Do Conditional Cash Transfers Reduce Fertility? Nationwide Evidence from Mexico

Susan W. Parker and Soomin Ryu

Conditional cash transfer (CCT) programs, which link transfers to investment in human capital in poor families, have spread around the world over the past two decades. This paper studies the medium-term effects of Progresa, the pioneering Mexican CCT program, on fertility using nationwide vital statistics combined with administrative data on program receipt. The effects of CCTs are likely to vary by age of the woman, and we study impacts by five-year age intervals. We test and account for possible underreporting of births using indirect methods. We find that Progresa led to an important and statistically significant decline in teenage fertility and smaller, but still significant, effects on reducing the fertility of older women.

Introduction

Mexico has experienced rapid decreases in fertility during the past decades, with the total fertility rate (TFR) declining from 6.6 in 1970 to 2.3 in 2010 (World Bank 2022). A large part of this decline has occurred since the early 1990s, with particularly noteworthy declines in poorer areas of Mexico. In this paper, we study the medium-term impacts of the pioneering Mexican conditional cash transfer (CCT) Progresa program on fertility, an understudied topic in the area of CCTs. CCT programs have greatly expanded over the past two decades and provide cash transfers to poor families conditional on children attending school and on regular preventive health clinic visits. Progresa has served as a model for the implementation of many similar CCT programs around the world, with CCT programs now representing a major strategy for poverty reduction across the developing world. We combine comprehensive vital statistics on births from 1990 to 2005 and

Susan W. Parker, Professor, School of Public Policy, University of Maryland, 7805 Regents Drive, College Park, MD, 20742, USA. E-mail: swparker@umd.edu. Soomin Ryu, Postdoctoral Researcher, Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor, MI, 48109, USA.

administrative data on the population proportion benefiting from Progresa across geographic areas and years to estimate dose–response difference-in-difference treatment models.

CCTs subsidize schooling by linking transfers to school enrollment in beneficiary families (Martinelli and Parker 2008) and thus in addition to alleviating current poverty conditions aim to increase human capital levels of the next generation. There are a number of mechanisms through which CCTs might affect fertility both in the short term and in the longer run and these mechanisms may differ by the age of program beneficiaries. To the extent increases in education may reduce early fertility, we would expect younger beneficiaries to show reductions in fertility relative to girls of the same age not receiving the program. For women who are out of school or older women who are no longer in school, the income and price effects of the program may impact desired fertility. Relatedly, the structure of the program where a greater number of children leads to higher monetary benefits might provide incentives for increased fertility.

There is a small literature on the effects of CCTs in developing country contexts on fertility, with some studies focusing on adolescents/young women and others on the overall group of women in reproductive age. Baird et al. (2011) studied the impacts of a CCT in Malawi on girls aged 13–22 preprogram and found a large decrease in the probability of ever being pregnant for those who were not enrolled in school prior to the program, strikingly, only one year after program implementation. Olson, Clark, and Reynolds (2019) studied the effects of the Bolsa Escolar program in Brazil on teenage pregnancy, taking advantage of the expansion of program eligibility from age 15 to age 17 and finding a significant reduction in teen fertility after five years of three percentage points in urban areas, but no significant effects in rural areas. Focusing on young urban beneficiaries, Gulemetova (2009) found that the Progresa program delayed marriage and births of young women after two years of benefits.

Studies of the impact of the CCT on overall fertility have shown more ambiguous results. Stecklov et al. (2007) studied the effects of CCT programs in Honduras, Nicaragua, and Mexico on fertility of the overall group of women in childbearing age (age 14–49) one to two years postprogram. They found increases in fertility in the case of Honduras and no significant effects in Nicaragua and Mexico, although Todd, Winters and Stecklov (2010) found an increase in birth spacing for the case of Nicaragua. Garganta et al. (2017) studied the effects of a cash transfer program in Argentina to families in the informal sector and found a significant increase in fertility in households that already had at least one child, with no significant effects for households with no children. Laszlo, Majid, and Renée (2021) studied the effects of the Peruvian CCT Juntos on contraceptive use for women either married or living with a partner (aged 15–49), finding increases in the use of modern contraceptives relative to traditional methods. Similarly, Feldman et al. (2009) and Lamadrid-Figueroa et al. (2008) concluded that beneficiaries of Progresa were more likely to use modern contraceptives compared to nonbeneficiaries.

In this paper, we make several contributions to the evidence of CCT programs on fertility. First, we provide estimates representative at the national level of one of the oldest and most influential CCT programs, which included at its height one-third of the population as beneficiaries. Second, given the different components of CCTs, the effects of CCTs on fertility are likely to vary by the age of the woman, and we study impacts by five-year age intervals, taking advantage of our datasets with nationwide births since before the program began. While most studies look only at the one to two-year impact of CCTs on fertility, we study effects in the medium term, an aspect we consider particularly important given that fertility is a variable which likely takes time to show changes. Finally, given that poor areas where CCTs operated may be areas where births were underreported, we account for possible underreporting of births in vital statistics using the Brass *P*/*F* ratio method, which adjusts vital statistics using census data.

Our results suggest some striking negative effects of Progresa on fertility and vary by age group. We find strong lasting effects of Progresa on reducing teenage births and smaller negative impacts on older age groups. When controlling for the potential underreporting of births, we continue to find similar results. Finally, we find no indication that any age group of women increased fertility in response to the Progresa program.

