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THE EFFECTS OF FAMILY PLANNING PROGRAMS ON WANTED AND UNWANTED FERTILITY IN SUB-SAHARAN AFRICA

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Persuading policy makers in sub-Saharan Africa (SSA) to invest in voluntary family planning (FP) programs is a big challenge for reproductive health advocates and demographers. This is the case even though FP programs have been widely accepted and successful in other developing regions. There are several reasons for the reluctance of policy makers (see May 2017), including the belief that population growth is not harmful (or even beneficial) and that FP program effects are small in a continent where desired family size remains high.

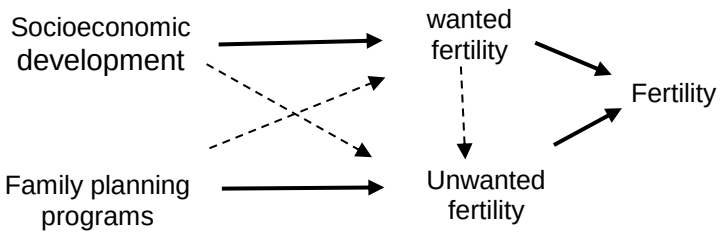
In addition, the literature on the fertility impact of family planning programs remains contentious. Lant Pritchett's controversial claim that fertility declines in LDCs are largely driven by declines in wanted fertility − and not by reductions in unwanted births resulting from family planning programs efforts − has led to a vigorous and still unsettled debate (Pritchett 1994). Several subsequent studies have concluded that Pritchett's analysis is flawed and that declines in unwanted fertility and family planning programs are much more important than Pritchett claims. (Bongaarts 1994,1997, 2011, 2020); Bongaarts and Hardee 2019; Feyisetan and Casterline 2000, Casterline et al 2009, Lam 2011).

The main objective of this study is to revisit this debate about the impact of family planning programs. The central section of this study consists of 1) An updated decomposition of the effects of trends in wanted and unwanted fertility on overall fertility trends in the developing world, and 2) An analysis of the effect of FP programs on unwanted and wanted fertility in SSA. The main conclusions are that declines in unwanted fertility have played an important role in reducing fertility and that FP programs have had a substantial impact not only on unwanted fertility but also on wanted fertility. These findings demonstrate that FP programs can be effective in SSA as has been demonstrated in several countries in the region which have implemented successful FP programs.

Analytic framework

The analysis presented below is guided by the framework for the determinants of fertility summarized in Figure 1. The solid arrows represent Pritchett's framework, in which development drives fertility preferences as measured by wanted fertility; family planning programs are considered the main determinant of unwanted fertility. The dashed arrows represent links that were ignored by Pritchett but will be examined here because they turn out to be important for a full understanding of fertility trends.

Figure 1: Analytic framework for the determinants of fertility



Methods and Data

Methods: 1) Standard decomposition of TFR trends into wanted and unwanted contributions in 54 countries in the developing world, and 2) Fixed effect regression models applied to longitudinal data from 30 countries in sub-Saharan Africa.

