CINCH
competence in competition + health
series

#2016/02

Damian Clarke and Hanna Mühlrad

The Impact of Abortion Legalization on Fertility and Maternal Mortality:

New Evidence from Mexico

Imprint

CINCH SERIES

CINCH – Health Economics Research Center
Weststadttürme Berliner Platz 6-8
45127 Essen

Phone +49 (0) 201 183 - 6326
Fax +49 (0) 201 183 - 3716
Email: daniel.avdic@uni-due.de
Web: www.cinch.uni-due.de

CINCH competence in competition + health series

#2016/02

Damian Clarke and Hanna Mühlrad

The Impact of Abortion Legalization on Fertility and Maternal Mortality:

New Evidence from Mexico

UNIVERSITÄT DUISBURG ESSEN Open-Minded

Bundesministerium für Bildung und Forschung

rwi

Damian Clarke[*] and Hanna Mühlrad[†]

The Impact of Abortion Legalization on Fertility and Maternal Mortality:

New Evidence from Mexico

Abstract

We examine the effect of a large-scale, free, elective abortion program implemented in Mexico City in 2007. Prior to this program, all states and districts in Mexico had very limited, or no, access to elective abortion. A localized reform in Mexico City resulted in a sharp increase in the request and use of early term elective abortions: approximately 90,000 abortions were administered by public health providers in the four years following the reform, versus only 62 in the five years preceding the reform. We provide evidence using national vital statistics data from Mexico covering over 23 million births and over 11,000 cases of maternal deaths. Our difference-in-difference estimates suggest that this program resulted in a reduction in births by 2.3 to 3.8% among women aged 15-44 and by 5.1 to 7.1% among teenage women (15-19 year-olds). Similar results are found for maternal mortality, for which we find a sharp fall in the rate of maternal deaths, by 8.8 to 16.2% for women aged 15-44 and by 14.9 to as much as 30.3% among teenagers. All told, the reform appears to increase the average age of women at first birth, and reduce the number of mothers giving birth at higher parities.

.JEL Classifications: J13, I15, I18, O15.

[*] Department of Economics, Universidad de Santiago de Chile. Contact: damian.clarke@usach.cl

[†] Department of Economics, University of Gothenburg. Contact: hanna.muhlrad@gu.se

We are grateful to Andrea Mitrut, Randi Hjalmarsson, Elin Larsson, Blair G. Darney, Hans Grönqvist and seminar audiences at the Department of Economics at University of Gothenburg, SOFI Stockholm University, Karolinska Institute and the CSAE conference for their very useful comments and discussions. We thank Alejandro del Valle for sharing data, and Susanna Lindahl for excellent research assistance.

1 Introduction

Breathtaking figures suggest that world-wide, unsafe abortions may result in as many as 8 maternal deaths per hour (The Lancet, 2009). By the best available estimates, 13% of all maternal deaths are due to complications surrounding clandestine and unsafe abortion, with these numbers being much higher in certain regions and groups (WHO, 2011). Nevertheless, the issue of abortion legalization continues to be a highly controversial social topic. This is especially true in Latin America, which has some of the world's most rigid abortion laws (United Nations, 2014) as well as the highest estimated rates of unsafe abortions in the world, with 31 abortions per 1,000 fertile-aged women compared to the worldwide rate of 14 per 1,000 women. The high number of unsafe abortions in the Latin American and Caribbean (LAC) region corresponds to an estimated 4.2 million unsafe induced abortions each year, and 12% of all maternal deaths in the region (WHO, 2011).

The relative paucity of recent large-scale reforms to abortion law has meant that estimating the causal effect of safe access to legal abortion procedures has not always been straightforward. This is particularly so when considering the effect of legalized abortion on rates of maternal death, given the well-known measurement challenges involved in collecting these figures (Hogan et al., 2010). While evidence from historical reforms points to large potential effects on rates of births and a wide range of social outcomes (Ananat et al., 2009; Angrist and Evans, 1996; Donohue and Levitt, 2001; Charles and Stephen, 2002; Bailey et al., 2013; Pop-Eleches, 2006), and while ample evidence exists to suggest that unsafe abortions have an extremely high toll on women's health (see for instance Grimes et al. (2006)), few estimates of the effect of legalizing abortion on maternal deaths when using complete vital registries are available.

In this study, we examine the effect of a sharply defined local abortion reform in Mexico

City and document the effect of free access to legal and safe abortion services on fertility and maternal mortality. We combine the state-level variation over time resulting from this natural experiment with high quality vital statistics data on 23 millions of births and more than 11,000 maternal deaths. This reform—the so called legal interruption of pregnancy program (or ILE for its name in Spanish)—was of considerable importance. During the pre-reform period of 2001-2007 a total of 62 legal abortions (available in restrictive conditions) were performed in Mexico City. Following the 2007 reform, more than 90,000 women accessed safe legal abortion between 2008 and 2012.

Abortion laws are determined at the state level in Mexico, where Mexico City (also known as the federal district of Mexico) has its own legislative assembly. The ILE reform provided all women who reside in Mexico City with access to legal and safe abortion procedures, free of charge and for any reason, during the first trimester of pregnancy. The law was a radical change from previous legislation in Mexico City, and also compared to the rest of the states of Mexico, where abortion is still banned in all but the extreme circumstances of rape, to save the mother's life, or in cases of severe fetal malformation.[1] Moreover, by legalizing abortion, Mexico City distinguishes itself from nearly all other countries in Latin America and the Caribbean which remain highly restrictive in their policies related to elective abortion (Fraser, 2015).[2]

We find that providing access to safe and legal abortions free of charge resulted in a decrease in rates of fertility between 2.3 to 3.8% and a reduction in maternal deaths by 11.1 to 20.0% among women aged 15-44 years. When considering only the direct effect of the reform on maternal mortality net of the mechanical reduction in deaths due to lower rates of birth, we find a lower, but still significant, reduction in rates of maternal deaths of between 8.8 and

[1]Depending on the state, these circumstances include none, some, or all of rape, fetal inviability or grave danger to the health of the mother. One exception is the state of Yucatan, which, since 1931, has permitted legally induced abortions for socio-economic reasons for women with at least three children (Juarez et al., 2013).

[2]According to the most recent United Nations figures (United Nations, 2014), Mexico is one of only three countries in the LAC region (along with Uruguay and Guyana) to be classified as the "Least restrictive" in abortion policy, implying that abortions are permitted for economic or social reasons upon request.

16.2%. Our results suggest that there are heterogeneous effects across ages. We document a particularly strong effect among teenage women (aged 15-19) of a 5.1-7.1% reduction in fertility and between a 14.9 to 30% reduction in the maternal mortality rate (when considering only the direct effect of the reform). The decline in teenage fertility in Mexico City is consistent with the findings from abortion legalization in other circumstances around the world. For example, estimates of the effect of *Roe v. Wade* in the US suggest an 8-12% reduction in teenage fertility (Angrist and Evans, 1996). These findings are noteworthy given the high proportion of teenage motherhood in Mexico (18% of all pregnancies are teenage pregnancies) and a well-documented negative association between teenage childbearing and education and labor market outcomes (Furstenberg, 1976).

When turning to the composition of all mothers, we find that the reform has a number of important effects on the characteristics of women giving birth. Firstly, and unsurpisingly, we find that conditional on motherhood, the probability of the birth occurring to a teenager decreases by 5.6%. We also find that the probability of having a first birth increases (compared to higher order births) and that the average age by parity (birth order) slightly increases. That is to say, following the reform, cohorts of mothers became on average older, less likely to be teenagers, and shifts in parity towards lower total fertility were observed. Finally, the reform explicitly encouraged contraceptive usage by giving out contraceptives to women who accessed abortions, as well as improved sexual education in schools. We supplement out analysis using vital statistics data with survey data from the Mexican Family Life Survey (MxFLS), and find that the main mechanism of reduced fertility and mortality during the period under study was access to legal and safe induced abortion, rather than other minor components of this program.

Despite increasing attention being paid to rates of morbidity and mortality following unsafe abortion procedures (Grimes et al., 2006; Brown, 2007; Kulczycki, 2011), adequately measuring the impact of access (or lack thereof) to safe abortion is often hindered by poor and incomplete vital registration systems, especially in developing countries (Grimes et al., 2006). In this study, we provide a rich set of empirical results to begin to fill this gap. Moreover, this is the first study to evaluate the overall effect on both fertility and maternal mortality from the 2007 abortion reform in Mexico City using the full set of available vital statistics for the period 2002-2011.[3] Many previous studies examine the effect of abortion legalization that took place in conjunction with other major laws and reforms. In contrast to those studies, contraception has been legal and freely provided by the government since 1974 in Mexico.

All told, the results from this study suggest that the April 2007 abortion reform in Mexico City is associated with an important reduction in fertility and maternal mortality. These results are highly relevant when considering the achievement of international development goals, including the Sustainable Development Goals (SDGs), which require a two thirds reduction in maternal deaths world-wide by the year 2030.

2 Mexican Context and the ILE Reform

The fertility rate in Mexico declined rapidly from roughly 6 children per woman in 1975 to approximately 2.2 in 2015. This major shift in fertility can be partially attributed to changes in access to modern contraceptive methods in the country (Juarez et al., 2013). In 1975, the Mexican government passed the General Population Law, which obliged the government to supply family planning services and provide contraceptives via the public health care sector free of charge. Although 67% of all women of childbearing age in Mexico report using modern contraceptive methods (and 5% use traditional and less safe methods), it is estimated that

[3] This is, however, not the first study of the effect of Mexico's 2007 abortion reform. A considerable academic literature exists across the fields of law (Johnson, 2013), public health (Contreras et al., 2011; Schiavon et al., 2010; Becker, 2013; Mondragón y Kalb et al., 2011) and medicine (Madrazo, 2009). It is, however, the first comprehensive analysis of the reform's effect using the full power of the vital statistics data. Other existing studies either use infrequent registers and focus only on fertility (Gutierrez-Vazquez and Parrado, 2015) or highly questionable data selection and analysis techniques (Koch et al., 2015).

more than half of all pregnancies are unintended. Estimates suggest that up to 54% of these unintended pregnancies are terminated (Juarez et al., 2013).

Mexico consists of 32 federal entities, 31 of which are federal states plus the federal district of Mexico (also known as Mexico D.F. or Mexico City). As well as having a national constitution, each of the 32 federal entities has its own state or local constitution, defined by its own legislative power. Abortion laws in all of Mexico are determined at the state level (Becker, 2013). Mexico City contains approximately 8% of the entire population (8.9 million of Mexico's 119.5 million inhabitants according to 2015 estimates) and, since 2007, is the only state that allows for elective abortion during the first trimester.

Prior to the reform in Mexico City, abortion laws were rather uniform across the 32 federal entities of Mexico. Induced abortion continues to be considered a criminal offense with the risk of legal consequence of up to 30 years imprisonment in many states (Juarez et al., 2013), and legal abortion was only permitted in the limited cases if rape, threat to the life of the mother, or severe malformation of the fetus. In practice, even in these limited cases, legal abortion has been described by human rights organizations as extremely difficult to access due to rigid legal barriers (Juarez et al., 2013). In the densely populated Mexico City, only 62 abortions were legally performed during 2001-2007 (Becker, 2013). As a substitute to legal options, abortions were performed in clandestine and often unsafe settings. For example, in 2009 alone, medical records from public hospitals show that an estimated 159,000 women in Mexico were treated for abortion-related complications (Juarez et al., 2013). The estimated national abortion rate in Mexico is 38 abortions per 1,000 women of fertile age (Juarez et al., 2013), which is considered high internationally (Becker, 2013).

Due to the high number of unsafe abortions as well as a growing movement for women's reproductive health rights, the legislative assembly of the Federal District of Mexico City voted to legalize elective abortion (termed legal interruption of pregnancy, or ILE for its name in Spanish) on April 24, 2007, reforming Articles 145-148 of the penal code of Mexico City, and Article 14 of the Health Code. These reforms were signed into law the following day, and published in the official Gazette of the Federal District on April 26, 2007 (Ciudad de México, 2007). A broader discussion of the reform's social and legal setting is provided in Kulczycki (2011); Madrazo (2009) and Johnson (2013). This immediately permitted women above the age of 18 to request legal interruption of pregnancy at up to 12 weeks of gestation without restriction, while for those aged under 18, access required a parent or guardian's consent. The law included public provision of abortion procedures free of charge for women with residency in Mexico City at a selected number of public health clinics operated via the Ministry of Health in Mexico City (MOH-DF)[4]. Additionally, under this law sexual education in schools was improved, and post-abortion contraceptives were made freely available directly from the health clinics which provided abortions (Contreras et al., 2011). Records from public hospitals show that the demand for post-abortion contraceptives is high (approximately 82% of all women accept contraceptives) and that prevalence of repeated abortion procedures are low (Becker, 2013).

