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# TRENDS IN CONTRACEPTIVE PREVALENCE IN SUB-SAHARAN AFRICA: THE ROLES OF FAMILY PLANNING PROGRAMS AND EDUCATION

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Abstract

Since the 1990s some countries in Africa have experienced very rapid increases in contraceptive prevalence (e.g. Ethiopia, Malawi, Rwanda), while others (e.g. Nigeria) have seen little change. This study aims to shed light on the causes of these different trends which remain controversial. We assess the role of family planning programs vs. socioeconomic development (in particular, women's educational attainment). Estimates of the effects of different explanatory factors are obtained by country level regressions (ordinary least squares and fixed effects) in which the prevalence of modern contraception is the dependent variable and women's educational attainment, GNI per capita, percent urban and child mortality as well as the family planning program score are the independent variables. Results show that women's educational attainment and program score are the dominant drivers of contraceptive prevalence trends. We also document the government actions that have been instrumental in raising the family planning program impact since 1990.

Over the past half century, the practice of contraception has spread rapidly through much of the developing world. In the early 1960s fewer than 1 in 10 women of reproductive age in union (MWRA) practiced modern contraception, but by 2015 prevalence of modern contraceptive methods ("prevalence") rose to 57 percent (United Nations 1994, 2018). The most rapid growth occurred in Asia and Latin America which reached prevalence levels of 61 and 69 percent, respectively, by 2015. Prevalence in sub-Saharan Africa also increased, but at a much slower pace reaching only 25 percent in 2015.

An extensive literature examines the causes of these trends, with general agreement that two factors have played a key role in raising prevalence. The first is socioeconomic development as argued by conventional demographic transition theory (Davis 1945; Notestein 1945). As countries develop, income and education levels rise. These changes lead couples to reduce their traditionally high desired family size and to implement these desires for fewer offspring contraception is practiced.

The second factor is the family planning movement that started in the developing world in the 1950s. In subsequent decades, governments and international organizations made large investments in voluntary family planning programs in the Asia, Latin America and Africa. These programs aim to provide information about and access to contraception to permit women and men to take control of their reproductive lives and avoid unwanted childbearing. Newly available contraceptive methods, such as the pill and the intrauterine device (IUD) in the 1960s and injectable and implants in the 1970s and 1980s, greatly expanded contraceptive choice for women and couples and facilitated the delivery of family planning services.

The continued choice of voluntary family planning programs as a policy instrument to meet people's needs and to accelerate fertility decline is based largely on the documentation of a substantial unsatisfied demand for contraception (Cleland et al. 2006; May 2012). In surveys, large proportions of married women in the developing world report that they do not want a pregnancy at the time of the interview. Some of these women want no more children because they have already achieved their desired family size, while others want to wait before having the next pregnancy. A substantial proportion of these women (more than one-half in some countries) risk pregnancy by not practicing effective contraception (including sterilization), and, as a result, unintended pregnancies are common. Each year about 73 million unintended pregnancies occur in the developing world (of which 49 percent end in induced abortions) with detrimental health and economic effects for many women, children and families (Sedgh et al. 2014).

It is therefore not surprising that past evaluations of family planning programs have found their impact on prevalence and fertility to be substantial. One of the best known controlled experiments was conducted in rural Matlab district of Bangladesh in the late 1970s. The provision of high quality services in the intervention area reduced fertility by 28% and raised

contraceptive prevalence to 35% while little change occurred in the control area (Phillips et al. 1982). A similar experiment conducted in Northern Ghana led to a 15% decline in fertility (Debpuur et al.2002). A recent review of the evidence concludes that the impact of voluntary family planning ranges up to 33% depending on the intensity and quality of the intervention (Miller 2016).

Another key rationale for investments in family planning program is the economic benefit of fertility decline that can result from an age structure favoring working age populations over those under age 15. This so-called demographic dividend that boosts GPD per capita was first documented in East Asian countries (Bloom and Canning 2003; Copenhagen Consensus Centre 2015; Kohler and Behrman 2014). More recently African governments are turning their attention to the potential economic benefit of their own demographic dividends (Drummond et al, 2014).