Overall, these results suggest important and lasting effects of Progresa on reducing the fertility of teenagers, a particularly vulnerable group. Further follow-up work is needed to determine if these results reflect reductions in final fertility or a postponement of fertility for adolescents. In either case, the intergenerational effects of delaying or reducing adolescent fertility may be substantial. Our results are also suggestive of reductions in the fertility of older women, consistent with the increased use of contraceptives noted by several previous studies and potentially the achievement of desired reproductive outcomes. The concern that is often present with transfer programs, namely that individuals will have more children in order to receive higher monetary benefits, is not supported by the results of our study. Our analysis thus adds to the literature on the impacts of transfers on fertility in the developing world by providing medium-term nationwide evidence on program effects at scale for a pioneering income transfer program. We distinguish impacts by age for all women of childbearing age and demonstrate important differences in program effects by age. Finally, we methodologically innovate by using vital statistics combined with indirect methods for our estimation models, an approach that might be replicated in other contexts where underreporting in vital statistics may be a concern.

Background

Progresa program description

Progresa began operating in small rural communities in 1997. It quickly grew over time and at its peak covered about seven million families, nearly one-third of all families in Mexico. While the program eventually expanded into urban areas, it remained largely rural throughout, with about two-thirds of its household beneficiaries deriving from communities with less than 2,500 inhabitants.

The main innovation of Progresa (and the numerous CCT programs that have followed) was to provide cash transfers to poor families conditional on regular school attendance of children and youth and on complying with a schedule of regular health clinic preventive visits which varied according to age and gender of household members. School enrollment and attendance as well as health clinic attendance was monitored and verified before bimonthly payments were made to beneficiaries.

Table A1 in the online Appendix provides the specific monthly grant amounts conditional to school attendance as well as the fixed amount linked to health clinic attendance. The scholarship amounts linked to education began in third grade, increased with grade, and were slightly higher for girls beginning in secondary school (seventh grade). The original program design provided education grants for children only up to ninth grade, with grants expanded up until 12th grade in 2002. Total benefits were capped, which original program documents (Progresa 1997) note was a design feature to reduce the probability that program beneficiaries might have additional children to increase total monetary benefits. Additionally, beginning grants linked to schooling in third grade (i.e., when a child would be about eight years old) delay substantially the possible program benefits from having additional children.

The program was means tested, with both geographic and household-level targeting. The geographic targeting selected poor rural localities in part by using a community-level marginality index, formed by taking the first principal component of socioeconomic aggregates from census data. The marginality index is a municipality (county) level measure of poverty, produced every five years by CONAPO the Mexican Population Council using aggregated census information on the characteristics of individuals and households.[1] The program in its initial period of operation was subject to a randomized controlled trial which allocated 506 communities to either a treatment or control group. The evaluation and its follow-up surveys led to a large number of studies evaluating the impacts of Progresa, likely making Progresa one of the most evaluated social programs in a developing country context (Parker and Todd 2017). Numerous evaluations have demonstrated important impacts on improving education and child health, and reducing the severity of poverty (Parker and Todd 2017). In particular, with respect to impacts on education of youth, Behrman, Parker, and Todd (2011) and Parker and Vogl (2018) estimated the longer-term impacts of receiving Progresa on completed schooling and found impacts of about a year of increased schooling.

We hypothesize the effects of Progresa on fertility may differ according to the age of the women when Progresa began because of differential impacts on schooling. For younger women in marginalized areas, increased time in school due to Progresa is likely to lead to a larger reduction or postponement of fertility relative to older women (approximately above the age of 20), whose schooling would not have been impacted by the program. For all women, there is a potential household income effect which might impact the number of desired children. Additionally, women are the recipients of the cash transfers and this might impact household bargaining over fertility. Finally, the additional benefits received by a larger number of children might increase the incentive to have additional children, although Progresa has a maximum impact on benefits received designed to reduce these possible incentives. Overall, the net effect of the program on fertility is ambiguous for both younger and older women and thus needs to be resolved empirically. We do however expect impacts on fertility of younger women to be relatively smaller or more negative relative to older women.

