

# Population Control Policies and Fertility Convergence\*

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## Abstract

The rapid population growth in developing countries in the middle of the 20th century led to fears of a population explosion and motivated the inception of what effectively became a global population-control program. The initiative, propelled in its beginnings by intellectual elites in the United States, Sweden, and some developing countries, mobilized resources to enact policies aimed at reducing fertility by widening contraception provision and changing family-size norms. In the following five decades, fertility rates fell dramatically, with a majority of countries converging to a fertility rate just above two children per woman, despite large cross-country differences in economic variables such as GDP per capita, education levels, urbanization, and female labour force participation. The fast decline in fertility rates in developing economies stands in sharp contrast with the gradual decline experienced earlier by more mature economies. In this paper, we argue that population-control policies are likely to have played a central role in the global decline in fertility rates in recent decades and can explain some patterns of that fertility decline that are not well accounted for by other socioeconomic factors.

*Key words:* fertility rates, birth rate, convergence, macro-development, Malthusian growth, population, population-control policies.

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# 1 Introduction

In the middle of the twentieth century, almost all developing countries experienced a significant increase in life expectancy, which, together with high fertility rates, led to rapid population growth rates. The fear of a population explosion lent impetus to what effectively became a global population-control program. The initiative, propelled in its beginnings by intellectual elites in the United States, Sweden, and some developing countries, most notably India, mobilized international private foundations as well as national governmental and nongovernmental organizations to advocate and enact policies aimed at reducing fertility. By 1976, following the preparation of the World Population Plan of Action at the World Population Conference in Bucharest in 1974, 40 countries, accounting for 58 percent of the world's population and virtually all of the larger developing countries, had explicit policies to reduce fertility rates. Between 1976 and 2013, the number of countries with direct government support for family planning rose to 160. In this essay, we will argue that concerted population control policies implemented in developing countries are likely to have played a central role in the global decline in fertility rates in recent decades and can explain some patterns of that fertility decline that are not well accounted for by other socioeconomic factors.

To set the stage, we begin by reviewing some trends and patterns in the fertility decline in the last half-century across countries and regions. We argue that although socioeconomic factors do play an important role in the worldwide fertility decline, they are far from sufficient to account for the timing and speed of the decline over the past four decades. For example, the cross-country data in any given year show a negative correlation between per capita income and fertility rates. However, that relationship has shifted downward considerably over time: today the typical woman has, on average, two fewer children than the typical woman living in a country at a similar level of development in 1960.

We then discuss the evolution of global population-control policies in more detail. All population-control programs involved two main elements: promoting an increase in information about and availability of contraceptive methods, and creating public campaigns aimed at establishing a new small-family norm. The evidence suggests that these public campaigns appeared to have been critical in complementing contraceptive provision. While estimating the causal effects of these programs is challenging, we examine the relationship between different measures of family planning program intensity and the declines in fertility over the past decades and find

a strong association, after controlling for other potential explanatory variables such as GDP, schooling, urbanization, and mortality rates.

In a final section, we discuss in more detail the role played by these other variables in the decline in fertility and highlight that the drop in fertility rates seems to be occurring and converging across countries with varying levels of urbanization, education, infant mortality, and so on. We conclude that population control policies seem to be the factor that best accounts for this commonality.

## 2 Fertility patterns across time and space

The world’s total fertility rate declined from over 5.0 children per woman in 1960 to 2.5 children per woman in 2013.<sup>1</sup> This trend is not driven by just a few countries. Figure 1 plots fertility rate histograms for the start of decades since 1960; the bars show the fraction of countries for each fertility interval. (The figure shows 2013 rather than 2010 to report the most recent information.) In 1960, more half the countries in the world had a fertility rate between 6 and 8, and the median fertility rate was 6.2 children per woman. (When weighted by population, the world’s median is 5.8.) In 2013, the largest mass of countries is concentrated around 2, with the median total fertility rate being 2.2.

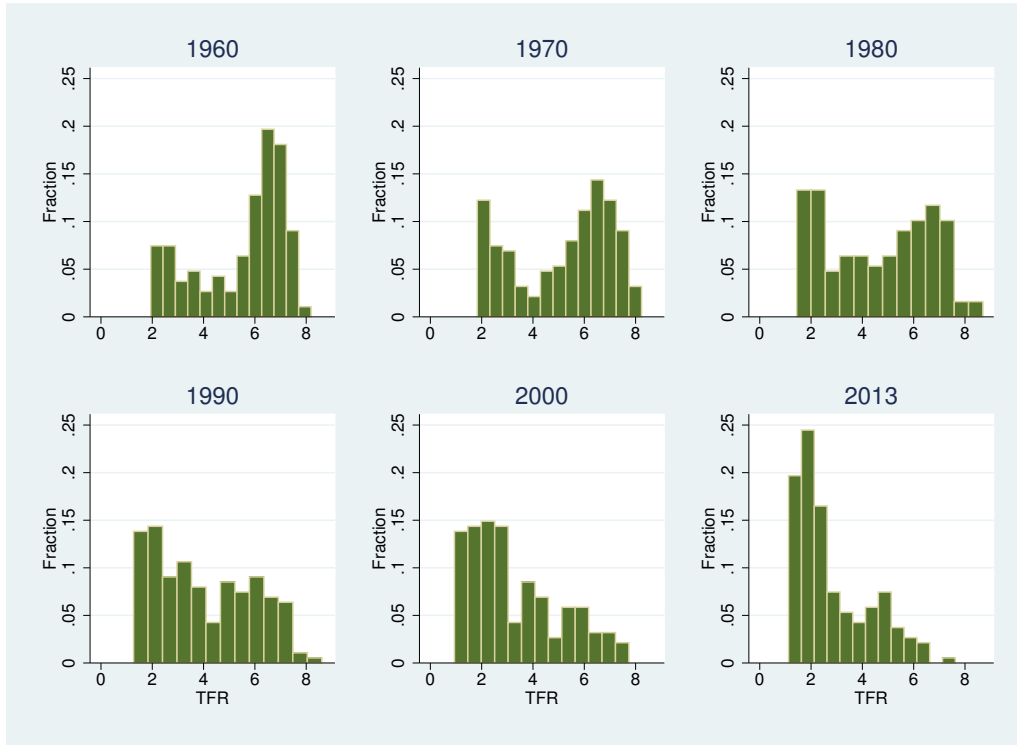
These large declines in fertility took place in most regions of the world, as shown in Figure 2. Between 1960 and 2013, fertility rates fell from 5.4 to 1.81 in East Asia and the Pacific, from 5.98 to 2.16 in Latin America and the Caribbean, from 6.87 to 2.83 in the Middle East and North Africa, and from 6.02 to 2.56 in South Asia. The fertility decline in sub-Saharan Africa has been slower, but still sizeable: since the 1980s, the total fertility rate in this region fell from 6.7 to 5. Within this region, South Africa has already reached a total fertility rate of 2.4 and Mauritius is now at a fertility rate of 1.44. While absolute declines in fertility were not as large in North America or Europe and Central Asia, the percentage declines in both regions have been significant — nearly 50 percent in North America and close to 40 percent in Europe and Central Asia. Interestingly, the fertility rate for North America bottomed out in the 1980s, and in Europe and Central Asia, it bottomed out in the 1990s.

A number of empirical studies have documented a negative relationship between

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<sup>1</sup>The total fertility rate is defined as the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates. In this paper, we will use “total fertility rate” interchangeably with “fertility” and “fertility rate.”

Figure 1: Fertility histograms over time

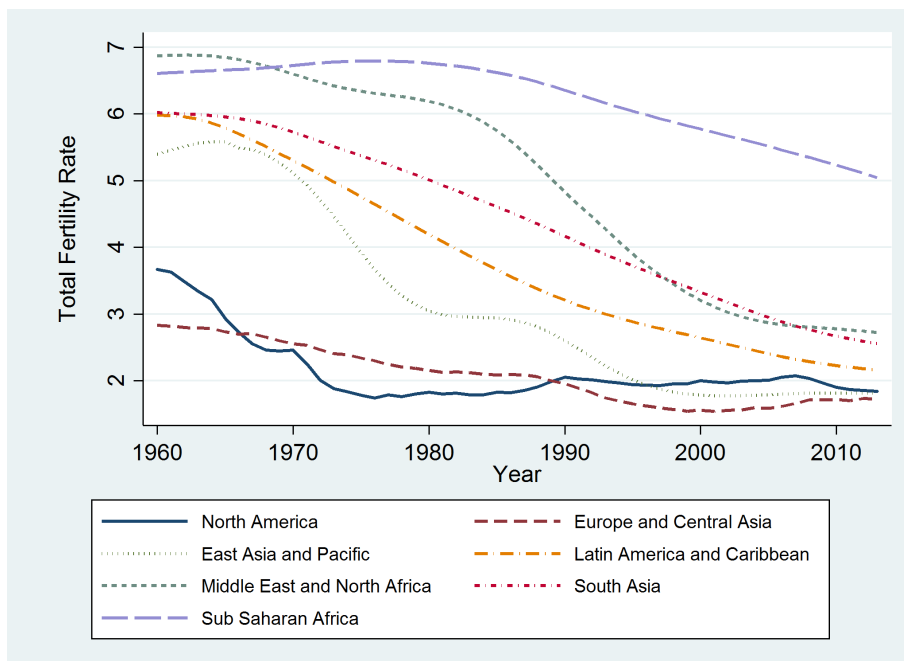


Source: The data comes from the World Bank's World Development Indicators database.  
 Note: The figure shows fertility histograms at the beginning of each decade. In the final histogram, the year 2013 is used rather than 2010 to report the latest available information.

fertility rates and income. While this relationship is indeed negative in the cross-section of countries, the relationship has changed over time, shifting downward and becoming flatter over time. Figure 3 shows the relationship between the total fertility rate and real GDP per capita in 1960 and in 2013. The figure also shows fitted lines for these two years. The downward shift has been, on average, around 2 children per woman, meaning that today a woman has 2 fewer children than a woman living in a country at the same level of development in 1960, which is close in magnitude to the drop in overall world fertility of 2.5 children per woman. The cross-section relationship between fertility and income observed in 1960 would predict a total fertility rate of around 4 at the average per capita GDP for 2013 (recall the actual rate is 2.5).

As Figure 3 illustrates, the issue is not just to explain a decline in global fertility. It is also necessary to explain why the fall in fertility rates witnessed by developing countries in recent decades was so very rapid, compared with the rather slow and secular decline in fertility rates experienced by more mature economies. For example, the fertility decline began as early as the mid-1700s in some European countries

Figure 2: Fertility trends across regions



Note: This figure plots the trends in fertility by region, as defined by the World Bank, between 1960 and 2013. The data comes from the World Development Indicators database.

and only reached replacement levels in the early twentieth century (Coale 1969). Furthermore, it is necessary to explain why countries with markedly different levels of income, urbanization, education, and other factors are all converging to very similar fertility rates. As we discuss in the next section, the worldwide spread of population-control programs can help to explain these patterns in the fertility data.

### 3 The global family planning movement and its consequences

The following section provides a brief overview of the global family planning program, discussing the historical context as well as outlining some of its characteristics. We then examine more systematically the link between fertility policy adoption and declines in fertility.<sup>2</sup>

<sup>2</sup>This section draws heavily on Robinson and Ross (2007), who provide a compilation of case studies of family planning programs in 22 countries across the world.