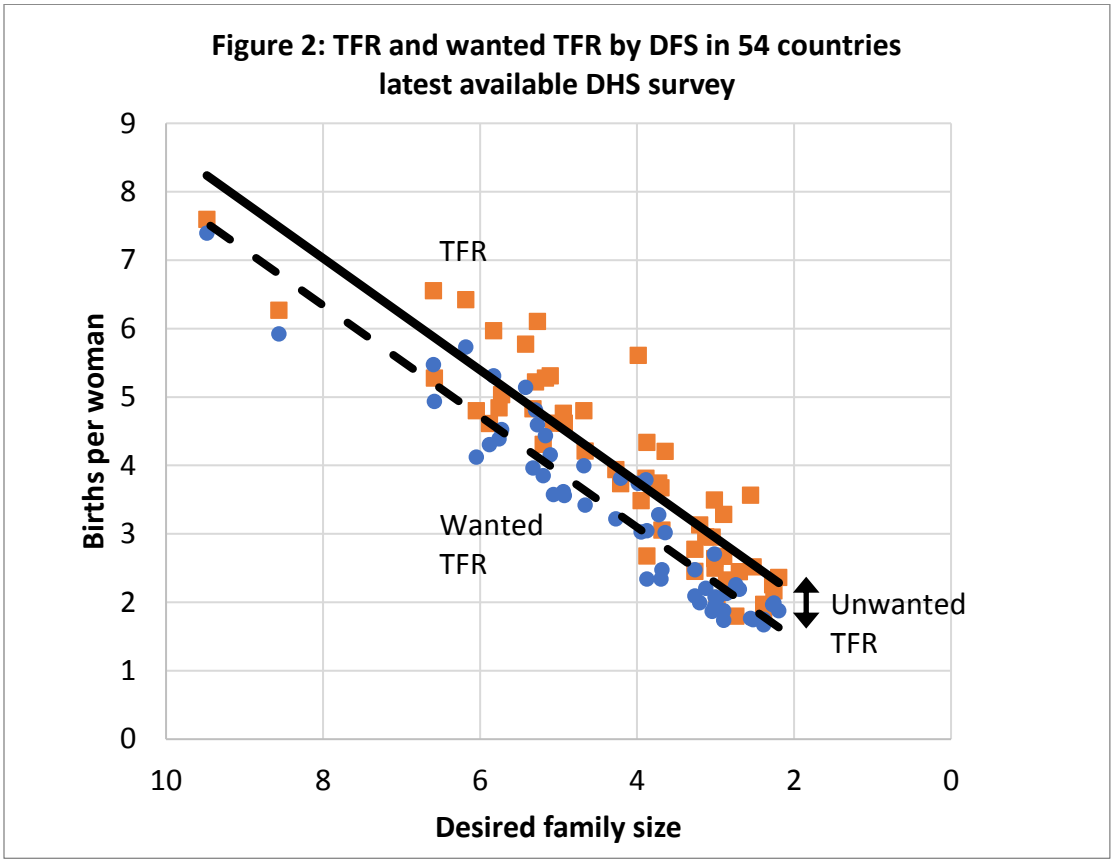
Data sources: DHS surveys from 54 countries with at least two surveys since 1990 and with a population size above one million (ICF 2021). The dependent variables in the regressions are (1) the total fertility rate (TFR), (2) the wanted total fertility rate (WTFR), and (3) the unwanted total fertility rate (UWTFR). Estimates of TFR and WTFR are obtained from DHS surveys using the method proposed by Bongaarts (1990). This method is also used by Lam (2011) and Pritchett (1994).

The explanatory variables consist of the family planning program score, PS, and the following socioeconomic variables: (1) education as measured by the average years of schooling among women aged 20–39 (women‘s educational attainment), (2) child mortality (ages 0–4), (3) GDP per capita (PPP), and (4) percent of population that is urban. The education estimates are taken from the Wittgenstein Center for Demography and Global Human Capital (2020) and estimates of child mortality and percent urban come from the World Bank Development Indicators database (2021). GDP per capita (PPP) is provided by Penn World table, version 9.1 (Feenstra et al. 2015). The family planning program score PS is calculated from DHS survey information with an equation described by Bongaarts and Hardee (2017).

Background: Pritchett and his critics

Pritchett’s key conclusions were largely based on a number of cross-sectional country level regressions using fertility measures as the dependent variables and preference indicators as the explanatory variables. Figure 2 repeats two such regressions, plotting the total fertility rate (TFR, square markers) and the wanted total fertility rate (WTFR, round markers) by the desired family size (DFS) for 54 countries using the latest available DHS surveys. The OLS regression lines fitted to these data are also presented. This updated figure looks similar to one from Pritchett’s original study using only data through the beginning of the 1990s. Three findings stand out: 1)

almost all country variation in the TFR is explained by variation in desired family size (R^2=0.80) 2) Not surprisingly, the same is true for wanted fertility (R^2=0.90) and 3) the difference between the total fertility and wanted fertility equals unwanted fertility (i.e., UWTFR); it averages about 0.7 births per woman and shows no significant correlation with fertility preferences. Pritchett (1994b) summed up these findings as "Desired fertility plus a constant is an excellent prediction of actual fertility" (p.621). He also noted that "Countries move from high fertility to low fertility not because unwanted fertility goes down, but because desired fertility goes down" (p.623).



Since 1994 studies by Casterline at al. (2009) and Lam (2011) have critically assessed the above claims. The main problem with Pritchett's analysis is that inferences about trends are made from cross-sectional data. Longitudinal data give a very different picture of trends in unwanted fertility. Casterline et al (2009) estimated that 26 % of fertility declines in 44 countries were due to changes in unwanted fertility and Lam (2011), using a different estimate of wanted fertility, found that unwanted fertility accounted for fully 47% of fertility declines in a set of 48 countries.