Yet, questions about the role of family programs versus the role of socioeconomic development in reducing fertility continue to be raised (Bongaarts et al. 2012; World Bank 2016; Kantner, 2014). Proponents of family planning programs argue that these programs are essential to reproductive health and point to the high levels of unmet need and unplanned pregnancies as the key rationale for investing in these programs. Critics argue that socioeconomic development and, in particular, female education is the main driver of changes in reproductive behavior and that family planning programs have only a minor impact on trends in contraceptive use. Some also argue that the experimental results such as from Matlab are not replicable at the country level because of the high expense of this experiment (Pritchett 1994).

This paper aims to shed light on this continuing controversy. The main objective is to assess the net impact of family planning programs on contraceptive prevalence after controlling for the effects of socioeconomic factors, most notably female education.

**Methodology**

This study examines the determinants of trends in use of contraception in sub-Saharan countries. The variables included in the analysis are as follows:

- *Independent variable:* contraceptive prevalence of modern methods (mCPR) among women who are married or in union (MWRA). For simplicity this variable will be referred to as "prevalence". Sources: ICF 2018 and United Nations 2087.

- *Socioeconomic explanatory variables*: 1) Education as measured by the average years of schooling among women aged 20-39 (women's educational attainment), 2) GNI/cap (PPP), 3) Percent urban and 4) Child mortality (ages 0-5). Education estimates are from the Wittgenstein Center for Demography and Global Human Capital (2018), and estimates of GNI per capita and percent urban and child mortality are taken from World Bank Development Indicators database (World Bank, 2018).

- *Family planning program indicator:* To measure the quality and scope of the government's public family planning program we rely on "public-sector family planning program impact score" developed by Bongaarts and Hardee (2017). This score ranges from 0 in the absence of a government program to a theoretical value of 100 for the strongest programs. For simplicity we will refer to this variable as the "program score".

The analysis focuses on trends from 1990 to 2015 in 24 sub-Saharan Africa with a population size above 5 million in 2015 and with at least two DHS surveys. Many of the smaller countries in sub-Saharan Africa have high international migration levels which affect reproductive behavior. The exclusion of smaller populations also makes the unweighted regional averages of indicators more representative of the continent and makes the figures easier to interpret[i].

Regression analysis (ordinary least squares (OLS) and fixed effects models) will be used to estimate the impact of the program score and socioeconomic variables on contraceptive prevalence. By using countries as their own controls, fixed effects models account for time-stable differences among countries, which may otherwise introduce bias into parameter estimation.

**Results**

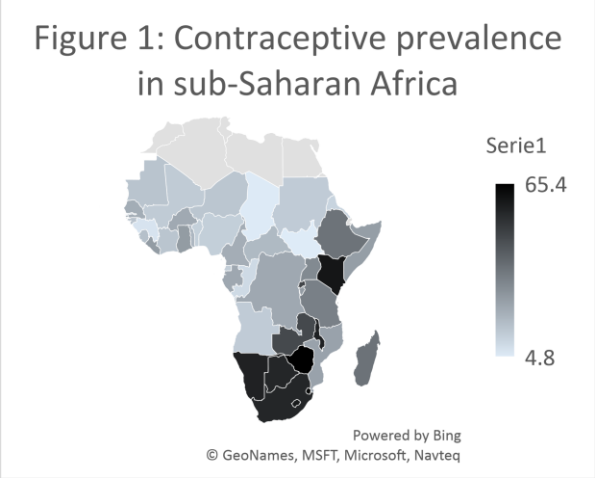
*Descriptive findings*

Table 1 presents estimates of the (unweighted) averages and ranges of the dependent and explanatory variables for the 24 countries in 1990 and 2015. Estimates for the program score are only available for years in which a DHS surveys was conducted; the earliest and latest available dates (circa 1996 and 2013 respectively) are also presented.

