

Social Norm Salience and Fertility: Evidence from Papal Visits*

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Abstract

How do social norms affect fertility? We examine the impact of Pope John Paul II's visits to 13 Latin American countries, which reinforced the salience of existing Catholic norms. We find positive long-term effects on fertility. These are driven by first births and by those residing in a region that the Pope visited. Papal messaging matters: fertility increases more when the Pope mentions marriage, abortion or contraception and decreases with condemnations of pre-marital sex. Marriages increase with all three messages. The fertility effect is stronger for wealthier and more educated women, whose behavior is further from the Catholic social norm.

JEL codes: J13, Z12, D83, N36, J12

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1. Introduction

Do social norms shape fertility decisions? If so, for whom, and through which channels? Although a large literature has examined the economic determinants of fertility, the global and contemporaneous decline in fertility across countries at widely differing stages of development (Delventhal et al., 2021; GBD 2021 Fertility and Forecasting Collaborators, 2024) has shifted attention toward other drivers, including the role of social and religious norms (Doepke et al., 2022; Kearney and Levine, 2025; Goldin, 2025). Yet identifying the influence of such norms is challenging because they are typically stable and deeply embedded, and rarely subject to discrete or observable shifts.

This paper addresses this challenge by studying how fertility responds when existing societal norms become more salient. Specifically, we examine the effects of 16 Papal visits by Pope John Paul II to 13 Latin American countries between 1979 and 1996 - events that drew millions of attendees in predominantly Catholic societies. Contemporary reporting captured their scale, from Bogota, where “Hundreds of thousands of people lined the 10-mile route from the airport to Bogota’s main plaza” (Graham, 1986), to Mexico where “The planned visit of Pope John Paul II... is awakening long dormant religious passions that could disturb the delicate balance of power that has existed between church and state for 90 years” (Riding, 1979).

Although the visits were not explicitly aimed at altering fertility behavior, they strongly reinforced Catholic Church teachings, which provide explicit guidance on fertility-related decisions. The Church proscribes abortion and artificial contraception, condemns premarital sex, and encourages marriage and procreation within marriage, positions that Pope John Paul II, like several predecessors and successors, repeatedly emphasized. The net effect of reinforcing these teachings is *ex-ante* ambiguous: reduced premarital sex would lower fertility, while reduced contraception or abortion would increase it.

We use Demographic and Health Survey (DHS) data on retrospective fertility histories to examine whether fertility increases following a Papal visit. We construct a woman-month panel in a balanced window around each visit to compare conception probabilities in the months after the visit to those before it, controlling for individual fixed effects, within-year seasonality, age and age squared, and secular time trends. We document significant and large increases in fertility in the 2-5 years after the Papal visit for all but one of the visits in our database. The effect sizes vary from 11% of the mean in Nicaragua to 65% of the mean in El Salvador. In our main analysis, we pool

all the country datasets together and find an overall increase in the probability of conception in the months following the visit of 0.075 percentage points, constituting 5% of the mean. Using simple back of the envelope calculations, our effect size translates to between 220,000 and 251,000 additional births across the continent (0.3 - 0.4% increase) in the years after the visit. Importantly, we find no significant *immediate* increase in the probability of conception (i.e. during the month of the Papal visit).

Our results are not driven by other confounding factors that could shape both fertility decisions and the occurrence of a Papal visit. Our findings remain robust when we allow for differential trends by the pre-visit change in total fertility rate or differential trends by the pre-visit share of Catholics. Our estimates increase in magnitude when we control for contemporaneous GDP per capita or the trade share of GDP; the latter was highlighted as a key consequence of Pope John Paul II's visits worldwide (Popov, 2025). The coefficients retain their magnitude and statistical significance when controlling for the presence of ongoing conflict - an explicit motivation for some visits and a potential determinant of fertility (e.g., Bove et al., 2024).

We then examine country and individual level heterogeneity to understand under what conditions the visit matters, and who responds to the visit. We first find that the fertility effects are larger among those who were more likely to be physically exposed to the Papal messages, proxied by residence in the subnational region of the actual Papal visit. However, there is no differential impact by whether a woman had a TV or radio in her home. This suggests that effects are driven more by interpersonal and social factors rather than by impersonal messaging.

We then compile data on the content of the Pope's speeches from the Vatican's archives to examine whether the specific messages of the Pope matter. We focus on words or phrases related to Church teachings that would directly impact fertility decisions, namely marriages, pre-marital sex, contraception, and abortions. We find that the messages do in fact matter. Greater mentions of marriage result in greater fertility increases: a doubled emphasis on marriage leads to a 0.47 percentage point increase in the probability of conception. In contrast, mentions of pre-marital sex (disapproved by the Church) reduce the probability of conceptions after the visit. Further, a doubled emphasis on abortion or contraception results in a 0.11 percentage point increase in long term conception probability.

We finally examine who responds to the Papal visit and through which margins. Consistent with a model of social norms where individuals face costs from deviating from culturally

prescribed behavior (Akerlof, 1997; Spolaore & Wacziarg, 2022), we find that the effects of increasing the salience of Catholic social norms are strongest for women who are less likely to be adhering to Catholic Church teachings on fertility control at the time of the visit. Fertility increases are larger for those who are wealthier and more educated, who we verify are also more likely to be using contraception in the data. We then establish that the increases are driven by first births, i.e., the extensive margin of fertility choice, with much weaker effects for higher order births. Complementary to this, we find that the Papal visit increases first marriages, suggesting that new family formation is a major driver of the fertility increase. The new family formation channel is also consistent with our finding of no immediate effects, but significant long-term effects, of Papal visits.

Our results contribute to two streams of literature. First, we contribute to the literature on the determinants of fertility choices. Following Becker (1960), previous work has focused on the traditional economic drivers of fertility such as labor market returns, opportunity costs, or wealth (Schultz, 1985; Lam & Duryea, 1999; Jensen, 2012; Black et al., 2013; Dettling and Kearney, 2014; Schaller, 2016; Berman et al., 2018; Kearney & Wilson, 2018; Ager et al., 2020; Kitchens & Rodgers, 2020; Zipfel, 2024; Moorthy, 2025). There is also a large literature examining the role of education (Becker & Lewis 1973; Galor and Weil, 2000; Bleakley & Lange, 2009; Aaronson et al., 2014; Okoye & Pongou, 2024), as well as more proximate causes such as access to contraceptives (Ashraf et al., 2014; Bailey, 2006; Bhattacharya & Chakraborty, 2017; Buckles & Hungerman, 2018; Dupas et al., 2024). More recent literature has emphasized the role of social norms and religion on fertility in both advanced economy settings (Murphy, 2015; Spolaore & Wacziarg, 2022; Beach & Hanlon, 2023; Blanc, 2024;) and in developing countries (Munshi & Myaux, 2006; Guirkingner & Villar, 2022; Godlonton & Theoharides, 2022).

We contribute to the fertility literature by documenting the specific role of religious leaders in shifting behavior.¹ Prior work has reached mixed conclusions: in Brazil, Bassi and Rasul (2017) show that a Papal visit reduced intentions to contracept and raised conceptions nine months later (consistent with persuasion effects on unprotected sex). In contrast, Farina and Pathania (2020) find a sizable decline in abortions after Papal visits in Italy but no corresponding rise in births,

¹ Two recent papers focus on the identity of political leaders and demographic outcomes. Bhalotra et al. (2021) find that the presence of Muslim legislators reduces abortion and increases fertility in India, attributing this to the known anti-abortion preferences of Muslims. Dahl et al. (2022) show that economic optimism led to higher fertility in Republican relative to Democratic districts following the election of Donald Trump.

implying an increase in contraception.² Outside Catholic settings, Chung et al. (2024) document fertility increases following the Patriarch of the Georgian Orthodox Church’s pledge to baptize higher-order births. We build on these studies in several ways. By exploiting a multi-country design that follows the same leader across heterogeneous contexts, we quantify how impacts vary by individual characteristics and visit-specific factors. We establish that the explicit content of the leader’s messages matters. Further, we show that the reinforcement of religious norms by religious leaders can influence fertility even among those behaviorally distant from Church teachings.

Second, we contribute to a broader literature on social factors and economic behavior. Prior work shows that making group identity or social norms salient affects choices in a wide range of economic domains (Akerlof & Kranton, 2000; Benjamin et al., 2016; Chen & Chen, 2011; Hungerman, 2014). Recent work on family formation has emphasized the role of cultural factors such as stigma or social comparisons and their interplay with economic incentives (Chabé-Ferret, 2019; Aizer et al., 2024; Mahler et al., 2025; Melki et al., 2024) or the role of information provision (Ashraf et al., 2022; Glennerster et al., 2022; Miller et al., 2020). We bring these strands together by studying fertility in a setting where norms are not changed, economic incentives are not directly altered, and no new information is provided, but existing religious norms become more salient following a high-profile visit by a religious leader. Several studies have also examined how media representations of fertility choices can influence fertility decisions (Jensen & Oster, 2009; Kearney & Levine, 2015; La Ferrara et al., 2012; Mello & Buccione, 2024).³ In contrast to most studies that are focused on lowering fertility, we study how social norm salience can increase fertility even when fertility is not explicitly targeted, analyze the role of specific messaging, and use individual heterogeneity to show who responds most strongly to such reinforcement.

The rest of the paper is structured as follows: Section 2 provides background information on religion and fertility in Latin America and Section 3 describes our data sources. Section 4 describes our results and Section 5 concludes.

² Couttenier et al. (2025) and Popov (2025) examine how Papal speeches and visits across countries affected non-demographic outcomes such as conflict and trade, respectively.