A key finding from these subsequent studies is that Pritchett's cross-sectional analysis gives an incorrect estimate of actual declines over time in wanted and unwanted fertility. While the patterns evident in Figure 2 suggests no decline in unwanted fertility, longitudinal measurement shows that declines in unwanted fertility play a substantial role in overall fertility decline.

RESULTS

The first section below examines the right-hand side of the analytic framework in Figure 2 and focuses on levels and trends in fertility and its wanted and unwanted components in all regions of the developing world. The subsequent second section then analyzes the multiple effects of development and family planning programs on wanted and unwanted fertility in SSA

1) Update and extension of Pritchett's analysis.

In the early 1990s, relatively few countries had repeated fertility surveys, which is one reason why Pritchett relied largely on cross-sectional analyses. As the number of surveys has grown since 1994 increasing number of countries have at least two surveys, thus allowing the estimation of changes over time in fertility indicators.

Table 1 presents an updated decomposition of the change in the TFR between the oldest and latest available DHS surveys (on average 1996 to 2014) in 54 countries.

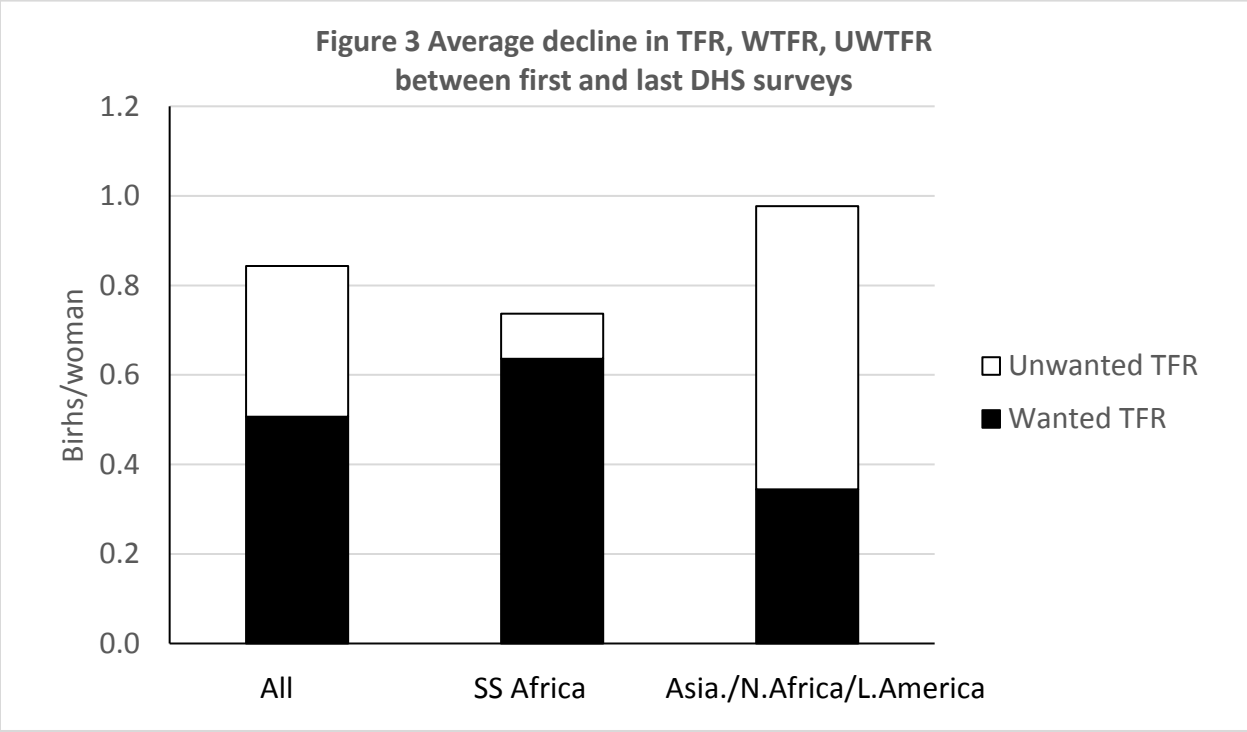
TABLE 1: Decomposition of the TFR into wanted (WTFR) and unwanted (UWTFR) components, unweighted averages for 54 countries