Figure 3: Fertility – income relation in 1960 and 2013



Source: Authors using data from the World Development Indicators database.

Note: For a sample of 88 countries, the figure shows the scatterplots and fitted line (that is, the lowess smoothed relationship or locally weighted smoothing function) between the total fertility rate and log of per capita GDP (in constant 2005 US\$) in 1960 and 2013. The x-axis is log scale.

### 3.1 Global evolution of family planning programs

After World War II, there was growing concern with the unprecedented levels of population growth. A population-control movement developed, led by, among others, John D. Rockefeller III, whose main preoccupations were the growing imbalance between population and resource growth, and the potential for political instability given that most of the population growth was concentrated in the poorest countries of the world. In 1952, Rockefeller founded the Population Council, aimed at providing research and technical assistance for population programs across the world. That same year, India started the first national population program, and in parallel, the International Planned Parenthood Federation was established.<sup>3</sup> By the late 1950s, the “population question” was receiving the attention of the US government. A report by a Presidential Committee studying the United States Military Assistance Program (Draper 1959) devoted an entire chapter to the issue, ending with a recommendation that the government “assist those countries with which it is cooperating in economic aid programs, on request, in the formulation of their

<sup>3</sup>The earlier birth-control movement led by Margaret Sanger in the United States (who set up the first birth-control clinic in the United States in 1916) and Elise Ottesen-Jensen in Sweden was another force leading to efforts for fertility reduction.

Table 1: Number of countries with government goals for fertility policy

Year	Lower fertility	Maintain fertility	No intervention	Raise fertility	Total
1976	40	19	78	13	150
1986	54	16	75	19	164
1996	82	19	65	27	193
2005	78	31	47	38	194
2013	84	33	26	54	197

Source: The data is obtained from the UN World Population Policies database.

Note: The table shows the number of countries by type of policy adopted towards fertility. The data begins in 1976. Countries are categorized according to whether they had a policy to lower, maintain, or raise fertility or if they had no intervention to change fertility.

plans designed to deal with the problem of rapid population growth.”<sup>4</sup> By this time, private foundations including the Rockefeller and Ford Foundations were providing seed funding for research and planning programs, but it was in the mid-1960s that large-scale funding became available and the population planning movement really took off.

The first large-scale intervention was carried out by the Swedish government, which supported family planning efforts in Sri Lanka (then Ceylon), India, and Pakistan, starting in 1962 (Sinding 2007). Over time, several international organizations, like USAID and the World Bank, joined in providing funds and support for family planning programs around the world. The invention of the modern intra-uterine device (IUD) and the oral contraceptive pill around the same time allowed for the possibility of easy-to-use and effective contraceptive methods becoming widely available for public use.

These early family planning efforts showed rapid effects in East Asian countries, including Hong Kong, South Korea, Singapore, and Thailand. Program implementation and success would take longer in other developing countries, partly due to the difficulty of overcoming cultural inhibitions and religious opposition towards birth control, as well as operational problems including inadequate transport infrastructure and insufficient funding. The World Population Conference in 1974 appeared to be a turning point for the global family planning movement. Tables 1 and 2 show how countries around the world have been categorized by their fertility goals and the type of government support for family planning for selected years from 1976 to 2013, according to the UN World Population Policy database.

<sup>4</sup>For more references that trace the origins of the population control movement primarily to the West, see Appendix A.

Table 2: Number of countries by government support for family planning

Year	Direct support	Indirect support	No support	Limit/Not permitted	Total
1976	95	17	28	10	150
1986	117	22	18	7	164
1996	143	18	26	2	193
2005	143	35	15	1	194
2013	160	20	16	1	197

Source: The data is obtained from the UN World Population Policies database.

Note: The table shows the number of countries by the type of support extended by the state for family planning services. The data begins in 1976. Countries are categorized by whether their governments directly supported, indirectly supported, or did not support family planning as well as if the government limited family planning services or did not permit family planning in the country.

In 1976, for example, the 40 countries that had explicit policies to limit fertility covered nearly one-third of East Asian countries, a quarter of Latin American and Caribbean countries, and nearly two-thirds of South Asian countries. By contrast, only one-fifth of countries in North Africa, the Middle East, and Sub-Saharan Africa had a fertility reduction policy in 1976. By 1996, 82 countries had a fertility reduction policy in place (by this time, some countries had reached their fertility reduction targets and changed to policies of maintaining fertility rates), including half of the countries in East Asia and Latin America, and more than two-thirds of the countries in Sub-Saharan Africa and South Asia. These countries represent 70 percent of the world’s population. In 1976, 95 governments were providing direct support for family planning. (Support for family planning was not always associated with an explicitly stated goal of reducing fertility.) The number of countries with state support for family planning has continued to rise steadily.

### 3.2 Features of family planning programs

The early phases of family planning programs in most developing countries typically sought to provide a range of contraception methods — some combination of oral contraceptives, IUD, condoms, sterilization, and abortion — and information on their use. However, increases in the supply of contraceptives proved insufficient to lower fertility rates to desired levels, particularly in poorer or more traditional societies. This failure led to concerted efforts to change public attitudes and beliefs and establish a new small-family norm through active mass-media campaigns. We discuss these two phases in turn.

The implementation of the family planning programs varied vastly across coun-



tries. Differences included the role of public and private provision; the price at which contraception was offered; subsidies to production or sales; the delivery system through which services were provided; the outlets for the mass-media campaigns; and the various supplementary policies that accompanied the core measures (Freedman and Berelson 1976).<sup>5</sup>

Most countries began their family planning programs with a clinic-based approach that took advantage of the existing health infrastructure to provide modern contraceptive methods. Many countries also implemented programs in hospitals to advise women on the use of contraception, often after women had given birth or undergone an abortion. However, this approach had limited success in countries where a large proportion of women gave birth outside of the formal health care system, like India and Iran. Thus, the policy was supplemented by the deployment of trained field workers who made house calls, particularly in rural areas. In some nations, such as Iran and Malaysia, family-planning programs were linked to maternal and child health services at an early stage, which allowed for better integration of the program into the country's health system. Towards the 1990s, with the re-branding of family planning as sexual and reproductive wellbeing, more countries have followed this approach.

Many of the family planning programs established in the 1950s and 1960s, which focused on increasing the supply of contraception, failed to gain much traction. For instance, highly traditional societies and countries with a predominantly Catholic or Muslim population had difficulty gaining wide acceptance for their family planning programs. It became clear that without changing the willingness to use contraceptives and, more importantly, reducing the desired number of children, merely improving access to birth control had limited impact. The importance of changing the desired number of children, in particular, was highlighted by leading demographers at the time such as Enke (1960) and Davis (1967), who argued that a desire to use contraceptives was perfectly compatible with high fertility. Countries thus began to present and to adapt their population-control policies to address these concerns.

For example, early in Indonesia's family planning program, the government published a pamphlet titled "Views of Religions on Family Planning," which documented the general acceptance of family planning by four of Indonesia's five official religions — Islam, Hinduism, and Protestant and Catholic Christianity (Hull 2007). To over-

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<sup>5</sup>For a more detailed summary of the key features of early family planning programs around the world, highlighting the countries that implemented each approach, see Appendix B1.

come fears that husbands would resist male doctors or health professionals working with their wives, the family planning program in Bangladesh relied heavily on female health workers visiting women in their homes to educate them about and supply them with contraceptive methods. This modality also ensured a greater diffusion of contraceptive knowledge and methods in rural Bangladesh (Schuler, Hashemi, and Jenkins 1995).

Mass communication was commonly used to shape attitudes toward family planning, often with the aim of changing public views by establishing a small-family norm. During the 1970s, slogans proliferated in different media outlets (television, radio, and magazines), street posters, brochures, and billboards, all conveying a similar message regarding the benefits of small families. In India, the family planning program's slogan, "Have only two or three children, that's enough," was widely publicized on billboards and the sides of buildings. Other slogans in India were "A small family is a happy family" and "Big family: problems all the way; small family: happiness all the way" (Khanna 2009). Bangladesh publicized the slogans "Boy or girl, two children are enough" and "One child is ideal, two children are enough" (Begum 1993). South Korea ran the slogan "Stop at two, regardless of sex" (Kim and Ross 2007); Hong Kong chose "Two is enough" (Fan 2007), and so on. China took population planning to the extreme in 1979, when it imposed a coercive one-child policy, but the Chinese fertility rate actually started falling significantly in the early 1970s, before the one-child policy was implemented (Zhang 2017). The strong population-control policy enacted in China in 1973 was characterized by mass-media messages such as "Later, longer, fewer" (Tien 1980) and "One is not too few, two, just right, and three, too many" (Liang and Lee 2006). In Singapore, bumper stickers, coasters, calendars, and key chains reinforcing the family planning message were distributed free of charge. In Bangladesh, television aired a drama highlighting the value of family planning (Piotrow and Kincaid 2001). The Indonesian program became particularly noteworthy in its collaboration between the government and community groups in getting the messages of the program across.

In Latin America, the Population Media Center (a nonprofit organization) collaborates with a social marketing organization in Brazil to ensure the inclusion of social and health themes in soap operas airing on TV Globo, the most popular television network in Brazil. (TV Globo's programming is estimated to currently reach 98 percent of Brazil's population, and 65 percent of all of Spanish-speaking Latin America.) The Population Media Centre studied how programs like "Paginas da Vida" ("Pages of Life") influenced Brazilians: about two-thirds of women inter-

viewed said the *telenovela* “*Paginas da Vida*” had helped them take steps to prevent unwanted pregnancy. Brazil’s *telenovelas* have been popular across Latin America since the 1980s; they almost invariably depict the lives of characters from small families who were also very rich and glamorous (Population Media Center 2016). In Brazil, the main force behind the anti-natalist movement was BEMFAM, an affiliate of the International Planned Parenthood Federation. The military regime of the 1970s and the Catholic Church hierarchy were opposed to birth control, though the local clergy and multiple nongovernmental organizations provided advice and information in favor of contraceptive use. In other Latin American countries, such as Colombia and Chile, family planning had strong support from the government.

Stronger inducements such as monetary or in-kind incentives and disincentives were also used in some countries as means of encouraging families to practice birth control. In Tunisia, for example, government family allowances were limited to the first four children; in Singapore, income tax relief was restricted to the first three children as was maternity leave, the allocation of public apartments, and preferred school places. Incentives for female or male sterilization was a common feature of family planning programs in India, Bangladesh, and Sri Lanka and resulted in a large number of sterilizations taking place during the 1970s. In Bangladesh, field health workers were paid for accompanying an individual to a sterilization procedure, while in Sri Lanka and India both the sterilization provider and patient were given compensation. In Kerala, India, individuals undergoing sterilization were given payments in cash and food roughly equivalent to a month’s income for a typical person. This type of incentivized compensation scheme, combined with increased regional sterilization targets, led to a drastic increase in sterilization procedures. Critics alleged that many acceptors were coerced by officials who stood to gain from higher numbers, both in monetary and political terms.

In addition to increased provision of information on and access to family planning methods, attempts were made to delay marriage and childbearing or to increase birth spacing as a means of controlling fertility. For example, the legal age of marriage was increased to 18 years for women and 21 years for men in India, and to 17 years for women and 20 years for men in Tunisia. China raised the legal age for marriage in urban areas (to 25 years for women and 28 years for men) and rural areas (23 years for women and 25 years for men). China also imposed a minimum gap of three to four years between births and restricted the number of children to three per couple until it decided to implement the draconian one-child policy in 1979.