**Table 1: Average (unweighted) and Range for Key Variables**

| Variable | 1990 | | 2015 | |
|---|---|---|---|---|
| | Average | Range | Average | Range |
| Contraceptive prevalence (%MWRA) | 5.7 | 0.70 - 38.1 | 27.1 | 5.10 - 65.4 |
| Women's educational attainment (years of schooling, women ages20-35) | 2.52 | 0.40 - 6.70 | 5.18 | 1.50 - 11.4 |
| GNI per capita (PPP), log transformed | 2.93 | 2.38 - 3.27 | 3.28 | 2.87 - 3.77 |
| % urban | 24.3 | 5.40 - 39.7 | 34.1 | 12.1 - 64.4 |
| Child mortality (per 1000 births) | 187.4 | 75.2 - 328.9 | 78.5 | 40.5 - 130.9 |
| | | | | |
| | Earliest DHS (ca 1996) | | Latest DHS (ca 2013) | |
| Family Planning Program score (range from 0 to 100) | 11.5 | 2.5 - 53.3 | 29.5 | 4.6 - 62.2 |

Average (unweighted) contraceptive prevalence rose from 5.7% to 27.1 % between 1990 and 2015. This is a substantial increase of 21.4 percentage points, but the 2015 level is far short of prevalence estimate for 2015 elsewhere in the developing world. Prevalence in 2015 varies widely among countries ranging from a low of 5.1% in Chad to 65.4% in Zimbabwe. As shown in Figure 1, prevalence is generally higher in Eastern and Southern Africa than in the rest of the continent.