On August 29 in 2008 the decision to pass the ILE law was ratified by the Supreme Court of Mexico. The abortion reform in Mexico City is distinguishable as a major social and political reform and makes Mexico City, together with Cuba and Uruguay, the most liberal jurisdiction in terms of abortion legislation in the entire Latin American and Caribbean region (Fraser, 2015).

Women with residency outside Mexico City can also access the public provision of abortion through MOH-DF but are charged with a sliding fee scale determined with regard to the woman's socioeconomic background. In 2010, 74% of all women who received an abortion through the

[4]The public health care sector in Mexico is divided at both federal and state level, where the Ministry of Health (MOH) in Mexico City provides abortion procedures at a selected number of MOH-DF hospitals. Other MOH facilities (federally or state funded) are not legally required to provide abortion procedures.

public health care were women living in Mexico City, 24% were living in the state of Mexico (which shares a border with Mexico City) and 2% were living in other states (Mondragón y Kalb et al., 2011). Figures from the Secretary of Health's administrative data suggest that abortions were used by women of all ages, though were disproportionately sought by younger (21-25 year-olds) and older women (36 year-olds and above), with lower rates of abortion among 26 to 35 year olds. The proportion of all births by age and all abortions in public health clinics by age is presented in figure 1.

The law also allowed for private clinics to provide abortion services. Information regarding the private provision of abortion services is limited due to the lack of supervision of the private market for legal abortion services (Becker, 2013). During the year of 2007, (when the reform was implemented), more than 7,000 abortion procedures were performed at 14 selected MOH-DF clinics. Over the years, the MOH-DF abortion program expanded its services and became more efficient at meeting the high demand for elective abortion (shifting from surgical abortion procedures to medical procedures). As of 2012, approximately 90,000 abortions have been carried out at the MOH-DF clinics (Becker, 2013), with no significant complications reported.

3 Data

To examine the effects on fertility and maternal mortality, we use vital statistics on all births and maternal deaths in Mexico for the time period 2002-2011. The data is provided by the National Institute of Statistics and Geography (INEGI for its name in Spanish) and covers 23,151,080 live births and 11,858 maternal deaths among women aged 15-44. Vital statistics for births in Mexico are compiled by INEGI based on birth registries completed by each parent or guardian at the civil registry, rather than being based on birth certificates issued at hospitals (as is the case, for example with the National Vital Statistics System in the USA). Using data from the

2010 census and birth records up until 2009, recent (backward looking) analysis suggests that 93.4% of all births in Mexico were registered within 1 year of birth of the child, and in total, 94.2% of birth are eventually registered at the national level (Instituto Nacional de Estadística y Geografía, 2012). The birth register is released once per year, containing all births *registered* in that year, as well as the year the birth occurred. In order to avoid problems of under-reporting, differential reporting over time, and double-reporting, we collate all birth registers between 2002-2014, and then keep all births registered within 3 years of the date of birth[5]. This implies that we only have complete birth registers based on birth years up to (and including) 2011.

Maternal death data is taken from INEGI's full mortality register, which officially classifies maternal deaths according to ICD-10 codes and the World Health Organization's definition (see the data section of the online appendix for full details). Mexico's register of maternal deaths is recognised to be of high quality, with Mexico being classified as belonging to the "A-class" (World Health Organization, 1987) in the latest WHO report on maternal mortality trends. This data has had particular improvements from 2002, and as such, we restrict our period of analysis to 2002 and beyond (see Schiavon et al. (2012) and the online appendix to this paper for further details). In the online appendix (table A1), we display the number of births and maternal deaths recorded in each federal entity over the period of study. There exists considerable variation in births and deaths (in line with large variations in population between geographic areas), and also considerable variation in rates of maternal deaths per live births. This ranges from as low as 25 deaths per 100,000 live births in the relatively highly developed state of Colima to as high as 87 deaths per 100,000 live births in the mountainous state of Guerrero. On average in the whole country over the period of study, microdata records suggest that the maternal mortality ratio was 51.21 deaths per 100,000 live births, a value which agrees with the official international figures released by WHO for this period (World

[5]This is very similar to the methodology employed by Mexico's population authority in their calculation of official demographic trends (Consejo Nacional de Población, 2012).

Health Organization, 2015). Data from the birth and death registers is aggregated by each age group between 15-44, state, and year, resulting in a total of 9,600 cells (years×states×age). The INEGI Birth Register contains information about the date of birth, actual birthplace and the official residency of the mother. In addition, information on maternal characteristics such as age, total fertility, educational attainment, marital status and employment status are recorded. The death register has a similar structure to the birth register and also records background information on the deceased women.

We then merge a range of time-varying covariates with birth and death data for each year and state group described above. This includes the population of women (variation by age, state and year) from the National Population Council of Mexico (CONAPO), socioeconomic variables including illiteracy, schooling, and access to health insurance from the National Institute for Federalism and Municipal Development (INAFED) and the National Education Statistical Information System (SNIE), and data on the municipal-level roll-out of the national health insurance program *Seguro Popular*[6] from the INEGI data bank. Socioeconomic data and measures of *Seguro Popular* coverage vary by state and year. We provide further details of data access and construction of covariates in the online appendix.

Summary statistics are presented in table 1. In the top panel we present state-level characteristics, and in the bottom panel, individual characteristics from the vital statistics registers. Unsurprisingly, there are relatively large differences between the densely populated Mexico City and the nearby state of Mexico and the rest of the country. Residents of Mexico City have higher education and better access to health care. There are also substantial differences in the age composition, where mothers in Mexico City are, on average, older especially when having their

[6] Mexico's General Health Law underwent a major reform in 2003, which intended to provide 50 million Mexican citizens lacking social security with subsidized and publicly financed health insurance. The core of this reform was the health insurance program *Seguro Popular* (SP). The "People's Insurance" or *Seguro Popular* was launched in 2002, offering health service free of charge or subsidized to those without formal health insurance. By 2005, two years before the reform, all 32 states had enrolled the SP program (Knaul et al., 2007).

first and second child. Women dying from causes related to childbirth are on average less educated compared to the mean: a pattern observed in all areas of the country. Turning to rates of maternal death and births per woman, Mexico City has slightly higher rates of maternal death than the country in general (see online appendix table A1 for a full breakdown), and lower rates of fertility per woman.

4 Empirical Strategy

The impact of the abortion reform is evaluated by using the subnational variation in abortion laws, and thus the access to legal and safe abortion procedures, resulting from the ILE reform. Given the temporal- and geographical-variation in availability of free legal abortions, we estimate the following difference-in-differences (DiD) specification:

$$\text{Outcome}_{ast} = \beta_0 + \beta_1 \text{ILE}_{st} + \beta_2 \text{CloseILE}_{st} + \boldsymbol{X}_{st}\boldsymbol{\delta} + \alpha_s + \nu_t + \pi_a + \lambda_s \cdot t + \varepsilon_{ast} \quad (1)$$

where Outcome_{ast} represents our dependent variable of interest (fertility or maternal death) for age group a in state s and year t. The treatment variable is determined by the official residency of the woman, and indicated by ILE_{st}. This variable takes the value of one in Mexico City nine months after the ILE reform was adopted in order to compensate for the lag caused by the pregnancy length (assuming 40 weeks of gestation), and zero otherwise.[7] As discussed in the previous section, a non-negligible proportion of all elective abortions were accessed by women with residency in the neighbouring state of Mexico. Thus, to account for the potential spillover effects of the reform, we separately control for this state using the binary variable CloseILE_{st}

[7] We choose the most conservative definition of the post-treatment period starting in January 2008 and onwards for our baseline specification. A more detailed description of the definition of treatment is provided in the online appendix, particularly table A3. As a robustness check, we use data at a monthly level and control separately for the partially treated births and maternal deaths and show that these results are consistent with our baseline results. These are available in online appendix tables A6-A7.

(equal to one in the state of Mexico nine months or more after the reform was passed, and zero otherwise).

The difficulty in evaluating effects of a new law lies in the fact that legislative changes often are endogenously determined. That is, abortion legalization is likely to be correlated with observed and unobserved characteristics of Mexico City. Even though the distribution of treatment is non-random, the inclusion of state (α_a), year (ν_t) and age (π_a) fixed effects allows us to estimate the impact of the reform in a so called difference-in-difference setting. Under the parallel-trends assumption that in the absence of the reform treated and untreated states would have followed similar trends over time, DiD gives the causal impact of the reform on outcome variables. We examine the veracity of this assumption in following sections. In certain specifications, we include a full set of state-level time varying controls $\boldsymbol{X}_{st}$, and also allow for differential linear time trends in each state over time, captured by the $\lambda_s \cdot t$ term. The idiosyncratic error term ε_{ast} is clustered at the state level in order to allow for autocorrelation of unobserved shocks within states over time[8], and age by state by year cells are weighted by the state population (see for example Dell (2015) for a discussion).

In our main specifications, births are measured as the log number of total births occurring in each cell. While births can be measured in a number of ways, including counts, gross fertility rate and total fertility rate (which we report in the online appendix), we prefer the logged number of births for a number of reasons. Firstly, we lack micro-data registers of population in each year and are constrained to demographic projections based on the census, quinquennial surveys, migration, births and deaths (Consejo Nacional de Población, 2012). Secondly, we

[8]This is the generally accepted method in a DiD model (Bertrand et al., 2004). However, there is a potential inconsistency in the standard error caused by serial correlation when the time period is long and numbers of groups (i.e. states) are small (Bertrand et al., 2004). A likely outcome in these circumstances is underestimated standard errors leading to falsely significant DiD estimates. This raises concern, since the number of clusters in our case are 32, which is slightly below commonly accepted “rule of thumb” thresholds for consistent estimation of standard errors (Angrist and Pischke, 2009; Cameron and Miller, 2015). One suggested way of dealing with this problem is to use wild bootstrapped standard errors (Bertrand et al., 2004; Cameron and Miller, 2015), and as such, we also examine our main specifications using wild bootstrapped standard errors and show that these results are consistent with our baseline results.

estimate regressions with log births using ordinary least squares (OLS) regressions. Without the log normalisation of births, regression residuals are not normally distributed, and predicted values are at times negative. Taking the log transformation allows us to resolve these issues in our case.

In contrast to the birth data which is strictly positive in all cells, the data on maternal mortality has a large number of cases where zero deaths are observed. In our main specifications for maternal deaths, we estimate using the count of maternal deaths as the dependent variable, and use a Poisson regression model (estimates using the maternal mortality ratio and OLS are presented in the online appendix). When using Poisson regression, the log average number of maternal deaths is modeled as a function of explanatory variables ($\log(\mu) = x\beta$), and taking the exponential of estimated coefficients gives the incidence rate ratios (percentage effect) corresponding to the reform.

5 Results

5.1 The effect of the reform on fertility and maternal mortality

In table 2 we present the results of the ILE reform on fertility. Results are presented for all 15-44 year-old women in columns 1-5, and for adolescents (15-19 year-olds) in columns 6-10. We present results separately for adolescents given that rates of teenage childbearing in Mexico are very high (approximately 18% of all births are to teenage mothers) and that teenage motherhood is correlated with worse outcomes in terms of education and poverty (see for instance (Furstenberg, 1976).) We begin by estimating simple DiD models, excluding state-specific linear time trends and time-varying controls (columns 1 and 6). We then gradually include trends (column 2 and 7) and further time-varying controls (economic, education and health factors). These results clearly indicate that the reform resulted in a reduction in childbearing. For women of all ages, the ILE reform is associated with a reduction in birth rates of between approximately 2.3 and 3.8%, while the reform had a larger effect on young women: between 5.1-7.1% depending on the specification used. These results are similar in magnitude to historical reforms in the United States and Romania (Levine, 2004; Pop-Eleches, 2010) and more recent results from Nepal (Valente, 2014). For women with residency in the state of Mexico (the neighboring state to Mexico City), we find little evidence to suggest a statistically significant effect of the reform, perhaps unsurprising given lower rates of usage spread over a much larger population.