More recently, given the sizeable decline in birth rates that has already occurred,

fertility control has been put on the back burner. In fact, the current HIV/AIDS epidemic has somewhat overshadowed fertility control, particularly in African countries (Robinson and Ross 2007), while family planning did not even warrant being a sub-goal in the Millennium Development Goals agreed to in 2000. Many countries are now below replacement-level fertility rates. Nonetheless, family planning programs seem to have been incorporated into the broader framework of sexual and reproductive health services and become firmly entrenched in health care systems around the world.

The details of fertility programs differed across countries. But from a broader view, the prevalence and growth of these programs is remarkable. Fertility reduction programs took place under both democratic and autocratic regimes, whether oriented to the political left or right (for example, Chile under both Allende and Pinochet), and in Buddhist, Christian, and Muslim countries alike. In some countries, like Brazil, family planning programs were initiated and almost exclusively run by nonprofit, nongovernmental organizations, while in others, like Singapore or India, the government was fully involved.

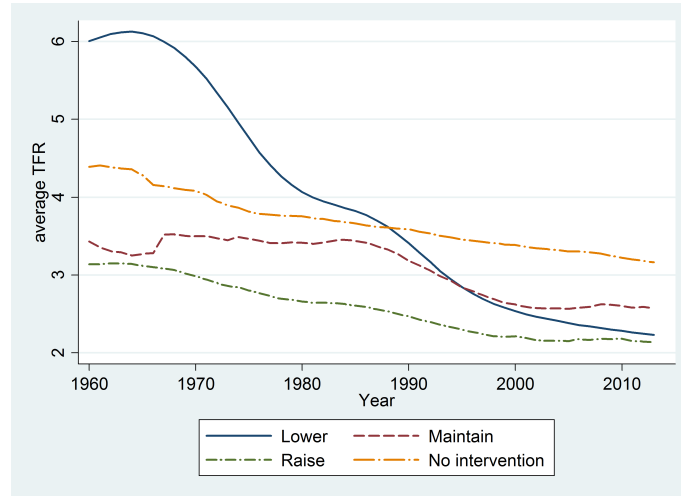
A natural question is whether the type of less-coercive intervention carried out by most countries can be effective in helping to rapidly change norms and in overcoming other socioeconomic influences that affect fertility rates. In the context of China, Zhang (in this journal, 2017) observes that the one-child policy can explain only a small change in fertility given that a robust family planning program was already in operation since the early 1970s. He argues that strong family planning programs, such as those observed in most East Asian countries during the 1960s and early 1970s, would be as effective in lowering fertility. In addition, recent experimental (or quasi-experimental) studies also suggest the effectiveness of public persuasion measures in reducing fertility. La Ferrara, Chong, and Duryea (2012) find that Brazilian regions covered by a television network showing soap operas that portray small families experienced a bigger reduction in fertility rates. In Uganda, Bandiera Buehren, Burgess, Goldstein, Gulesci, Rasul, and Sulaiman (2014) find that, adolescent girls who received information on sex, reproduction, and marriage reported wanting a smaller number of children. Evidence of family planning programs in the United States appears more mixed, though recently, Bailey (2013) has shown that a targeted US family planning program significantly reduced fertility. In the next section, we explore the question using cross-country data on spending and implementation effort of the program and their relationship with fertility reduction.

### 3.3 Fertility policies and the decline in fertility rates

In seeking to assess the quantitative effect of the fertility programs on the basis of cross-country data, there are clearly a number of covariates that could confound the estimation of a causal effect. The task is particularly difficult since different countries opted for a wide and varied range of fertility policies, with the specific choice of measures partly dictated by their feasibility in each country's institutional and cultural setting. Equally important, data availability is also limited. Thus, while estimating the causal effect of these programs is beyond the scope of this essay, our analysis illustrates some descriptive relationships between fertility rates, population policy, and different measures of family planning program intensity, conditioning on covariates of fertility traditionally used in the literature. Taken as a whole, this evidence is strongly consistent with the hypothesis that population control programs have played a major role in the fertility decline.

For the analysis that follows, infant mortality rates, the proportion of urban population, and per capita GDP are obtained from the World Bank's World Development Indicators, while data on the years of schooling of the population aged 25+ are taken from Barro and Lee (2013). Data on the existence of a fertility policy and government support for family planning come from the UN World Population Policies Database. We use three measures of family planning program intensity: funds for family planning per capita; a family planning program effort score; and the percentage of women exposed to family planning messages through mass media. Data on funds for family planning are taken from Nortman and Hofstatter (1978), Nortman (1982), and Ross, Mauldin, and Miller (1993), which, taken together, cover funding for family planning by source for 58 countries over various years starting in 1972 and going up to 1992. Family planning program effort is measured using the Family Planning Program Effort Index published in Ross and Stover (2001). This indicator, based on work by Lapham and Mauldin (1984), measures the strength of a given country's program along four dimensions: policies, services, evaluation, and method access. The score has a potential range of 0–300 points, based on 1–10 points for each of 30 items, and has been calculated for 1972, 1982, 1989, 1994, and 1999, covering 95 countries. Finally, the Demographic and Health Surveys (DHS) from 57 countries in various years provide data on the percentage of women who have been exposed to family planning messages on the radio, television, or newspapers. These three measures altogether aim at capturing the intensity with which population programs were implemented.

Figure 4: Evolution of fertility rates by policy in 1976



Source: The data on fertility policy is obtained from the UN World Population Policies Database and TFR is from the World Bank's World Development Indicators.

Note: The figure illustrates the evolution of weighted average total fertility rate, with countries grouped by the fertility policy observed in 1976. The policy could be to lower, maintain, or raise fertility; there also could be no intervention.

As a first exercise, we compare the country-level patterns in mean fertility rate by the fertility policy goals stated in 1976, which paints the striking picture shown in Figure 4. The data on fertility policy begins in 1976, but several countries had already adopted fertility reduction policies beforehand. While fertility has fallen in all regions, even in the group of predominantly European countries that wanted to increase fertility, the countries that had identified the need to reduce fertility in 1976 recorded by far the highest average fertility rates before 1976, but the second-lowest average fertility rates by 2013. The countries where there was no intervention had the second-highest average fertility rates in 1976 and became the highest fertility group by 2013.

As our next exercise to study the relation between population programs and fertility, we use data on funds for family planning. We look at the amount of funds (in real terms) available for family planning, from both government and non-government sources over the 1970s, 1980s, and 1990s for each country.

The patterns by region are as follows. Latin American countries appear to have the largest amount of funds for family planning per capita, with total funding exceeding US\$2 per capita (in 2005 US dollars) in Costa Rica, El Salvador, and Puerto Rico. The region also has the highest proportion of non-state funding for family planning, more than double the state-funding in some countries. By contrast, in Asia, funding for family planning is predominantly state-led. As a percentage of

Table 3: Change in total fertility rates (TFRs) and funding for family planning programs

Change in TFR	Absolute change		% change	
	(1)	(2)	(3)	(4)
Ln(average funds per capita)	-0.630*** [0.120]	-0.430** [0.181]	-10.470*** [1.487]	-4.974** [2.030]
Change in years of education of adults		-0.130 [0.133]		0.0008 [0.002]
Change in urban population as % of total		-0.008 [0.009]		0.001 [0.003]
Change in ln(GDP per capita)		-0.426* [0.227]		-0.382** [0.158]
Change in infant mortality rate		0.006* [0.003]		0.668*** [0.131]
N	56	37	56	37
R-squared	0.35	0.39	0.418	0.72

Source: Authors. Data on total fertility rate, urban population, per capita GDP, infant mortality rate, and US Consumer Price Index (used to convert the funds to real terms) are from the World Development Indicators. Data on years of schooling are from Barro and Lee (2013). Data on funds for family planning are from Nortman and Hofstatter (1978), Nortman (1982), and Ross, Mauldin, and Miller (1993).

Note: The table reports the results of regressions of the change in total fertility rate between 2013 and 1960 on the logged real value of average per capita funds for family planning for the 1970s, 1980s, and 1990s, controlling for the changes in years of schooling of the population aged 25+, urban population as a percentage of total population, log GDP per capita, and infant mortality rate between 2013 and 1960. Given the small number of observations for infant mortality rate and GDP per capita in 1960, we use the earliest available observation before 1965 to construct the change. All regressions include a constant. Per capita funds for family planning are converted to 2005 US\$ before averaging. The values in parentheses are robust standard errors. \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1 percent levels, respectively.

GDP, total funds for family planning averaged at around 0.05 percent in the 1970s and 0.07 percent in the 1980s, but was as high as 0.47 percent in Bangladesh and 0.46 in Korea in the 1980s.<sup>6</sup>

Table 3 shows the results of a regression of the change in fertility on (logged) average family planning funds per capita over the 1970s, '80s, and '90s, with and without controlling for changes in the covariates of fertility traditionally used in the literature, such as GDP per capita, educational attainment, urbanization, and infant mortality. (Each of these covariates will be discussed in more detail in the following section.) Columns 1 and 2 use absolute changes in all fertility (and the other covariates) between 1960 and 2013, and columns 3 and 4 use percentage changes in these variables over the same period.

Despite the small number of observations available once the controls are included, the negative relationship between changes in total fertility rate and funds for family

<sup>6</sup>The full table with funds for family planning by country for the 1970s and 1980s is available in Appendix B2.

planning remains significant, indicating that the countries with more funding for family planning experienced greater reductions in fertility rates, even after controlling for the changes in income, urbanization, infant mortality, and years of schooling of the adult population. (Controlling for years of schooling of adult women instead of adult population leads to similar results.) Quantitatively, the results indicate that a 1 percent increase in funding per capita is associated with a 5 percent reduction in the total fertility rate.

We do not include changes in female labour force participation rates in this regression because the cross-country data for this variable begins only in 1980. However, we replicate the exercise focusing on changes between 1980 and 2013 for all variables and find that the results hardly change, with no significant correlation between changes in female labour force participation and the fertility decline. We also carry out the exercise separately for government funding and private funding for family planning per capita, and find that government spending has a significant, positive correlation with the fertility decline whereas private spending does not appear to be significant (see Appendix B3 and C4 for the full set of results).

Our third exercise uses the family planning program effort index published by Ross and Stover (2001) as an alternative measure of program inputs. The regional averages of the index indicate that East Asia and South Asia have, in general, had the strongest family planning programs over time. Latin America, North Africa, and the Middle East seem to have caught up on program effort over the three decades, but the greatest gain appears to have been in Sub-Saharan Africa, which was the latest to adopt family planning programs, in 1989–1999.<sup>7</sup> We use these data to examine the relationship between the observed change in fertility over the 1960–2013 period and the average program effort score over the 1970s, '80s, and '90s, again controlling for the other covariates of fertility. Table 4 indicates a strong negative relationship, with larger fertility declines in countries with higher program effort.