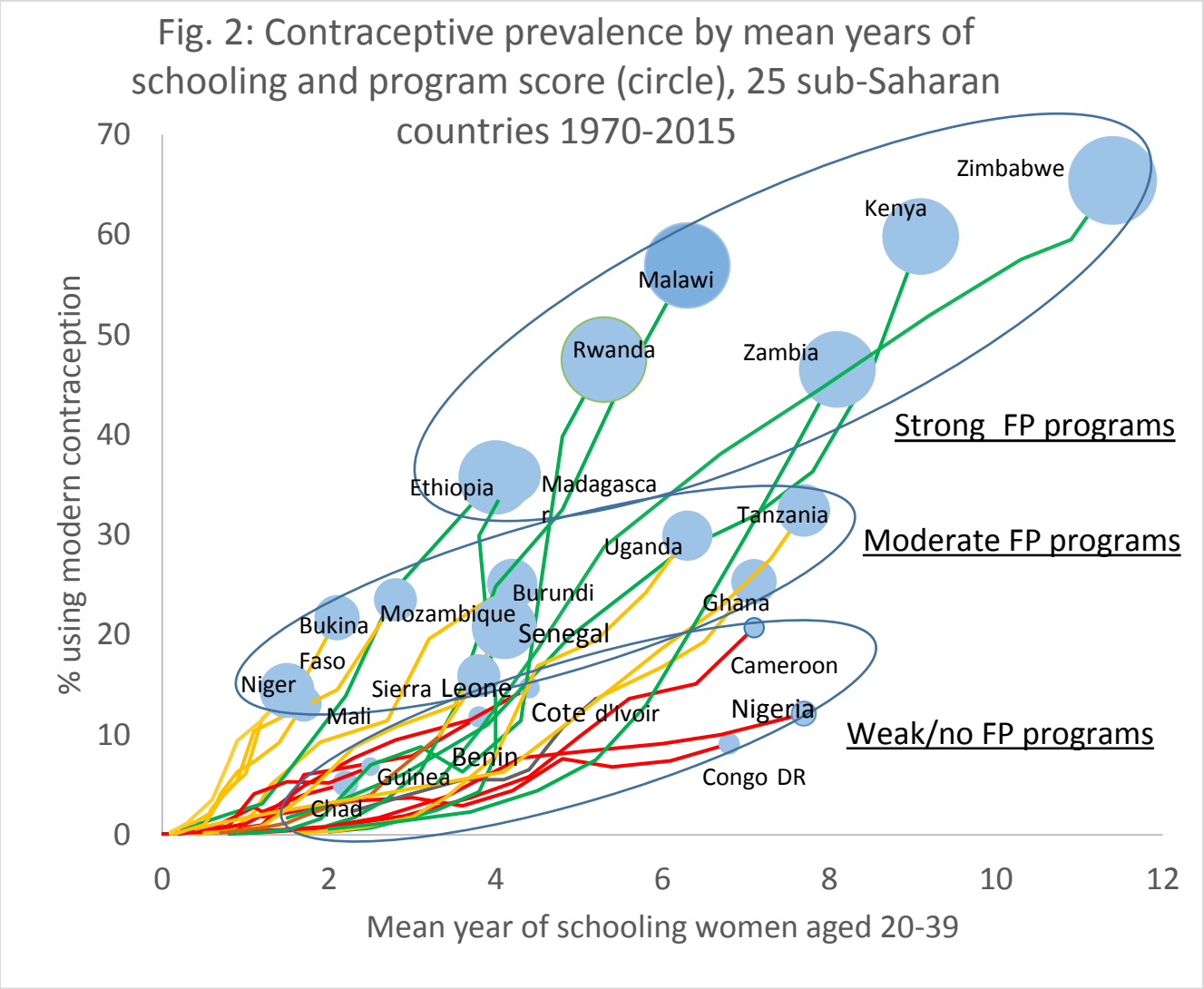



On average, all the socio-economic variables moved in the expected direction between 1990 and 2015. That is, women's educational attainment, GNI per capita and percent urban all rose, and child mortality declined. Variation in socio-economic indicators is wide. The program scores also rose substantially over time, averaging 11.5 at the time of the first available survey circa.1996 to 29.5 at the time of the last survey circa 2013. The program score ranged from a low of 4.6 in Guinea to a high of 62.2 in Zimbabwe at the time of the last DHS survey.

To provide a first look at the relationship between socio-economic variables and prevalence, we plot in Figure 2 the prevalence by mean years of schooling of women aged 20-39. (As will be shown later, education is the most important of the socio-economic determinants).
The figure contains 24 lines, one for each country, representing five-year estimates from 1970 to 2015 (United Nations 2018). The size of the circle at the end of each line is proportional to the program score of the country at the time of the most recent survey (ca. 2013).

The overall relationship between the mCPR and women's educational attainment is positive and statistically significant. However, if female education were the only determinant of mCPR, observations for all countries and all years would fall on a single line. This is clearly not the case, indicating an impact of programs and other factors. In general, the higher the level of women's educational attainment and the higher the program score, the higher the prevalence. The six countries in the upper oval have the strongest program scores (>35). The ten countries in the second oval all have program scores above 15 and in the third oval all countries have scores

below 15. At any level of women's educational attainment, prevalence varies widely. For example, in the three countries with schooling levels between six and seven years, prevalence ranges from 10% in DR Congo to 29.9% in Uganda to 56.9% in Malawi. As will be shown below, the differenecs among these countries with similar levels of women's educational attainment are mostly due to program differences.




The findings in Figure 3 suggest that education and program score both have a substantial effect on prevalence, but the estimation of the magnitudes of these effects requires regression analysis.

*Regression analysis*

Although country-level data on six explanatory variables are available, it is desirable to reduce this number in order to reach more stable regression results with the limited number of country observations. To identify which explanatory variable(s) to retain we first estimated separate

bivariate OLS regressions of mCPR on each of the explanatory variables at the time of the last DHS survey with countries as the unit of analysis (N=24). The results show a strong and highly significant correlation (P<0.000) in the expected direction between mCPR and three of the explanatory variables: women's educational attainment, child mortality and program score. In contrast, the correlations between prevalence and GNI/cap and percent urban were not significant (P>0.05). This led us to exclude GNI/cap and percent urban from the remaining regressions.

Second, we estimated multivariate OLS regressions using mCPR data for the year of the latest DHS survey with women's educational attainment, child mortality and program score as the independent variables. The results are presented in panel 1 of Table 1. The coefficients for education and program score are statistically significant, while the coefficient for child mortality is not.

Table 1: Results of OLS and fixed effects regression models of socioeconomic variables on contraceptive prevalence in 24 Sub-Saharan Africa countries.

| | | |
|---|---|---|
| **Panel 1: OLS** | | |
| | Coefficient | P |
| Education | 2.72 | 0.000 |
| Child mortality | -0.030 | 0.612 |
| Program score | 0.672 | 0.000 |
| Constant | -5.988 | 0.466 |
| N | 24 | |
| $R^2$adj | 0.921 | |
| | | |
| **Panel 2: Fixed effects** | | |
| Education | 3.320 | 0.000 |
| Child mortality | 0.027 | 0.069 |
| Program score | 0.696 | 0.000 |
| Constant | -14.17 | 0.001 |
| N | 98 | |
| $R^2$adj | 0.892 | |
| | | |
| **Panel 3: Fixed effects** | | |
| Education | 2.814 | 0.000 |
| Program score | 0.640 | 0.000 |
| Constant | -7.460 | 0.000 |
| N | 98 | |
| $R^2$adj | 0.888 | |