³ A related literature examines how messaging and persuasion affect economic behavior more generally. DellaVigna and Gentzkow (2010) review the literature on persuading voters, donors, and investors, while other reviews discuss the wider impact of mass media (DellaVigna & La Ferrara, 2015; La Ferrara, 2016).

2. Religion and Fertility in Latin America

2.1. Catholicism in Latin America

Owing to the influence of Spanish and Portuguese colonization, Latin America is a predominantly Catholic region. Even after successful independence movements in the mid-1800s, most Latin American countries signed formal *concordat* agreements to retain the official patronage of the Catholic Church. Approximately 80% of the Latin American population was baptized Catholic in 2020, a decline from 92% in 1970 (Zurlo & Johnson, 2024).

Because Latin America is already overwhelmingly Catholic, Papal visits primarily operate by reinforcing existing social norms rooted in Catholic doctrine, rather than altering the region's religious composition or generating interfaith tensions. This contrasts with other regions where the Pope's influence may work through different channels. For instance, Couttenier et al. (2025) found that Papal speeches in African countries impacted local conflict, consistent with an inter-religious effect.

2.2. Pope John Paul II

Despite the lengthy presence of the Church in the region, the first Papal visit to the South American continent took place only in 1968 when Paul VI visited Colombia. During his papacy from 1978 to 2005, Pope John Paul II made 118 trips to 102 different countries, visiting more countries than all previous Popes combined. These travels were a central feature of his pontificate and served as an important vehicle for Vatican diplomacy, helping to re-establish the Papacy (the "Holy See") as a visible and influential actor on the international stage (Barbato, 2013). Over the course of his papacy, Pope John Paul II visited nearly every country in Latin America, which he famously referred to as "the continent of hope."

A Papal visit usually begins with invitations from the bishops' conferences and the country's government, often aiming to address pertinent issues where the church's involvement could have a positive influence. For example, the visit to Colombia in 1986 followed the country's recovery from the "Armero tragedy," a volcanic eruption that resulted in several thousand deaths. Several visits were partly motivated to promote peace among ongoing internal violent conflicts. Papal visits are planned and announced months in advance, to give host countries time to prepare

and in some cases, build new infrastructure to accommodate the Pope's public appearances. Papal visits center around public speeches and masses, which are well-publicized events and extremely well attended. For example, the Pope's public mass in Trinidad and Tobago was attended by an estimated 35,000 people, and the Pope's speech upon arrival to Paraguay was attended by about 500,000 people, approximately 1/8th of the country's population (Butturini, 1985; Drosdoff, 1988).

For descriptive context of the actual content of Pope John Paul II's addresses during his Latin American visits, we analyze the texts of all his speeches from the Vatican archives using both word counts and unsupervised topic modeling. Appendix Figure A.1 displays the 100 most frequently used words across speeches, with word size proportional to frequency. As expected, the most prominent terms are general Catholic references such as "faith," "church," and "Jesus," reflecting the religious nature of these events. We then apply a latent Dirichlet allocation (LDA) topic model to the full corpus of speeches. LDA is a probabilistic text analysis method that represents each document (each individual speech) as a distribution of topics, where topics themselves are defined as distributions over words (Hansen et al., 2018). This model is unsupervised in the sense that we do not impose predefined themes or guide the algorithm towards any specific substantive dimension. Appendix Table A.1 summarizes the top ten topics estimated in the LDA model across all sixteen visits. While these include topics related to diplomacy, socioeconomic conditions, and conflict, a substantial share of the content is purely ecclesiastical in nature, such as church governance, missionary vocation, holy sacraments, and the pursuit of a religious and consecrated life.

Although altering fertility behavior was not the explicit purpose of these papal visits, Pope John Paul II was a prominent and consistent advocate of traditional Catholic teachings on family life and reproduction. Catholic doctrine permits only timed abstinence as an acceptable method of birth control, and, like many of his predecessors, Pope John Paul II regularly spoke against premarital sex, contraception, and abortion. In his 1981 encyclical *Familiaris Consortio*, he characterized modern contraception as a practice that "degrades human sexuality." During his visit to Paraguay, he explicitly warned against premarital sex, and in Trinidad and Tobago he condemned "the unspeakable crime of abortion" (see Appendix C for detailed quotes). We discuss the frequencies of fertility related terms further in Section 3.2.

2.3. Possible Effects of Papal Visits on Fertility

Latin America has experienced a dramatic decline in fertility, from an average of 5.9 births per woman in 1960 to 2.2 in 2010. For comparison, the corresponding figures for the United States were 3.6 and 1.9, respectively. Abortion in Latin America remains either illegal or severely restricted, with only a few countries having recently legalized it. The region's history of opposing sex education and the use of modern contraception directly correlates with the influence of the Catholic Church in Latin American society.

Since Papal visits emphasize Catholic Church teachings, there can be several possible changes in fertility-related behaviors if individuals are persuaded by these messages. First, a reduction in pre-marital sexual relationships would result in a decline in out-of-wedlock births. Second, individuals may be incentivized to marry rather than continue “living in sin,” potentially resulting in higher (within-marriage) birth rates. Third, contraceptive usage and abortion rates could decrease, in both married and unmarried couples, thereby increasing birth rates. Alternatively, there could be no change in births if aversion to abortion rises high enough that women increase contraception or abstinence to avoid the possibility of an abortion decision. Fourth, factors unrelated to the actual messages may be relevant, such as individuals devoting greater time towards traveling to Papal visit venues, listening to the Pope’s speeches, attending church, or engaging in other activities such as charity ventures. These alternative uses of time may result in a decline in sexual activity and therefore birth rates, particularly in the month of the visit. Finally, increased optimism generated by the Pope’s visit may increase fertility in the long run (Dahl et al., 2022; Ivanova & Balbo, 2024).

The net effect of the Pope’s visit on observed fertility is therefore ambiguous ex-ante. In our analysis, we will examine marriage decisions and out-of-wedlock conceptions as additional outcomes to shed light on possible mechanisms. Administrative data on abortion are not available, and survey responses may not be reliable since abortion was illegal in all Latin American countries during the period of our analysis. The surveys we use only ask about contraceptive usage at the time of the survey, and do not provide a time series on this.

There is also likely heterogeneity in who is more likely to respond to the papal visit. In Appendix B, we provide a simple model of social influence based on Spolaore and Wacziarg (2022) and Akerlof (1997) in which the salience of social norms influences fertility behavior. The key implication of the model is that when the cost of deviating from societal norms is increased

(say, by the Pope's visit making them more salient), women who are less likely to be adhering to Church teachings at the time of the visit are those whose behavior will respond more strongly to an increase in the salience of social norms. In other words, women who deviate from Church teaching face larger utility costs if the social or moral stigma associated with fertility control becomes more salient following a papal visit, whereas women who are already adhering to Catholic proscriptions would not be as influenced to alter their fertility behavior.⁴ Thus, we may expect to see fertility increase more for those who were more likely to be practicing some form of modern birth control, or those with lower levels of religiosity.

It is also ambiguous as to when we might expect to see the effect of a Papal visit on fertility decisions. We may see an increase in births within a couple of months after the visit, if the main mechanism is reduced abortion for conceptions that began prior to the Pope's arrival. If, instead, the main margin of behavior change is lowered contraception use, we would expect to see a rise in births over a longer time frame i.e. at least 8-9 months after the Pope's visit or even later. If the visit results in changing attitudes towards higher marriage and more fertility within marriage, we expect positive fertility effects over an even longer time frame. Finally, since the Pope's visit is announced several months prior, the Catholic church's teachings may be amplified by bishops or pastors even prior to the actual visit, so that the social norm salience may increase in anticipation of the visit. In our data analysis, therefore, we examine both short-term and long-term effects, and we also consider the possibility of anticipatory effects prior to the arrival of the Pope.

3. Data Sources and Empirical Strategy

3.1. Data on Fertility

We use data from the Demographic and Health Surveys (DHS), which are nationally representative household surveys funded by the U.S. Agency for International Development (USAID) and conducted in over 90 countries since the mid-1980s. We identify 13 Latin American countries that were visited by Pope John Paul II, which also have DHS surveys conducted after the Pope's visit: Bolivia, Brazil, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Mexico, Nicaragua, Paraguay, Peru, and Trinidad & Tobago (see map in

⁴ This prediction aligns with classic evidence from social psychology showing that increases in the salience of group norms can induce conformity, particularly among individuals whose prior behavior deviates from those norms (Sherif, 1936; Asch, 1951).

Appendix Figure A.2). Three of these countries were visited twice by the Pope, resulting in 16 country-visit samples. Table 1 shows the dates of Papal visits and the dates of the DHS surveys we use. Several Papal visits to Latin America are excluded from our analysis, as they were not followed by a DHS survey.⁵

The DHS surveys collect detailed information from women of child-bearing age about their fertility histories, including a retrospective questionnaire on the month and year of all births. These fertility histories enable us to construct fertility time series for each woman using a consistent survey methodology and questionnaire across countries. We create a balanced woman-month panel around the Pope's visit by retaining observations in a symmetric time window around the visit, using the gap between the DHS survey date and the Papal visit date as the window length. For instance, when we use Colombia's 1990 DHS to examine the effect of the July 1986 Papal visit, we retain months from July 1982 through July 1990.

The countries included in our analysis vary considerably across many dimensions, including education and economic status. For instance, less than 10% of Nicaragua's population had a car at the time of the Pope's visit, compared to 26% in Brazil and 54% in Trinidad and Tobago (Appendix Table A.2).