Next, we use the Demographic and Health Surveys (DHS) data on percentage of women exposed to family planning messages through mass media to carry out the same exercise as for family planning program funds and program effort score. Table 5 shows these results. The context of this analysis is slightly different from the two previous exercises because the data are based on DHS surveys which were carried out predominantly in sub-Saharan African countries (30 of the countries in the sample used in columns 1 and 3, and 15 of the countries in the sample used in

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<sup>7</sup>For more details on regional average program effort scores by year, see Appendix B5.



Table 4: Change in total fertility rates (TFRs) and family planning program effort

Change in TFR	Absolute change		% change	
	(1)	(2)	(3)	(4)
Average family planning program effort score	-0.039*** [0.007]	-0.041*** [0.014]	-0.716*** [0.101]	-0.500*** [0.166]
Change in years of education of adults		-0.124 [0.115]		0.003 [0.003]
Change in urban population as % of total		-0.012 [0.008]		-0.0001 [0.005]
Change in ln(GDP per capita)		0.015 [0.198]		-0.108 [0.192]
Change in infant mortality rate		0.002 [0.003]		0.549*** [0.142]
N	107	55	107	55
R-squared	0.21	0.41	0.321	0.636

Source: Authors. Data on total fertility rate, urban population, per capita GDP, and infant mortality rate are from the World Development Indicators. Data on years of schooling are from Barro and Lee (2013). Data on family planning program effort are from Ross and Stover (2001).

Note: The table reports the results of regressions of the change in TFR between 2013 and 1960 on the average family planning program effort score over the 1970s, 1980s, and 1990s, controlling for the change in years of schooling of the population aged 25+, urban population as a percentage of total population, log GDP per capita, and infant mortality rate between 2013 and 1960. All regressions include a constant. Given the small number of observations for infant mortality rate and GDP per capita in 1960, we use the earliest available observation before 1965 to construct the change. All regressions include a constant. The values in parentheses are robust standard errors. \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1 percent levels, respectively.

columns 2 and 4) starting from the early 1990s. Therefore, these results capture more recent efforts in family planning as seen in sub-Saharan Africa.

The regression results show a significant, negative association between the fertility change and exposure to family planning messages after controlling for other covariates. It therefore seems likely that the delay in the implementation of the family planning programs in sub-Saharan Africa explains the delayed decline in fertility in the region. Both in Table 4 and Table 5, the coefficients corresponding to the policy measure change little when adding the controls; this suggests that additional omitted variables are unlikely to make a difference.<sup>8</sup>

These exercises demonstrate a strong association between the establishment and

<sup>8</sup>As an additional robustness check, in the Appendix we exploit variation in the starting year of state-led family planning programs in 31 countries to further explore the relationship between fertility decline and the establishment of these programs. After controlling for changes in covariates as well as shocks that might have affected fertility in all countries in a given year, we find that the decline in fertility accelerated with their inception. Given the very small sample size, which comprises mainly the early adopters of family planning, we do not place too much weight on these results, but consider it to be further suggestive evidence in favor of the importance of these programs in accelerating the fertility decline. The results of this analysis are available in Appendix B6.

Table 5: Change in total fertility rates (TFRs) and exposure to family planning messages

Change in TFR	Absolute change		% change	
	(1)	(2)	(3)	(4)
% of women with exposure to FP messages	-0.038*** [0.007]	-0.050*** [0.011]	-0.602*** [0.090]	-0.449** [0.169]
Change in years of education of adults		0.054 [0.154]		0.001 [0.002]
Change in urban population as % of total		-0.035** [0.016]		-0.016 [0.010]
Change in ln(GDP per capita)		-0.529** [0.244]		-0.379* [0.197]
Change in infant mortality rate		0.002 [0.005]		0.551*** [0.175]
N	57	30	57	30
R-squared	0.301	0.567	0.347	0.631

Source: Authors. Data on total fertility rate, urban population, per capita GDP, and infant mortality rate are from the World Development Indicators. Data on years of schooling are from Barro and Lee (2013). Data on exposure to family planning messages are from Demographic and Health Surveys from various years.

Note: The table reports the results of regressions of the change in total fertility rate between 2013 and 1960 on the percentage of women exposed to family planning messages through mass media for the earliest year (before 2005) for which information is available for that country, controlling for the change between 2013 and 1960 in years of schooling of the population aged 25+, urban population as a percentage of total population, log GDP per capita, and infant mortality rate. All regressions include a constant. Given the small number of observations for infant mortality rate and GDP per capita in 1960, we use the earliest available observation before 1965 to construct the change. The values in parentheses are robust standard errors. \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1 percent levels, respectively.

intensity of family planning programs with the decline in fertility rates, after adjusting for changes in per capita income, urbanization, infant mortality, female labour force participation, and educational attainment. Most sub-Saharan African governments acknowledged rapid population growth as a policy concern much later than developing countries elsewhere. Even after the formulation of population control policies, commitment to family planning lagged behind that of other regions leading most international agencies working in family planning to invest their resources in the more promising areas of Asia and Latin America. The onset of the HIV/AIDS epidemic is also likely to have weakened the emphasis on fertility control due to limited resources being targeted towards addressing the epidemic as well as the emergence of a pro-natalist response to the high mortality rates caused by the epidemic (National Research Council Working Group on Factors Affecting Contraceptive Use 1993). While almost all African countries now provide direct or indirect support for family planning, their efforts have only recently caught up with the rest of the world. Perhaps not surprisingly in light of the strong correlations, the countries in

sub-Saharan Africa tend to be the ones where fertility rates still remain above the world's average.

## 4 Considering other explanations for the decline in fertility

A number of other socioeconomic factors have been suggested as possible causes for the decline in fertility: urbanization, greater investment in education per child, rising female labour force participation, and lower infant mortality (see Becker 1960, Becker and Barro 1988, Barro and Becker 1989, and Manuelli and Sheshadri 2009). The regressions presented in the previous section indicate that, population-control policies are strongly associated with the fertility decline, whereas some of the traditional covariates display a much weaker association. Of course, these results are hardly conclusive, as disentangling cause and effect in this area is quite difficult, an issue compounded by the shortage of data and potential measurement error. In this section, we provide further arguments for why these factors, while important, are unlikely to overshadow the role of population-control policies in the fertility decline.

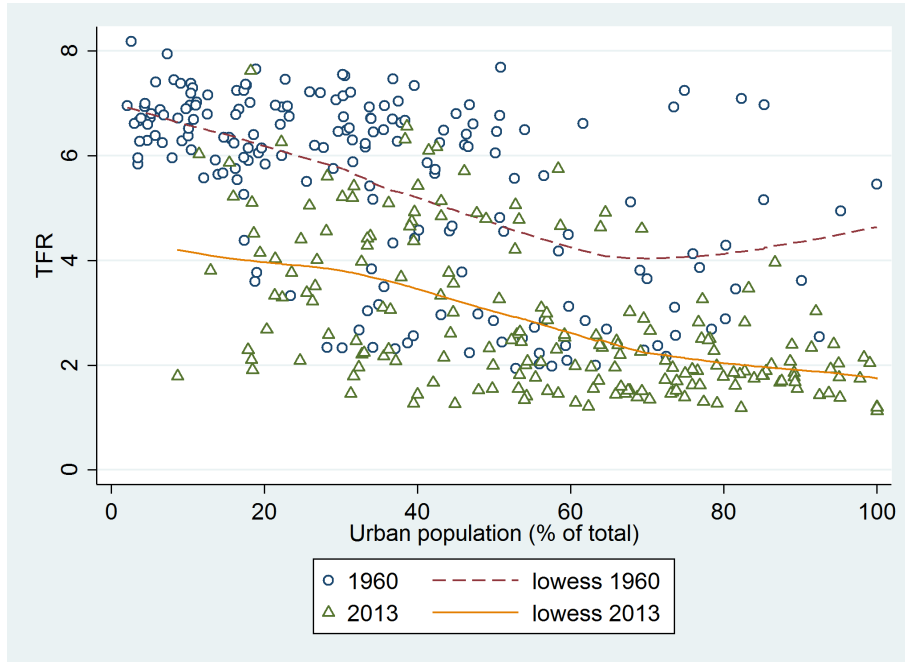
Urbanization has been put forward as an explanation for the decline in fertility, as rural areas have historically had much higher fertility rates than urban ones. Arguably, in rural areas, children can be a significant input in agricultural production. Moreover, despite the fact that parents can earn higher average wages in urban areas, it can cost more to raise children there, as the costs of housing and (typically compulsory) education are higher.<sup>9</sup> The negative relationship between urbanization and fertility is illustrated in Figure 5, which plots the proportion of population living in urban areas against the total fertility rate for all countries in 1960 and in 2013. Although countries with less urbanization have higher fertility, it does not appear that the urbanization process alone can account for the sharp decline in fertility rates observed over the past five decades. Rather, it appears that fertility rates fell rapidly in both urban and rural areas.

Given the strong possibility that the cross-country data on urbanization is mis-measured, we explored this issue in more detail using the Demographic and Health

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<sup>9</sup>Becker (1960) argues that urbanization could explain the decline in fertility. The idea is that farmers have a comparative advantage in producing children and food, though this advantage is smaller for higher “quality” of childbearing. Caldwell (1976)’s net wealth flow theory also supports the view that wealth flows from children to parents in primitive agricultural societies, whereas the direction of flows reverses as society modernizes and costs of raising children go up.

Figure 5: Fertility and urbanization



Source: Authors using data from the World Development Indicators database.

Note: For a sample of 190 countries, the figure shows the scatter plot and fitted line (smoothed lowess relationship, or locally weighted smoothing function) between fertility and urbanization in 1960 and 2013. Urbanization is measured as the proportion of the population living in urban areas.

Survey (DHS) data from 57 countries which, through their identification of rural and urban areas, provide separate rural and urban fertility rates. The decline in fertility can be decomposed into a within-area effect, corresponding to the decline in fertility within either rural or urban areas, and a between-area effect (that is, the urbanization effect), corresponding to the decline in fertility rates due to the increase in the share of the population living in (lower-fertility) urban areas rather than (higher-fertility) rural areas.<sup>10</sup> Perhaps surprisingly, the increased urbanization (between-area effect) contributed to only about 14 percent of the fertility decline. Most of the decline in fertility is explained by the within-area effect. Moreover, the contribution of urbanization to the decline in fertility does not vary significantly with a country's fertility or urbanization rates. This result suggests that while urbanization may be a small part of the decline in fertility rates, other forces have been at work driving down fertility in both rural and urban areas around the world.

The decline in fertility is often discussed as being part of a shift away from the quantity of children towards higher quality, as demonstrated by the increase

<sup>10</sup>It should be noted that, because these surveys were carried out in different years and at different intervals in different countries, the period over which the changes are computed is not the same for every country. Details of the data and calculations are available in Appendix C.

Table 6: Fertility change by education in 2010

Schooling 2010	Absolute decline in TFR	% decline in TFR	TFR in 2010
$years \leq 3$	1.35	19.12	5.87
$3 < years \leq 6$	3.23	52.26	3.15
$6 < years \leq 9$	4.09	67.23	2.04
$9 < years \leq 12$	1.67	43.50	1.73
$years > 12$	1.51	45.22	1.81

Source: Authors. Data on fertility are from the World Development Indicators database and “years of schooling” comes from Barro and Lee (2013).