		TFR	WTFR	UWTFR
A. All regions				
	Oldest survey	4.80	3.80	1.00
	Latest survey	3.96	3.29	0.66
	Decline	0.84	0.51	0.34
B. Sub-Saharan Africa				
	Oldest survey	5.70	4.77	0.93
	Latest survey	4.96	4.14	0.82
	Decline	0.74	0.64	0.10
C. Asia, L.America, N.Africa				
	Oldest survey	3.68	2.58	1.10
	Latest survey	2.70	2.24	0.46
	Decline	0.98	0.34	0.63

The upper panel in Table 1 presents average levels of the TFR, WTFR and UWTFR at the time of the earliest and latest available survey and the decline between them. Since TFR=WTFR+UWTFR, it follows that a decline in the TFR between two points in time equals the decline in WTFR plus the decline in the UWTFR. Panel's B and C present the same estimates for, respectively, sub-Saharan Africa and the other developing regions. Figure 2 presents the results for the declines in TFR, WTFR and UWTFR in graphical form.

Key findings:

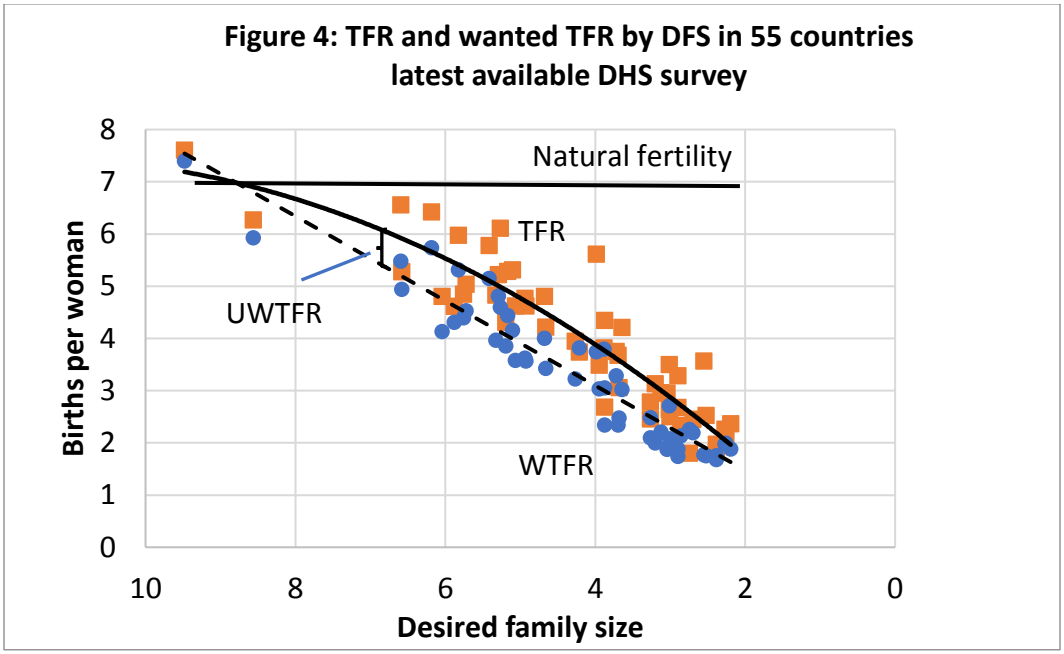
- The average decline in the TFR (0.84) for all countries substantially exceeds the decline in the WTFR (0.51). This finding is contrary to Pritchett expectation of approximately equal changes in WTFR and TFR. The same is true for the regional estimates.
- The average UWTFR for all countries declined by 0.34 (from 1.0 to 0.66), while Pritchett predicted a constant UWTFR.
- The decline in the UWTFR accounts for 40% of the decline in the TFR in all countries. This is consistent with the earlier findings of Casterline (2009) and Lam (2011). However, large differences exists between regions: the contribution of decline in the UWTFR is much larger in Asia/N.Africa/L.America (65%) than in SS Africa (14%).



The findings in Table 1 and Figure 2, clearly demonstrate that the longitudinal trends in unwanted fertility play an important role in determining overall fertility trends and are very different from the Pritchett assumption of no change.