3.2. Data on Papal Visits and Messages

The website of the Vatican provides the dates of Papal visits and the full content of every speech delivered by Pope John Paul II. The length of these visits varied across countries. For instance, the Pope spoke more than 56,000 words in 36 speeches during his visit to Colombia in 1986, compared to less than 3,000 words in three speeches during the visit to Trinidad & Tobago in 1985. We searched the content of these speeches for several keywords related to the potential mechanisms discussed in Section 2.3 (premarital sex, marriage, abortion, contraception). The frequency of these terms varied considerably across different visits. Abortion, contraception or sterilization were explicitly mentioned in six visits (Table 1, column 7), marriage was mentioned in 11 countries (column 8), and pre-marital sex in five (column 9), all with differing per-speech intensities.

⁵ The visits excluded from the analysis are the visits to Argentina (1982 and 1987), Brazil (1997), Chile (1987), Costa Rica (1983), Mexico (1990, 1993, 1999), Uruguay (1987 and 1988), and Venezuela (1985 and 1996). These countries either conducted their own national surveys or had set up detailed administrative data systems to track demographic and health outcomes. Such administrative data may not be available in comparable formats across countries, unlike the standardized questionnaires and methodology of the DHS.

3.3. Outcomes

Our main fertility outcome is a dummy for whether the woman conceives in a specific month. We compute the date of conception as nine months prior to the month and year of birth recorded in the DHS. Note that there could be measurement error in this dependent variable if respondents do not recall the birth month accurately, if the birth was premature, or if the pregnancy extended significantly beyond the usual length. We are also not able to track conceptions that ended prior to birth, e.g., through abortion or miscarriage. We drop the nine months following a conception, since the risk of further conception is zero, and we drop sterilized women from the month they report being sterilized. Women re-enter the panel following a birth due to the possibility of a subsequent birth. The average probability of conception in a given month varies considerably across countries, from 0.85 percent in Trinidad and Tobago to 2.07 percent in Guatemala (Appendix Table A.2).

Since the Pope’s messages can cause behavior change along several dimensions, we also analyze marriage and premarital sex as supplementary outcomes. The DHS only records the date of first marriage, so that we can examine whether Papal messages result in higher rates of first marriage. Women exit the panel following their first marriage. Our proxy for premarital sex is the occurrence of an out-of-wedlock conception, defined as a conception prior to the date of first marriage.⁶ Note that out-of-wedlock births account for only 1-8% of all conceptions in our data (Appendix Table A.2). As mentioned earlier, the surveys we use only ask about contraceptive usage at the time of the survey.

3.4. Linear Probability Model (LPM)

To examine the effect of the visit on the probability of conception, we pool all the country level datasets together and estimate the following linear probability model (LPM):

$$(1) \quad \text{Conceive}_{icmy} = \alpha_i + \tau_m + \delta_y + \beta_1 \text{PapalVisit}_{cmy} + \mathbf{X}_{icmy}'\gamma + e_{icmy}$$

In equation (1), Conceive_{icmy} is a dummy that equals one if woman i conceived in month m of year y . α_i , τ_m , and δ_y represent fixed effects for each woman, month, and year respectively. These

⁶ Since the DHS does not record dates of second or subsequent marriages, it is possible that we underestimate the rate of overall marriage and out-of-wedlock conceptions, such as those that occur after the dissolution of a first marriage. This is unlikely to be very high since only 3.4% of respondents are divorced or widowed at the time of the surveys.

capture the effects of any time-invariant characteristics of the woman (such as education, religion, or rural residence), seasonal effects on conception, and any macroeconomic factors that affect all women in that year. Note that the individual fixed effects subsume country fixed effects. X_{imy} is a vector of time- and woman-varying controls such as age and age-squared. Standard errors are clustered for each woman i to account for serially correlated shocks for each individual.

$PapalVisit_{cmy}$ is our main variable of interest, which we define in two ways to capture different possible effects of the Pope’s visit that may vary across short versus longer time frames. For instance, temporary distractions or travel during the month of the Pope’s visit may result in lower fertility in that month, but this may reverse in the longer term as this disruption ceases. Conversely, if temporary religious fervor leads to greater compliance with the non-contraception stance of the Catholic church, this may dissipate in the longer term. To estimate any immediate effects of the visit, we define $PapalVisit$ as a dummy that equals one for the month and year in which the Pope visited. In this case, β_l , the coefficient of interest, captures whether the probability of conception is significantly different in the month of the Pope’s visit, compared to the same month in other years.⁷

To capture longer term effects, we define it as an indicator equal to one for all months following the visit, excluding the actual visit month. For this specification, β_l estimates whether women systematically increase or decrease fertility after the visit compared to before, controlling for age and age-squared, seasonality (via month fixed effects τ_m), and year effects. Comparing the magnitude of the immediate and long-run estimates would capture any retiming of fertility in response to Papal visits. For example, if women have children earlier than they would have absent the visit, but do not increase their overall level of fertility, then we would see a positive coefficient for the immediate effect, followed by a negative coefficient for the long-term coefficient. We also run an “event-study” specification where we replace the $PapalVisit_{cmy}$ dummy with a vector of indicators for 12 months prior and 12 months following the visit. This allows us to examine if there were any pre-trends in fertility or dynamic effects (e.g. anticipatory effects).

⁷ We also use a discrete proportional hazard model to estimate the short-term results. See Appendix D for details.

3.5. Mechanisms and Heterogeneous Effects

We also examine heterogeneous effects across different visits, countries, and individuals to shed light on the mechanisms by which the Papal visit may influence fertility. To do so, we run the following interacted regression specification:

$$(2) \quad \text{Conceive}_{icmy} = \alpha_i + \tau_m + \delta_y + \beta_1 \text{PapalVisit}_{cmy} + \beta_2 \text{PapalVisit}_{cmy} * A_{ic} + \mathbf{X}_{icmy}'\gamma + e_{icmy}$$

where Conceive_{icmy} represents the conception dummy for woman i of country c in month m of year y . β_1 represents the impact of the Papal visit on conception for individuals or countries without characteristic A_{ic} , while β_2 represents the additional effect for those with characteristic A_{ic} . A_{ic} could be either binary or continuous. Note that the individual fixed effects absorb the main effect of A_{ic} .

4. Fertility Effects of Papal Visits

4.1. Preliminary Country by Country Analysis

Before proceeding to the main results, we first explore whether there is any variation in the effects by country. To do so, estimate both the immediate and long run versions of equation (1) for each country individually.⁸ Figure 1 shows both estimated coefficients for each country. Across visits, immediate effects on conceptions are mostly negative or null. Only four countries show small, statistically insignificant increases in the month of the visit, while four, El Salvador (1983), Haiti (1983), Ecuador (1985), and Nicaragua (1996), show significant declines.⁹ In contrast, the long-run effects are primarily positive: 15 of 16 country-visits (the exception is Peru 1985) exhibit statistically significant increases in fertility in the years after a Papal visit, averaging 0.42 percentage points. Even the countries with short-run declines flip to positive and significant long-run effects, suggesting that the immediate declines in fertility were only temporary. The estimated magnitudes range from 0.13 percentage points (Nicaragua 1983) to 0.86 percentage points (El Salvador 1983).¹⁰ We perform a back-of-the-envelope calculation to quantify the magnitude of

⁸ For the country-specific long run effects, PapalVisit_{my} is collinear with the month and year fixed effects, so we instead control for a linear time trend.

⁹ If we instead use a discrete proportional hazard model to estimate equation (1), the country level coefficients that are highly correlated (0.97) with the LPM estimates presented in Figure 1 (see Appendix D for details).

¹⁰ Re-estimating the longer run effects using a uniform two-year window for all country-visits, we find that, for Bolivia, Ecuador, El Salvador, Paraguay, and Trinidad and Tobago, the two-year effects capture more than half of

these estimates. For each country, we take the number of births prior to the visit from the United Nations Population Division database and multiply these by their respective country specific coefficient to obtain the implied increase in births following the visit.¹¹ Adding these country specific numbers together implies approximately 251,000 additional births in the years after the Papal visit. This represents a 0.4% increase over the total number of pre-visit births.

4.2. Main Results

Table 2 presents the estimated coefficients from (1). The reported coefficients and standard errors are multiplied by 100 and therefore represent percentage point changes in the probability of conception. Columns 1 and 2 present the immediate and long-run effects, respectively. While there is a positively signed but statistically insignificant effect in the month of the visit, there is a statistically significant .075 percentage point increase in the probability of conception in the month following the visit, constituting 5% of the mean conception probability in the sample. Given the smaller and statistically insignificant immediate effects, we focus our analysis on the longer run effect in the remainder of the paper.

We next examine whether there are any anticipatory effects by estimating a version of equation (1) where we replace the main *PapalVisit* variable with a vector of indicators for the 12 months following and preceding the Papal visit.¹² Appendix Figure A.3 shows that there is no systematic trend in the probability of conception before the Papal visit, and the probability of conception begins an increasing trajectory in the months following, becoming statistically significant 6-8 months after the Papal visit. These further suggest that we are not capturing effects from economic changes or disruptions arising as countries prepared for the Pope's visit in the months leading into the visit.

We verify that our estimated coefficients are not driven by potential confounding factors that affect both the occurrence of a Papal visit and fertility. While the goal of the Papal visits was not to alter fertility behavior, it could be the case that the Pope visited countries based on factors correlated with fertility trends prior to the visit. Our estimated coefficient increases in magnitude

the overall post-visit fertility effect, while the two-year effects are much closer to the small or negative immediate effects for the other countries (Appendix Figure A.4)

¹¹ We limit the number of years before the visit to the number of years we have in our sample for each country.