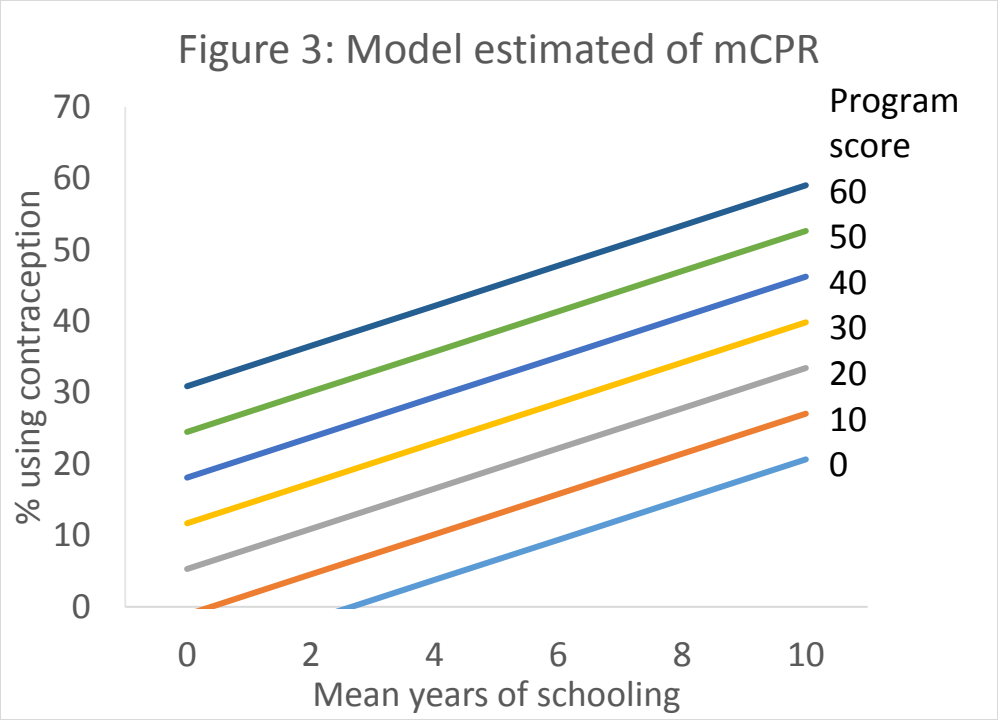
Finally, we estimated the effect of education level and program score on contraceptive prevalence using a fixed effects model to better control for time-invariant confounding variables

using all available DHS surveys for the 24 countries (N=98). The results, presented the second panel of Table 1, are similar to the findings for the OLS regressions in the upper panel. In particular, the coefficients for women's educational attainment and program score are of approximately the same magnitude in the OLS and fixed effects models, and again the effect of child mortality is not significant. This led us to also drop the child survival variable.

The last panel in Table 2 presents the fixed effect regression results using only women's educational attainment and program score as explanatory variables. Note that the removal of the child survival variable does not significantly change the adjusted $R^2$ for the regression.