Results examining maternal deaths are presented in table 3. In this case, as outlined above, rather than estimate using OLS regression, we use Poisson regression models. The point estimates for the full sample of women aged 15-44 (column 1-5) suggest that the abortion reform is associated with a significant decline in maternal mortality: by between 11.1 and 20.0% depending on the specification examined.[9] For 15-19 year-olds (columns 6-10), the point estimates suggest a much larger reduction in rates of maternal death of between 19.0-37.6%. The effects on teenage women are double the magnitude of the full sample results but are only marginally statistically significant when including trends and state level controls. For women living close to the reform area (i.e. in Mexico State), a significant effect is found for the full sample and for teenage women, however is no longer statistically significant in the most demanding specifications.

The effect sizes for maternal mortality are very large, particularly when cast in terms of prevailing estimates of the proportion of maternal deaths due to abortion. When examining the cause of maternal deaths in Mexico between 1990-2008, Schiavon et al. (2012) estimate the 7.2% of maternal deaths were due to unsafe abortion, while the WHO estimates that approximately

[9] The effect size is calculated by taking the exponent of coefficients i.e. exp($\hat{\beta}$)-1, and can be interpreted as the incidence rate ratio.

13% and 10% of maternal deaths are due to unsafe abortion in the world and the Americas respectively (WHO, 2011). However, it is important to note that these estimates nest both the mechanical reduction in maternal deaths due to the reform's effect on fertility, as well as the direct effect of the reform on fewer unsafe abortions, and hence fewer maternal deaths.

We can conduct a back of the envelope calculation to determine what proportion of the reform's effect is due to the fact that there are fewer undesired births in general (and hence a lower likelihood of maternal death in childbirth), and what proportion is due to the remaining direct effect of the reform. For all women, our most demanding estimates suggest that the reform resulted in 3.8% fewer births. From table 1, we know that there were 1,505,790 births and 818 maternal deaths recorded in Mexico city during the period under study, resulting in a maternal mortality ratio of 54.3 deaths per 100,000 live births. Thus, if the rate of maternal death remained constant, the mechanical effect of the reform would be to (similarly) reduce the number of maternal deaths by 3.8%. In reality, our corresponding estimate is a 20% reduction, implying that the *direct* effect of the reform (net of the mechanical effect) is a 16.2% reduction in maternal deaths: much closer to proportion of deaths due to unsafe abortion estimated by the WHO. In the same vein, the *direct* effect on young women is estimated to vary between 14.9 and 30%, depending on the specification examined, and in this case the lower bound value is quite close to the WHO's estimate of the percent of maternal deaths due to unsafe abortion.

The regression results for births and for maternal deaths appear to be quite robust to alternative specifications and definitions of the control group. Quantitatively similar results are found when we work only with urban states (online appendix table A8), or omit the nearby state of Mexico entirely from the analysis. Likewise, estimating at a monthly rather than a yearly level leads to similar conclusions (online appendix table A6). Alternative definitions of outcome variables (for example birth rates and the maternal mortality ratio) are examined in table A9, and results using Wild bootstrap for clustering are presented in appendix table A10.

5.2 Validity of Difference-in-Differences Strategy

The quasi-experimental framework which we use to motivate estimation is based on the reform's arrival only to Mexico city, and not to other areas of the country simultaneously. While resulting in a striking change in rates of access to safe abortion, consistent estimation in a DiD framework requires the parallel trend assumption to hold. This requires, among other things, that no prevailing difference in average trends between the treatment and control area existed before the ILE law was passed in Mexico City. We provide some partial tests of this assumption in this section.

Raw trends in the main outcome variables over the time period of interest are presented in figure 2. Although there is a clear level difference in the number of births (panel A) and births per 1,000 woman of fertile age (panel B) between Mexico city and the rest of the country, changes in the number of births appear to be parallel by visual inspection prior to the reform. For maternal mortality the variation is large and it appears rather difficult to draw conclusions from a visual inspection (see Figure 2c and Figure 2d).

In order to test this more formally, we run an event study analysis surrounding the date of the reform. This consists of fully interacting the treatment indicator (1 if Mexico City, 0 otherwise) with a dummy for each year in our sample, both before and after the arrival of the reform. If the difference between treatment and control areas really only does emerge after the reform, we should see that no pre-treatment interaction terms are significantly different to zero, with the differential effect only emerging once the ILE reform has taken place.[10]

Results for these event studies are presented in figure 3. In these figures, point estimates

[10] We also test whether a linear time trend in the control group for the pre-treatment period is statistically different from the trend in Mexico City. This test suggests that *no* statistically distinguishable trend exists in either outcome variable in the pre-reform period.

reflect the interaction between the treatment area dummy and each respective lag or lead, and 95% confidence intervals are plotted to accompany each estimate. Year 2007 is omitted as the base year in each case, so all estimates are cast as changes relative to this year. In both cases, we see that the difference between Mexico City and the rest of the country (Mexico state is excluded to ensure that local spillovers do not bias the control group) occurs only *after* the introduction of the reform. In panel A the event study for log births is presented. This suggests an immediate effect of the reform occurring when examining births in 2008, and then a further reduction, before approximately constant coefficients (at approximately -4 to -5%) in years 2009-2011. Although the effect size is similar in the final two years of data, these are not significantly different, due to larger standard errors on effects given that the absolute number of births in early and late years is most different to the number in the omitted base case. Similarly, in panel B the event study on maternal deaths suggests a similar dynamic: a small but significant difference in the first post-reform year, which then increases in magnitude (though is less tightly estimated) in later post-reform years. In both cases, these results provide support for the parallel trends assumption and the use of DiD estimates to assess the impact of the reform.

5.3 Compositional Changes

We examine whether the ILE reform had distinguishable effects on the characteristics of cohorts of mothers. In order to do so, we use the disaggregated (micro-level) data on all births and maternal deaths contained in the Mexican vital statistics. By comparing the characteristics of all mothers before and after the reform in Mexico city, and comparing them with any changes in general characteristics in the rest of the country, we can estimate the reform's effect on any compositional changes in a similar logic to the DiD tests described in section 5.1.

There is considerable evidence to suggest that abortion reforms can have important effects on the composition of mothers, and, subsequently, children over the long- (Ananat et al., 2009; Pop-Eleches, 2006; Bailey, 2013) and even short-term (Bailey et al., 2014). Here, given the reform's timing, we are restricted to looking at short-term changes in the characteristics of mothers. Given that the most complete record of motherhood is available in the birth registry, we are also restricted to analysis with variables recorded in this data. As such, we examine the effects of the reform on the probability of teenage motherhood, the probability of a given birth being a mother's first, second, or higher order birth, and the age of birth at each of these parities.[11] In each case, the regression from equation 1 is estimated, however at the individual-, rather than aggregate-level.

Results are displayed in Table 4. The DiD analysis suggest that, conditional on motherhood, the reform decreases the probability of teenage motherhood by 5.6% when comparing the estimate to the mean of the dependent variable (column 1). The significance and magnitude of this result from micro-data provides good support for the aggregate results described in previous sections. In columns 2-4 we examine the effect of the reform on the parity at which births occur. While point estimates suggest a shift of births from higher to lower birth orders, these are not large, nor statistically significant results. In examining age at birth, we find some evidence to suggest that mothers are slightly older (though only for their second birth). This provides some evidence that the ILE reform did affect birth timing and birth spacing, though again, the evidence is not particularly strong. While these results suggest that the immediate effect of the reform has done relatively little to change the characteristics of mothers in Mexico City, this is perhaps unsurprising given the well known difference between short-term and longer-term changes in cohorts of mothers, as well as the next generation, following contraceptive reform (Ananat et al., 2009; Gruber et al., 1999).

[11] In online appendix tables we present additional available measures of mother's education. We do not report these results in the paper given that examination of trends between reform and non-reform areas suggests that DiD estimates are unlikely to be causal.

5.4 Abortion Access, Contraceptive Use, or Education?

The 2007 ILE reform had three components, with legal access to safe and free abortion being the most central. However, the reform also called for improved sexual education in schools as well as access to free post-abortion contraceptives through the MOH-DF program (Becker, 2013). In the analysis up to this point, we have examined the general effect of the reform, which will capture all changes flowing from each aspect: access to abortion, as well as contraceptive knowledge and access. To close, we examine the mechanism through which the reform reduced rates of births and maternal death.

In order to examine potential mechanisms, we generate data on contraceptive use and knowledge from the Mexican Family Life Survey (MxFLS), a panel survey which was conducted in 2002-2003, 2005-2006 and 2009-2012 and covers a representative sample (at the state level) of 15,768 women. Using these survey waves, we are thus able to generate quite rich measures of contraceptive use and contraceptive knowledge, both in Mexico City and the rest of the country, though only at three points in time. We provide a description of this dataset and its generation in the online appendix to this paper.

In order to determine whether these simultaneous changes crowd out the estimated effect of the reform, we re-estimate equation (1) by DiD, however now supplement the regression models to include measures of contraceptive useage and knowledge. For those time periods in which no data is available from the MxFLS, we linearly interpolate points (see online appendix).

These results are presented in Table 5. Column 1 displays baseline results from table 2 and 3 when controlling for a full set of fixed effects, state-specific trends and time varying covariates. To this specification, we then add controls for each of: the prevalence of usage of modern contraceptives by fertile aged women (column 2), current use of any type of contraceptives by fertile aged women (column 3), and knowledge about modern contraceptives (column 4). For fertility, we see that the estimated effects of the reform in all cases hold up, even when controlling for these potential correlated inputs. The baseline effect of a 3.8% reduction in fertility is, at most, attenuated to a 2.5% reduction in rates of births. Similarly, in examining the results for maternal deaths, the main estimated effects of the reform remain, even conditional upon changes in contraceptive knowledge and use. The estimated baseline effect (with trends) of a 23.3% reduction in maternal deaths, never falls below 22.6% when including contraceptive controls, and in no case are the coefficients statistically distinguishable.

Overall, the results of this exercise seem to confirm the notion that the main channel by which fertility and maternal deaths were affected by the reform were through the access to free and legal abortion procedures. Although only based on infrequently available survey data, adding additional covariates, which may themselves be an effect of the reform, does little to dampen the significant estimated effects of the 1000 fold increase in legally accessed abortions in Mexico City.

6 Conclusion

In this paper, we examine the effect of abortion legalization on women's fertility and health in Mexico City. The 2007 passing of the ILE law was a major social and political reform, providing all women with residency in Mexico City access to safe elective abortion during the first trimester. Prior to the reform very few legal abortions were performed, although clandestine abortion was very common (Becker, 2013) leading to a high number of women suffering from complications associated with unsafe procedures each year (Juarez et al., 2013). By using sub-national variation in abortion laws, we analyze the effect of the reform on fertility and maternal mortality using vital statistics from the National Institute of Statistics and Geography (INEGI) during the time period 2002-2011.

We document two main findings. Firstly, the reform has a considerable effect on fertility rates, reducing births in Mexico City by between 2.3 and 3.8%. Secondly, access to elective abortions significantly reduces maternal mortality by between 11.1 to 20.0%. These effects are especially strong among teenage women, with a decline in fertility of between 5.1 and 7.1% and in maternal mortality of between 14.9 to 30%. Moreover, our results suggest that the reform affected the composition of mothers. Conditional on motherhood, we find that mothers are 5.6% less likely to be teenage mothers and a document a small effect on age by parity, where age slightly increases for the second child. In addition, we utilize survey data from the MxFLS regarding knowledge and use of contraceptives and investigate potential mechanisms. Our findings indicate that the main mechanism behind these striking reductions in fertility and maternal death was free access to legal and safe induced abortion, with only smaller effects flowing from the program's other complimentary (and more minor) aspects.

The reduction in fertility indicates that despite the large number of risky clandestine abortions practiced prior to the reform in Mexico City, considerable unmet demand for contraception still remained. In the presence of high rates of teenage pregnancy and undesired births, the legalization of abortion was thus responsible for an important reduction in the number of births observed. Moreover, our maternal mortality results suggest that safe procedures in legal environments can have large impacts on the significant number of women who still die from complications due to unsafe abortion in Mexico.