But the finding that the role of the trend in UWTFR is much smaller in SS Africa than elsewhere is unexpected. Solving this puzzle requires another look at the cross-sectional association between TFR and desired family size. Figure 3 is very similar to Figure 1 in that it plots the same data points and has the same axes, but there is a key difference: the regression line fitted to the TFR estimates is quadratic instead of linear. This nonlinear function fits the data better and yields an important insight. Unwanted fertility, instead of being constant exhibits an inverted U-shaped curve over the course of the transition. Unwanted fertility is lowest at the highest and lowest values of desired family size and is highest at intermediate values. This phenomenon was

examined in some detail by Bongaarts (1997). He concluded that the very low unwanted fertility at high levels of desired family size was due to the fact that women in these societies needed all their reproductive years to bear wanted children, so that there was no time left for unwanted childbearing. However, as soon as wanted fertility drops early in the transition a gap appears between wanted fertility and natural fertility thus putting women at risk of unwanted childbearing. This gap represents potential unwanted childbearing. The rising use of contraception prevents a substantial part of this potential unwanted fertility, but some unwanted births nevertheless occur as some women do not practice contraception. The gap between wanted and natural fertility rises steadily over the course of the transition. During the first half of the transition women have difficulty preventing unwanted fertility from rising (even though overall fertility declines) but as society reaches the latest transition stages, women's use of contraception and abortion becomes sufficiently prevalent and effective that unwanted fertility declines.



This pattern of rising and declining unwanted fertility over the course of the transition provides a plausible partial explanation for the differences between SS Africa and the rest of the developing world in Figure 3. SS Africa is still in the earlier stages where there is upward pressure on unwanted fertility. (The longitudinal estimates in Table 1 show a small decline because there is an offsetting longitudinal component - i.e., a trend over time - that is not evident in Figure 3). In contrast, countries in the other regions are mostly in the last stages of the fertility transition when the cross-sectional data indicate declines in wanted TFR. This decline is accelerated by longitudinal effects. As a result, declines in unwanted fertility are the main cause of fertility decline in Asia/N.Africa /L.America.

2) The role of FP programs and socio-economic variables in sub-Saharan Africa

I turn now to a fuller analysis of the analytic framework presented in Figure 1 by examining the roles of development and family planning programs in sub-Saharan Africa. According to Pritchett, socio-economic development (and particularly women's education) is the main determinant of wanted fertility, and family planning programs are the main determinants of unwanted fertility. These assumptions are not controversial. However, as will be shown next, Pritchett ignored the dashed links in Figure 1; as a result, he missed a number of important effects, including the impact of family planning programs on wanted fertility.

The determinants of wanted and unwanted fertility in SSA will be assessed by relying on fixed effect regression analysis of country-level data from all DHS surveys in 30 countries with at least two such surveys.

a) The effects background variables on the total fertility rate

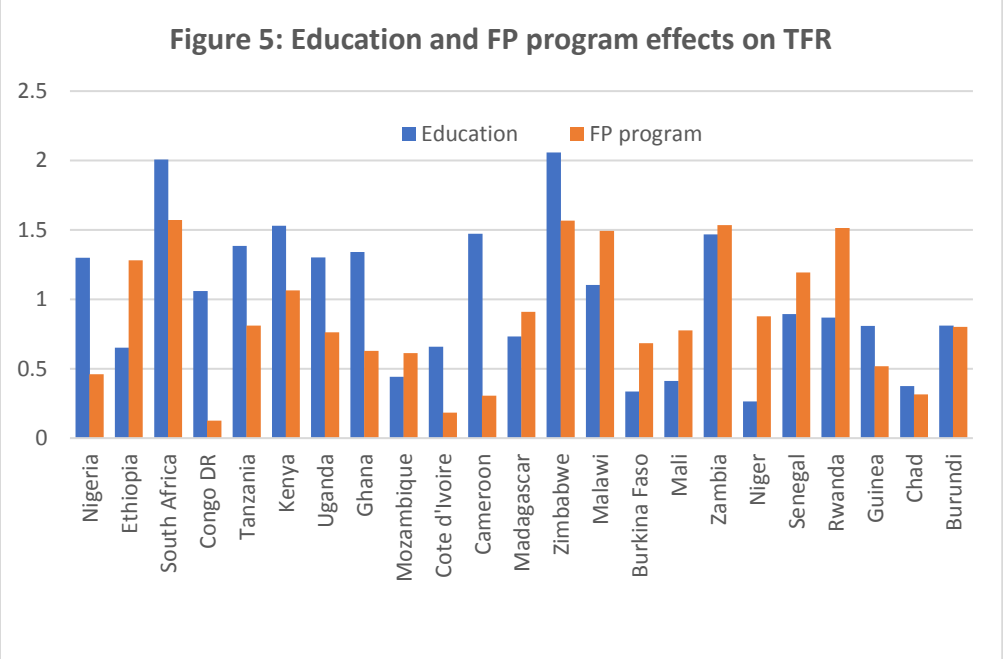
The first step in this exercise is to determine which development indicator(s) to use as explanatory variables. The second column of Table 2 presents the results of Model 1, a fixed effects regression in which the TFR is the dependent variable, and four socio-economic indicators are the explanatory variables. The coefficient for education is highly significant, while the other indicators are not. Subsequent regressions therefore rely on education is as the key socioeconomic explanatory variable.