Fertility trends in Mexico

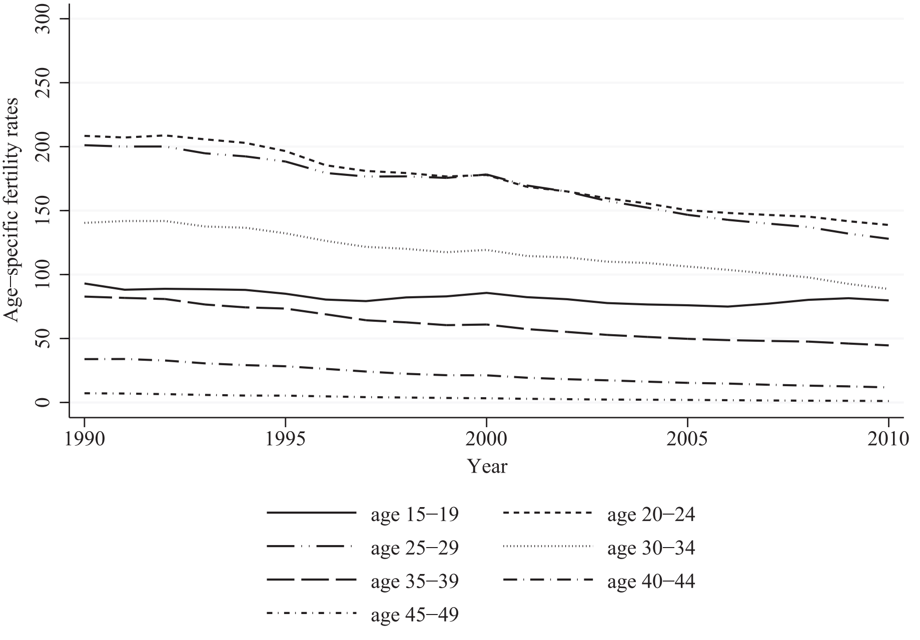
Figures 1 and 2 show age-specific fertility rates (ASFR; the number of live births occurring during a given year per 1,000 women of reproductive age classified in five-year age groups) over time in Mexico. Figure 1 shows generally decreasing fertility for all age groups nationwide between 1990 and 2010 with a noticeably flatter profile for the fertility of teenagers aged 15–19 where trends show fewer reductions. Figure 2 divides these trends between poor municipalities (municipalities with high and very high levels of marginality) and nonpoor municipalities (municipalities with very low, low, and medium levels of marginality) according to the preprogram margination index in 1990. Overall, the decline in fertility has been much larger overtime in poorer areas than those in the nonpoor areas, particularly for women aged 20–29 where overall fertility appears to fall by about a third between 1990 and 2010.

Data and methods

Data

We merged administrative information on the number of households receiving Progresa in the municipality by year to vital statistics on fertility

FIGURE 1 Age-specific fertility rates, Mexico, 1990–2010

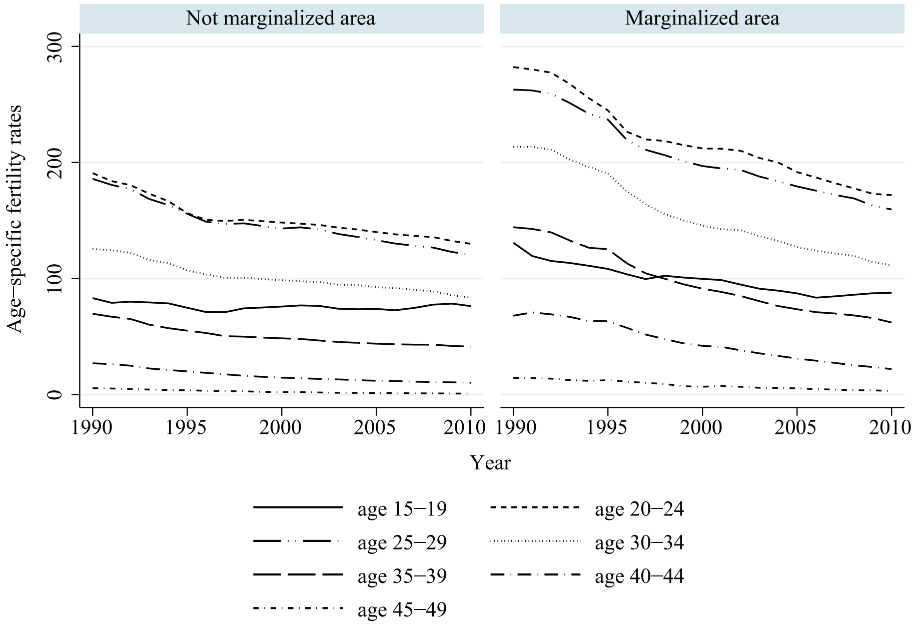


SOURCE: Authors' calculations using data on births from the Instituto Nacional de Estadistica y Geografia and Mexican Census data from 1990, 2000, and 2010.

from INEGI (Instituto Nacional de Estadistica y Geografia) from 1990 to 2005. Our main variable of impact is the municipal-level program intensity, that is, the cumulative number of households receiving Progresa divided by the total number of households in the municipality preprogram. The main identification strategy is a dose–response difference in difference estimation with a continuous treatment variable, namely variation in program intensity across municipalities and time (Imbens 1999; Callaway, Goodman-Bacon, and Sant'Anna 2021; Parker and Vogl 2018) where some municipalities have a higher program intensity or dosage than others. Identification of program effects thus relies on both variation between untreated municipalities and treated municipalities with a higher and lower dosage of the program over time.[2]

Data on births for the period 1990–2005 was drawn from the INEGI, which is the principal government agency responsible for the Population Censuses and national surveys. Birth data were derived from a certification system provided by the Mexican Ministry of Public Health, which contains information on the municipality where a birth occurred and where it was reported. Data on the number of women by age groups were drawn from various rounds of the Mexican Census. We constructed the number of births per 1,000 women aged 15–49 by five-year age groups at the municipality level for each year of our data analysis period. The number of births was

FIGURE 2 Age-specific fertility rates in nonmarginalized (nonpoor) and marginalized (poor) municipalities, Mexico, 1990–2010



NOTES: Authors' calculations using data on births from the Instituto Nacional de Estadistica y Geografia and Mexican Census data from 1990, 2000, and 2010.

constructed to reflect the year of birth, regardless of when the birth was reported. ASFRs are defined as the number of live births occurring during a given year per 1,000 women of reproductive age classified in five-year age groups. ASFR measures the age pattern of fertility, that is, the relative frequency of childbearing among women of different ages within the reproductive years. Based on ASFR, we also constructed the total number of children born to a woman in her lifetime if she were subjected to the prevailing rate of age-specific fertility in the population, which is defined as the TFR.