This last finding has significant implications for reproductive health policy in Mexico. The Sustainable Development Goals, to which Mexico is a signatory, require a 75% reduction in maternal deaths by 2030. If Mexico is to achieve such a reduction, this would require cutting maternal deaths from 50 deaths per 100,000 births to approximately 13: ratios prevailing in countries like France, New Zealand, or South Korea (World Health Organization, 2015). To do so will require a multifaceted response, involving significant work on health infrastructure, accessibility in remote regions, and work with marginalized groups. However, the results in this paper suggest that even with impressive gains in other areas, clandestine abortions currently play an important role in maternal deaths in Mexico. The natural experiment played out over the past decade suggests that abortion legalization can have extremely important impacts on women's health, and lead to significantly fewer maternal deaths.

References

Ananat, E. O., J. Gruber, P. B. Levine, and D. Staiger (2009): "Abortion and Selection," *Review of Economics and Statistics*, 91, 124–136.

Angrist, J. D. and W. N. Evans (1996): "Schooling and Labor Market Consequences of the 1970 State Abortion Reforms," NBER Working Papers 5406, National Bureau of Economic Research, Inc.

Angrist, J. D. and J.-S. Pischke (2009): *Mostly harmless econometrics: an empiricist's companion*, Princeton University Press.

Bailey, M., M. Guldi, and B. Hershbein (2013): "Recent Evidence on the Broad Benefits of Reproductive Health Policy," *Journal of Policy Analysis and Management*, 32, 888–896.

Bailey, M. J. (2013): "Fifty Years of Family Planning: New Evidence on the Long-Run Effects of Increasing Access to Contraception," *Brookings Papers on Economic Activity*, 46, 341–409.

Bailey, M. J., O. Malkova, and J. Norling (2014): "Do Family Planning Programs Decrease Poverty? Evidence from Public Census Data," *CESifo Economic Studies*, 60, 312–337.

Becker, D. (2013): "Decriminalization of Abortion in Mexico City: The Effects on Women's Reproductive Rights," *American Journal of Public Health*, 103, 590–593.

Bertrand, M., E. Duflo, and S. Mullainathan (2004): "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 119.

Brown, H. (2007): "Abortion round the world," *BMJ*, 335, 1018–1019.

Cameron, A. C. and D. L. Miller (2015): "A Practitioner's Guide to Cluster-Robust Inference," *Journal of Human Resources*, 50, 317–372.

Charles, K. K. and M. Stephen, Jr. (2002): "Abortion Legalization and Adolescent Substance Use," NBER Working Papers 9193, National Bureau of Economic Research, Inc.

Ciudad de México (2007): "Gaceta Oficial del Distrito Federal," Gaceta Oficial, No 70, Órgano del Gobierno del Distrito Federal, 26 April, 2007, accessed at `http://web.archive.org/web/20150924024041/http://www.inmujeres.df.gob.mx/wb/inmujeres/decreto_por_el_que_se_reforma_el_codigo_penal_para` (consulted April 26, 2016).

Consejo Nacional de Población (2012): "Proyecciones de la población de México 2010–2050," Tech. Rep. Documento Metodológico, CONAPO.

Contreras, X., M. G. van Dijk, T. Sanchez, and P. S. Smith (2011): "Experiences and Opinions of Health-Care Professionals Regarding Legal Abortion in Mexico City: A Qualitative Study," *Studies in Family Planning*, 42, 183–190.

Dell, M. (2015): "Trafficking Networks and the Mexican Drug War," *American Economic Review*, 105, 1738–79.

Donohue, J. J. and S. D. Levitt (2001): "The Impact Of Legalized Abortion On Crime," *The Quarterly Journal of Economics*, 116, 379–420.

Fraser, B. (2015): "Tide begins to turn on abortion access in South America," *The Lancet*, 383, 2113 – 2114.

Furstenberg, F. F. (1976): *Unplanned parenthood: The social consequences of teenage childbearing*, Free Press.

Grimes, D. A., J. Benson, S. Singh, M. Romero, B. Ganatra, F. E. Okonofua, and I. H. Shah (2006): "Unsafe Abortion: The Preventable Pandemic," *The Lancet*, 368, 1908–1919.

Gruber, J., P. Levine, and D. Staiger (1999): "Abortion Legalization and Child Living Circumstances: Who is the "Marginal Child"?" *The Quarterly Journal of Economics*, 114, 263–291.

Gutierrez-Vazquez, E. Y. and E. A. Parrado (2015): "Abortion Legalization and Fertility Rates in Mexico," Unpublished manuscript, University of Pennsylvania, available at `http://paa2015.princeton.edu/uploads/151146`.

Hogan, M. C., K. J. Foreman, M. Naghavi, S. Y. Ahn, M. Wang, S. M. Makela, A. D. Lopez, R. Lozano, and C. J. Murray (2010): "Maternal mortality for 181 countries, 1980–2008: a systematic analysis of progress towards Millennium Development Goal 5," *The lancet*, 375, 1609–1623.

Instituto Nacional de Estadística y Geografía (2012): "Derecho a la identidad. La cobertura del registro de nacimiento en México en 1999 y 2009," Tech. rep., INEGI and UNICEF.

Johnson, T. (2013): "Guaranteed Access to Safe and Legal Abortions: The True Revolution of Mexico City's Legal Reforms Regarding Abortion," *Columbia Human Rights Law Review*, 44, 437–476.

Juarez, F., S. Singh, I. Maddow-Zimet, and D. Wulf (2013): "Unintended Pregnancy and Induced Abortion in Mexico: Causes and Consequences," Tech. rep., Guttmacher Institute, New York.

Knaul, F. M., H. Arreola-Ornelas, O. Méndez-Carniado, C. Bryson-Cahn, J. Barofsky, R. Maguire, M. Miranda, and S. Sesma (2007): "Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico," *Salud Pública De México*, 49, S70–87.

Koch, E., M. Chireau, F. Pliego, J. Stanford, S. Haddad, B. Calhoun, P. Aracena, M. Bravo, S. Gatica, and J. Thorp (2015): "Abortion legislation, maternal healthcare, fertility, female literacy, sanitation, violence against women and maternal deaths: a natural experiment in 32 Mexican states," *BMJ Open*, 5.

Kulczycki, A. (2011): "Abortion in Latin America: Changes in Practice, Growing Conflict, and Recent Policy Developments," *Studies in Family Planning*, 42, 199–220.

Levine, P. B. (2004): "Abortion policy and the economics of fertility," *Society*, 41, 79–85.

Madrazo, A. (2009): "The evolution of Mexico City's abortion laws: From public morality to women's autonomy," *International Journal of Gynecology & Obstetrics*, 106, 266 – 269.

Mondragón y Kalb, M., A. Ahued Ortega, J. Morales Velazquez, C. Diaz Olavarrieta, J. Valencia Rodriguez, D. Becker, and S. Garcia (2011): "Patient characteristics and service trends following abortion legalization in Mexico City, 2007-10," *American journal of public health*, 3, 159–66.

Pop-Eleches, C. (2006): "The Impact of an Abortion Ban on Socioeconomic Outcomes of Children: Evidence from Romania," *Journal of Political Economy*, 114, 744–773.

——— (2010): "The Supply of Birth Control Methods, Education, and Fertility: Evidence from Romania," *Journal of Human Resources*, 45, 971–997.

Schiavon, R., M. E. Collado, E. Troncoso, J. E. S. Sánchez, G. O. Zorrilla, and T. Palermo (2010): "Characteristics of private abortion services in Mexico City after legalization," *Reproductive Health Matters*, 18, 127–135.

Schiavon, R., E. Troncoso, and G. Polo (2012): "Analysis of maternal and abortion-related mortality in Mexico over the last two decades, 1990–2008," *International Journal of Gynecology & Obstetrics*, 118, Supplement 2, S78 – S86.

The Lancet (2009): "Unsafe abortions: eight maternal deaths every hour," *The Lancet*, 374, 1301 –.

United Nations (2014): "Abortion Policies and Reproductive Health around the World," Tech. Rep. E.14.XIII.11, Department of Economic and Social Affairs: Population Division.

Valente, C. (2014): "Access to abortion, investments in neonatal health, and sex-selection: Evidence from Nepal," *Journal of Development Economics*, 107, 225–243.

WHO (2011): "Unsafe abortion: global and regional estimates of incidence of unsafe abortion and associated mortality in 2008," Tech. Rep. 6th edition, World Health Organization Geneva.

World Health Organization (1987): "Studying Maternal Mortality in Developing Countries: A Guidebook," Tech. Rep. HO/FHE/87.7, WHO.

——— (2015): "Maternal mortality ratio (modeled estimate, per 100,000 live births)," WHO, UNICEF, UNFPA, The World Bank, and the United Nations Population Division. Trends in Maternal Mortality: 1990 to 2015., accessed at `http://data.worldbank.org/indicator/SH.STA.MMRT` (consulted April 26, 2016).

Tables

Table 1: State and Maternal Characteristics

	(1) Mexico City	(2) State of Mexico	(3) Rest of Mexico	(4) Full Country
	State Characteristics			
Birth rate	64.7	85.7	88.5	86.0
	(33.5)	(48.9)	(47.7)	(47.3)
Maternal Mortality Ratio	54.3	54.7	50.3	51.2
	(47.4)	(41.6)	(68.0)	(63.8)
Illiteracy	2.409	11.74	8.756	8.606
	(0.257)	(1.202)	(5.125)	(5.104)
People aged 6-14 with no schooling	2.951	7.976	5.373	5.398
	(0.151)	(1.005)	(1.562)	(1.706)
No health rights	39.13	59.74	42.74	43.52
	(4.334)	(11.35)	(15.47)	(15.43)
	Individual Characteristics			
Mothers				
Age	26.51	25.60	25.61	25.66
	(6.235)	(6.064)	(6.146)	(6.145)
Age at first birth	24.71	22.78	22.72	22.94
	(6.140)	(5.620)	(5.453)	(5.559)
Incomplete Primary	2.123	6.810	13.06	12.16
	(0.346)	(2.150)	(9.363)	(9.273)
Primary	10.51	20.60	25.66	24.62
	(1.937)	(2.742)	(6.207)	(6.847)
Secondary	39.35	44.70	34.69	35.48
	(0.750)	(1.795)	(7.704)	(7.703)
Preparatory	28.93	19.40	16.68	17.45
	(1.333)	(2.339)	(4.588)	(5.153)
Professional education	19.08	8.490	9.911	10.29
	(1.470)	(0.847)	(2.840)	(3.397)
Deceased Mothers				
No Schooling	2.049	5.810	10.60	9.903
	(8.949)	(14.64)	(25.32)	(24.36)
Incomplete Primary	18.44	30.47	35.45	34.32
	(26.29)	(27.00)	(40.25)	(39.22)
Primary	10.25	10.76	10.18	10.22
	(19.99)	(17.69)	(26.34)	(25.64)
Secondary	32.05	29.99	24.27	24.98
	(32.17)	(24.51)	(36.79)	(36.05)
Prepatory	22.94	14.59	11.40	12.15
	(29.17)	(17.32)	(27.04)	(26.82)
Professional education	14.28	8.380	8.101	8.426
	(24.28)	(14.38)	(23.06)	(22.76)
N Births	1,505,790	3,186,751	18,464,578	23,157,119
N Maternal Deaths	818	1,745	9,295	11,858
N States	1	1	30	32

Note to Table 1: The data regarding fertility, mortality and maternal characteristics is obtained from the National Institute of Statistics and Geography and covers all births and deaths among women aged 15-44 during the time period 2002-2011. Data on state level education and health care is obtained from the National Institute for Federalism and Municipal Development respectively the National Education Statistical Information System for the same period. Proportion of the population in percentage and standard deviation in the parenthesis.