¹² We omit the indicator for 13 months prior, making each estimate a comparison of the probability of conception in each month relative to that of 13 months before the visit. We group all time periods greater than 13 as one indicator and do the same for months less than 13.

when we control for differential trends by the pre-visit change in the country-level total fertility rate (Table 2, column 3) or when we control for the share of Catholics in 1970 taken from the World Christian Database (Zurlo & Johnson, 2024) prior to any visit with a linear time trend, allowing for differential fertility trajectories by how strongly Catholic the country was (column 4). Our results are also robust to controlling for each country’s contemporaneous GDP per capita as well as the trade share of GDP (columns 5 and 6).¹³ In Column (7), we control for an indicator for whether there was an ongoing armed conflict in a given month-year, as reported by Uppsala Conflict Data Program, as some visits explicitly sought to promote peace. The coefficient remains positive and modestly larger, consistent with conflict being positively correlated with visit timing but negatively correlated with fertility.

Finally, Column (8) includes all these controls simultaneously. The estimated effect of the Papal visit on the probability of conception rises to 0.098 percentage points, compared to 0.075 in the baseline. Overall, these checks indicate that if anything, omitted factors related to economic conditions, religiosity, or conflict would bias our estimates downward. For this reason, we treat the specification in Column (2) as our preferred and more conservative estimate of the fertility effect of Papal visits.

4.3. Exposure to the Visit

We now examine whether the fertility effects vary with exposure to the Pope’s messages. We construct two proxies of such exposure: whether the household has a radio or TV, and whether the Pope visited the subnational region where the household lives.¹⁴ We use these proxies as A_{ic} in equation (2). Table 3 reports the results of the regression, again with estimated coefficients and standard errors multiplied by 100. We find that while the Papal visit has a statistically significant 0.04 percentage point increase in the fertility of those who do not live in the subnational regions where the Pope visited, the effect is larger for those that do. In these regions, conception probability rises by 0.11 percentage points in the long term ($\beta_1 + \beta_2$ coefficients). In contrast, the fertility impact does not vary across households that have a TV or a radio and those that do not, with both

¹³ Using a global sample, Popov (2025) shows while the timing of Papal visits was unrelated to prior trade patterns, and the visits subsequently increase exports from highly Catholic countries to non-Catholic trading partners. Increased trade can influence fertility through income or opportunity-cost effects (e.g. Do et al., 2015).

¹⁴The DHS records the *de facto* region of residence where the respondent was interviewed. The level of granularity varied by country, from two regions in Trinidad and Tobago to 17 in Nicaragua. Across all countries, 43% of women lived in a region that contained a city where the Pope visited.

groups showing significant fertility increases in the longer term. The contrast suggests that personal or social factors are more likely to drive the increased salience of norms rather than impersonal messaging.

4.4. Does the Message Matter?

We next investigate how the fertility responses change when the Pope speaks about fertility-related topics. We expect Papal mentions of fertility-related topics such as marriages, pre-marital sexual relationships, abortions and contraception usage to nudge individual behavior towards the social norms endorsed by the Catholic church i.e. towards more marriage and higher (within-marriage) fertility, lower premarital sex (and hence lower fertility), and lower use of abortion or contraception (and hence higher fertility), respectively. We report estimates of equation (2) in Table 4 where we interact the Papal visit indicator with the mentions of each topic per speech. The reported coefficients and standard errors are multiplied by 100.

We find that the patterns of fertility change are strongly correlated with the specific content of the Pope's speeches. There is a statistically significant and economically large increase in long term fertility when the Pope explicitly mentions marriage in his speeches. If the Pope included an additional mention of marriage in every speech, there would be a 0.94 percentage point (β_2 in column 1, t-statistic =18) increase in the probability of conception in the long term (Table 4, column 1). This is consistent with the idea that marriages may not happen immediately. Note that one additional mention of marriage is equivalent to quadrupling the Pope's emphasis on marriage, since the average of marriage mentions per speech is 0.24 (Table 1). Therefore, doubling the emphasis on marriage would result in long term increases of 0.47 percentage points in the probability of conception (33% of the mean).

We can also directly observe the impact on marital formation: one additional mention of marriage per speech increases the probability of marriage by 0.535 percentage points in the long term (Appendix Table A.3, column 2; t-statistic = 5.8). Doubling the emphasis on marriage would result in a 0.27 percentage point increase in the probability of marriage (27% of the mean). This suggests that explicit mentions of marriage increase marital formation and fertility in the long run.

We next examine whether there are any changes in premarital sex. If the Pope were to include an additional mention of pre-marital sex in each speech, this would result in a 0.53 percentage point decline in long term fertility (t-statistic = -4.3), suggesting that people engage

less in premarital sex (β_2 from Table 4, column 2).¹⁵ Interestingly, this is more likely because people are waiting to get married: we find that each additional Papal mention of premarital sex increases the probability of marriage by a statistically significant 0.61 percentage points and decreases the probability of an out-of-wedlock conception by a statistically significant 0.08 percentage points (Appendix Table A.3, columns 3 and 7). Mentions of marriages lead to a statistically insignificant but negatively signed effect on such births over the longer term (Appendix Table A.3, column 6). The overall positive effect of Papal visits on out-of-wedlock births is likely due to decrease in the probability of aborting such conceptions.

Since the Pope was an outspoken critic of both contraception and abortion, his visits may result in a decline in such actions, leading to an increase in fertility. We find that that this is indeed the case: each additional mention of abortions/contraceptives increases the probability of conception by 0.71 percentage points in long run (Table 4, column 3; t-statistic = 8.3). Since the average mentions per speech is only 0.08, a doubling of emphasis ($0.16 * \beta_2$) would result in an increased conception probability of 0.11 percentage points in the long term, representing an 8% increase relative to the outcome mean. Further, mentions of abortion increase marriages and have a positively signed but insignificant effect on out-of-wedlock fertility (Appendix Table A.3, columns 4 and 8).

4.3. Who Responds More to Papal Visits?

Our framework of social norms suggests that fertility behavior will change more among those who are least likely to be following Church teachings regarding fertility at the time of the visit. Based on intrinsic costs and benefits, we posit that more educated and wealthier women, who have a higher opportunity cost of time, are more likely to limit fertility by adopting practices such as contraception.¹⁶ We find that Papal visits had significantly larger long run effects on the fertility of women who were more educated or richer. Each additional year of education increases the probability of conceptions following the visit by 0.042 percentage points (Table 5, column 1). For poorer households, proxied by those without having a car, there is a statistically significant 0.09

¹⁵ Note that this is rarely mentioned in Papal speeches: one additional mention per speech represents a 20-fold increase in emphasis.

¹⁶ Our cross-sectional analysis shows that such individuals are indeed more likely to be using contraception: five additional years of education increases the probability of using contraception by 3 percentage points, and having a car (our proxy for wealth) increases it by 4 percentage points.

percentage point increase in conception probability following the visit, but their richer counterparts show a 0.25 percentage point increase ($\beta_1 + \beta_2$ from column 2). Note that this pattern works against other channels such as the Pope's visit bringing an end to conflict or resulting in greater poverty reduction or charitable giving which would presumably affect the poor more.

Consistent with the idea that Papal visits encourage within-marriage fertility, we find that most of the long-term fertility increase occurs on the “extensive” margin i.e. by changing the choice to have a first child. Women who had no children prior to the Papal visit experience a 1.7 percentage point increase in longer-term conception probability (Table 5, column 3). For women who already had one child prior to the Papal visit, the long run effect is an insignificant 0.09 percentage points. This is consistent with the idea that childless women are the most likely to be perceived as being inconsistent with Catholic fertility norms.¹⁷

5. Conclusions and Future Research

With fertility declining across almost every country in the world, economists have turned to other determinants besides traditional economic factors to understand these trends. In this paper, we explore one such factor: social norms. Specifically, we examine how fertility responds to an increase in the salience of Catholic religious' norms by exploiting the visits and speeches of Pope John Paul II across the Latin American continent. We find that the papal visits result in large and statistically significant increases in conception probability over the long term (more than two years). We find bigger fertility increases after visits where the Pope emphasizes marriage or contraception but declines with mentions of pre-marital sex. Mentions of all three led to increases in the probability of marriage, suggesting marital formation as an important channel in driving births. Consistent with this, increases in fertility are concentrated along the extensive margin (first births). Further, the increase in the salience of social norms have stronger impacts on individuals who are less likely to be following Church teachings at the time of the visit, such as richer and more educated women.

Overall, our results demonstrate the key role that social norms play in driving fertility behavior. This has several implications for how the changing religious landscape has contributed

¹⁷ We combine the estimated impact on childless women with nationwide data on the number of women aged 15-49 in the year before the Papal visit (obtained from the United Nations Population Division) and the share of women that are childless (from the DHS). This yields an estimate of 221,880 additional first births in the years following the Papal visit.

to the recent trend of declining fertility. Future work in this direction can include analyzing the effects of other changes in social norms such as increased secularization or changing religious denominations and contrasting these with the effects of government policies and economic incentives.