Note: The table presents the average absolute and percentage change in total fertility rate between 2013 and 1960 as well as average total fertility rate in 2010 by years-of-schooling groups. Years of schooling is grouped into five categories:  $years \leq 3$ ;  $3 < years \leq 6$ ;  $6 < years \leq 9$ ;  $9 < years \leq 12$ ; and  $years > 12$ . “Years of schooling” is for the population aged 25+ in 2010 and covers 143 countries.

in education levels around the world. There is clearly a strong negative relationship between fertility and education, but it is difficult to establish the direction of causality between fertility and education given that they are both endogenous outcomes of a household’s decision-making process. For example, quantity – quality trade-offs are analyzed in Galor and Weil (2000) and Galor and Moav (2002), where technological growth, by raising the return to human capital, can generate a demographic transition (see also Doepke 2004). The link between fertility and education emerges not just because of a tradeoff between quantity and quality (or education) of the children, but also because educated parents choose to have fewer children, possibly because they attach more value to quality in that tradeoff or they have a comparative advantage in educating children (Moav 2005). Remarkably, fertility has fallen significantly even in countries and rural areas where educational attainment still remains low. For instance, Bangladesh, Morocco, Myanmar, and Nepal all recorded fertility rates below 2.7, with percentage declines of over 60 percent from their 1960 levels, despite their populations having less than five years of schooling on average in 2010. Table 6 presents the average fertility rate in 2010 and fertility change (between 2013 and 1960) for countries grouped by the level of education of the adult population in 2010. While fertility rates are clearly declining in the years of schooling of the population, all but the lowest education group display sizeable percentage declines in fertility. The countries with less than three years of schooling in 2010 are nearly all in sub-Saharan Africa, where the fertility remains very high.

The cross-country correlation between female labour force participation and fertility indicates only a weak relationship, given the high female labour force participation in European and North American countries as well as in sub-Saharan African

countries. (Data on female labour force participation rates are obtained from ILO-STAT.) Furthermore, labour force participation rates did not change much over the past few decades, other than in Latin America and the Caribbean, where the female labour force participation rate rose from 34 percent in 1980 to 54 percent in 2013. For comparison, over the same period, female labour force participation fell slightly in East Asia and the Pacific (from 64 to 61 percent) and South Asia (from 35 to 30 percent), while it rose slightly in the Middle East and North Africa (from 18 to 22 percent) and Sub-Saharan Africa (from 57 to 64 percent).

Changes in infant mortality rates appear to be highly correlated with changes in fertility. There are two, not mutually exclusive, interpretations of this correlation. First, as infant mortality declines, fewer births are needed to ensure that a family's desired number of children survives to adulthood (for example, Kalemli-Ozcan 2002). The second interpretation, which we have emphasized in this paper, is that the decline in mortality rates and the consequent population acceleration in the 1950s and 1960s, triggered the population-control movement; this, in turn, with its emphasis on changing family-size norms and contraception provision, accelerated the fertility fall by reducing the desired number of children and the number of unwanted births.

With regard to the first interpretation (that as infant mortality declines, fewer births are needed), it is apparent that fertility rates did not react quickly to the decline in mortality rates in the mid-20th century; after all, it is precisely the relatively slow change in fertility compared to the relatively rapid growth in life expectancy that caused the remarkable acceleration in population growth in the 1950s and 1960s. As noted in the Report of the President's Committee to Study the US Military Assistance Program (Draper 1959), "high fertility rates are normally part of deeply rooted cultural patterns and natural changes occur only slowly." This was also the view shared by demographers at the time (Enke 1960; Davis 1967). Our regression analysis in the previous section has attempted to gauge the two channels — the direct effect of infant mortality declines, and population-control programs — separately and both appeared relevant. Another way to tease out the role played by population-control programs as separate from the direct effect of infant mortality, is to study trends in desired or ideal number of children and the share of unwanted pregnancies, which are two main targets of the population-control programs. In principle, according to the first interpretation, lower mortality rates should only affect the number of births, not the ideal number of surviving children.<sup>11</sup> Population-

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<sup>11</sup>Interestingly, the Barro and Becker (1989) framework predicts that, as mortality rates fall, the

control programs, however, focused on influencing the desired number of children or family size.

The data from the Demographic and Health Surveys provide two measures aimed at capturing fertility preferences: one is the “ideal number of children” and the other is “wanted fertility rate.” The ideal number of children is obtained as a response to the question: “If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?” The wanted fertility rate is constructed as the fertility rate that would be observed if all “unwanted” births were eliminated; that is, births that raise the number of surviving children over the stated desired number of children (Rutstein and Rojas 2006). We consider the ideal or “desired” number of children as a measure of preference for surviving children: the number of children the woman would choose to have in her whole life. In this context, fertility is directly affected by the desired number of children, but can deviate from it for reasons that are unrelated to preferences, such as infant mortality or the availability of means to control fertility. In particular, the wanted total fertility rate can exceed the desired number of children when women replace children who have died with additional births to reach the desired number of surviving children (Bongaarts 2011). Table 7 uses data from Demographic and Health Surveys in 52 countries to present the average change in wanted fertility rates as a percentage of the change in total fertility rate over the period analyzed (different countries were surveyed in different years and at different time intervals, so the period over which the changes are computed differ across countries). The change in wanted fertility is further decomposed into the contribution of changes in the desired number of children and a second (residual) component that captures other reasons, which might include changes in infant mortality (under the heading “other”). The data indicates that the fall in wanted fertility accounts for a significant share of the fall in fertility, and that a large part of the fall in wanted fertility can be accounted for by the decline in the number of desired children. The pattern is observed in both rural and urban areas. The large role played by the change in the desired or ideal number of children is supportive of the role played by population programs over and above the direct effect of lower mortality rates.

The last row of Table 7 reports the change in unwanted fertility also as a share of the change in total fertility rate. Unwanted fertility is defined as the difference

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ideal (or, in the jargon, “optimal”) number of surviving children actually increases, as the cost of raising children decreases. See Doepke (2005), who analyses different variants of the Barro–Becker model yielding this prediction.

Table 7: Changes in wanted and unwanted fertility (as a percentage of change in total fertility rate)

Change as a % of change in TFR	Overall	Urban	Rural
Wanted fertility	75.35	63.48	82.26
<i>Ideal no. of children</i>	<i>57.97</i>	<i>56.08</i>	<i>51.92</i>
<i>Other</i>	<i>17.38</i>	<i>7.41</i>	<i>30.35</i>
Unwanted fertility	24.65	36.52	17.74

Note and Source: The table shows the change in wanted fertility rate and unwanted fertility rate (defined as the difference between total and wanted fertility rates) as a percentage of the change in total fertility rate using data from the Demographic and Health Surveys in 52 countries. The change in wanted fertility is further decomposed into the contribution of the change in the ideal number of children and a residual. Note that different countries were surveyed in different years and at different intervals — the earliest available survey is from 1986 while the latest is from 2015.

between total fertility rate and wanted fertility. Unwanted fertility has also fallen in both urban and rural areas, pointing to improved ability to control fertility given the wider availability of contraceptives. The decline in unwanted fertility is relatively less important as a share of the change in overall fertility. This, together with the large share accounted for by the decline in the ideal number of children, is consistent with the introduction of additional measures to promote a smaller family size as a result of the sluggish fertility response to wider contraception provision.

## 5 Conclusion

The rapid decline in fertility rates in the past five decades cannot be accounted for in a satisfactory way by economic growth, urbanization, education levels, or other socioeconomic variables. The timing and speed of the fertility decline coincides with the growth of a neo-Malthusian global population-control movement that designed and advocated a number of policy measures aimed at lowering fertility rates across the world. The precise measures chosen by different countries varied in nature and scope, depending on the individual country’s socioeconomic context. But common to almost all programs was an enhanced provision of contraceptive methods and mass-media campaigns to establish a new small-family norm.

The global convergence in fertility to near replacement fertility rates will eventually ensure a constant world population, although the rise in life expectancy implies that it will take another few decades to reach a constant population level. Projections by the UN Population division suggest that populations in all regions except



for Africa will stabilize by 2050. Including Africa, for which the projections are more uncertain, world population is expected to stabilize by 2100 at around 11.2 billion, with total fertility rates converging to 2 in all regions (United Nations Population Division 2015). Concerns over possible imbalances between resources and population will not disappear, but will be mitigated as population growth flattens out. Insofar as the US experience can offer guidance, the diffusion of contraception and the decline of fertility and postponement of childbearing could increase female empowerment in developing countries through higher levels of investment in human capital (Goldin and Katz 2002). To the extent that lower fertility rates are associated with higher investment in human capital, the trends bode well for development and living standards in the world's poorest regions.

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## Appendix A

In the paper we argue that the origins of the population control movement can be traced to the West. In what follows, we reproduce extracts from historical documents reflecting the preoccupation of intellectuals and policy makers in the West with the high fertility levels.

*John D. Rockefeller, Jr., 1934, in a letter to his father:*

“In concluding, may I add one further statement in regard to my interest in birth control. I have come pretty definitely to the conclusion that it is the field in which I will be interested, for the present at least, to concentrate my own giving, as I feel that it is so fundamental and underlying.” [Rockefeller 1934]

*Report of the President’s Committee to Study the U.S. Military Assistance Program, 1959:*

“[T]hese high fertility rates are normally a part of deeply rooted cultural patterns, and natural changes occur only slowly. In many countries, national production is failing even to keep pace with population growth, and per capita gross national product and food supplies are therefore decreasing rather than increasing.

Government leaders in many of the less developed nations recognize that the only hope for their people lies in accelerating the normal adjustment to the rapidly declining mortality rate. Few countries have set up the necessary programs, although broad acceptance has been found in those areas where programs have been established.

The United States and the other more advanced countries can and should be prepared to respond to requests for information and technical assistance in connection with population growth. Such information will help to point up the seriousness of the problem, and to encourage action in countries where population pressures exist. Such information is also useful in defining the areas in which initial efforts will be most effective. Recognizing an immediate problem created by the rapid growth, the United States should also increase its assistance to local programs relating to maternal and child welfare.

We Recommend: That, in order to meet more effectively the problems of economic development, the United States (1) assist those countries with which it is cooperating in economic aid programs, on request, in the formulation of their plans designed to deal with the problem of rapid population growth, (2) increase its assistance to local programs relating to maternal and child welfare in recognition of the immediate problem created by rapid population growth, and (3) strongly sup-

port studies and appropriate research as a part of its own Mutual Security Program, within the United Nations and elsewhere, leading to the availability of relevant information in a form most useful to individual countries in the formulation of practical programs to meet the serious challenge posed by rapidly expanding populations.” [Draper 1959, p 96-97]

*John D. Rockefeller Jr. at the National Conference on the Population Crisis 1960:*

“In May 1960 at a National Conference on the Population Crisis co-sponsored by the Dallas Council on World Affairs and Newsweek magazine, John D. Rockefeller 3rd made a plea that was to be repeated many times in the decade ahead: The problems of population are so great, so important, so ramified and so immediate that only government, supported and inspired by private initiative, can attack them on the scale required. It is for the citizens to convince their political leaders of the need for imaginative and courageous action-action which may sometimes mean political and economic opposition.” [Piotrow 1973, p 49]

*Enke (1960) based on discussions with senior officials and Prime Minister of the Indian government:*

“The willingness versus ability of adults to limit births has long been a matter of controversy. A cheap and available contraceptive pill will not be the answer in Asia unless couples wish to avoid pregnancies. . . In the ”extended” or three generation households of Asia, which still predominate in rural areas, children are not a liability to their parents during their infancy. And they are a real asset in later life to their procreators.