Table 2: Effects of the Reform on Fertility

	Full-Sample 15-44					**Teenage women 15-19**				
	(1) OLS Log Num. of Births	(2) OLS Log Num. of Births	(3) OLS Log Num. of Births	(4) OLS Log Num. of Births	(5) OLS Log Num. of Births	(6) OLS Log Num. of Births	(7) OLS Log Num. of Births	(8) OLS Log Num. of Births	(9) OLS Log Num. of Births	(10) OLS Log Num. of Births
Reform	-0.0218**	-0.0282***	-0.0353***	-0.0376***	-0.0379***	-0.0509***	-0.0581***	-0.0717***	-0.0704***	-0.0711***
	(0.009)	(0.005)	(0.006)	(0.008)	(0.007)	(0.012)	(0.007)	(0.007)	(0.010)	(0.010)
ReformClose	-0.00865	0.00543	0.00109	0.00356	0.00211	-0.0261**	0.00926	0.00223	0.000573	-0.00288
	(0.009)	(0.005)	(0.006)	(0.011)	(0.012)	(0.012)	(0.006)	(0.006)	(0.011)	(0.013)
R^2	0.988	0.989	0.989	0.989	0.989	0.993	0.994	0.994	0.994	0.994
Mean of Dep. Var.	7.819	7.819	7.819	7.819	7.819	7.918	7.918	7.918	7.918	7.918
Observations	9600	9600	9600	9600	9600	1600	1600	1600	1600	1600
Number of women	269189193	269189193	269189193	269189193	269189193	53570502	53570502	53570502	53570502	53570502
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Note to Table 2. Difference-in-differences estimates from OLS regressions are presented. The sample consists of all births among women aged 15-44 (column 1-5) and the sub-sample of 15-19 year-olds (column 6-10) for the period 2002-2011. The independent variable *Reform* takes the value one in Mexico City nine months after the ILE law was passed. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are state level illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the coverage of the national health insurance program "Seguro Popular" (at the state level). Fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table 3: Effects of the Reform on Maternal Mortality

	Full-Sample 15-44					Teenage women 15-19				
	(1) Poisson	(2) Poisson	(3) Poisson	(4) Poisson	(5) Poisson	(6) Poisson	(7) Poisson	(8) Poisson	(9) Poisson	(10) Poisson
	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths
Num Maternal Deaths										
Reform	-0.118***	-0.220***	-0.215***	-0.217***	-0.224***	-0.211***	-0.428**	-0.440**	-0.454*	-0.471*
	(0.027)	(0.050)	(0.061)	(0.067)	(0.064)	(0.067)	(0.188)	(0.192)	(0.235)	(0.250)
ReformClose	-0.102***	-0.0213	0.00835	0.0364	0.0461	-0.162**	-0.103	-0.146	-0.121	-0.180
	(0.027)	(0.050)	(0.058)	(0.064)	(0.063)	(0.068)	(0.185)	(0.190)	(0.234)	(0.207)
Pseudo R^2	0.322	0.324	0.324	0.324	0.324	0.295	0.299	0.299	0.299	0.301
Mean of Dep. Var.	2.588	2.588	2.588	2.588	2.588	1.935	1.935	1.935	1.935	1.935
Observations	9600	9600	9600	9600	9600	1600	1600	1600	1600	1600
Number of births	23157119	23157119	23157119	23157119	23157119	4053832	4053832	4053832	4053832	4053832
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Notes to Table 3. The table displays the difference in difference estimates from Poisson regressions. The sample consists of all maternal deaths among women aged 15-44 (column 1-5) and sub-sample of teenage women aged 15-19 (column 6-10), for the period 2002-2011. The dependent variable is defined as the number of maternal deaths. Refer to table 2 for a description of control variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table 4: Effects of the Reform on the Composition of Mothers

	Maternal Composition						
	(1) OLS Teen Birth	(2) OLS 1st Child	(3) OLS 2nd Child	(4) OLS 3rd Child	(5) OLS Age 1st Child	(6) OLS Age 2st Child	(7) OLS Age 3st Child
Reform	-0.00986***	0.0220**	-0.00251	-0.0109***	0.0828	0.125***	0.0437
	(0.002)	(0.010)	(0.006)	(0.003)	(0.084)	(0.040)	(0.048)
Observations	1157301	1157301	1157301	1157301	491307	320960	345034
R^2	0.00203	0.01077	0.00327	0.00203	0.01850	0.01328	0.00540
Mean of Dep. Var.	0.175	0.425	0.277	0.165	22.94	25.56	29.64
FEs, Trends and Controls	✓	✓	✓	✓	✓	✓	✓

Notes to Table 4. The table displays the difference in difference estimates from OLS regressions. The sample consists of a representative 5% of all births for women aged 15-44 for the period 2002-2011. The dependent variables are the probability of teen birth (column 1), probability of first child (column 2), probability of second child (column 3), probability of third or higher order children (column 4), mother's age at first child (column 5) mother's age at second child (column 6) and mother's age at third child (column 7). Additional details on control variables are provided in table 2. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table 5: Mechanism

(a) Fertility

	Full-Sample 15-44			
	(1)	(2)	(3)	(4)
	Baseline	Modern Method	Any Method	Information
	OLS	OLS	OLS	OLS
	Log N. Births	Log N. Births	Log N. Births	Log N. Births
Reform	-0.0332***	-0.0387***	-0.0348***	-0.0253**
	(0.010)	(0.010)	(0.010)	(0.010)
ReformClose	0.0124	0.0270**	0.0309**	0.0141
	(0.012)	(0.012)	(0.012)	(0.012)
R^2	0.989	0.989	0.989	0.989
Mean of Dep. Var.	8.064	8.064	8.064	8.064
Observations	4890	4890	4890	4890
Number of women	188587527	188587527	188587527	188587527
FEs, Trends, Controls	✓	✓	✓	✓
Use of modern method		✓		
Use of any method			✓	
Information				✓

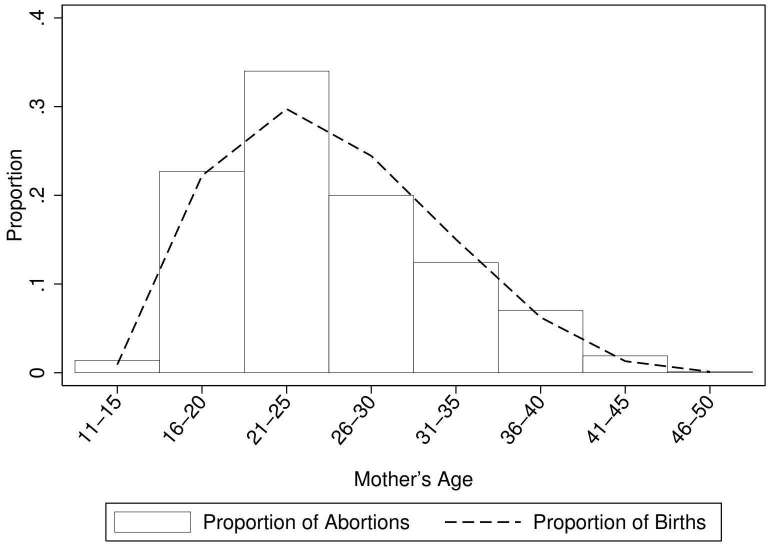
(b) Maternal Mortality

	Full-Sample 15-44			
	(1)	(2)	(3)	(4)
	Baseline	Modern Method	Any Method	Information
	Poisson N. Deaths	Poisson N. Deaths	Poisson N. Deaths	Poisson N. Deaths
Reform	-0.266***	-0.271***	-0.256***	-0.320***
	(0.070)	(0.066)	(0.066)	(0.067)
ReformClose	0.0445	0.0743	0.103	0.0244
	(0.075)	(0.076)	(0.068)	(0.074)
Pseudo R^2	0.322	0.322	0.322	0.322
Mean of Dep. Var.	3.089	3.089	3.089	3.089
Observations	4890	4890	4890	4890
Number of births	15825960	15825960	15825960	15825960
FEs, Trends, Controls	✓	✓	✓	✓
Use of modern method		✓		
Use of any method			✓	
Information				✓

Notes Table 5. State-level information on contraceptive use and knowledge is obtained from the *Mexican Family Life Survey (MxFLS)*. The baseline specification is presented in column 1. We include state-level information on current use of modern contraceptives (column 2), current use of any type of contraceptives (column 3) and knowledge about modern contraceptives (column 4). In all regressions, fixed effects (age, state and year), state-specific trends and state-level controls are included (see notes to Table 2). The sample size is smaller compared to the main results due to missing values for some states. *** p<0.01,** p<0.05,* p<0.1.

Figures

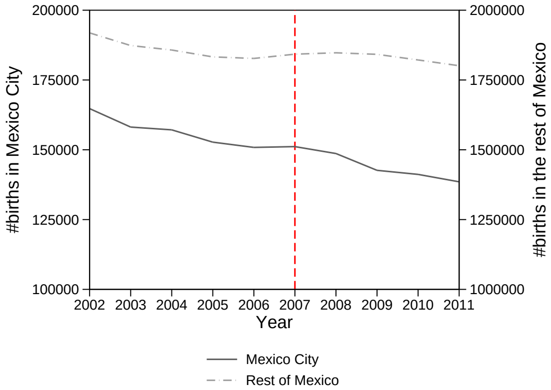
Figure 1: Birth and Abortion Descriptives: Mexico



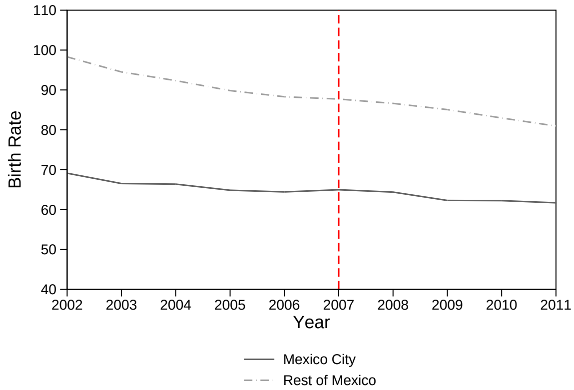
Notes to figure: Total births are plotted between 2002 and 2011. Abortions are plotted from the date of reform (April 26, 2007) until 2011. The total quantity of births is 23.2 million (all of Mexico), and total abortions are 69,861 (Mexico City only). Births are calculated from administrative data (INEGI) and abortions from administrative data (Secretary of Health, Mexico DF).

Figure 2: Trends in Reform and non-Reform Areas

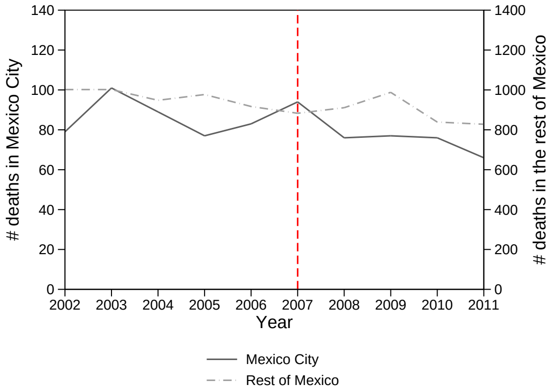
(a) Trends in number of births



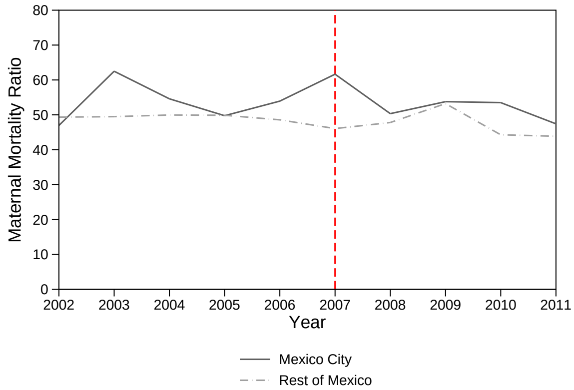
(b) Trends in birth rates



(c) Trends in number of maternal deaths



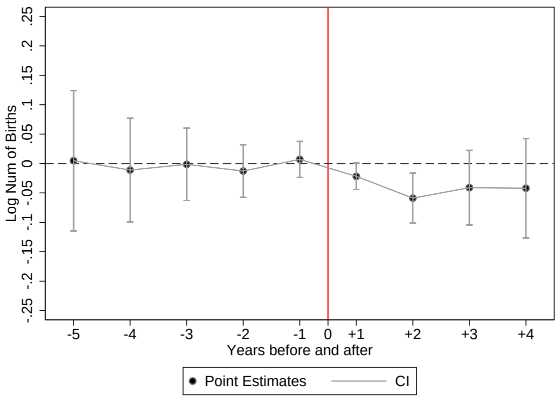
(d) Trends in maternal mortality ratio



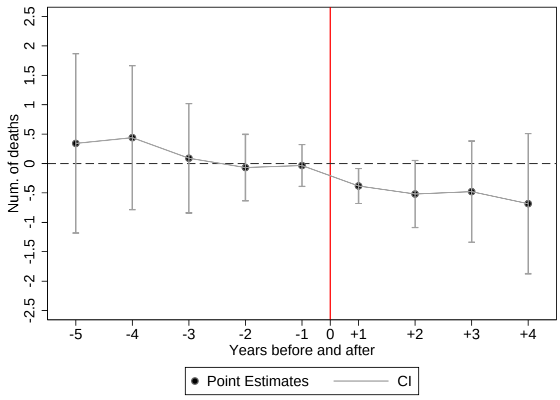
Note to Figure 2: Each figure is constructed from administrative data made available by INEGI. Trends are constructed based on population weighted means for fertile aged women 15-44. The vertical dashed line indicates the year of the reform. The State of Mexico is excluded due to potential spillover effects. In Figure a) trends in the number of births are displayed. In Figure b) trends in birth rates (the annual number of births per 1,000 women) are presented. In Figure c) the number of maternal deaths are presented followed by the trends in maternal mortality ratio (the annual number of deaths per 100,000 deaths) presented in Figure d). In Figure a) and c) the y-axis to the left shows the levels in Mexico City and y-axis to the right shows the levels in the rest of Mexico.