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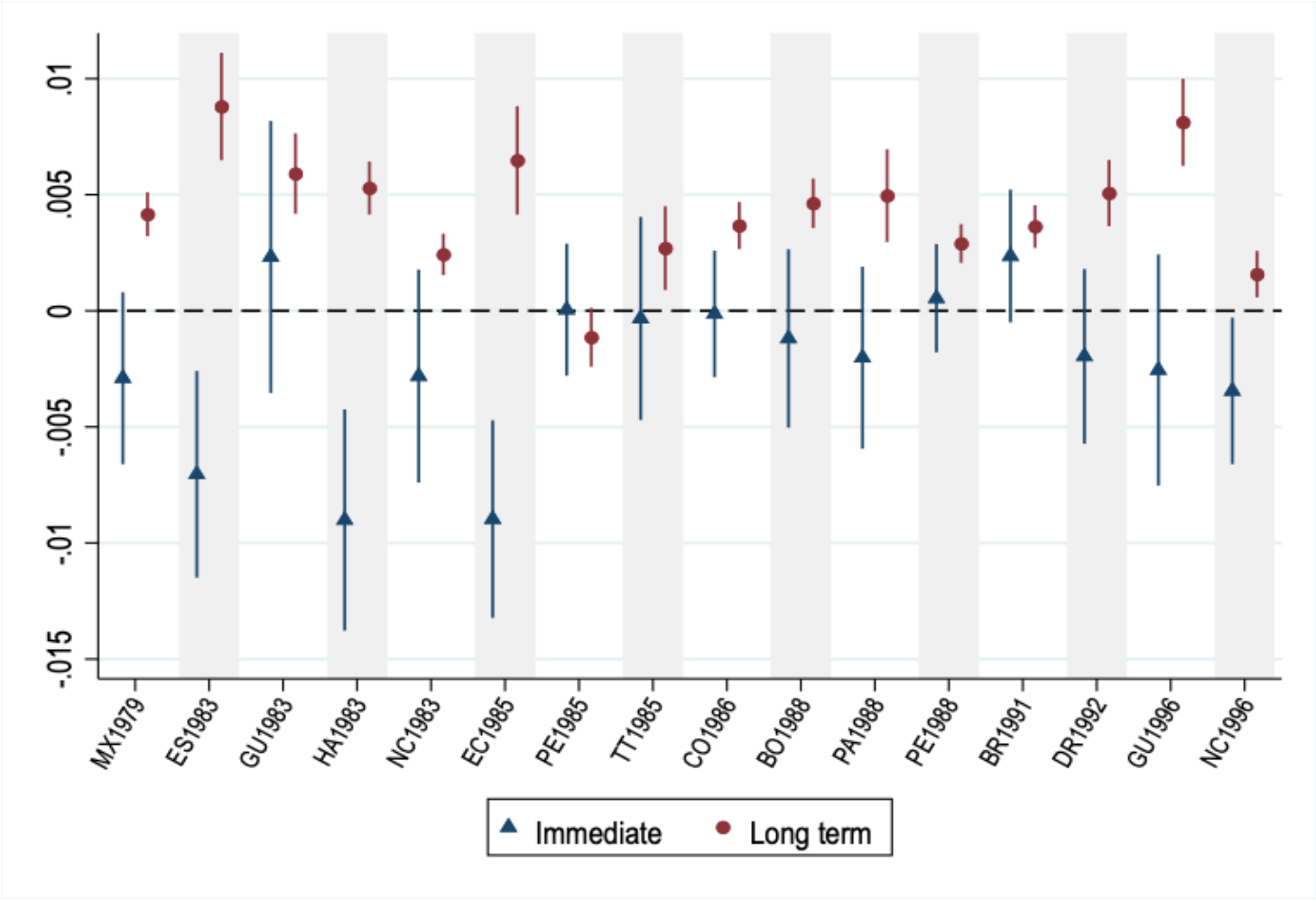
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Figure 1. Fertility impact of Papal visits



Notes: Figure shows the linear probability model (LPM) coefficients for the immediate and long term effects of Papal visits. The markers represent the coefficient estimates and the lines represent 95% confidence intervals. The dependent variable equals one if conception occurred in that month. Countries are ordered by the date of the visit.

Table 1. Pope John Paul II's visits to Latin America

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Country	Date of Pope visit	Visit code	DHS wave used	# speeches	# words spoken	Mentions of abortion, contraception or sterilization per speech	Mentions of marriage per speech	Mentions of premarital sex per speech	
Bolivia	May	1988	BO1988	1994	21	43166	0.190	0.524	0.190
Brazil	October	1991	BR1991	1996	32	48040	0.313	0.469	0.031
Colombia	July	1986	CO1986	1990	36	56934	0.000	0.306	0.056
Dominican Republic	October	1992	DR1992	1996	16	27701	0.250	0.313	0.000
Ecuador	January	1985	EC1985	1987	16	26687	0.000	0.250	0.125
El salvador	March	1983	ES1983	1985	5	4874	0.000	0.000	0.000
Guatemala	March	1983	GU1983	1987	7	8693	0.000	0.000	0.000
Guatemala	February	1996	GU1996	1998	5	4953	0.000	0.000	0.000
Haiti	March	1983	HA1983	1994	4	6403	0.000	0.250	0.000
Mexico	January	1979	MX1979	1987	26	32664	0.038	0.115	0.000
Nicaragua	March	1983	NC1983	1997-98	5	5316	0.000	0.000	0.000
Nicaragua	February	1996	NC1996	2001	4	3975	0.000	0.500	0.000
Paraguay	May	1988	PA1988	1990	13	30743	0.000	0.462	0.000
Peru	February	1985	PE1985	1991-92	15	28792	0.133	0.467	0.000
Peru	May	1988	PE1988	1991-92	13	21200	0.000	0.154	0.000
Trinidad and Tobago	February	1985	TT1985	1987	3	2826	0.333	0.000	0.333

Notes: Data includes speeches, masses, or prayers by John Paul II during the visits to these countries. Counting was done from the original speech in Spanish, except for Haiti and Trinidad & Tobago, where English-language speeches were used. Source: <https://www.vatican.va/content/john-paul-ii/es.html>

Table 2. Effect of Papal Visits on Fertility

	Controlling for							
	Immediate	Long term	TFR change before Papal visit * time trend	Pre-existing Catholic share * time trend	GDP per capita	Trade share of GDP	Conflict	All controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Papal visit	0.0254 (0.0426)	0.0753*** (0.0125)	0.113*** (0.0129)	0.0848*** (0.0125)	0.0778*** (0.0127)	0.103*** (0.0133)	0.0807*** (0.0127)	0.0981*** (0.0143)
Observations	10,481,928	10,481,928	10,481,928	10,481,928	10,481,928	9901713	10,481,928	9,901,713
# Women	133011	133011	133011	133011	133011	129273	133011	129273
R-squared	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. The dependent variable equals one if conception occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects. "Papal visit" equals one for the month of the visit when estimating the immediate effect, and equals one for all post-visit months for the long term effect. Note that the lower number of observations in Columns (5) and (8) reflect the fact that data on trade share of GDP is missing for Trinidad and Tobago.

Table 3. How does the fertility impact vary with exposure to Papal speeches?

	Pope visited local region	Have TV or radio
	(1)	(2)
Papal visit (PV)	0.0411*** (0.0156)	0.125*** (0.0307)
PV*Area visited by Pope	0.0685*** (0.0179)	
PV*Has TV or radio		-0.0266 (0.0301)
Observations	10,481,928	9,408,966
# Women	133011	123263
R-squared	0.022	0.022

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Each column shows the results from the heterogeneous effects specification (2). The dependent variable equals one if conception occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects. "Papal visit" is an indicator equal to one for all post-visit months. The "have TV or radio" variable is missing for the Mexico DHS survey of 1987.

Table 4. How does the fertility impact vary with the content of Papal speeches?

	Mentions of marriage per speech	Mentions of premarital sex per speech	Mentions of abortion or contraception per speech
	(1)	(2)	(3)
Papal visit (PV)	-0.211*** (0.0202)	0.0952*** (0.0133)	0.000416 (0.0156)
PV*Mentions of marriage per speech	0.939*** (0.0523)		
PV*Mentions of premarital sex		-0.527*** (0.120)	
PV*Mentions of abortion or contraception			0.709*** (0.0854)
Observations	10,481,928	10,481,928	10,481,928
# Women	133011	133011	133011
R-squared	0.022	0.022	0.022

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Each column shows the results from the heterogeneous effects specification (2). The dependent variable equals one if conception occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects. "Papal visit" equals one for all post-visit months.

Table 5. How does the fertility impact vary by individual characteristics?

	<u>Years of education</u>	<u>Economic status</u>	<u>Birth parity</u>
	(1)	(2)	(3)
Papal visit (PV)	-0.204*** (0.0185)	0.0862*** (0.0145)	1.171*** (0.0144)
PV*Years of education	0.0416*** (0.00179)		
PV*Has car		0.161*** (0.0230)	
PV*One child before Pope visit			-1.077*** (0.0231)
PV*Two or more children before Pope visit			-2.034*** (0.0189)
Observations	10,460,504	8,604,970	10,481,928
# Women	132607	115156	133011
R-squared	0.022	0.023	0.023

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Each column shows the results from the heterogeneous effects specification (2). The dependent variable equals one if conception occurred in that month. Differences in the number of observations reflect data availability for relevant questions in the DHS surveys. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects.

