squared	0.342	0.381	0.371	0.396	
year FE	yes	yes	yes	yes	
country FE	yes	yes	yes	yes	
Standard errors are clustered in cluster level					
*** p<0.01, ** p<0.05, * p<0.1					

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Demand for Contraception

- All results henceforth using mortality IV
- Measure usage from 6 months after first observed birth to before second pregnancy/end of observation
- Modern: pill, IUD, injectables, diaphragm, condom, female sterilization, male sterilization, lactational amenorrhea method, female condom, foam and jelly, standard days method.
- Traditional: withdrawal, abstinence, other folkloric methods
 - Usage of modern may not be continuous.
 - switch33/36 = 1 if respondent used traditional method more than 3 months continuously, then switched to modern and used it for 3/6 months continuously

■ If b1 = time of first birth and p2 = time of second pregnancy,focus on $s \in [b1 + 6, \min\{p2 - 1, t\}]$

$$FPuse_t = \frac{\sum_{s} I(\text{used contraception method}_s)}{\min\{p2 - 1, t\} - (b1 + 6)}$$
$$FPmodern_t = \frac{\sum_{s} I(\text{used modern method}_s)}{\min\{p2 - 1, t\} - (b1 + 6)}$$

Fixed cost of adoption related to social and information costs.

- Depend on prevalence of modern contraception. Percent of households in the village/cluster using modern methods
- Also media: Percent of households in cluster that have TV, whether or not respondent heard about family planning in the mass media

Survival & Contraception Trends



	(1)	(2)	(3)	(4)
VARIABLES	FPuse	FPuse	FPuse	FPuse
Child survival rate	2.521***	2.436***	2.065***	2.025***
	(0.227)	(0.226)	(0.253)	(0.253)
Modern prevalence	0.007***	0.007***	0.008***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)
FP	0.049***	0.043***	0.055^{***}	0.050***
	(0.002)	(0.002)	(0.003)	(0.003)
Has TV (% in cluster)	0.001***	0.001***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Husband education (years)	0.007***	0.003^{***}	0.006^{***}	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Education (years)		0.008***		0.007***
		(0.000)		(0.000)
Has electricity	0.049***	0.046***	0.047^{***}	0.044***
	(0.004)	(0.004)	(0.004)	(0.004)
Age	0.005***	0.005^{***}	0.004^{***}	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.013***	-0.007***	-0.017***	-0.012***
	(0.003)	(0.003)	(0.004)	(0.004)
Hindu			0.004	0.004
			(0.007)	(0.007)
Buddhism			0.004	0.004
			(0.017)	(0.017)
Christian			-0.023***	-0.025***
			(0.008)	(0.008)
Catholic			0.024^{***}	0.023***
			(0.007)	(0.007)
Other			-0.017	-0.017
			(0.015)	(0.015)
Constant	-2.260***	-2.200***	-1.877***	-1.854***
	(0.211)	(0.210)	(0.238)	(0.238)
Observations	164,484	164,435	96,551	96,506
R-squared	0.270	0.273	0.297	0.299
year FE	yes	yes	yes	yes
country FE	yes	yes	yes	yes
Robust standard errors in p	arentheses			
*** p<0.01 ** p<0.05 * p<0.1				

	(1)	(2)	(3)	(4)
VARIABLES	FPmodern	FPmodern	FPmodern	FPmodem
Child survival rate	2.060***	1.993***	1.604***	1.576***
	(0.225)	(0.225)	(0.246)	(0.247)
Modern prevalence	0.009***	0.009***	0.009***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)
FP	0.041***	0.037***	0.051^{***}	0.048***
	(0.002)	(0.002)	(0.003)	(0.003)
Has TV (% in cluster)	0.001^{***}	0.001***	0.000^{***}	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Husband education (years)	0.004***	0.001***	0.004***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Education (years)		0.006***		0.005***
		(0.000)		(0.000)
Has electricity	0.045***	0.043***	0.050^{***}	0.048***
	(0.004)	(0.003)	(0.004)	(0.004)
Age	0.002***	0.002***	0.001^{***}	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.018***	-0.013***	-0.014***	-0.011***
	(0.003)	(0.003)	(0.004)	(0.004)
Hindu			-0.009	-0.008
			(0.007)	(0.007)
Buddhism			-0.011	-0.011
			(0.017)	(0.018)
Christian			-0.043***	-0.045***
			(0.006)	(0.006)
Catholic			0.006	0.005
			(0.006)	(0.006)
Other			-0.038**	-0.038**
			(0.015)	(0.015)
Constant	-1.827***	-1.780***	-1.455^{***}	-1.439***
	(0.208)	(0.208)	(0.232)	(0.232)
Observations	164,484	164,435	96,551	96,506
R-squared	0.265	0.267	0.300	0.301
year FE	yes	yes	yes	yes
country FE	yes	yes	yes	yes
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

[(1)	(2)	(2)	(4)	
VABIABLES	switch36	(2) switch36	switch36	(4) switch36	
Child survival rate	1.012*	0.947*	0.021*	0.828	
Child Survivar Fate	(0.542)	(0.540)	(0.522)	(0.522)	
Madam monolonas	0.009***	0.009***	0.002***	0.002***	
Modern prevalence	(0.002	(0.002	(0.000)	(0.000)	
ED	(0.000)	(0.000)	(0.000)	(0.000)	
FF	(0.024	(0.000)	(0.007)	(0.022	
$\mathbf{H} = \mathbf{T} \mathbf{Y} \left(0^{\prime} := 1 = 1 = 1 \right)$	(0.006)	(0.006)	(0.007)	(0.007)	
Has I V (% in cluster)	-0.000	-0.000**	0.000	-0.000	
	(0.000)	(0.000)	(0.000)	(0.000)	
Husband education (years)	0.009***	0.002**	0.009***	0.001	
	(0.001)	(0.001)	(0.001)	(0.001)	
Education (years)		0.014***		0.015***	
		(0.001)		(0.001)	
Has electricity	0.006	-0.001	-0.002	-0.008	
	(0.009)	(0.008)	(0.010)	(0.010)	
Age	-0.035***	-0.036***	-0.038***	-0.038***	
	(0.001)	(0.001)	(0.001)	(0.001)	
Rural	-0.031***	-0.023***	-0.038***	-0.031***	
	(0.006)	(0.006)	(0.008)	(0.008)	
Hindu			0.017	0.017	
			(0.015)	(0.015)	
Buddhism			0.062*	0.064*	
			(0.033)	(0.033)	
Christian			-0.043***	-0.050***	
			(0.016)	(0.016)	
Catholic			0.025	0.022	
			(0.019)	(0.019)	
Other			-0.023	-0.030	
			(0.038)	(0.038)	
Constant	0.351	0.384	0.165	0.224	
	(0.508)	(0.506)	(0.503)	(0.502)	
	(0.000)	(01000)	(01000)	(0.00-)	
Observations	37,575	37.560	20,514	20,501	
R-squared	0.095	0.103	0.115	0.123	
vear FE	ves	ves	ves	ves	
country FE	ves	ves	ves	ves	
Robust standard errors in p	arentheses		5.00		
*** p<0.01. ** p<0.05. * p	< 0.1				
p color, p color, p col					