Figure 3: Placebo tests

(a) Event study, Fertility



(b) Event study, Maternal mortality



Note to Figure 3: The coefficient plot shows point estimates and confidence intervals estimated using OLS regressions (Figure 3a) and Poisson regressions (Figure 3b). The sample consists of all births and maternal deaths among women aged 15-44 for the period 2002-2011. Leads and lags (5 years before and 4 years after the reform) defined by interaction terms for each year and the treatment area (Mexico City) are included in order to examine anticipatory effects as well as post treatment effects for fertility (a) and maternal mortality (b) respectively. The year of the reform, 2007, is used as the baseline category. The State of Mexico is excluded due to potential spillover effects. A full set of fixed effects, time varying controls and state-specific linear time trends are included in each regression (see note to Table 2).

ONLINE APPENDIX

For the paper:

The impact of abortion legalization on fertility and maternal mortality: New evidence from Mexico

Damian Clarke and Hanna Mühlrad

Contents

A Data Appendix

A.1 Vital Statistics Data

Vital statistics data are publicly available from Mexico's National Institute of Statistics and Geography (INEGI). We download all microdata files from 2002 to 2014 (the most recent data available at the time of writing). We then keep all records corresponding to events occurring in 2002 to 2011. We do not use data from 2012 onwards given problems of reporting births in subsequent years, and concerns that births may be only partially recorded until a number of years after the event (Consejo Nacional de Población, 2012). This results in data on 23,157,119 births, and 11,858 cases of maternal deaths (see table A1).

Maternal deaths are recorded officially in the vital statistics registers of deahts, and are classified accourding to the 10$^{\text{th}}$ revision of the International Classification of Disease (ICD-10) codes. Formally, maternal deaths are defined by the WHO as "The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes".

The final sample consists of all births and maternal deaths of women aged 15-44 (most fertile ages) occurring during 2002-2011, though results are not sensitive to including all women up to the age of 49. The time period is chosen due to data availability and quality. In the effort of meeting the UN Millennium Development Goals (MDG 5), a study was conducted in 2002 in order to investigate misclassification of maternal mortality in Mexico. Maternal deaths were found to be incorrectly registered in the death certificates as well as underreported. This together with lagged reporting in live births (affecting the denominator) gave the false impression of a reduction in the maternal mortality ratio. To correct these deficiencies, large improvements were made in 2002 by deliberately searching for maternal deaths as well as reclassifying maternal deaths according to the standards of the WHO. As such, we begin analysis in year 2002, when the updated maternal death reporting standards were put into place.

A.2 Time Varying Controls

We merge data on the female population with birth and death data aggregated at the level of age, year and state. This population data is obtained from the National Population Council in Mexico (CONAPO), and is constructed from censal and inter-censal survey data, which is a national representative sample of over ten million individuals stratified geographically by municipality (Consejo Nacional de Población, 2012). This survey was conducted in 2000, 2005 and 2010 and the data between those years are interpolated using multiple imputation.

The economic and educational variables available at the state level are rates of illiteracy, schooling and the proportion of the population that lacks health insurance. These variables are obtained from the National Institute for Federalism and Municipal Development (INAFED) and the National Education Statistical Information System (SNIE) respectively. Information on the roll out of the national health insurance program *Seguro Popular* is obtained from the INEGI data bank. The full dataset is made available on the authors' webpages.

A.3 MxFLS

In order to examine potential mechanisms through which the reform may have affected fertility and maternal mortality, longitudinal data on contraceptive use and knowledge is collected from the Mexican Family Life Survey (MxFLS). The MxFLS is a nationally representative longitudinal dataset that follows individuals over time, covering various topics regarding the well-being of the Mexican population including information on reproductive health. This survey was conducted during three waves in 2002-2003, 2005-2006 and 2009-2012. The data between the years when the survey was conducted is generated by linear interpolation. The analysis sample used consists of women aged 15-44 who completed the reproductive health questionnaire resulting in a total of 15,114 individuals. Further descriptive statistics are displayed in table A2.

In classifying contraceptive use, modern contraceptives are defined as condoms, oral or injectable implants of hormones preventing ovulation, IUD, sterilization and emergency contraception. Traditional or less safe methods are defined as the usage of the calendar method or rhythm method, coitus interruptis, herbs or teas. A detailed account of modern and traditional methods is provided by World Health Organization (2015).

B Additional Details of the ILE Reform

B.1 Reform Background

A brief description of the reform and its timing is provided in section 2 of the main paper. In figure A1, a map of Mexico is presented, with the reform are (Mexico City) highlighted in grey. In table A3, we provide a break down of reform timing and affected cohorts. A medical abortion is a non-invasive procedure that causes contractions of the womb terminating the pregnancy. The MOH-DF program offers both surgical and medical abortion procedures and is the main provider of medical abortion (Winikoff and Sheldon, 2012). Medical abortion procedures are safer and more cost-efficient compared to other methods and the patient self-administers the abortion at home. The large shift from 25% of all abortion procedures being medical in 2007 to as much as 74% in 2011 have played a key part of meeting the demand (Becker, 2013).

A final concern regarding the identification strategy is interventions occurring at the same time as the abortion reform. Of particular concern is the large scale welfare program called Seguro Popular (SP) or "People's' Insurance" that was launched in 2002. SP is a national health insurance program with the aim to provide the then 50 million uninsured Mexican citizens with access to health care. The evidence of SP's impact on actual health outcomes is mixed. Results from multiple previous studies on SP show a positive effect on public health care utilization (see for instance Knox (2008) and Barros (2008)). In contrast to these studies, results indicating no effect on public health care utilization, medical expenditure and self-assessed health has also been found King et al. (2009). Moreover, there is evidence that SP is associated with lower infant mortality and improved antenatal care (Conti and Ginja, 2014) and better access to obstetric care (Sosa-Rubi et al., 2009). However, to the best of our knowledge there is no evidence of decreased maternal mortality, see for instance (Conti and Ginja, 2014) who analyze mortality. In 2005 all 32 states had enrolled in the SP program (Knaul et al., 2007) and the program was implemented in a time varying fashion up until 2013. As of 2010, 90% of the uninsured population was affiliated with SP (Bosch et al., 2012). The SP program offers a wide range of health care services, including 250 indispensable services and 57 expensive interventions of "catastrophic diseases" (Darney et al., 2016). Amongst these are services related to childbirth, antenatal care (Knox, 2008) and contraceptives (Darney et al., 2016). However, contraceptives and other family planning services have been provided free of charge by the government since 1975 (Juarez et al., 2013). Moreover, to the best of our knowledge there is no evidence of an effect on fertility from the SP program. Similarly, the effect on mortality from the SP program has been documented only for infants (Conti and Ginja, 2014). Nevertheless, the SP program may have a direct or indirect effect on fertility and maternal mortality, which is why we control for the roll out of this program as well as the percentage of population that is covered by health insurance at the state level.

B.2 Spillover Effects

The ILE reform took place in Mexico City, and in our main specification, we compare changes in fertility and maternal deaths in Mexico City with those occurring in the rest of the country. The causal effect of the reform can only be estimated in the absence of spillover effects. Women with residency outside of Mexico City, traveling to Mexico City to have an induced abortion would lead to a partially treated control group causing a downward bias in the estimates. Even in the presence of spillover effects however, the treatment effect can be estimated if these spillover effects occur in areas located close to Mexico City but not in more distant areas. This assumption is further supported by data available from the public hospital records (MOH), showing that approximately 74% of all women accessing the reform are women with residency in Mexico City, 24% are resident in the neighboring State of Mexico and only 2% of the women accessing the reform are residents in other states. Accordingly, we assume that the spillover effects are concentrated to the State of Mexico. In order to mitigate concern for spillover effects in the State of Mexico, which constitute a large part of the greater metropolitan area of Mexico City, the State of Mexico is either controlled for or omitted from the analysis. In addition, we estimate the treatment effect using a specification to flexibly capture local spillover effects:

$$\text{Outcome}_{ast} = \beta_1 \text{ILE}_{st} + \sum_j \beta_j \text{Close}^j_{st} + X_{st}\delta + \alpha_s + \nu_t + \pi_a + \lambda_s \times t + \varepsilon_{ast}, \qquad \text{(A1)}$$

for $\in \{0-5km, 6-10km, 11-15km, \ldots, 51-55km\}$.

This equation is analogous to equation 1 from the paper, however now including multiple "close to treatment variables" equal to one after the law was passed for states within j km of Mexico City. As in Equation 1, we include age, year and state fixed effects in order to account for unobserved heterogeneity. In addition, we include state-specific time trends as well as state level time-invariant controls. As in the main paper, the fertility equation is estimated using OLS regression, and the maternal mortality specification is estimated by Poisson regression. Standard errors are clustered at the level of the state.

Results to this specification are presented in figure A3, which find little evidence to suggest that spillover important spillover effects exist, at least when agglomerating to the level of the state.

C Appendix Tables

Table A1: List of States

State	Number of maternal deaths	Number of births	MMR
Aguascalientes	87	257,576	33.77
Baja California	250	5,68,276	43.99
Baja California Sur	53	120,621	43.94
Campeche	88	160,185	54.94
Chiapas	825	1,220,254	67.61
Chihuahua	440	678,600	64.84
Coahuila	198	552,608	35.83
Colima	31	120,840	25.65
Distrito Federal (Mexico City)	818	1,505,790	54.32
Durango	154	362,410	42.49
Guanajuato	489	1,160,802	42.13
Guerrero	702	809,783	86.69
Hidalgo	297	538,216	55.18
Jalisco	577	1,522,825	37.89
State of México	1,745	3,186,751	54.76
Michoacán	458	946,165	48.41
Morelos	185	326,129	56.73
Nayarit	109	216,272	50.40
Nuevo León	204	882,618	23.11
Oaxaca	639	851,138	75.08
Puebla	739	1,377,091	53.66
Querétaro	168	385,391	43.59
Quintana Roo	136	256,223	53.08
San Luis Potosí	276	552,094	49.99
Sinaloa	173	554,838	31.18
Sonora	197	513,172	38.39
Tabasco	211	477,473	44.19
Tamaulipas	258	630,260	40.94
Tlaxcala	121	261,363	46.30
Veracruz	922	1,467,936	62.81
Yucatán	176	360,051	48.88
Zacatecas	132	333,368	39.60
Total	11,858	23,157,119	51.21

Administrative data made available by INEGI on all births and maternal deaths by each state for ages 15-44 during the time period 2002-2011.

Table A2: Descriptives MxFLS data

	Mexico City			The rest of Mexico		
Variable	Mean	Std.	Obs	Mean	Std.	Obs
Contraception use	0,647	0,479	0,479	0,604	0,489	14766
Modern Contraception use	0,612	0,488	0,488	0,563	0,496	14768
Knowledge of contraception	0,981	0,137	0,137	0,969	0,173	23473

Note to Table A2: The data is obtained from the Mexican Family Life Survey (MxFLS).