Social Norm Salience and Fertility: Evidence from Papal Visits

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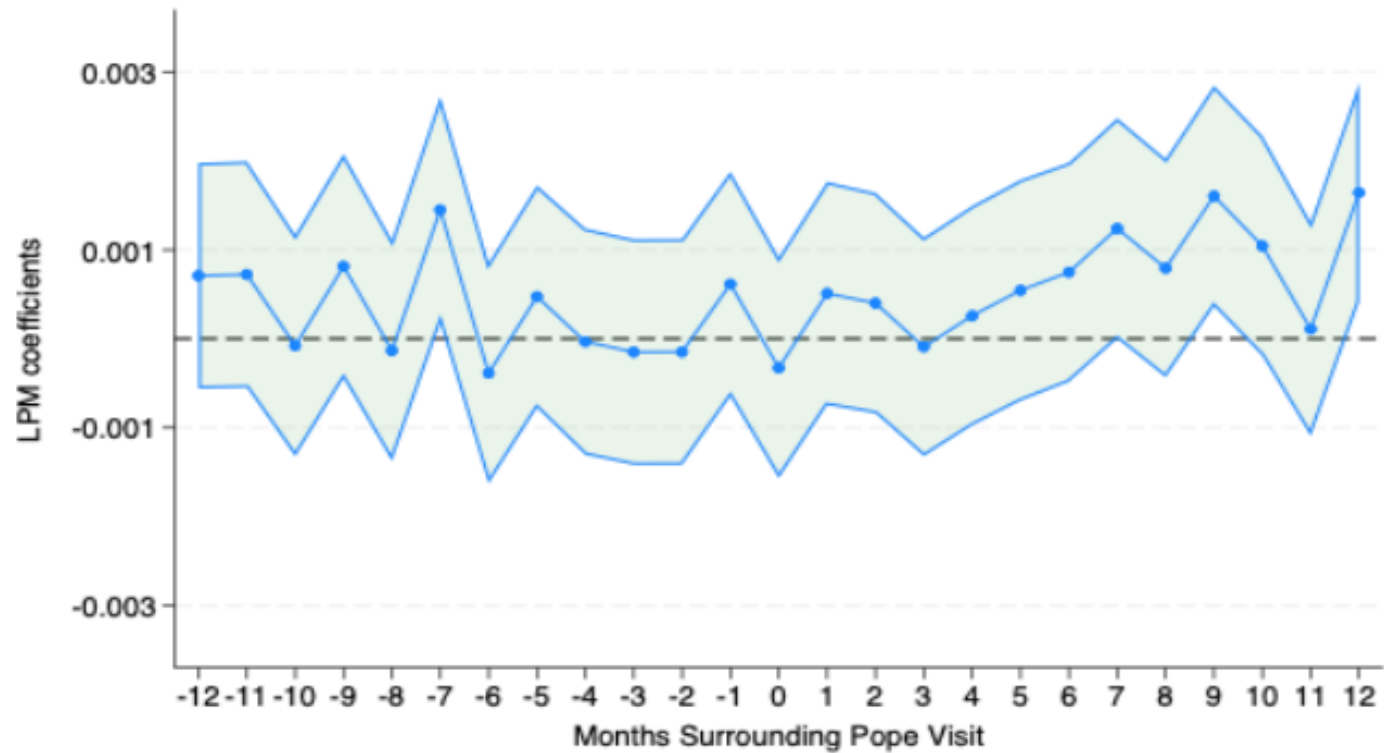
Appendix A: Additional Figures and Tables

Figure A.2. Map of Latin America



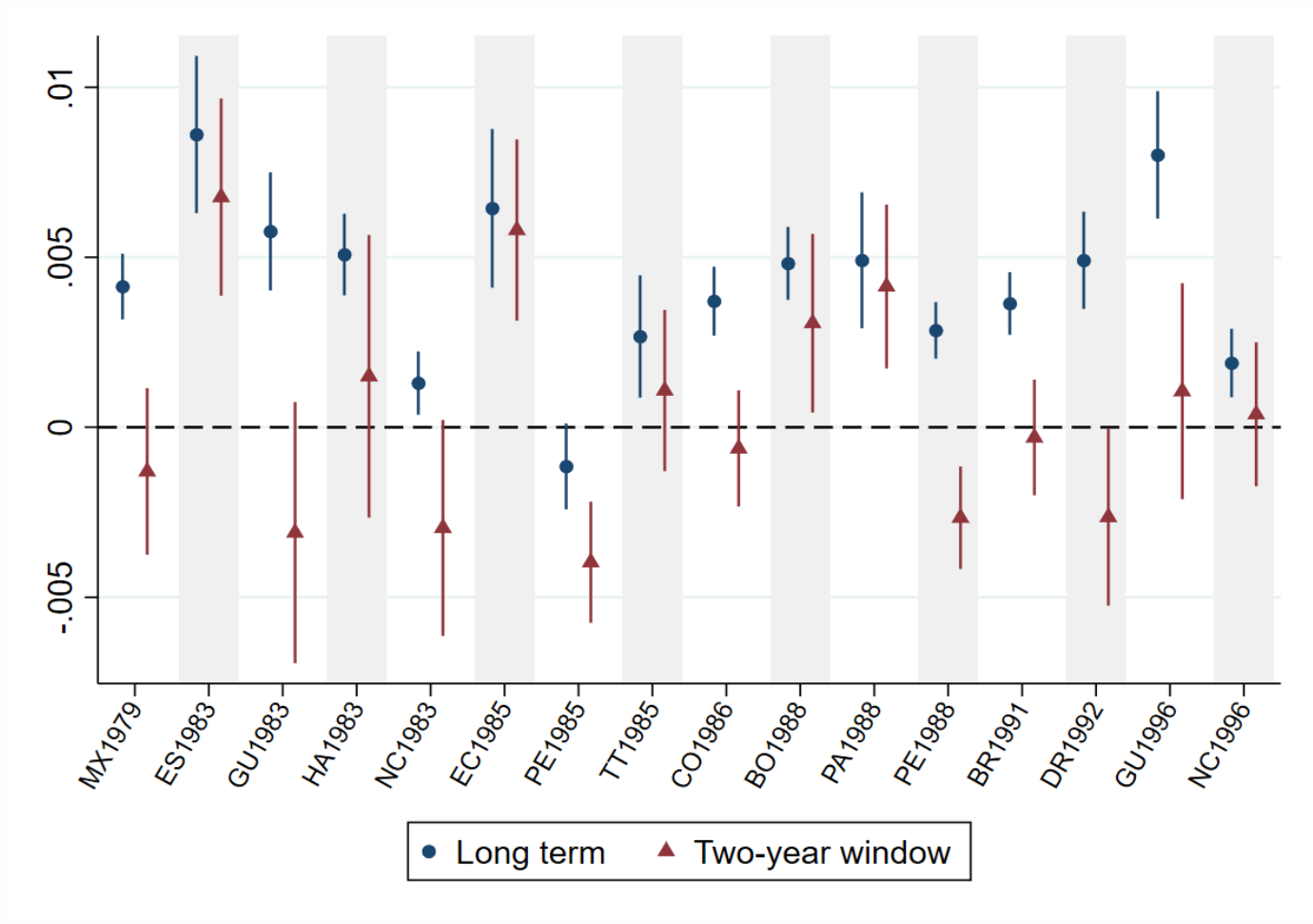
Notes: Shaded countries are those included in our analysis.

Figure A.3. Dynamic effects of Papal visits on fertility outcomes



Notes: The dots represent the coefficient estimates and the shaded areas represent 95% confidence intervals. The x-axis shows months since the Pope's visit (0 indicates the month of the visit, +1 the month after, -1 the month before and so on), and the y-axis shows the additional probability of conception in that month controlling for year and month fixed effects. The regression is based on specification (1), where we pool data from all the countries in our sample, and replace the pope visit indicator with indicators for 12 lags and leads surrounding the papal visit. The indicator for 13 months prior is omitted, making each coefficient a comparison of the probability of conception in a given month surrounding the visit and the probability 13 months prior to the visit. We bin 13 months before and onwards and 13 months after and onwards into their own separate indicators.

Figure A.4. Comparing long term fertility effects to two-year effects



Notes: Figure shows the coefficients for the long term and two-year effects of Papal visits, using the linear probability models of equation (1). The markers represent the coefficient estimates and the lines represent 95% confidence intervals. The dependent variable equals one if conception occurred in that month. Countries are ordered by the date of the visit.

Table A.1. Main themes across all Papal speeches in Latin American visits

Topic ID	Topic Theme	Top Words (Stems)
T0	Latin American identity/Continental unity	fidel, amer, latinoamerican, anos, aquell, continent, dia, voz, catol, latin, conferent, misterri, vec, acept, cultur
T1	Youth and missionary vocation	misioner, joven, san, alegri, ibid, dic, nin, oracion, frut, alab, anos, pedr, discipul, amig,
T2	Evangelization and salvation	san, cultur, cruz, salvacion, misioner, jesucrist, muert, imag, ciud, dej, anos, nombr, anunci, conoc, ibid
T3	International relations and social justice	president, internacional, respet, derech, diplomat, dignid, desarroll, solidar, autor, episcop, continent, esfuerz, problem, nacional, fratern
T4	Socioeconomic issues and conflict	cultur, joven, derech, laic, violenci, econom, polit, respons, dignid, activ, problem, condicion, cultural, necesari, bienaventur
T5	Poverty and human dignity	pobr, dignid, necesit, educ, obras, situacion, libert, ensen, derech, elev, pobrez, pan, necesari, pon, afect
T6	Youth formation and moral development	joven, mandamient, derech, san, desarroll, jov, dialog, respons, invit, imag, divin, dignid, personal, juventud, ano
T7	Priestly and consecrated Life	vocacion, consagr, pastoral, comunion, eclesial, sacrament, sacerdotal, pobr, ensen, camp, carid, sign, entreg, oracion, evangel
T8	Devotion and sacraments	misterri, nin, santuari, muert, rein, san, marian, ciel, presenci, pec, eucaristi, santisim, dic, peregrin, anunci
T9	Latin American church governance	amer, cultur, latin, pastoral, univers, continent, catol, latinoamerican, pues, conferent, desarroll, moral, jesucrist, histori, episcop

Notes: This table presents the ten highest-probability stems associated with each latent Dirichlet allocation (LDA) topic, estimated from the full corpus of papal speeches delivered across Latin America. These speeches are published in multiple languages: primarily Spanish, but also Portuguese (Brazil), French/Portuguese (Haiti), and English (Trinidad and Tobago). We translated all non-Spanish speeches into Spanish using DeepL to create a single corpus. Words appear in stemmed Spanish form, following preprocessing (lowercasing, accent removal, tokenization, stopword removal, stemming). Topic labels were assigned ex post by the authors with assistance from a large language model (LLM), based on inspection of the most probable stems within each topic.