To the fertility dataset, we merged administrative program information on the number of households enrolled in Progresa by year and by municipality. With the administrative data, we created a treatment indicator "program intensity," a ratio of the cumulative number of beneficiary households to the total number of households in municipality in the 1990 census. Table 1 presents summary statistics of marginalized and nonmarginalized municipalities in Mexico preprogram as well as the level of program intensity. As the table demonstrates, the set of marginalized municipalities have much poorer living conditions and as expected, a much higher rate of enrollment in Progresa, as measured by the program intensity. We focus our analysis on fertility in the set of poor (marginalized) municipalities.

TABLE 1 Summary statistics of poor (marginalized) and non-poor (non-marginalized) municipalities, Mexico

	Poor	Nonpoor
A. Program rollout		
Cumulative program intensity, 1999	0.39 (0.19)	0.08 (0.10)
Cumulative program intensity, 2005	0.69 (0.22)	0.23 (0.18)
B. Characteristics of municipalities, 1990		
Average population	11,431 (15041)	53,782 (136668)
Components of the marginality index		
Illiterate population	33.33 (13.33)	13.34 (6.58)
With less than primary education	69.58 (9.69)	45.76 (12.34)
Without a toilet	60.17 (18.57)	25.92 (16.63)
Without electricity	36.43 (24.74)	11.79 (10.27)
Without running water	50.58 (24.13)	19.35 (14.81)
With crowding	73.99 (8.19)	59.82 (9.80)
With dirt floor	61.90 (21.56)	22.08 (14.25)
In communities with less than 5,000 inhabitants	95.43 (13.71)	60.25 (36.18)
Earning less than twice the minimum wage	85.81 (8.54)	69.22 (11.62)
Number of municipalities	1,123	1,231

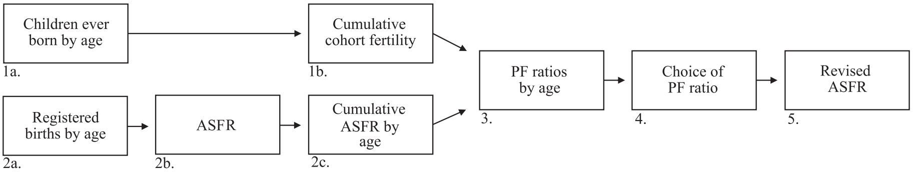
NOTES: The table reports the sample mean (%) of each variable and standard deviations are in parentheses. "With crowding" is measured by the number of rooms divided by household size.
SOURCE: Authors' calculations using Mexican Census 1990 and Progresa administrative data on beneficiaries.

Underreporting of births

A possible concern with using vital statistics to measure fertility is underreporting, particularly in the poor areas where Progresa principally operates. The quality of vital statistics in Mexico has improved substantially overtime and was recently classified based on data in 2010 as "very high quality" comparable to data in the United States (Mikkelsen et al. 2015). However, if underreporting at the beginning of the program was still important (e.g. in the late 1990s), Progresa, due to the emphasis on prenatal and postnatal care, might have reduced underreporting of births, thereby biasing the estimate of its impact on births (potentially implying the program increased births relative to the true outcome if Progresa indeed reduced underreporting).[3]

Therefore, as a robustness check, we analyzed the extent of underreporting by using the *P*/*F* ratio method developed by Brass (1964). The Brass *P*/*F* ratio method adjusts period measures of ASFR by leveraging information on cohort-specific fertility (Baker, Alcantara, and Ruan 2011; Brass 1964). Figure 3 summarizes the procedure of the Brass *P*/*F* ratio method. Data on children ever born (step 1a) are usually derived from the census, while the period measures of current fertility (step 2a) can be computed from a survey question about births in the past year or date of the most recent birth from the vital statistics system. The current paper uses (1) data on the number of children ever born by the age group of women from the

FIGURE 3 The procedure of the Brass P/F ratio method



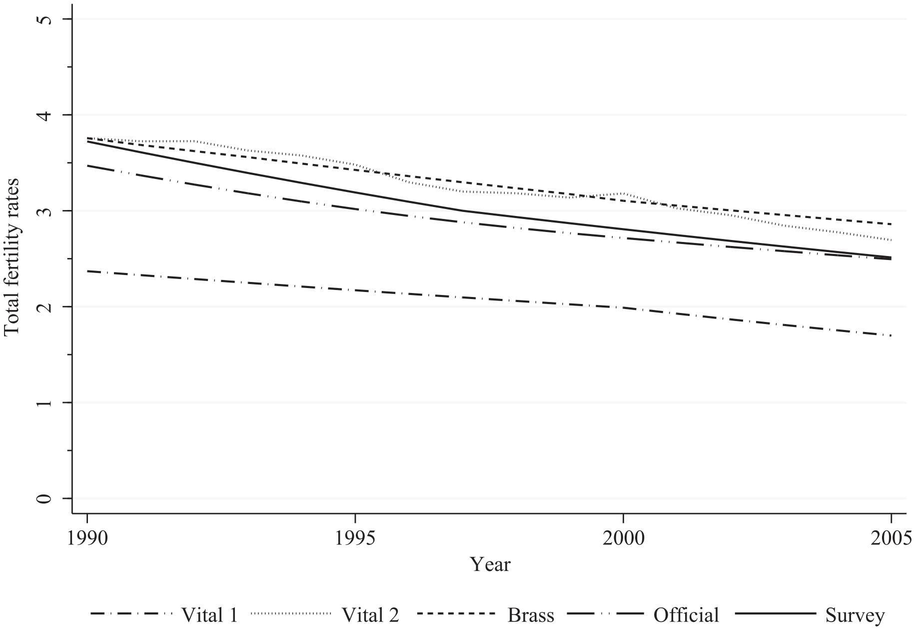
SOURCE: Baker et al. (2011) with modifications by the authors.