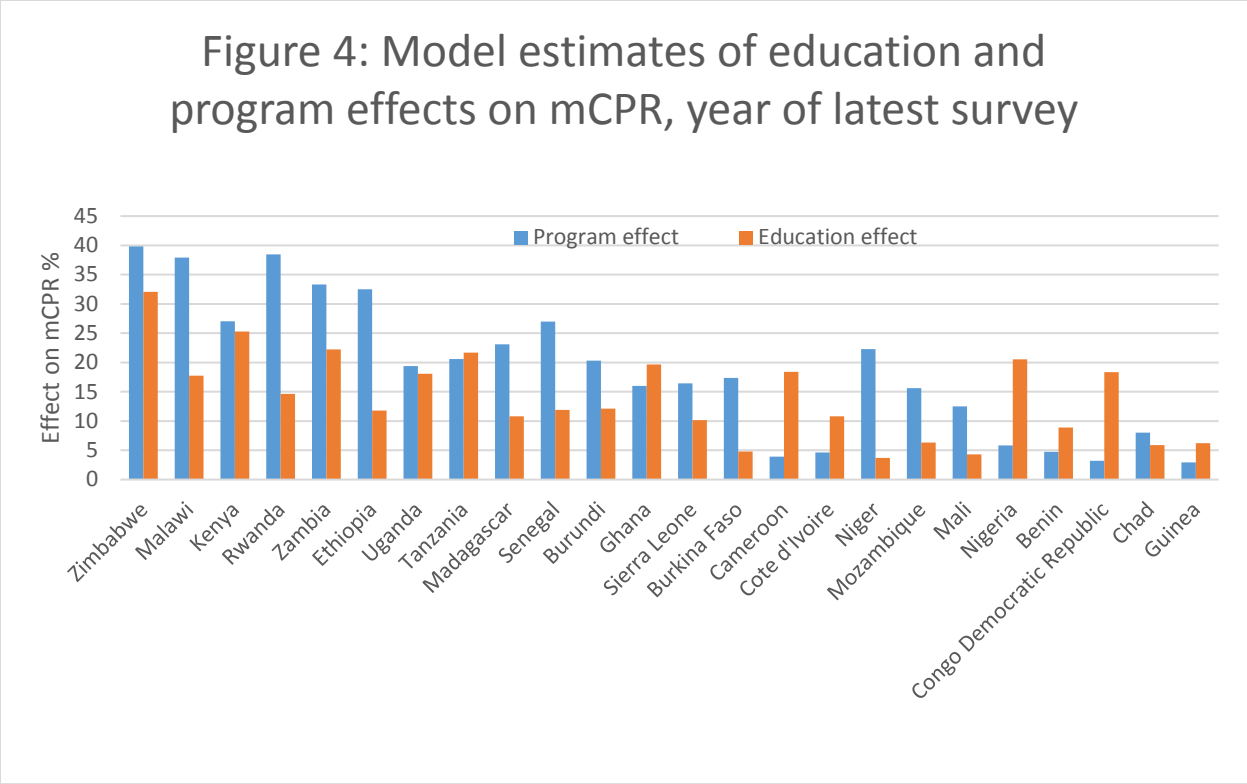
Results from the regression analyses confirm that women's education and family planning programs have a substantial impact on contraceptive prevalence. The size of the effect can be demonstrated with simple simulation presented in Figure 3 which plots model mCPR estimates for a range of values of women's educational attainment and program score. The range of mCPR values are consistent with the observed values in Figure 2. At the lowest levels of women's educational attainment even a strong program can raise mCPR only to about 30% due to limited demand and programs with intermediate scores achieve mCPRs of 10 to 20%.

At the other end of the women's education spectrum, countries with 10 years of schooling for women and the strongest programs can reach mCPR around 60% (as observed in Kenya and Zimbabwe). It is noteworthy that the effect of the Matlab experiment in Bangladesh is consistent with the model estimates. In the mid-1970s, women's educational attainment in Bangladesh was 1.4 years which according to the model should lead to a mCPR of 33.1% assuming a program score of 60. This is close to the observed value at the time.