It is not enough for governments in these countries to support clinics that provide contraceptive information. It is not practical to tax extra children. Instead, governments must offer some strong and positive inducement to couples to limit births. Money might be such an incentive if paid in large enough amounts. Or other costly benefits, such as the education and support of parents’ existing children, might be offered. [Enke 1960, p 343]

. . . In countries that are already overpopulated, and have crude population increases of 2 percent a year, there may not be time to wait for uncertain birth reductions following urbanization, emancipation of women, and a delayed recognition that falling death rates have reduced the number of infants a couple must have to obtain a given size family of grown children.

The knowledge and availability of contraceptives can be increased by government action. But the ability rather than the willingness to limit family size is affected

thereby. Even a contraceptive pill is no panacea for the same reason. It may benefit "emerging" urban parents but not untutored rural peasants. And, even if the pill cost only 10 cents, the total resource cost over the fertile period of a woman's life would exceed \$100. So money payments to men and women to constrain family size—in the ways described here—may be far more effective a limitation and much cheaper in resources. Schemes of this kind may do more for suffering humanity than successful medical research on contraceptives." [p 348]

*Davis (1967) on the effectiveness of family planning programs:*

"By sanctifying the doctrine that each woman should have the number of children she wants, and by assuming that if she has only that number this will automatically curb population growth to the necessary degree, the leaders of current policies escape the necessity of asking why women desire so many children and how this desire can be influenced ... Instead they claim that satisfactory motivation is shown by the popular desire (shown by opinion surveys in all countries) to have the means of family limitation, and that therefore the problem is one of inventing and distributing the best possible contraceptive devices. Overlooked is the fact that a desire for availability of contraceptives is compatible with high fertility ... We thus see that the inadequacy of current population policies with respect to motivation is inherent in their overwhelmingly family planning character. [Davis 1967, p 733-734]

... If excessive population growth is to be prevented, the obvious requirement is somehow to impose restraints on the family... Population-control policy can de-emphasize the family in two ways: (i) by keeping present controls over illegitimate childbirth yet making the most of factors that lead people to postpone or avoid marriage and (ii) by instituting conditions that motivate those who do marry to their families small. [p 737]

... In any deliberate effort to control the birth rate along these lines, a government has two powerful instruments – its command over economic planning and its authority (real or potential) over education. The first determines (as far as policy can) the economic conditions and circumstances affecting the lives of all citizens; the second provides the knowledge and attitudes necessary to implement the plans. The economic system largely determines who shall work, what can be bought, what rearing children will cost, how much individuals can spend. The schools define family roles and develop vocational and recreational interests; they could, if it were desired, redefine the sex roles, develop interests that transcend the home, and transmit realistic (as opposed to moralistic) knowledge concerning marriage, sexual behaviour, and population problems. When the problem is viewed in this light, it is clear that

the ministries of economics and education, not the ministry of health, should be the source of population policy.” [p 738]

*John D. Rockefeller Jr. in a speech at the Population Tribune in Bucharest, 1974:*

“It turns out that women who avail themselves of family planning are chiefly those who already have had many children. Over the 40-year span I have referred to, the population of the world has increased by 86 percent, from 2.1 billion to 3.9 billion. And the absolute number of people in poverty has continued to grow. Clearly, the programs that have been undertaken have proved inadequate when compared to the magnitude of the problems facing us. [Rockefeller 1978, p 511]

... [R]apid population growth is only one among many problems facing most countries, it is a multiplier and intensifier of other problems. ... [R]educing population growth is not an alternative to development, but an essential part of it for most countries.” [p 512]

*National Security Study Memorandum 200 (The Kissinger Report), 1974:*

“High birth rates appear to stem primarily from: a. inadequate information about and availability of means of fertility control; b. inadequate motivation for reduced numbers of children combined with motivation for many children resulting from still high infant and child mortality and need for support in old age; and c. the slowness of change in family preferences in response to changes in environment.

... We cannot wait for overall modernization and development to produce lower fertility rates naturally since this will undoubtedly take many decades in most developing countries, during which time rapid population growth will tend to slow development and widen even more the gap between rich and poor. [National Security Council 1974, p 6-7]

... The political consequences of current population factors in the LDCs - rapid growth, internal migration, high percentages of young people, slow improvement in living standards, urban concentrations, and pressures for foreign migration — are damaging to the internal stability and international relations of countries in whose advancement the U.S. is interested, thus creating political or even national security problems for the U.S. In a broader sense, there is a major risk of severe damage to world economic, political, and ecological systems and, as these systems begin to fail, to our humanitarian values. [p 8]

... While specific goals in this area are difficult to state, our aim should be for the world to achieve a replacement level of fertility, (a two-child family on the average), by about the year 2000. [p 9]

...The World Population Plan of Action is not self-enforcing and will require vigorous efforts by interested countries, U.N. agencies and other international bodies to make it effective. U.S. leadership is essential. The strategy must include the following elements and actions:

- a. Concentration on key countries. Assistance for population moderation should give primary emphasis to the largest and fastest growing developing countries where there is special U.S. political and strategic interest. Those countries are: India, Bangladesh, Pakistan, Nigeria, Mexico, Indonesia, Brazil, the Philippines, Thailand, Egypt, Turkey, Ethiopia and Columbia. Together, they account for 47 percent of the world's current population increase. (It should be recognized that at present AID bilateral assistance to some of these countries may not be acceptable.) Bilateral assistance, to the extent that funds are available, will be given to other countries, considering such factors as population growth, need for external assistance, long-term U.S. interests and willingness to engage in self-help. Multilateral programs must necessarily have a wider coverage and the bilateral programs of other national donors will be shaped to their particular interests. At the same time, the U.S. will look to the multilateral agencies, especially the U.N. Fund for Population Activities which already has projects in over 80 countries to increase population assistance on a broader basis with increased U.S. contributions. This is desirable in terms of U.S. interests and necessary in political terms in the United Nations. But progress nevertheless, must be made in the key 13 and our limited resources should give major emphasis to them.
- b. Integration of population factors and population programs into country development planning. As called for the world Population Plan of Action, developing countries and those aiding them should specifically take population factors into account in national planning and include population programs in such plans.
- c. Increased assistance for family planning services, information and technology. This is a vital aspect of any world population program. 1) Family planning information and materials based on present technology should be made fully available as rapidly as possible to the 85 % of the populations in key LDCs not now reached, essentially rural poor who have the highest fertility.
- d. Fundamental and developmental research should be expanded, aimed at sim-

ple, low-cost, effective, safe, long-lasting and acceptable methods of fertility control. Support by all federal agencies for biomedical research in this field should be increased by \$60 million annually.

- e. Creating conditions conducive to fertility decline. For its own merits and consistent with the recommendations of the World Population Plan of Action, priority should be given in the general aid program to selective development policies in sectors offering the greatest promise of increased motivation for smaller family size. In many cases pilot programs and experimental research will be needed as guidance for later efforts on a larger scale. The preferential sectors include: . . .
  - Developing alternatives to children as a source of old age security;
  - Education of new generations on the desirability of smaller families. [p 10-11]

. . . The U.S. should encourage LDC leaders to take the lead in advancing family planning and population stabilization both within multilateral organizations and through bilateral contacts with other LDCs. This will require that the President and the Secretary of State treat the subject of population growth control as a matter of paramount importance and address it specifically in their regular contacts with leaders of other governments, particularly LDCs.” [p 12]

# Appendix B

## 1 Features of early family planning programs

Strategy	Method of implementation	Description
Increasing access to contraceptives	Ministry of Health clinics or hospital-based facilities	All countries with a state-led family planning program as well as countries where the state allowed private institutions to use state infrastructure provided family planning services in clinics and hospitals. Main examples: Mexico, Brazil, Uruguay, Kenya.
	Post-partum family planning in major hospitals	Women counselled on birth spacing and contraceptive methods soon after delivery. Limited in scope as most deliveries did not take place in hospitals in most developing countries at the time Main examples: Iran, Sri Lanka, Colombia, Tunisia, Jamaica, Hong Kong, Thailand, Malaysia, India, Ghana.
	Pairing family planning with maternal and child health services	While this was usually done in order to make use of existing medical infrastructure, particularly in rural areas, it was also carried out in countries that wished to maintain a low profile for their programs (e.g., Guatemala). Main examples: Iran, Chile, Colombia, Korea, Singapore, Thailand, Malaysia (rural areas), Philippines, Pakistan, Sri Lanka, Nepal, Brazil, Honduras, Botswana, Guatemala.
	Trained fieldworkers to reach remote, rural areas	Midwives and/or community workers were trained to deliver and in some cases prescribe or administer contraceptive methods. Main examples: Egypt, Morocco, Korea, Hong Kong, Taiwan, Singapore, Indonesia, Philippines, India, Pakistan and Bangladesh, Sri Lanka, Kenya, Costa Rica, Colombia, Mexico, Iran, Nepal.

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Strategy	Method of implementation	Description
	Mobile clinics and family planning camps	<p>Mobile clinics generally visited rural clinics, schools and government offices on a regular basis. The team usually consisted of one person to provide education and information and another to provide the medical services.</p> <p>Main examples: Iran, Hong Kong, Singapore, Malaysia, Nepal, Honduras, Tunisia, Turkey, South Korea, India.</p> <p>In India and Nepal, large scale vasectomy camps were set up temporarily in primary health centers to perform sterilizations and insert IUDs</p>
	Contraceptive provision through integrated rural development programs	<p>Rural development projects (including education, sanitation and agricultural projects) expanded to include a family planning component, usually in the form of program officers advocating and providing contraception to target population alongside their usual activities.</p> <p>Main examples: Philippines, Ghana, Iran, Turkey, Egypt.</p>
	Employment based family planning programs <sup>a</sup>	<p>Contraceptive distribution, educational and promotional activities undertaken by employers or labour unions usually working in collaboration with a Family Planning Association or the government.</p> <p>Main examples: Tata Iron and Steel Company in India, the military in South Korea and Ecuador, Philippine Appliance Corporation, Misr Spinning and Weaving Company in Egypt, Coffee Grower's Association in Colombia, as well as employers in Kenya, Thailand, China, Bangladesh, Malaysia and Sri Lanka, labour unions in Turkey (TURK-IS) and Indonesia (Textile and Garment Labour Union).</p>