Census (1990, 2000, 2005, 2010) for step 1a and (2) data on ASFRs from the INEGI for step 2a.

The number of children ever born represents the estimates of the cumulative fertility of cohorts up to that age (cohort-specific fertility) (step 1b), while ASFRs (step 2b) are summed up to each age group to estimate cumulative fertility (a period measure of fertility) (step 2c). In the Brass *P*/*F* ratio, *P* is average parity, which represents the cohort-specific fertility, and *F* is closely related to the cumulated period measure of fertility (Moultrie et al. 2013). Using these two quantities, the average parity of women by age group (P_i) and the average parity equivalents for a period by age group (F_i) is calculated to derive the P_i/F_i ratio for each age group (step 3). As the number of children ever born reported by women at younger reproductive ages is likely to be lower biased, we use the ratio of 20–24 age group (P_2/F_2) to adjust the level of observed ASFR (United Nations 1983). The Brass *P*/*F* ratios of age group 20–24 are calculated for each municipality group, classified based on the margination index (step 4), and the ratios are used to adjust the TFR and ASFR from the birth data excluding late-reported births (step 5) (Ryu 2022).

Figure 4 presents the results of this exercise and compares births unadjusted for underreporting with those which adjust for underreporting. We present TFRs based on vital statistics both excluding ("Vital 1") and including late reported births ("Vital 2") as well as the estimates of births adjusting for underreporting using the Brass method ("Brass"). It is noteworthy that the Brass method adjusting for underreporting of births ("Brass"), leads to a similar pattern and level of births as the unadjusted vital statistics series which includes late reported births ("Vital 2"). This is suggestive that while many births may be reported with some delay, it appears most births are eventually reported. Also, important to note, both sets of estimates are similar to official Mexican statistics and those based on survey data. With this in mind, our main results estimating the impacts of Progresa on fertility rely on the series of vital statistics including late-reported births. For completeness and as a robustness check, we provide in the online Appendix estimates which adjust for underreporting of births based on the Brass method.

FIGURE 4 Comparison of TFRs by source, all areas, Mexico, 1990–2005



NOTES: "Vital 1" indicates unadjusted TFR derived from vital statistics excluding late-registered births. "Vital 2" is unadjusted TFR from vital statistics including late-registered births. "Brass" is adjusted TFR based on the Brass *P/F* method using census and vital statistics, excluding late-registered births. "Official" is the TFR announced by the Mexican National Population Council (CONAPO). "Survey" is the extrapolated TFR based on Mexican survey data, Encuesta Nacional de la Dinámica Demográfica (ENADID).
SOURCE: Authors' calculation using data from the Mexican Institute of Statistics Geography and Informatics (INEGI), Mexican Census (1990, 2000, 2005, 2010), Encuesta Nacional de la Dinámica Demográfica (ENADID).

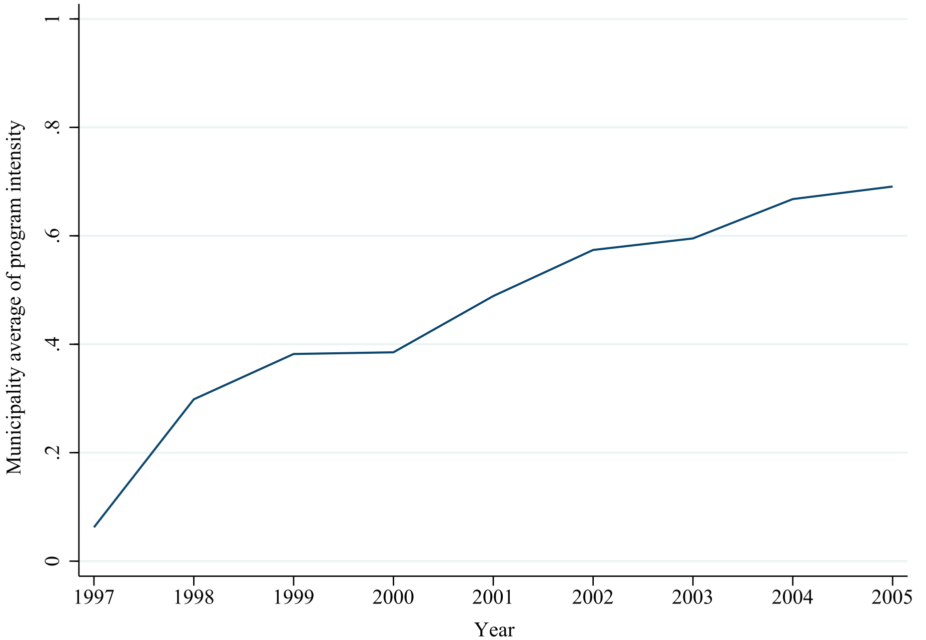
Methods

We estimate the following equation for the period 1990–2005:

$$\begin{aligned} \mathit{Fertility}_{m,t} = \beta_0 + \beta_1\ PI_{m,\ t-1} + \beta_2\ PI_{m,\ t-3} + \beta_3\ PI_{m,\ t-5} + \mathrm{X}_{m,t} + \delta_m \\ + \gamma_t + \varepsilon_{m,t}, \qquad (1) \end{aligned}$$

where *Fertility* is TFR and ASFR in municipality m at time t, and *PI* is program intensity, the number of cumulative Progresa beneficiary households divided by the total number of households in municipality m and at time $t-1$, $t-3$, and $t-5$. Figure 5 shows the trends of the municipality level of program intensity for the period 1997–2005 (mean: 0.47, range: 0−1) in marginalized areas. X includes four time-varying municipality characteristics: the percentage of households without piped water, the percentage of households without electricity, the percentage of the population who are illiterate, and the percentage of births taking place in hospitals. Fixed effects on municipality (δ_m) and year (γ_t) control for municipal- and time-invariant unobservable variables. Additionally, we cluster errors at the municipality

FIGURE 5 Municipality average of program intensity in poor (marginalized) municipalities, Mexico, 1997–2005



NOTES: Program intensity is the number of cumulative Progresa beneficiary households divided by the total number of households in each municipality.
SOURCE: Authors' calculation using data from Progresa administrative information and Mexican Population Council (CONAPO).

level, controlling for potential serial correlation in the error term. The effect of the cash transfer program on fertility rate is estimated by β_1 β_2, and β_3. All regressions are weighted by the number of women in a municipality for TFR and by the number of women in each age group in a municipality for ASFR.

To investigate the impacts of Progresa on fertility in the short run and medium term, we include several lagged terms, specifically one, three, and five years lagged specification. Comparing the coefficients on these different lagged terms allows us to assess if impacts change or appear overtime. The above specification relies on the assumption of similar preintervention trends for fertility between municipalities with more or less program intensity.

We carry out two exercises to test this trends assumption. First, we provide as part of our main results a specification including a lead of program intensity ($PI_{m,t+1}$) augmenting Equation (1) with ($PI_{m,t+1}$):

$$Fertility_{m,t} = \beta_0 + \beta_1\ PI_{m,\,t-1} + \beta_2\ PI_{m,\,t-3} + \beta_3\ PI_{m,\,t-5} + \beta_4\ PI_{m,\,t+1} + X_{m,t} + \delta_m + \gamma_t + \varepsilon_{m,t}. \quad (2)$$

In general, our results are similar with and without this lead and the lead is not predictive of mean TFR and mean ASFR in municipality *m* at time *t*. Second, following Barham (2011), we classify our sample of poor municipalities into four quartiles based on program intensity in 1999 and compare the difference in mean TFR and mean ASFR between these four quartiles for the preprogram years 1990–1996 by using the following equation:

$$Fertility_{m,t} = \beta_0 + \Sigma_{i=1990}^{1995}\beta_i \, Year_{i,t} + \Sigma_{i=1990}^{1995}\Sigma_{k=2}^{4}\sigma_{i,k} \, Year_{i,t} \times PQ_{k,m} + X_{m,t} + \delta_m + \varepsilon_{m,t}, \quad (3)$$

where *PQ* is quartile 1 through 4 based on program intensity in 1999, the percentage of cumulative beneficiary households. Year 1996 and quartile 1 are reference groups. We expect the coefficients on the interactions between preprogram years and program intensity group, $\sigma_{i,k}$, to be insignificantly different from zero, supporting parallel preintervention trends between the program quartiles, which provides a reasonable confirmation of the identification strategy. Table A2 in the online Appendix presents the results from this exercise. In general, there are few statistically significant coefficients and provide support for a lack of preexisting trends in fertility by the proportion of beneficiary households. However, for quartile 4, that is, the set of poor municipalities with the highest enrollment intensities, there are a larger number of significant coefficients than might be expected by chance, suggesting the possibility of bias by pretrends in this group. For this reason, we carry out and report all our main results using two estimation samples (1) all poor municipalities excluding quartile 4, the highest enrollment intensity group[4] (we term this sample low and moderate enrollment intensity municipalities) and (2) the sample of all poor communities. In practice, the results are quite similar.

Results

We now turn to our main results on the impact of Progresa on fertility. Table 2 reports the effects of the lag of Progresa by one, three, and five years on the TFR of poor municipalities, using low and moderate enrollment intensity municipalities. All regressions include municipality characteristics, municipality and time-fixed effects and are weighted by the number of women in a municipality. Columns 1 and 2 correspond to estimates from Equations (1) and (2) and present impacts of TFR entering each lag term in the same equation (one, three, and five years). The results show generally negative effects of Progresa on TFR; however, the size and significance of these results fall overtime. When all three lag terms are included in the same regression, only the one-year lag of Progresa's intensity has a statistically significant impact on reducing TFR, implying an overall decrease of 0.25 births per woman during her lifetime ($p < 0.001$)

TABLE 2 Medium-term effects of Progresa on the TFR 1990–2005, Mexico (n = 13,582)

	(1)	(2)	(3)	(4)	(5)
Lead of intensity		0.021	0.013	−0.092	−0.155
		(0.153)	(0.151)	(0.161)	(0.155)
One-year-lagged intensity	−0.248*	−0.261***	−0.338**		
	(0.124)	(0.065)	(0.102)		
Three-year-lagged intensity	−0.119	−0.122		−0.272†	
	(0.092)	(0.099)		(0.140)	
Five-year-lagged intensity	−0.100	−0.098			−0.252
	(0.138)	(0.135)			(0.176)
Mean of TFR, 1996			4.4		