*Country estimates of roles of education and program*

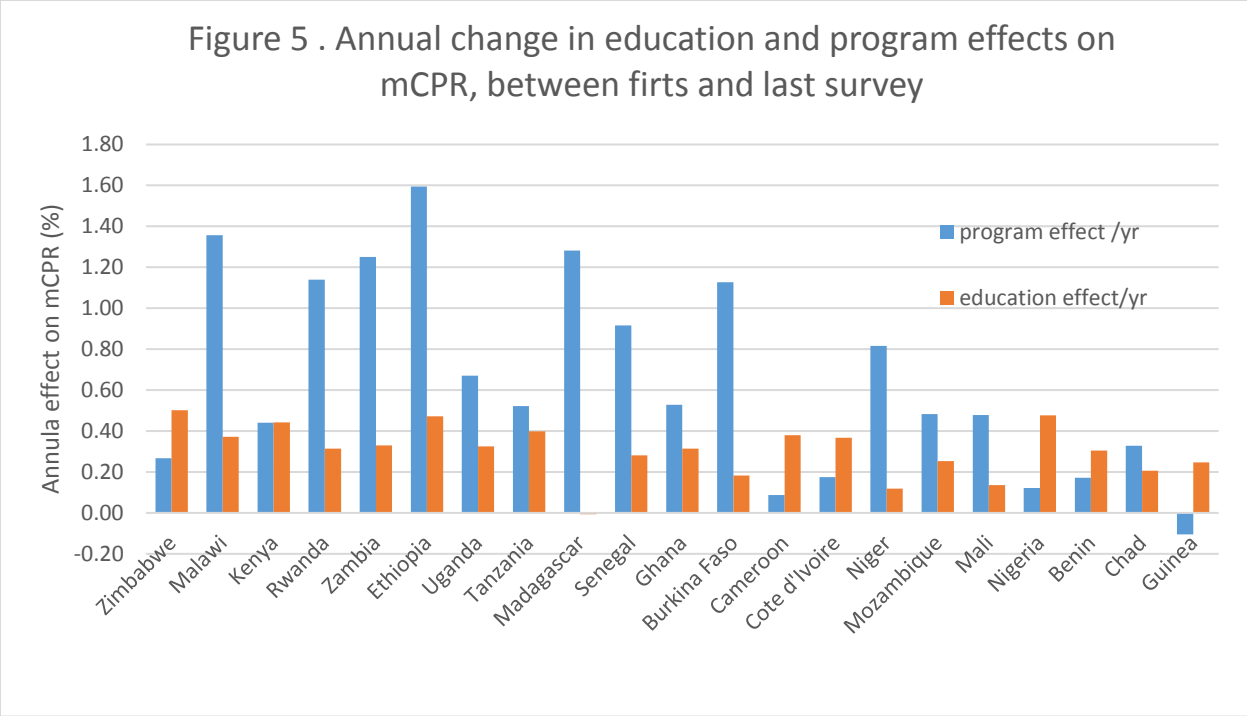
The fixed effect regression results allow the estimation of the separate effects of women's schooling and the program on the mCPR in each of the 24 countries at most recent survey, using observed values of these explanatory variables[ii]. The results of this exercise are summarized in Figure 4 which plots estimates of women's educational attainment and program components of the mCPR in each country at the time of the latest survey (ordered from lowest to highest mCPR).




The two components vary widely in size with one dominating the other in several countries. For example, the program effect is substantially larger than the women's educational attainment effect in Malawi, Rwanda and Ethiopia, while the reverse is observed in Cameroon, Nigeria and DR Congo. Effects are approximately equal in Kenya, Uganda, Tanzania and Ghana.

To examine the recent pace of change in the impacts of women's education and program score, Figure 5 plots the annual changes in the program effect and in the women's education effect. These pace estimates are calculated for the period between the first and last DHS survey[iii]. For example, for Ethiopia the program impact rose from 7 percent in 2000 to 33 percent in 2016, yielding an annual pace of 1.6 percent per year.

The pace of change in the program effect varies widely among countries. The most rapid increases (above 1 percent per year) have occurred in Rwanda, Zambia, Malawi, Ethiopia, Madagascar, and Burkina Faso. In half of the countries the pace of program improvement is slow or negligible (<0.5% per year). The pace of improvement in the impact of women's education shows less variation among countries and is on average lower than the pace of improvement in program impact.




**Discussion**

The findings of Figure 5 are of clear interest to policy makers throughout Africa because they indicate that expanding FP programs can have a rapid effect on the mCPR. The very rapid improvement in program impact in six countries (Rwanda, Zambia, Malawi, Ethiopia, Madagascar and Burkina Faso) stand out. How did these countries achieve such rapid progress, and can this success be replicated elsewhere? The accelerations in program impact are directedly traceable to government actions:

- *Rwanda*'s FP program has been hailed as "a phenomenal success," due to strong political will, rebuilding of the health system and community mobilization starting in the early 2000's (USAID et al., 2012). With a vision of Rwanda becoming a middle income country, President Kagame saw the need to address population growth as part of the country's development strategy (Solo, 2008). All ministries are responsible for developing action plans for FP (Say, Chou, Mommaerts and Haviland, 2011), and the government emphasizes the need for high quality services.