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Strategy	Method of implementation	Description
	<p data-bbox="723 552 1178 616">Enabling private sector and NGO involvement</p> <p data-bbox="723 1046 1178 1118">Subsidized contraceptive provision and incentives for contraceptive usage</p>	<p data-bbox="1207 320 2119 472">Later (starting in the 1980s) Latin America and the Caribbean (where most workers and their families are offered health care through the national social security system) extended their social security systems to include family planning. Main examples in Latin America: Mexico, Peru and Brazil.</p> <p data-bbox="1207 488 2119 679">In most countries, family planning programs were originally piloted by private family planning associations which were later supported (through provision of state sector facilities and technical support) or taken over by the state. These associations continue to play a role in service provision and public education in many countries.</p> <p data-bbox="1207 695 2119 847">Main examples: Family Planning Associations in Chile (APROFA), Colombia (PROFAMILIA), Guatemala (APROFAM), Jamaica (JFPA), Costa Rica, Honduras, Mexico, Brazil and Uruguay continue to be leaders in family planning activities alongside state programs.</p> <p data-bbox="1207 863 2119 1015">In Egypt, Iran, Tunisia, Morocco, Turkey, South Korea, Singapore, Hong Kong, Taiwan, Indonesia, India, Pakistan, Bangladesh, Sri Lanka, Nepal, Ghana, Kenya Zimbabwe, Botswana and Mauritius family planning associations laid the foundations for large scale national programs.</p> <p data-bbox="1207 1031 2119 1142">This included state subsidization of private sector sale of contraceptives (social marketing), provision of contraceptives at no cost, and provision of incentives for the use of contraceptives.</p> <p data-bbox="1207 1158 2119 1262">Main examples: Social marketing programs in Bangladesh, Pakistan, India, Iran, Philippines, Honduras, Colombia, Mexico, Zimbabwe, Ghana, Mauritius, Taiwan.</p>

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Strategy	Method of implementation	Description
Educating public on population issues and contraceptive use	Interpersonal communication with fieldworkers and community based education	<p>Certain family planning methods were provided free of charge in Jamaica, Iran, Turkey, Malaysia, Sri Lanka, Morocco and China.</p> <p>Patients, providers and/or fieldworkers bringing in the patient for sterilizations and IUD insertions compensated for travel and time in Bangladesh, Nepal, India, Sri Lanka, South Korea.</p> <p>In addition to clinic based counselling, many programs employed fieldworkers to provide information about family planning at family planning clinics and child health centers, on a door to door basis and even at marriage and birth registries (Hong Kong).</p>
	Print media such as posters, leaflets etc.	<p>Main examples: Egypt, Chile, Korea, Hong Kong, Taiwan, Indonesia, Philippines, Pakistan, Bangladesh, Sri Lanka, Kenya, Iran, Singapore.</p> <p>In Singapore, lectures and seminars on family planning were organized for newlyweds, community leaders, teachers and school principals.</p> <p>Posters, leaflets, newspaper advertisements and magazine articles were used to disseminate information about the benefits of contraceptive use, technical information about specific contraceptive methods, nearest family planning clinics, as well as to create awareness about the benefits of having smaller families.</p> <p>Main examples: Turkey, Korea, Singapore, India, Kenya, Egypt, Iran, Mauritius, Hong Kong, Indonesia.</p>
	Electronic mass media including radio, film and television (particularly important for reaching non-literate population) <sup>b</sup>	Information on contraceptive use and population related issues was provided through spot announcements, interviews, news broadcasts, lectures, drama, advertisements and even music. Most early programs focused on radio, later branching out into TV.

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Strategy	Method of implementation	Description
		Main examples: use of radio for building awareness in Iran, South Korea, Taiwan, Singapore, Indonesia (radio serial drama - Grains of sand in the sea), India, Colombia (radio spots pointing out benefits of having only the number of children that could be cared for, ending with the name and address of a PROFAMILIA clinic), Pakistan, Bangladesh, Costa Rica (nation-wide 10 minute radio program Dialogo), Mauritius, Egypt, Turkey. Later, television dramas and films were used in Hong Kong, Mexico, India, Bangladesh, Brazil etc. to promote family planning and establish a small family norm. TV spots carrying family planning messages were also used in Egypt, Nigeria, Mali, Liberia, Zimbabwe and Mauritius. Population topics were incorporated into social studies, geography, home economics, science and mathematics courses at primary and secondary school levels. Some Asian (Philippines, South Korea, China) and Latin American countries also incorporated material on human reproduction and family planning. Main examples: Morocco, Turkey, Hong Kong, Taiwan, Philippines, Costa Rica, Bangladesh, Indonesia, South Korea, Malaysia, Singapore, China, Sri Lanka, Thailand, Sierra Leone, Tunisia, El Salvador, Iran, Mauritius.
	Including population concepts and concerns in school curricula <sup>c</sup>	
Other policies to encourage having fewer children	Increasing the legal age of marriage	Legal age of marriage increased in order to delay childbearing.  Main examples: Tunisia, India, China.
	Incentives for having smaller families	These include explicit policies to discourage couples from having too many children.

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Strategy	Method of implementation	Description
		Main examples: Limiting government family allowances to the first four children in Tunisia, number of children for which tax exemptions are claimed cut to four and restricting paid maternity leave to four children in Philippines, and restricting maternity leave to the first two children born, restricting income tax relief to the first three children, and giving priority for the allocation of public apartments for families with fewer children among other policies in Singapore.

Notes: The table summarizes key features of early family planning programs around the world. Information on programs in Egypt (Robinson and El-Zanaty 2007), Iran (Moore 2007), Tunisia (Brown 2007b), Morocco (Brown 2007a), Turkey (Akin 2007), Chile (Sanhueza 2007), Colombia (Measham and Lopez-Escobar 2007), Guatemala (Santiso-Galvez and Bertrand 2007), Jamaica (King 2007), South Korea (Kim and Ross 2007), Hong Kong (Fan 2007), Singapore (Teng 2007), Thailand (Rosenfield and Min 2007), Indonesia (Hull 2007), Malaysia (Tey 2007), Philippines (Herrin 2007), India (Harkavy and Roy 2007), Bangladesh and Pakistan (Robinson 2007), Sri Lanka (Wright 2007), Nepal (Tuladhar 2007), Ghana (Caldwell and Sai 2007) and Kenya (Heisel 2007) is from the compilation of case studies by Robinson and Ross (2007). Further information on the Latin American countries including Chile, Colombia and Guatemala is obtained from Shaffer (1968), Bertrand, Ward and Santiso-Galvez (2015) and the Cavenaghi (2009). Information on China (pre one-child policy) is obtained from Attane (2002) and Wang (2012). Information on Taiwan is obtained from Sun (2001). Information on Mauritius is from Hogan, Kennedy, Obetsebi-Lamptey and Sawaya (1985) and the information on Botswana and Zimbabwe is taken from the report by the National Research Council Working Group on Factors Affecting Contraceptive Use (1993).

<sup>a</sup> Information on this section is obtained from Rinehart, Blackburn and Moore (1987) <sup>b</sup> Information on this section is obtained from Gilluly and Moore (1986) and Church and Geller (1989) <sup>c</sup> Information on this section is obtained from Sherris and Quillin (1982)

## 2 Funds for family planning by country

Country	Total per		Govt per		Non-govt per		Total funds	
	capita funds		capita funds		capita funds		(% of GDP)	
	1970s	1980s	1970s	1980s	1970s	1980s	1970s	1980s
<b>Asia</b>								
Afghanistan		2.56		0.00		2.56		
Bangladesh	41.02	186.56	16.39	36.24	24.63	150.32	0.07	0.47
Hong Kong, China	54.65	66.00	26.74	48.42	27.91	17.57	0.01	0.00
India	68.42	99.55	64.10	89.67	4.32	9.88	0.08	0.16
Indonesia	74.75	101.37	39.52	71.38	35.23	29.99	0.09	0.11
Korea, Rep.	108.63	147.06	85.32	132.12	23.32	14.94	0.04	0.46
Malaysia	165.63	105.86	102.10	95.60	63.53	10.26	0.04	0.03
Mongolia		6.60				6.60		0.00
Nepal	28.06	35.94	15.67	27.93	12.40	8.02	0.07	0.12
Pakistan	76.01	41.58	32.21	18.07	43.79	23.51	0.13	0.07
Philippines	145.58	62.43	79.85	37.85	65.73	24.58	0.11	0.05
Singapore	134.12	97.74	132.62	97.38	1.50	0.36	0.01	0.01
Sri Lanka	16.11	16.68		11.76		4.92	0.02	0.02
Taiwan	50.88	89.44	46.52	89.35	4.36	0.10		
Thailand	44.54	42.87	11.33	26.70	33.21	16.17	0.03	0.03
Vietnam				5.81				
<b>Latin America and Caribbean</b>								
Bolivia	13.20		0.96		12.25		0.01	
Brazil		8.70	2.28	0.00		8.70		
Colombia	59.18	47.40		23.70		23.70	0.02	0.02
Costa Rica	184.92	203.73	52.57	132.81	132.35	70.92	0.05	0.06
Dominican Rep.	91.42		43.28		48.15		0.04	
El Salvador	300.66	324.76	237.06	235.47	63.60	89.29	0.15	0.22
Honduras		125.80		0.00		125.80		0.08
Nicaragua				204.57				
Panama		59.59		14.29		45.30		0.01
Puerto Rico	897.43		390.17		507.26		0.09	

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Country	Total per		Govt per		Non-govt per		Total funds	
	capita funds		capita funds		capita funds		(% of GDP)	
	1970s	1980s	1970s	1980s	1970s	1980s	1970s	1980s
Trinidad and Tobago				26.51				
Venezuela			123.35	1.50				
<b>North Africa and Middle East</b>								
Egypt	16.33		1.81	11.96	14.51		0.01	
Iran	248.01		243.34	0.07	4.67		0.05	
Iraq		3.26		2.25		1.02		0.00
Jordan		61.82		21.45		40.37		0.02
Morocco		55.53		45.49		10.05		0.03
Tunisia	124.05	130.23	36.10	73.57	87.96	56.66	0.05	0.06
Turkey	23.03	23.58	21.81	20.51	1.22	3.06	0.01	0.01
<b>Sub Saharan Africa</b>								
Botswana		15.40		7.48		7.93		0.01
Burkina Faso		23.93		6.70		17.23		0.05
Central African Rep.		35.21		16.93		18.28		0.05
Congo, Rep.				0.37				
Ethiopia		6.66						0.02
Ghana	49.70		40.64		9.06		0.04	
Guinea		15.24		0.71		14.53		0.02
Kenya		43.36		12.25		31.11		0.07
Liberia		48.34						0.08
Madagascar		3.78		1.46		2.32		0.01
Mauritania		29.51		0.76		28.75		0.04
Mauritius	356.05	385.87	180.29	244.30	175.76	141.58	0.11	0.12
Nigeria		9.39						0.02
Rwanda		55.90		29.90		25.99		0.10
Somalia		2.00						0.01
Tanzania	7.52		0.35		7.17			
Uganda	5.63						0.01	
Zambia		23.26		3.53		19.73		0.03

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Country	Total per		Govt per		Non-govt per		Total funds	
	capita funds		capita funds		capita funds		(% of GDP)	
	1970s	1980s	1970s	1980s	1970s	1980s	1970s	1980s
Zimbabwe	51.70	142.60	45.47	100.50	6.23	42.10	0.02	0.10

Notes: The table reports the total funds for family planning per capita and per capita funds for family planning by source: government or non-government for the 1970s and 1980s. (We compute averages for the two decades as different countries have data for different years.) Averages for the 1970s and 1980s are computed in constant 2005 U.S.\$ cents for comparability. The final two columns report the total funds for family planning as a percentage of GDP (both in nominal terms) averaged for the 1970s and 1980s. Data on funding for family planning are taken from Nortman and Hofstatter (1978), Nortman (1982), and Ross, Mauldin, and Miller (1993), while data on the price index (for conversion to real terms) and nominal GDP are from the WDI.