Table A3: Exposure to the reform at time of conception

	Fertility			Maternal Mortality		
		Partial exposure	**Full exposure**		**Partial exposure**	**Full exposure**
Month of Conception	*Month of Birth*	*Abortion legal at at the month of conception*	*Abortion legal at some point during the first trimester*	*Month of Death*	*Spillover effect from illegal abortions*	*No spillover effects and abortion available the full 1st trimester*
24 Dec 06-23 Jan 07	24 Sep-23 Oct, 2007	no	no	24 Apr-23 May, 2007	yes	no
24 Jan-23 Feb, 2007	24 Oct-23 Nov, 2007	yes	no	24 May-23 Jun, 2007	yes	no
24 Feb-23 Mar, 2007	24 Nov-23 Dec, 2007	yes	no	24 Jun-23 Jul, 2007	yes	no
24 Mar-23 Apr, 2007	24 Dec 07-23 Jan, 08	yes	no	24 Jul-23 Aug, 2007	yes	no
24 Apr-23 May, 2007	24 Jan-23 Feb, 2008	-	yes	24 Aug-23 Sep, 2007	yes	no
24 May-23 Jun, 2007	24 Feb-23 Mar, 2008	-	yes	24 Sep-23 Oct, 2007	yes	no
24 Jun-23 Jul, 2007	24 Mar-23 Apr, 2008	-	yes	24 Oct-23 Nov, 2007	no	yes
24 Jul-23 Aug, 2007	24 Apr-23 May, 2008	-	yes	24 Nov-23 Dec, 2007	-	yes
24 Aug-23 Sep, 2007	24 May-23 Jun, 2008	-	yes	24 Dec 07-23 Feb 08	-	yes
24 Sep-23 Oct, 2007	24 Jun-23 Jul, 2008	-	yes	24 Jan-23 Feb, 2008	-	yes

This table displays exposure to the reform at time of conception for birth and maternal deaths respectively. The abortion law was passed on 24 April 2007. In terms of fertility outcome, the full effect of the reform will be observed in January 2008 since fertility exhibits a nine month lag due to realization of gestation (assuming 40 weeks of gestation). That is, women who got pregnant after the law was passed, had access to abortion during their whole first trimester and are therefore considered as fully treated. Women who got pregnant three months before the law was passed, had at least some period of time when they could access the reform, and are therefore considered partially treated. The earliest time for which any impact on fertility can be detected would then be from October 2007 and onwards. Regarding maternal mortality, women conceiving after 24 January 2007 could access the reform at least at some point during the first trimester while women conceiving after the reform was passed could access the reform during the whole first trimester. However, women conceiving before 24 January 2007, that is women pregnant beyond their first trimester at the time when the reform was passed, could have an illegal abortion during the remaining six months of their pregnancy and hence "contaminate" the maternal deaths taking place in the six months after the reform was passed. The fully exposed maternal deaths (without contamination) therefore occurs from 24 October and forward. Additionally, we also expect a lagged effect from maternal mortality since it is a function of fertility (i.e lower fertility implies lower mortality).

Table A4: Heterogeneous Effects of the Reform Across Ages

(a) Fertility

	Ages 15-18	**Ages 19-24**	**Ages 25-29**	**Ages 30-24**	**Ages 35-39**	**Ages 40-44**
	(1) OLS Log Num. of Births	(2) OLS Log Num. of Births	(3) OLS Log Num. of Births	(4) OLS Log Num. of Births	(5) OLS Log Num. of Births	(6) OLS Log Num. of Births
Reform	-0.0872***	-0.0124	0.0107	-0.0622***	-0.0472***	-0.0358**
	(0.011)	(0.009)	(0.008)	(0.011)	(0.011)	(0.014)
ReformClose	-0.00861	0.00693	0.0128	0.00402	-0.0248**	0.0282
	(0.013)	(0.014)	(0.012)	(0.015)	(0.010)	(0.020)
R^2	0.994	0.998	0.998	0.997	0.994	0.987
Mean_of_dep_Var	7.753	8.644	8.495	8.091	7.292	5.731
Observations (State*Year*Age)	1280	1920	1600	1600	1600	1600
Number of women	43106477	60894528	47542195	44176996	39516001	33952996
FEs, Trends and Controls	✓	✓	✓	✓	✓	✓

(b) Maternal Mortality

	Ages 15-18	**Ages 19-24**	**Ages 25-29**	**Ages 30-24**	**Ages 35-39**	**Ages 40-44**
	(1) Poisson Num. of Deaths	(2) Poisson Num. of Deaths	(3) Poisson Num. of Deaths	(4) Poisson Num. of Deaths	(5) Poisson Num. of Deaths	(6) Poisson Num. of Deaths
Reform	-0.593**	0.308**	-0.690***	-0.393***	0.0631	-0.371***
	(0.253)	(0.137)	(0.105)	(0.128)	(0.152)	(0.125)
ReformClose	-0.460**	0.129	0.0315	0.101	0.247	-0.0261
	(0.223)	(0.110)	(0.097)	(0.152)	(0.151)	(0.073)
Pseudo R^2	0.313	0.331	0.330	0.332	0.293	0.228
Mean_of_dep_Var	1.727	2.731	2.791	2.861	2.354	1.037
Observations (State*Year*Age)	1280	1920	1600	1600	1600	1600
Number of births	2732961	8296491	5918229	3948224	1817803	443411
FEs, Trends and Controls	✓	✓	✓	✓	✓	✓

Notes to Table A4. The table shows the difference-in-difference estimates of the heterogeneous effects of the reform on (a) log number of births (b) and number of maternal deaths by age group. There are six different subsamples of the following age intervals: 15-18, 19-24, 25-29, 30-34, 35-39 and 40-44 for the period 2002-2011. The dependent variables are defined as the log number of births (A5a) and number of maternal deaths (A5b). The independent variable *Reform* takes the value one in Mexico City nine months after the law was passed due to realization of gestation and zero otherwise. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program "Seguro Popular". The fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table A6: The Effect of the Reform on Births, monthly data

	Full-Sample 15-44					**Teenage women 15-19**				
	(1) OLS Log Num. of Births	(2) OLS Log Num. of Births	(3) OLS Log Num. of Births	(4) OLS Log Num. of Births	(5) OLS Log Num. of Births	(6) OLS Log Num. of Births	(7) OLS Log Num. of Births	(8) OLS Log Num. of Births	(9) OLS Log Num. of Births	(10) OLS Log Num. of Births
PartiallyBirth	-0.0217*	-0.00821	-0.00692	-0.0101	-0.00919	-0.0153	-0.00489	-0.00284	-0.00526	-0.000861
	(0.013)	(0.009)	(0.009)	(0.011)	(0.011)	(0.014)	(0.011)	(0.010)	(0.011)	(0.012)
FullyBirth	-0.0307***	-0.00781	-0.0166***	-0.0147**	-0.0144**	-0.0551***	-0.0375***	-0.0517***	-0.0461***	-0.0467***
	(0.011)	(0.005)	(0.006)	(0.006)	(0.006)	(0.011)	(0.007)	(0.008)	(0.009)	(0.008)
R^2	0.970	0.970	0.970	0.970	0.970	0.977	0.978	0.978	0.978	0.978
Mean_of_dep_Var	4.562	4.562	4.562	4.562	4.562	4.846	4.846	4.846	4.846	4.846
Observations (State*Year*Age)	111529	111529	111529	111529	111529	18653	18653	18653	18653	18653
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Notes to Table A6. The table displays the difference in difference estimates from OLS regressions. The sample consists of all births among women aged 15-44 (column 1-5) and sub-sample of teenage women aged 15-19 (column 6-10), for the period 2002-2011, on a monthly level. Partially treated women (who had some exposure to the reform but not during the entire trimester), such that births occurring between Oct-Dec 2007, are excluded from the sample. The dependent variables are defined as the log number of births. The independent variable *Reform* takes the value one in Mexico City nine months after the law was passed due to realization of gestation and zero otherwise. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program "Seguro Popular". The fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table A7: The Effect of the Reform on Maternal Mortality, monthly data

	Full-Sample 15-44					Teenage women 15-19				
	(1) Poisson	(2) Poisson	(3) Poisson	(4) Poisson	(5) Poisson	(6) Poisson	(7) Poisson	(8) Poisson	(9) Poisson	(10) Poisson
	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths	Num. Maternal Deaths
PartiallyMMR	0.0947*	0.0744	0.0562	0.0608	0.0634	0.306*	0.230	0.229	0.211	0.212
	(0.052)	(0.066)	(0.065)	(0.064)	(0.066)	(0.179)	(0.172)	(0.176)	(0.174)	(0.175)
FullyMMR	-0.0414	-0.0728	-0.102**	-0.0776*	-0.0809*	-0.0966	-0.212**	-0.231**	-0.331**	-0.312*
	(0.026)	(0.049)	(0.048)	(0.046)	(0.045)	(0.061)	(0.089)	(0.100)	(0.147)	(0.169)
Pseudo R^2	0.13641	0.13712	0.13725	0.13726	0.13726	0.14010	0.14307	0.14309	0.14325	0.14365
Mean_of_dep_Var	0.103	0.103	0.103	0.103	0.103	0.0785	0.0785	0.0785	0.0785	0.0785
Observations (State*Year*Age)	115146	115146	115146	115146	115146	19259	19259	19259	19259	19259
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Notes to Table A7. The table displays the difference in difference estimates from OLS regressions. The sample consists of all maternal deaths among women aged 15-44 (column 1-5) and sub-sample of teenage women aged 15-19 (column 6-10), for the period 2002-2011, on a monthly level. Partially treated maternal deaths are deaths occurring between April-October 2007 because these deaths could be due to induced abortion beyond the first trimester, which would not occur if these women have had access to legal first trimester abortion. These are excluded from the sample. The dependent variables are defined as the number of maternal deaths. The independent variable *Reform* takes the value one in Mexico City six months after the law was passed on order to account for late term abortions. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico six months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program "Seguro Popular". The fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table A8: State of Mexico is Omitted

	Fertility					Maternal Mortality				
	(1) OLS Log Num. of Births	(2) OLS Log Num. of Births	(3) OLS Log Num. of Births	(4) OLS Log Num. of Births	(5) OLS Log Num. of Births	(6) Poisson Num. of Deaths	(7) Poisson Num. of Deaths	(8) Poisson Num. of Deaths	(9) Poisson Num. of Deaths	(10) Poisson Num. of Deaths
main										
Reform	-0.0217**	-0.0285***	-0.0374***	-0.0338***	-0.0341***	-0.119***	-0.216***	-0.226***	-0.193***	-0.205***
	(0.009)	(0.005)	(0.006)	(0.006)	(0.006)	(0.027)	(0.049)	(0.060)	(0.053)	(0.054)
R^2	0.986	0.986	0.986	0.986	0.986					
Pseudo R^2						0.188	0.190	0.191	0.191	0.191
Mean_of_dep_Var	7.633	7.633	7.633	7.633	7.633	1.875	1.875	1.875	1.875	1.875
Observations (State*Year*Age)	9300	9300	9300	9300	9300	9300	9300	9300	9300	9300
Number of women	231990879	231990879	231990879	231990879	231990879					
Number of births						19970368	19970368	19970368	19970368	19970368
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Note to Table A8. The table displays the difference in difference estimates from OLS regressions (column 1-5) and Poisson regressions (column 6-10). The sample consists of all births and maternal deaths among women aged 15-44 for the period 2002-2011. The State of Mexico is omitted due to potential spillover effects. The dependent variables are defined as the log number of births (column 1-5) and maternal deaths (column 6-10). The independent variable *Reform* takes the value one in Mexico City nine months after the law was passed. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are state level illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program “Seguro Popular” (state level). The fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table A9: Robustness