Model 2 in Table 2 adds the family planning program indicator as an explanatory variable. This index was specifically developed for countries in SSA (Bongaarts and Hardee 2017). The two independent variables included in Model 2 therefore are women's education and a family planning program index. The results are clear: the coefficients for both variables are highly significant.

TABLE 2: Results of fixed-effects regression for determinants of TFR

	Dependent variable: Total fertility rate	
	Model 1	Model 2
Education	**-0.322*****	**-0.185*****
Child mortality	0.002	
Log GDP/cap (PPP)	0.122	
% Urban	-0.0025	
Family planning program index		**-0.025*****
Constant	6.25	6.80
N	129	129
R^2	0.52	0.66

In each country the absolute fertility effects of women's schooling and the FP program can be estimated by multiplying the regression coefficients in Model 2 by the observed values of the two explanatory variables. Figure 5 plots the resulting fertility effects in countries with a population over 5 million at the time of the latest DHS survey. The average education effect (1.04 births per woman) exceeds the average program effect (0.84). There is considerable variation among countries. For example, the education effect exceeds 1.5 birth per woman in Kenya, South Africa and Zimbabwe, but is less than 0.5 in Mozambique, Burkina Faso, Mali Niger and Chad. The countries with the highest program score (around 1.5 births per woman) are Malawi, Rwanda, South Africa, Zimbabwe and Zambia[1].



b) The effects background variables on wanted and unwanted fertility

The regressions assessing the effects of the background variables on wanted fertility are summarized in Table 3 Model 3. The coefficients for education and FP program score are both highly significant and negative as expected on theoretical grounds. On average, one year of education reduces wanted fertility by 0.215 births per woman and one point in the FP score reduces the WTFR by 0.016 births per woman.

Model 4 repeats Models 2 and 3 except that the dependent variable is unwanted fertility. The results show a significant effect of FP program score but not for education. The latter finding is surprising because educated women generally have more knowledge about and access to contraception and have higher opportunity costs associated with an unwanted birth. The

[1] These regression results are slightly different from those presented in Bongaarts (2020). The main reason for this difference is that Bongaarts (2020) uses the standard DHS calculation for wanted fertility while the present study relies on a different approach proposed by Bongaarts (1990).

explanation for this unexpected finding lies in the process discussed above in connection with Figure 4. As wanted fertility declines the potential number of unwanted births rises. Education and FP programs therefore have an uphill battle to overcome this rising level of potential unwanted fertility and the result is a nonsignificant effect for education and a relatively small but significant effect for FP. To reveal the unbiased effect of these two variables it is therefore necessary to control for the confounding effect of declining wanted effect. This is the objective of Model 5. As expected, these results show a strong and highly significant inverse effect of WTFR, and the effects of education and FP program now are larger than in Model 4 and are statistically significant. In fact, the coefficient for the effect of FP score on unwanted fertility (-0.016) is the same as for the effect on wanted fertility.

TABLE 3: Results of fixed-effects regression for determinants of TFR

	Wanted TFR	**Unwanted TFR**	**Unwanted TFR**
	Model 3	**Model 4**	**Model 5**
Education	**-0.215*****	0.03	**-0.067***
Program index	**-0.016*****	**-0.009*****	**-0.016*****
Wanted TFR			**-0.452*****
Constant	5.7	1.05	3.64
N	129	129	129
R^2	0.55	0.09	0.39

Conclusion

Pritchett correctly concluded that fertility preferences are a key driver of fertility declines. But his claim that unwanted fertility is nearly constant and that family planning programs have trivial effects are incorrect. This study shows that FP programs reduce unwanted fertility (which is expected) but they also reduce wanted fertility (which Pritchett ignores). The overall fertility effect of the most successful family planning programs in Malawi, Rwanda, South Africa, Zimbabwe and Zambia reaches a very substantial 1.5 birth per woman, thus providing women with valuable reproductive health benefits and substantially accelerating the fertility transition.

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