Table A.2. Summary statistics

Country	Pope visit	DHS wave used	Characteristics of DHS sample						Outcome variables (woman-month observations)			
			Has TV or Radio	Years of education	Has a car	Catholic	#children prior to Pope visit	# of Women	#observations	Conception	Out-of-wedlock birth	Marriage
Bolivia	1988	1994	0.88	6.70	-	-	2.0	8555	835,933	0.0160	0.0010	0.009
Brazil	1991	1996	0.92	6.38	0.261	0.78	1.7	11097	821,555	0.0109	0.0009	0.008
Colombia	1986	1990	0.93	7.32	0.159	-	1.5	8240	594922	0.0091	0.0007	0.007
Dominican Republic	1992	1996	0.85	7.64	0.124	-	1.9	7127	458,046	0.0147	0.0003	0.012
Ecuador	1985	1987	0.89	7.09	0.172	-	2.2	4410	187,887	0.0112	0.0005	0.008
El Salvador	1983	1985	0.83	4.73	0.107	-	0.9	4503	191011	0.0133	0.0005	0.011
Guatemala	1983	1987	0.72	3.07	0.099	-	2.0	5097	377,305	0.0207	0.0005	0.012
Guatemala	1996	1998	0.83	3.56	0.121	0.52	2.6	5697	317,581	0.0166	0.0005	0.011
Haiti	1983	1994	0.51	3.60	0.051	0.57	0.9	5353	727,692	0.0156	0.0003	0.010
Mexico	1979	1987	-	6.60	-	-	1.5	9300	1,041,025	0.0153	0.0005	0.009
Nicaragua	1983	1997-98	0.84	5.72	0.088	-	0.9	13631	1,785,038	0.0194	0.0004	0.014
Nicaragua	1996	2001	0.88	5.86	0.085	-	2.0	12421	942,648	0.0164	0.0005	0.012
Paraguay	1988	1990	0.91	6.44	0.137	0.96	2.3	5686	250,904	0.0125	0.0012	0.008
Peru	1985	1991-92	0.88	7.48	0.124	0.87	1.6	12699	670,834	0.0158	0.0008	0.009
Peru	1988	1991-92	0.88	7.46	0.128	0.87	2.0	15502	1,085,362	0.0114	0.0006	0.007
Trinidad and Tobago	1985	1987	0.98	7.84	0.541	0.27	1.8	3693	194,185	0.0085	0.0001	0.011

Table A.3. How does the content of Papal speeches affect on marriage and out-of-wedlock births?

	Dependent variable: First marriage				Dependent variable: Out-of-wedlock birth			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Papal visit (PV)	0.0404*	-0.117***	0.0211	-0.0528**	0.00890**	0.0123**	0.0118***	0.00566
	(0.0216)	(0.0335)	(0.0225)	(0.0251)	(0.00383)	(0.00584)	(0.00410)	(0.00472)
PV*Mentions of marriage per speech		0.535***				-0.0113		
		(0.0916)				(0.0156)		
PV*Mentions of premarital sex			0.607***				-0.0771**	
			(0.235)				(0.0356)	
PV*Mentions of abortion/contraception per speech				0.965***				0.0306
				(0.148)				(0.0267)
Observations	3,915,724	3,915,724	3,915,724	3,915,724	10,481,928	10,481,928	10,481,928	10,481,928
# Women	79609	79609	79609	79609	133011	133011	133011	133011
R-squared	0.056	0.056	0.056	0.056	0.016	0.016	0.016	0.016

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects.

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Appendix B: Model of Social Norms and Fertility Choice

We present a simple model based on Spolaore and Wacziarg (2022) and Akerlof (1997). Consider a household i choosing their level of fertility, n_i . Let F_n denote the maximum level of fertility that would occur with full adherence to Catholic social norms that prohibit modern birth control.¹ The household then chooses the level of fertility to maximize the following indirect utility:

$$(1) \quad V_i = b_i n_i - \frac{c_i}{2} n_i^2 - \sigma(F_n - n_i)$$

where $0 \leq n_i \leq F_n$. The first two terms capture, in the language of Akerlof (1997), the “intrinsic” benefit of fertility b_i and the opportunity cost c_i of forgone consumption from having children. These are individual specific, representing the individual’s costs and preferences. The final term captures the impact of social norms, namely, a utility cost from deviating from the prescribed societal norm. $\sigma \geq 0$, not indexed by i , captures the cost an individual incurs for choosing fertility below the culturally prescribed level. In our setting, σ is interpreted as the marginal costs from social stigma incurred from deviating from Catholic Church proscriptions of fertility control in a Catholic-majority country. This is a cost borne by anyone residing in a majority Catholic country, regardless of their religious beliefs and intrinsic valuations. We view the Papal visit as increasing this social stigma cost σ .² Thus, the utility loss associated with an increase in the salience of social norms is increasing in the size of the deviation between the optimal choice of fertility and the prescribed norm:

$$(2) \quad \frac{\partial V_i}{\partial \sigma} = -(F_n - n_i^*)$$

Maximizing (1), the demand for children is given by:

¹Generally, this could refer to any culturally prescribed level of fertility that households are expected to achieve given their social norm.

² Spolaore and Wacziarg (2022) offer two interpretations of σ , the moral/social costs from deviating from the norm, their preferred interpretation, or the costs of obtaining/learning about contraception. For instance, abortion or contraception could become difficult to access following the Papal visit from the supply side.

$$n_i^* = \min \left\{ \frac{b_i + \sigma}{c_i}, F_n \right\}$$

First, consider the subset of households would choose the socially prescribed level of fertility based on their intrinsic costs and benefits alone for all $\sigma \geq 0$, or for whom $n_i^* = F_n \leq \frac{b}{c}$. These households are inframarginal and would not alter their fertility choice in response to increases in σ . In other words, $\frac{\partial V_i}{\partial \sigma} = 0$.

On the other hand, for the subset of households for which fertility is below F_n given the current level of σ , $n_i^* = \frac{b_i + \sigma}{c_i} < F_n$. These are households that live in a society that has a particular norm over fertility choice, but their intrinsic benefit-to-cost ratio is sufficiently low that they do not chose the prescribed level of fertility given the current costs from deviating from the norm. These households are the ones who face the largest incentives to respond to changes in σ .³

Overall, this framework suggests that the fertility response to the papal visit should be stronger for those who are less likely to be adhering to Catholic norms on fertility at the time of the visit, or those whose intrinsic benefit-to-cost ratios for children are low. This can include women who are non-Catholics, or who face higher opportunity costs of their time, or women who are more likely to be using modern contraceptives at the time of the visit.

³ There are also those whose intrinsic utility would lead them to choose a level of fertility below their desired level of fertility, $\frac{b_i}{c_i} < F_n$, however the current levels of σ are such that $\frac{b_i + \sigma}{c_i} \geq F_n = n_i^*$. These households would be “switchers” in the case of lowering costs of social norms, however these households are not relevant in our setting here, where the focus is the increase in the salience of norms.

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Appendix C: Views of Pope John Paul II

We present some extracts from the speeches and writings of Pope John Paul II to illustrate his stance towards fertility-related issues such as marriage, pre-marital sex, contraception and abortion.

On marriage:

“The union between man and woman has been sanctified by Christ in the sacrament of *Matrimony*. In it, spouses are indissolubly united to form a community of life and love (cf. *Gaudium et Spes* , n. 48) and to give rise to a family. Children are born in their womb, the fruit of parental love, who fulfill God's will and thus collaborate with his creative power. This sacrament gives you the grace necessary to increase love, to remain faithful and to educate your children to be honest men and good Christians. Conscious of the dignity of marriage and the family, you must reject those modes of behavior that are contrary to the teachings of Christ and to true conjugal happiness.” (Meeting with indigenous people during visit to Paraguay, 1988)

“The reciprocal gift of the spouses, both physically and spiritually, thereby acquires its true, great, and indestructible importance—even from a human point of view—as the total commitment of man and woman for life, until death; and from this totality also arise the demands of responsible parenthood, “which, oriented towards engendering a human person, by its nature surpasses the purely biological order and touches a series of personal values, for whose harmonious growth the lasting and concordant contribution of the parents is necessary” (Ibid.). Therefore, this donation is only possible within marriage, in the community of life and love willed by God.” (Homily during visit to Ecuador, January 1985)

“The conjugal union is a covenant modeled on the communion of love between God and His people in the history of salvation, with a bond of fidelity from which its nature, strength, and indissolubility derive; moreover, it is modeled on the spousal union between Christ and His

Church, in the sacramental economy of the New Testament; so that the spouses, belonging to each other, are its true image, its eloquent ‘sign,’ its real representation... Thus, the most precious gift of children is the highest expression of this reciprocal donation, founded on the donation of God to humanity and of Christ to the Church (Familiaris Consortio, 14).” (Visit to Ecuador, January 1985)

On pre-marital sexual relations:

“In this situation, some of you may be tempted to flee from your responsibility: into the illusory worlds of alcohol and drugs, into fleeting sexual relationships without any commitment to marriage or family, into indifference, cynicism, and even violence. Be on your guard against the fraud of a world that wants to exploit or misdirect your energetic and anxious search for happiness and direction.” (“Peace and young people walk together,” Message of His Holiness John Paul II for the celebration of the 18th World Day of Peace, January 1, 1985.)