### 3 Change in fertility rates (1980-2013) and funding for family planning programs

Change in TFR	Absolute change	% change
Ln(average funds per capita)	-0.257*	-5.487***
	[0.141]	[1.529]
Change in years of education of adults	-0.168	-0.020
	[0.130]	[0.015]
Change in urban population as % of total	-0.022	-0.015***
	[0.013]	[0.005]
Change in ln(GDP per capita)	0.331	-0.045
	[0.298]	[0.216]
Change in infant mortality rate	0.018***	0.363***
	[0.005]	[0.094]
Change in female LFPR	0.003	-0.029
	[0.008]	[0.021]
N	43	43
R-squared	0.402	0.574

Notes: The table reports the results of regressions of the change in TFR between 2013 and 1980 on the logged value of average per capita funds for family planning for the 1970s, 80s and 90s, controlling for the changes in years of schooling of the population aged 25+, urban population as a percentage of total population, log GDP per capita infant mortality rate and female labour force participation rate between 2013 and 1980. All regressions include a constant and use a sample of 43 countries. Total per capita funds for family planning are converted to 2005 US\$ before averaging. Data on total fertility rate, urban population, per capita GDP, infant mortality rate and US Consumer Price Index (used to convert the funds to real terms) are from the World Development Indicators. Data on years of schooling is from Barro-Lee (2013). Data on female labour force participation rate is from ILOSTAT. Data on funds for family planning are from Nortman and Hofstatter (1978), Nortman (1982) and Ross, Mauldin and Miller (1993). The values in parentheses are robust standard errors. \* Significant at 10% level \*\* Significant at 5% level \*\*\*Significant at 1% level

## 4 Change in fertility rates and funding for family planning program by source

Change in TFR	(1)	(2)	(3)
Ln(average government funds per capita)	-0.250** [0.116]		-0.241** [0.117]
Ln(average private funds per capita)		-0.125 [0.128]	-0.060 [0.0947]
Change in years of education of adult women	-0.047 [0.121]	-0.199 [0.138]	-0.0688 [0.123]
Change in urban population as % of total	-0.014* [0.007]	-0.007 [0.010]	-0.013 [0.008]
Change in ln(GDP per capita)	-0.377* [0.216]	-0.369 [0.246]	-0.382* [0.223]
Change in infant mortality rate	0.004* [0.003]	0.004 [0.003]	0.005* [0.003]
N	31	31	31
R-sq	0.445	0.34	0.449

Notes: The table reports the results of regressions of the change in TFR between 2013 and 1960 on the logged value of average per capita funds for family planning from the state and private sources for the 1970s, 80s and 90s, controlling for the changes in years of schooling of the population aged 25+, urban population as a percentage of total population, log GDP per capita and infant mortality rate between 2013 and 1960. All regressions include a constant and use a sample of 31 countries. Total per capita funds for family planning are converted to 2005 US\$ before averaging. Data on total fertility rate, urban population, per capita GDP, infant mortality rate and US Consumer Price Index (used to convert the funds to real terms) are from the World Development Indicators. Data on years of schooling is from Barro-Lee (2013). Data on funds for family planning are from Nortman and Hofstatter (1978), Nortman (1982) and Ross, Mauldin and Miller (1993). The values in parentheses are robust standard errors. \* Significant at 10% level \*\* Significant at 5% level \*\*\*Significant at 1% level

## 5 Program effort score by region

Region	1972	1982	1989	1994	1999
Europe and Central Asia	20	27	46	42.2	53
East Asia and the Pacific	39.4	46.1	52.5	55.7	58.5
Latin America and the Caribbean	30.2	39	50.6	50.3	50
North Africa and the Middle East	11.4	17.9	40.5	41.8	58.3
South Asia	24.3	46.3	55.6	56.8	64.4
Sub Saharan Africa	5	15.5	36.7	43.9	51.1
Total	19.3	28.5	44.3	47.8	53.6
No. of countries	89	94	92	95	88

Notes: The table reports the average family planning program effort score for each region. The regional averages are calculated using data from Ross and Stover (2001).

## 6 Effect of state-led family planning program implementation on fertility decline

$\Delta TFR_t$	(1)	(2)	(3)
State program	-0.066** [0.023]		
L1.State program		-0.059** [0.020]	
L2. State program			-0.050* [0.018]
$\Delta GDP_t$	0.009 [0.078]	0.005 [0.077]	0.003 [0.080]
$\Delta IMR_t$	0.001 [0.005]	0.002 [0.005]	0.002 [0.005]
$\Delta Urban_t$	-0.022 [0.016]	-0.021 [0.016]	-0.021 [0.016]
$\Delta Edu_t$	0.006 [0.011]	0.006 [0.011]	0.005 [0.011]
Total obs. (NT)	1574	1574	1553
R-squared	0.191	0.187	0.177

Notes: The table reports the results of fixed effects regressions of the year on year change in TFR on a dummy variable for establishment of state family planning program (0 before establishment, 1 after), controlling for the year on year change in the log of per capita GDP, infant mortality rate, urban population as a % of total population and years of schooling of the population aged 25+. Columns (2) and (3) use 1 and 2 year lags of the program dummy, respectively. All regressions are estimated using a sample of 31 countries and include country and year fixed effects. Data on total fertility rate, urban population, per capita GDP, and infant mortality rate are from the World Development Indicators. Data on years of schooling is from Barro-Lee (2013). Since years of schooling at available at 5-yearly intervals we replace missing values with data from the closest year for which data is published. Data on family planning program implementation dates are compiled using information from Robinson and Ross (2007), Cavenaghi (2009), Shaffer (1968), Bertrand et al (2015), Attane (2002), Hogan et al (1985) and National Research Council Working Group on Factors Affecting Contraceptive Use (1993). The values in parentheses are robust standard errors. \* Significant at 10% level \*\* Significant at 5% level \*\*\*Significant at 1% level

## Appendix C

In formulas, the overall fertility rate equals the weighted average of urban and rural fertility rates:

$$F_t = \lambda_{r,t}F_{r,t} + \lambda_{u,t}F_{u,t}$$

Where  $\lambda_{r,t}$  is the proportion of the country's population living in rural areas in period t,  $\lambda_{u,t} = 1 - \lambda_{r,t}$ , and  $F_{r,t}$  and  $F_{u,t}$  are the rural and urban fertility rates at time t, respectively.

With some algebra, the change in overall fertility between time 0 and time t can be exactly decomposed as:

$$\Delta F_t = F_t - F_0 = \underbrace{(\Delta\lambda_{r,t}\bar{F}_{r,t} + \Delta\lambda_{u,t}\bar{F}_{u,t})}_{\text{Between (urbanization) effect}} + \underbrace{(\bar{\lambda}_{r,t}\Delta F_{r,t} + \bar{\lambda}_{u,t}\Delta F_{u,t})}_{\text{Within effect}}$$

where 0 and t correspond to the start and end of the period, respectively; and the terms denoted with a bar are the time averages:  $\bar{x}_j = (x_{j,t} + x_{j,0})/2$ , for  $j = r, u; x = \lambda, F$

The results of the decomposition exercise are presented in the table below.

Fertility rate decomposition by region

Country	Change in fertility	Between effect	Within effect	First year	Last year
Angola	0.5	108.82%	-8.82%	2006	2011
Bangladesh	-1.1	6.82%	93.18%	1993	2014
Benin	-1.1	8.65%	91.35%	1996	2011
Bolivia	-1.5	8.03%	91.97%	1989	2008
Brazil	-0.9	18.32%	81.68%	1986	1996
Burkina Faso	-1	17.41%	82.59%	1993	2014
Burundi	-0.8	14.63%	85.37%	1987	2012
Cambodia	-1.1	7.58%	92.42%	2000	2014
Cameroon	-0.7	21.78%	78.22%	1991	2011
Colombia	-1.1	21.19%	78.81%	1986	2010

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Country	Change in fertility	Between effect	Within effect	First year	Last year
Comoros	-0.3	21.37%	78.63%	1996	2012
Congo, Dem. Rep.	0.3	40.30%	59.70%	2007	2013
Congo, Rep.	0.3	-96.59%	196.59%	2005	2011
Cote d'Ivoire	-0.3	43.75%	56.25%	1994	2011
Dominican Republic	-1.2	-11.64%	111.64%	1986	2013
Egypt, Arab Rep.	-1	-31.42%	131.42%	1988	2014
Eritrea	-1.3	16.86%	83.14%	1995	2002
Ethiopia	-0.7	31.49%	68.51%	2000	2011
Gabon	-0.1	200.00%	-100.00%	2000	2012
Ghana	-2.2	13.64%	86.36%	1988	2014
Guatemala	-2.4	9.38%	90.62%	1987	2014
Guinea	-0.4	-1.36%	101.36%	1999	2012
Guyana	0.3	27.78%	72.22%	2005	2009
Haiti	-1.3	13.02%	86.98%	1994	2012
Honduras	-0.4	20.83%	79.17%	2005	2011
India	-0.7	4.52%	95.48%	1992	2005
Indonesia	-0.5	15.00%	85.00%	1987	2012
Jordan	-2.1	4.93%	95.07%	1990	2012
Kazakhstan	-0.5	8.71%	91.29%	1995	1999
Kenya	-3	22.70%	77.30%	1989	2015
Kyrgyz Republic	0.2	-56.87%	156.88%	1997	2012
Lesotho	-0.2	97.16%	2.84%	2004	2014
Liberia	-2	20.83%	79.17%	1986	2013
Madagascar	-1.7	-18.15%	118.15%	1992	2013
Malawi	-2.3	2.27%	97.73%	1992	2015
Mali	-0.8	-4.40%	104.40%	1987	2015
Morocco	-2.1	4.89%	95.11%	1987	2003
Mozambique	0.7	-38.10%	138.10%	1997	2011
Namibia	-1.8	25.03%	74.97%	1992	2013
Nepal	-2	4.76%	95.24%	1996	2011

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Country	Change in fertility	Between effect	Within effect	First year	Last year
Nicaragua	-0.4	0.00%	100.00%	1998	2001
Niger	0.6	-15.24%	115.24%	1992	2012
Nigeria	-1	11.28%	88.72%	1990	2015
Pakistan	-1.1	4.85%	95.15%	1990	2012
Peru	-1.5	9.17%	90.83%	1986	2012
Philippines	-1.1	1.71%	98.29%	1993	2013
Rwanda	-2	5.46%	94.54%	1992	2014
Senegal	-1.4	21.92%	78.08%	1986	2014
Sierra Leone	-0.2	14.32%	85.68%	2008	2013
Tanzania	-1	17.94%	82.06%	1991	2015
Togo	-1.6	10.31%	89.69%	1988	2013
Turkey	-0.3	33.33%	66.67%	1993	2003
Uganda	-1.7	17.44%	82.56%	1988	2014
Vietnam	-0.4	-3.89%	103.89%	1997	2002
Yemen, Rep.	-3.3	12.01%	87.99%	1991	2013
Zambia	-1.2	-2.32%	102.32%	1992	2013
Zimbabwe	-1.4	11.48%	88.52%	1988	2015

Notes: The table reports the overall decline in fertility, the percentage of the change due to the between-area effect (urbanization effect) and within-area-effect, and the years over which the overall change is calculated. Data on total and urban and rural fertility rates are obtained from the Demographic and Health Surveys. Proportion of urban population is calculated as  $\lambda_{u,t} = \frac{F_t - F_{r,t}}{F_{u,t} - F_{r,t}}$ .