NOTES: Sample includes poor municipalities with low to moderate program intensity (defined as program intensity <0.55 by 1999). All regressions include municipality characteristics, municipality, and time-fixed effects, and are weighted by the number of women in a municipality. The municipality characteristics include the percentage of households without piped water, without electricity, percentage of illiterate population, and percentage of hospital births. The total fertility rate (TFR) refers to the total number of children born to a woman in her lifetime if she were subject to the prevailing rate of age-specific fertility in the population. The lag of program intensity is the percentage of cumulative beneficiary households in each municipality and in the previous year. Standard errors clustered at the municipality level are in parentheses.
SOURCE: Authors' calculations using data from Instituto Nacional de Estadistica y Geografia, Mexican Census 1990 and Progresa administrative data on beneficiaries.
$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

or about a six percent reduction in TFR. In later years, the coefficients on lags of Progresa's intensity are smaller and lack statistical significance. Table 2 also presents regressions including separately each lag term in the same equation (Columns 3 through 5) and shows similar results with fertility impacts significant and declining overtime. Table A3 in the online Appendix repeats these results, including all poor municipalities (e.g., with all program intensity municipalities) and demonstrates similar results. Overall, these results on overall fertility suggest initial significant effects of Progresa in reducing fertility, which decline overtime. However, these overall impacts may mask differential impacts of the program on fertility by age. We thus now turn to the impacts of Progresa on ASFR.

Table 3 presents the effects of the lag of Progresa by one, three, and five years on ASFR in poor municipalities, including only low to moderate program intensity municipalities. These results show some statistically significant effects of Progresa on reducing fertility. These effects are particularly notable for adolescent fertility, with Progresa reducing adolescent fertility (age 15–19) by approximately 7 percent after one year and 11 percent after three years. After five years, the coefficient continues to be negative but becomes more imprecise. For women aged 20–24 and 25–29 who had the highest fertility levels, the effects on fertility, while initially negative, quickly become statistically insignificant and/or reverse sign. For women aged 30–44, the coefficients are also generally negative and statistically significant at one- or three-years postprogram, averaging reductions between 5 percent and 10 percent. Table A4 in the online Appendix repeats these estimations

TABLE 3 Medium-term effects of Progresa on ASFR, 1990–2005, Mexico (n = 13,582)

	ASFR, 15–19		ASFR, 20–24	
	(1)	(2)	(1)	(2)
Lead of intensity		1.650		6.895
		(4.210)		(6.918)
One-year-lagged intensity	−6.459†	−7.478**	−5.429	−9.668*
	(3.392)	(2.563)	(6.315)	(4.156)
Three-year-lagged intensity	−10.569***	−10.759***	−0.552	−1.346
	(2.988)	(3.098)	(5.556)	(5.728)
Five-year-lagged intensity	−4.610	−4.494	8.799	9.308
	(4.257)	(4.199)	(8.456)	(8.299)
Mean of ASFR, 1996	99.6	99.6	218.3	218.3

	ASFR, 25–29		ASFR, 30–34	
	(1)	(2)	(1)	(2)
Lead of intensity		8.399		-9.148
		(7.000)		(7.669)
One-year-lagged intensity	−6.751	−11.911*	−20.792***	−15.220***
	(6.314)	(4.701)	(5.971)	(4.017)
Three-year-lagged intensity	5.627	4.646	−7.143	−6.054
	(4.652)	(4.808)	(5.411)	(5.949)
Five-year-lagged intensity	−4.139	−3.511	−11.597	−12.233†
	(7.584)	(7.446)	(7.527)	(7.411)
Mean of ASFR, 1996	212.1	212.1	165.3	165.3

	ASFR, 35–39		ASFR, 40–44	
	(1)	(2)	(1)	(2)
Lead of intensity		−3.762		−1.570
		(5.507)		(3.514)
One-year-lagged intensity	−7.708	−5.412†	−2.598	−1.651
	(4.747)	(3.211)	(3.306)	(2.259)
Three-year-lagged intensity	−6.290†	−5.847	−5.379*	−5.192*
	(3.433)	(3.583)	(2.335)	(2.432)
Five-year-lagged intensity	−6.010	−6.258	−3.894	−3.991
	(4.240)	(4.208)	(3.306)	(3.287)
Mean of ASFR, 1996	106.8	106.8	54.2	54.2

	ASFR, 45–49	
	(1)	(2)
Lead of intensity		−1.485
		(1.143)
One-year-lagged intensity	−2.034†	−1.132
	(1.056)	(0.960)
Three-year-lagged intensity	−1.223	−1.047
	(0.870)	(0.895)
Five-year-lagged intensity	0.613	0.529
	(1.251)	(1.240)
Mean of ASFR, 1996	10.6	10.6

/...