“In particular, young people should be instructed in a timely and opportune manner, preferably within the family itself, about the dignity, value, and role of conjugal love, so that, formed in the preservation of chastity, when they reach the appropriate age, they can transition from an honorable courtship to marriage’ (Ibid., 49). This formation, which should be personal, will primarily be the responsibility of parents (Congregation for Catholic Education, Educational Guidance on Human Love, nn 48 and 84).” (Speech during visit to Bolivia, May 1988)

“There lies the allure of easy and quick enrichment, through ways that are contrary to the law and Christian morality; the temptation of escape that can sink you into the alienation of drugs, alcoholism, sex, and other regrettable vices... Do you want to be faithful to Jesus and His doctrine in your personal life, in the respect for your body, and in your friendships and courtships?” (Meeting with the Youth, Homily during visit to Colombia, July 1986)

On contraception and abortion:

“When couples, by means of recourse to contraception, separate these two meanings that God the Creator has inscribed in the being of man and woman and in the dynamism of their sexual communion, they act as ‘arbiters’ of the Divine plan and they ‘manipulate’ and degrade human

sexuality - and with it themselves and their married partner - by altering its value of 'total' self-giving. Thus, the innate language that expresses the total reciprocal self-giving of husband and wife is overlaid, through contraception, by an objectively contradictory language, namely, that of not giving oneself totally to the other. This leads not only to a positive refusal to be open to life but also to a falsification of the inner truth of conjugal love, which is called upon to give itself in personal totality." (*Familiaris Consortio* encyclical, 1981)

"Families suffer from such evils as conjugal infidelity and divorce, while the very life of the unborn is snuffed out by the unspeakable crime of abortion. Always remember that respect for the sacredness of life is a guarantee of stability for the human community. No society can survive - no nation can last - unless all human life is honored and protected." (Homily during visit to Trinidad and Tobago, February 1985)

"Contraception is a falsification of conjugal love that turns the gift of participating in God's creative action into a mere convergence of petty selfishness (*Familiaris Consortio*, 30 and 32). And how can we not repeat once again in this circumstance that if obstacles cannot be placed in the way of life, even less can the unborn be eliminated with impunity, as is done with abortion?" (Homily during visit to Dominican Republic, October 1992)

"Never fall into the regrettable temptation of thinking that the solution to problems lies in the elimination of new lives through prohibited methods of birth control, or through sterilization or abortion. Do not yield to the moral blackmail of those who condition healthcare and material aid on illicit plans of birth limitation." (Visit to Bolivia, May 1988)

"The family: Make every effort to have a family pastoral care. Attend to this priority field with the certainty that evangelization in the future depends largely on the 'domestic Church.' It is the school of love, of the knowledge of God, of respect for life, for human dignity. This pastoral care is all the more important as the family is the target of many threats. Think of the campaigns favorable to divorce, the use of contraceptive practices, abortion, which destroy society." (Speech by Pope John Paul II at the third general conference of the Latin American Episcopate during his visit to Mexico, January 1979).

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Appendix D: Proportional Hazards Model

As an alternative specification, and also to check consistency with the earlier Bassi and Rasul (2017) paper, we estimate an extension of the proportional hazards framework to a discrete time setting, namely the complementary log-log hazard model. This models the hazard of woman i conceiving in month-year t , conditional on not conceiving up to then, as a function of a baseline hazard rate and covariates \mathbf{Z}_{it} as follows:

$$(D.1) \quad \text{Log}[-\log(1-t, \lambda(t-\mathbf{Z}_{it}))] = \theta_0(t) + \mathbf{Z}_{it} \beta$$

In equation (D.1), the baseline hazard $\theta_0(t)$ is the complementary log-log transformation of the baseline hazard ($=\log[-\log(1-\lambda_0(t))]$); the latter is modeled by including dummies for the number of months since the last birth. \mathbf{Z}_{it} includes a dummy variable for the month of the Pope's visit (our main variable of interest), time-invariant characteristics of the woman (education, religion, rural residence, proxies for economic status such as car ownership), time-varying characteristics of the woman (number of previous children, age and age-squared) and woman-invariant characteristics to capture seasonal or macroeconomic effects (month of birth and year of birth dummies).

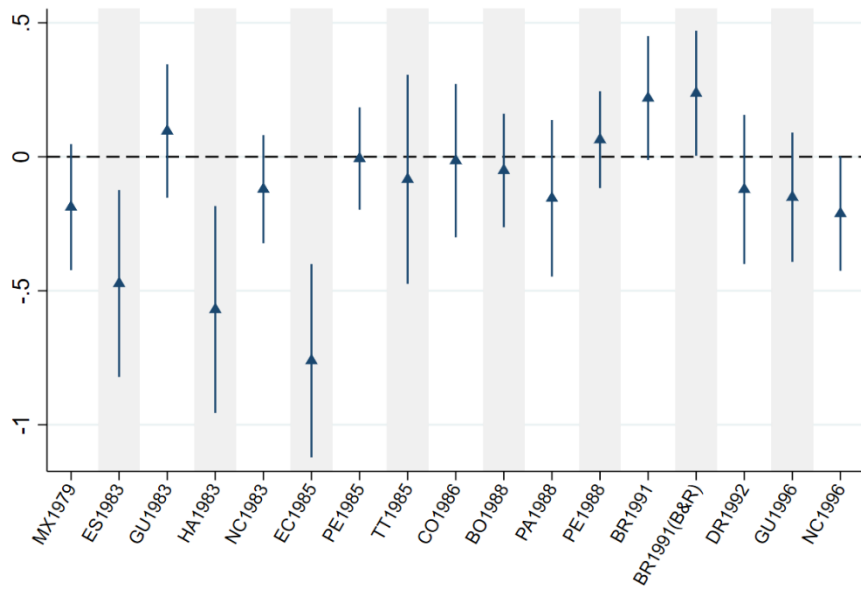
The signs and statistical significance of the hazard model estimates are very similar to immediate effects estimated by the LPM model: most of the coefficients are statistically significant, except for three negative and significant coefficients for El Salvador, Haiti and Ecuador (Appendix Figure D.1, panel A). Note that our estimated coefficient for the Brazil 1991 visit (labeled BR1991) is extremely close to the estimated coefficient in the Bassi and Rasul (2017) paper (labeled "BR1991(B&R)" in the graph), though our estimated coefficient is significant only at the 10% level.¹ Only two other country-visits show a positively-signed coefficient (Guatemala 1983 and Peru 1988), though these are not statistically significant.

¹ Due to data sharing restrictions of the DHS, actual replication data is not available for the B&R paper. We downloaded the DHS data and applied their sample restrictions and methodology and obtained very close results, however, we could not obtain the exact number of observations or the same exact regression coefficient. e.g. our coefficient is 0.216 compared to their coefficient of 0.237.

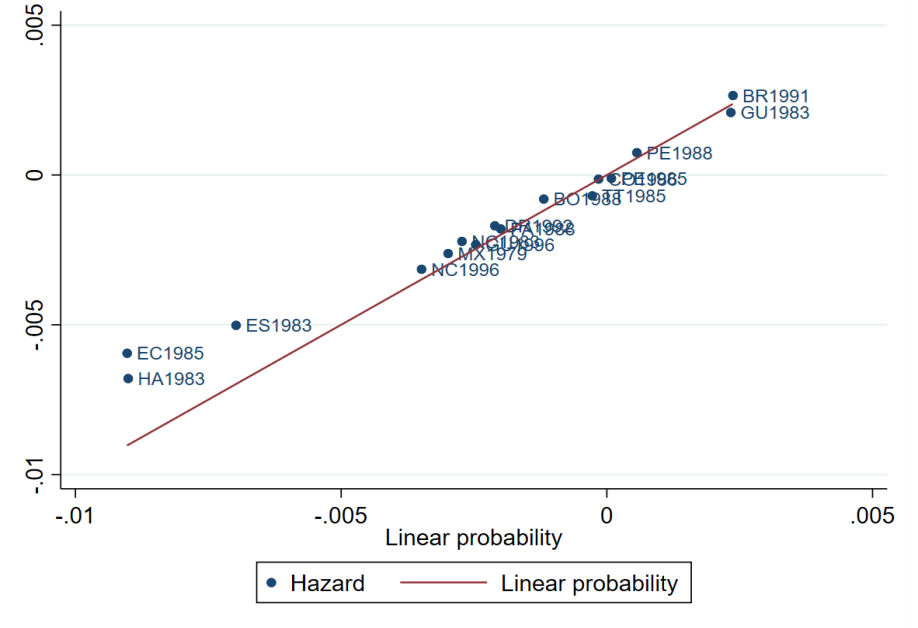
Interpreting the magnitude of the complementary log-log coefficients is similar to the interpretation of Cox proportional hazards coefficients. For instance, the hazard model coefficient of 0.216 for Brazil implies a 24% increase over the baseline hazard rate ($\exp(0.216)-1$); since the average probability of conception in any given month is 0.0108, this translates to a 0.26 percentage point increase in the conception probability during the month of the Pope's visit. This is quite close to the 0.24 percentage point increase estimated by the LPM. This closeness holds for all the countries in our sample (Appendix Figure D.1, panel B): the correlation between the estimated effect sizes from the LPM and hazard models is 0.97.

Figure D.1. Comparing the magnitudes of the hazard model and linear probability model effects

A. Hazard Model Coefficients



B. Comparison with LPM Coefficients



Notes: Figure A shows the results of estimating a discrete proportional hazard model instead of the linear probability model in (1). The dots represent the coefficient estimates and the lines represent 95% confidence intervals. BR1991(B&R) represents the estimate taken from Bassi and Rasul (2017) in Brazil. In Figure B, the x-axis graphs the change in conception probability during the month of the Pope's visit, obtained from the linear probability model (equation (1)). The y-axis graphs the increases in the probability of conception during the month of the Pope's visit, obtained from the hazard model coefficients (Figure A above). For a hazard model coefficient β , the percentage increase in the probability is obtained as $[\exp(\beta) - 1]$. This is converted to percentage points by using the average probability of conception (Appendix Table A.2).