- *Zambia*. Progress on FP was slow until the early 2000s, but the government then accepted FP as a key strategy for contributing to the country's ambitious development goals (Republic of Zambia, 2006). The government's family planning program focuses on expanding method mix, reaching rural and hard to reach populations, reducing barriers

for youth and increasing domestic resources for commodities (Republic of Zambia, 2018).

- *Malawi*. Since the early 2000s, Malawi's government has provided high-level support to the expansion of the FP program (USAID/Africa Bureau et al., 2012). Malawi has expanded the method mix, increased service options and strengthened financing and accountability for the program. With a slogan of "no parenthood before adulthood," Malawi has also focused attention on meeting the needs of youth (Government of Malawi, 2015). In its commitment at the 2017 Family Planning Summit, Malawi pledged to "involve all key [stakeholders] through a robust multi-sectoral approach and achieving declined fertility paramount for the development of Malawi" (FP2020, 2018).

- *Ethiopia*. The rapid increase in mCPR in Ethiopia after 2005 shows the effect of strong government commitment coupled with expansion in access to FP through improved health services and community-based programming (USAID/Africa Bureau et al., 2012; Olson and Pillar, 2013). In 2005, with full support from the Prime Minister, FP was widely implemented (AFIDEP, 2013). Family planning was included in the package of essential services in Ethiopia's Health Extension Plan, provided through paid female health extension workers (HEW) assigned to rural health posts and supported by volunteer Community Health Workers (Workle and Ramana, 2013). HEWs also serve urban areas.

- *Madagascar*. Since the early 2000s, Madagascar's FP program has enjoyed presidential-level support, with FP considered a national priority for development. Access to services has been expanded, including through community-based distribution of FP (USAID/Madagascar, 2010). A new law recognizes FP as a basic human right of all individuals, regardless of age, and overturns a 1920 law prohibiting promotion of FP (Schlachter and Van Boven, 2018).

- *Burkina Faso* hosted a landmark 2011 conference, attended by 12 francophone West African countries, that resulted in the Ouagadougou Call to Action and a partnership to enhance FP in the region (Health Policy Project, 2013). The Reproductive Health Law passed in 2005 propelled the program forward as it overturned a 1920 law banning FP and guarantees the right to health (Health Policy Project, 2013). Over the past decade and a half, FP in Burkina Faso has enjoyed high level political support, a strong policy environment, expanding service access, a growing method mix and attention to contraceptive security, reaching rural areas, and serving youth.

The common theme among these successful countries is that they all have exhibited political will and commitment for FP from the highest to lowest political leaders, thus creating a chain of

responsibility and accountability. Changes in the laws have removed obstacles to FP promotion and provision. Although these countries are dependent on donor funding, they have worked to increase domestic expenditures on FP and to ensure that contraceptives are reliably available, including long acting and permanent methods. FP services have expanded through community-based services. Demand creation and social behavior change have also been given priority, as has meeting the needs of young people. Program documents, including FP Costed Implementation Plans developed to reach goals set as part of the FP2020 partnership, reinforce FP as a human right.

**Conclusion**

Our analysis leads to three conclusions. First, women's educational attainment and program score are the main determinants of levels of contraceptive prevalence in sub-Saharan countries. FP programs can increase mCPR at all levels of female education. Second, the very rapid increases in prevalence in several countries since the 1990s are mainly due to the rapid strengthening FP programs and not to an acceleration of education levels. Third, the improvements in FP programs are directly traceable to increase in government actions including stronger commitment from political leaders and increased funding.

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## End notes

[i] Also excluded are the 2003 survey in Mozambique (because it occurred shortly after massive floods had devastated the country) and the 1993 survey in Burkina Faso (because the coding of traditional methods is not standard)

[ii] Regression results from the final fixed effects model (Table 1, panel 3) were used to estimate the separate effects of women's schooling and program score on the mCPR in each of the 24 countries. Specifically, the effect coefficient for education and program score, respectively, were multiplied by the observed mean education level and program score for each country, using data at the time of the latest survey. These results are summarized in Figure 4 which plots the estimated average effect of women's educational attainment and program score on mCPR for each country (ordered from lowest to highest mCPR).

[iii] To avoid large sampling errors in pace estimates only countries with at least 10 years between the first and last survey are included in Figure 5. Burundi, Congo DR, Sierra Leone are therefore excluded.

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