TABLE 3 (Continued)

NOTES: Sample includes poor municipalities with low to moderate program intensity (defined as program intensity <0.55 by 1999). All regressions include municipality characteristics, municipality, and time-fixed effects and are weighted by the number of women in each age group in a municipality. The municipality characteristics include percent of households without piped water, without electricity, percentage of illiterate population, and percentage of hospital births. ASFR (age-specific fertility rates) is the number of live births occurring during a given year per 1,000 women of reproductive age classified in five-year age groups. The lag of program intensity is the percentage of cumulative beneficiary households in each municipality and in the previous year. Standard errors clustered at the municipality level are in parentheses.
SOURCE: Authors' calculations using data from Instituto Nacional de Estadistica y Geografia, Mexican Census 1990 and Progresa administrative data on beneficiaries.
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

including all poor municipalities. These results are very similar to those in Table 3, demonstrating the largest and most lasting effects of Progresa on reducing fertility for adolescents and for women aged 30–34. Smaller and less lasting effects are observed for women between the ages of 20 and 29. Overall, these results consistently suggest some large and important effects on reducing fertility, particularly for adolescents and women aged 30–34.[5]

Conclusions

In this paper, we study the medium-term effects of a pioneering CCT program on the fertility of its beneficiaries. We use vital statistics combined with administrative data to provide nationally representative estimates of the impact of Progresa on fertility by age group and indirect methods to ensure our results are not affected by the potential problem of underreported births in poor areas where Progresa operated.

Our results suggest important effects on reducing fertility, particularly for the case of teenage fertility, and somewhat lower effects for other groups of women. These differences suggest that the conditionality of benefits to school enrollment are not only increasing school enrollment of adolescents (Behrman, Parker, and Todd 2011; Paul Schultz 2004) but also reducing early fertility of adolescents, which has been high in Mexico. We find no evidence to suggest any positive effects of Progresa on the fertility of any age group of women. The concern that transfer programs might encourage greater childbearing to have more children is thus not supported by the results of our study of the Progresa context.

Our results are consistent with several previous studies that demonstrated negative effects of CCTs on adolescent fertility in Mexico (Gulemetova-Swan 2009), Brazil (Olson, Clark, and Reynolds 2019), and Malawi (Baird et al. 2011). However, our study also shows that the CCT reduced the fertility of older women, including those whose educational attainment would not have been affected by the CCT. Previous studies of CCTs on adult fertility in the Progresa context had not shown significant effects (Stecklov et al. 2007; Todd and Wolpin 2006). These two prior studies focused on the experimental data based on 506 communities in seven

Mexican states and covered a one-to-two-year period, whereas the current study used 15 years of nationwide data which had larger variations across areas and time. Fertility is naturally an impact variable which may take longer to observe reactions to policy change, implying the importance of sufficient follow-up study.

The results obtained here might reflect reductions in total fertility eventually for adolescents or simply the postponement of fertility. Future evaluations should continue to follow and study the effects of Progresa on the lifetime fertility of these adolescents and in other CCTs around the world. Note, however, that either a reduction in or postponement of fertility are arguably both consistent with CCTs leading to the achievement of more desired fertility outcomes. CCTs may be an important instrument for reducing adolescent fertility around the world, particularly those where adolescent fertility is high.

Our results are consistent with the positive education effects of CCTs leading to a reduction in adolescent fertility. However, a limitation of our study is we cannot directly isolate the different mechanisms through which CCTs may impact fertility in both of adolescents and women above the age of 20. There are price, income, and possible intrahousehold bargaining effects of CCTs which might all affect fertility (Martinelli and Parker 2008); these mechanisms should be further studied and isolated. Indeed, we believe it of critical importance to continue the follow-up of the long-term impacts of Progresa on the fertility of adolescents and other reproductive outcomes, as well as impacts on their quality of life and their children's quality of life. Our results point to the importance of measuring the potential intergenerational effects of Progresa attained through reductions in adolescent fertility.

Acknowledgments

We thank the organizers and participants of the Population Association of America on April 23–25, 2020, where preliminary results of this paper were presented. We gratefully acknowledge support from the Eunice Kennedy Shriver National Center for Child Health and Human Development grant P2C-HD041041, the Maryland Population Research Center, and the University of Maryland Graduate School Faculty-Student Research Award. We are very grateful to the editorial team and two anonymous reviewers for their insightful and constructive comments which helped to significantly improve this article.

Data Availability Statement

All data used in our analyses are publicly available at the given sources and Figshare (http://doi.org/10.6084/m9.figshare.22996313).

Notes

1 CONAPO divides municipalities into five groups ranging from very high to very low levels of margination. Throughout the paper, we classify high and very high margination as poor (marginalized) municipalities and medium, low, and very low margination municipalities as nonpoor (nonmarginalized) municipalities.

2 As elaborated in Callaway et al. (2021), this estimator relies on both the assumption that lower-dose units would have the same evolution of untreated potential outcomes as higher dose units and that the evolution of outcomes at the lower dose would have been the same as that at the higher dose.

3 A related concern is the late reporting of births. Our data include both the date of birth and the date the birth is reported allowing us to include late reported births in their appropriate birth time period. Harbers (2020) also found evidence that enrollment in Progresa was strongly associated with a shorter delay in registration, suggesting that the prospect of program benefits prompted parents to register their children more quickly. Ryu (2022) also explored the extent of late reporting by the margination index and finding more reporting of late births in higher poverty communities.

4 In practice, this excludes municipalities with more than 55 percent of all households in the municipality enrolled in Progresa by 1999, e.g. in the first two years of the program.

5 Estimation results with adjusted TFR and ASFR using the Brass *P*/*F* ratio have similar trends to the main results and can be found in online Appendix Tables A5 and A6.

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