	Fertility					Maternal Mortality				
	(1) OLS Log Num. of Births	(2) OLS Log Num. of Births	(3) OLS Log Num. of Births	(4) OLS Log Num. of Births	(5) OLS Log Num. of Births	(6) Poisson Num. of Deaths	(7) Poisson Num. of Deaths	(8) Poisson Num. of Deaths	(9) Poisson Num. of Deaths	(10) Poisson Num. of Deaths
main										
Reform	-0.0283**	-0.0261***	-0.0308***	-0.0331***	-0.0330***	-0.148***	-0.217***	-0.250***	-0.278***	-0.267***
	(0.012)	(0.006)	(0.006)	(0.009)	(0.009)	(0.019)	(0.057)	(0.047)	(0.060)	(0.052)
ReformClose	-0.0149	0.00748	0.00536	0.0112	0.0129	-0.132***	-0.0168	0.0176	0.0331	0.0632
	(0.012)	(0.006)	(0.006)	(0.013)	(0.016)	(0.019)	(0.057)	(0.058)	(0.071)	(0.071)
R^2	0.990	0.990	0.990	0.990	0.990					
Pseudo R^2						0.371	0.372	0.372	0.372	0.372
Mean_of_dep_Var	7.888	7.888	7.888	7.888	7.888	2.823	2.823	2.823	2.823	2.823
Observations (State*Year*Age)	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300
Number of women	193099050	193099050	193099050	193099050	193099050					
Number of births						15763586	15763586	15763586	15763586	15763586
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Note to Table A9. The table displays the difference in difference estimates from OLS regressions (column 1-5) and Poisson regressions (column 6-10). The sample consists of all births and maternal deaths among women aged 15-44 for the period 2002-2011. States where more than 50% of all births occur in rural areas are omitted from the analysis. The dependent variables are defined as the log number of births (column 1-5) and maternal deaths (column 6-10). The independent variable *Reform* takes the value one in Mexico City nine months after the law was passed. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico after nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are state level illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program "Seguro Popular" (state level). The fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table A10: Alternative Specifications

	Fertility					**Maternal Mortality**				
	(1) OLS Birth Rate	(2) OLS Birth Rate	(3) OLS Birth Rate	(4) OLS Birth Rate	(5) OLS Birth Rate	(6) OLS MMR	(7) OLS MMR	(8) OLS MMR	(9) OLS MMR	(10) OLS MMR
Reform	4.898***	-1.758***	-2.264***	-2.337***	-2.361***	-3.061**	-9.930***	-11.21***	-11.03***	-11.32***
	(0.705)	(0.382)	(0.535)	(0.584)	(0.585)	(1.295)	(1.753)	(2.202)	(2.225)	(2.097)
ReformClose	-1.094	0.843**	0.489	0.701	0.624	-5.263***	2.288	2.711	2.243	2.678
	(0.704)	(0.374)	(0.513)	(0.859)	(0.954)	(1.297)	(1.750)	(2.086)	(3.309)	(3.223)
R^2	0.968	0.969	0.969	0.969	0.969	0.221	0.224	0.225	0.225	0.225
Mean_of_dep_Var	86.03	86.03	86.03	86.03	86.03	51.21	51.21	51.21	51.21	51.21
Observations (State*Year*Age)	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600
Number of women	269189193	269189193	269189193	269189193	269189193					
Number of births						23157119	23157119	23157119	23157119	23157119
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Note to Table A10. The table displays the difference in difference estimates from OLS regressions (column 1-5) and Poisson regressions (column 6-10). The sample consists of all births and maternal deaths among women aged 15-44 for the period 2002-2011. The dependent variables are birth rate defined as the annual number of births per 1,000 women (column 1-5) in a specific area and maternal mortality ratio defined as the annual number of deaths per 100,000 live births (column 6-10). The independent variable *Reform* takes the value one in Mexico City nine months after the law was passed. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico after nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are state level illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program "Seguro Popular" (state level). The fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table A11: Alternative Specifications

	Fertility					Maternal Mortality				
	(1) OLS Num. of Births	(2) OLS Num. of Births	(3) OLS Num. of Births	(4) OLS Num. of Births	(5) OLS Num. of Births	(6) OLS Num. of Deaths	(7) OLS Num. of Deaths	(8) OLS Num. of Deaths	(9) OLS Num. of Deaths	(10) OLS Num. of Deaths
Reform	-442.7***	-48.91**	-59.30**	-82.99*	-78.96*	-0.482***	-0.558***	-0.546***	-0.579***	-0.595***
	(32.686)	(21.747)	(26.138)	(42.347)	(40.603)	(0.054)	(0.096)	(0.137)	(0.105)	(0.102)
ReformClose	-463.3***	328.8***	321.3***	369.1***	373.0***	-1.098***	0.347***	0.392***	0.467***	0.499**
	(32.238)	(21.013)	(24.272)	(65.804)	(70.545)	(0.052)	(0.095)	(0.125)	(0.169)	(0.183)
R^2	0.815	0.816	0.816	0.816	0.816	0.612	0.618	0.618	0.618	0.619
Mean_of_dep_Var	4402.4	4402.4	4402.4	4402.4	4402.4	2.588	2.588	2.588	2.588	2.588
Observations (State*Year*Age)	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600
Number of women	269189193	269189193	269189193	269189193	269189193					
Number of births						23157119	23157119	23157119	23157119	23157119
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Note to Table A11. The table displays the difference in difference estimates from OLS regressions (column 1-10). The sample consists of all births and maternal deaths among women aged 15-44 for the period 2002-2011. The dependent variables are the numbers of births (column 1-5) and numbers of maternal deaths (column 6-10). The independent variable *Reform* takes the value one in Mexico City nine months after the law was passed. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico after nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are state level illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program "Seguro Popular" (state level). The fixed effects consist of age, state and year binary variables. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

Table A12: Inference

	Fertility					Maternal Mortality				
	(1) OLS Log Num Births	(2) OLS Log Num Births	(3) OLS Log Num Births	(4) OLS Log Num Births	(5) OLS Log Num Births	(6) OLS Log Num Deaths	(7) OLS Log Num Deaths	(8) OLS Log Num Deaths	(9) OLS Log Num Deaths	(10) OLS Log Num Deaths
Reform	-0.0300**	-0.0283**	-0.0370**	-0.0385**	-0.0382**	-0.0674**	-0.163**	-0.185**	-0.187**	-0.189**
	(0.013)	(0.012)	(0.016)	(0.017)	(0.016)	(0.029)	(0.070)	(0.080)	(0.080)	(0.081)
ReformClose	-0.0173	0.00290	-0.00258	-0.00292	-0.00766	-0.112**	0.108***	0.101***	0.0911***	0.0891**
	(0.013)	(0.005)	(0.005)	(0.012)	(0.008)	(0.048)	(0.000)	(0.000)	(0.000)	(0.038)
Observations	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600
R^2	0.98806	0.98853	0.98854	0.98854	0.98855	0.49129	0.49468	0.49508	0.49515	0.49520
State, Year and Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State Specific Linear Trends		✓	✓	✓	✓		✓	✓	✓	✓
Economic controls			✓	✓	✓			✓	✓	✓
Education controls				✓	✓				✓	✓
Health controls					✓					✓

Note to Table A12. The table displays the difference in difference estimates from OLS regressions (column 1-10). The sample consists of all births and maternal deaths among women aged 15-44 for the period 2002-2011. The dependent variables are the numbers of births (column 1-5) and numbers of maternal deaths (column 6-10) (wild bootstrapping is not compatible in non-linear models such as Poisson regressions). The independent variable *Reform* takes the value one in Mexico City nine months after the law was passed. Similarly, *ReformClose* is a binary variable equal to one in the neighboring State of Mexico after nine months after the reform was introduced. The economic controls are state level income, unemployment and rurality. The controls for education are state level illiteracy and proportion of people aged 6-14 who are not enrolled in school. The health controls are the proportion of residents with no health rights and the roll out of the national health insurance program "Seguro Popular" (state level). The fixed effects consist of age, state and year binary variables. standard errors are estimated using wild bootstrapping.*** p<0.01,** p<0.05,* p<0.1.

Table A13: Educational Composition

(a) Birth Register

	Maternal Composition, Education				
	(1) OLS No Education	(2) OLS Primary Education	(3) OLS Secondary Education	(4) OLS High School	(5) OLS Professional Education
Reform	-0.00235	0.00417	0.0191***	-0.0136***	-0.00701***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)
Observations	1081393	1081393	1081393	1081393	1081393
R^2	0.10147	0.03111	0.05042	0.02922	0.05671
Mean_of_dep_Var	0.120	0.242	0.360	0.176	0.101
State and Year	✓	✓	✓	✓	✓
State Specific Linear Trends	✓	✓	✓	✓	✓
Economic controls	✓	✓	✓	✓	✓
Health controls	✓	✓	✓	✓	✓

(b) Deaths Register

	Maternal Composition, Education				
	(1) OLS No Education	(2) OLS Primary Education	(3) OLS Secondary Education	(4) OLS High School	(5) OLS Professional Education
Reform	0.0587**	-0.0941***	0.0296	-0.0247	0.0306**
	(0.026)	(0.015)	(0.018)	(0.015)	(0.012)
Observations	11556	11556	11556	11556	11556
R^2	0.12714	0.08852	0.05357	0.04339	0.02780
Mean_of_dep_Var	0.443	0.101	0.245	0.126	0.0852
State and Year	✓	✓	✓	✓	✓
State Specific Linear Trends	✓	✓	✓	✓	✓
Economic controls	✓	✓	✓	✓	✓
Health controls	✓	✓	✓	✓	✓

Note to Table A13. The table displays the difference in difference estimates from OLS regressions. The sample consists of all births and maternal deaths for women aged 15-44 for the period 2002-2011. The dependent variables are, conditional on motherhood, the probability of having no or incomplete primary education (column 1), probability of primary education (column 2), probability of secondary education (column 3), probability of high school degree (column 4), probability of professional education (column 5) age (column 6) teenage death (column 7) and probability of single motherhood. The independent variable *Reform* takes the value of one in locations and time where the reform was passed i.e. in the Mexico City after 2007. A full set of fixed effects, time varying controls and state-specific linear time trends are included in each regression. Standard errors are clustered at state level.*** p<0.01,** p<0.05,* p<0.1.

D Appendix Figures

Figure A1: Map of Mexico

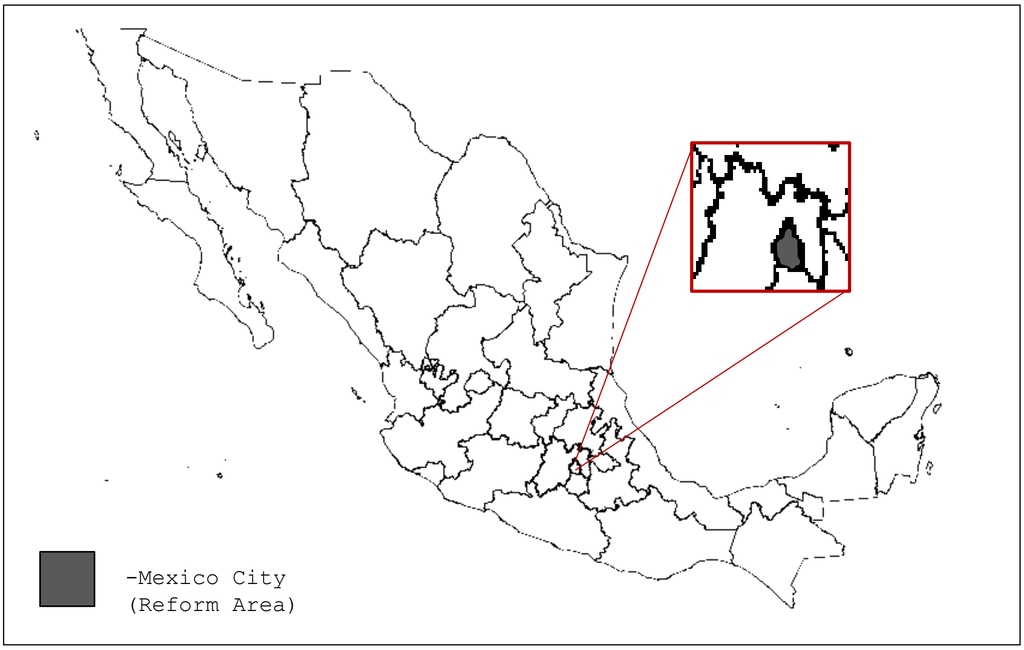
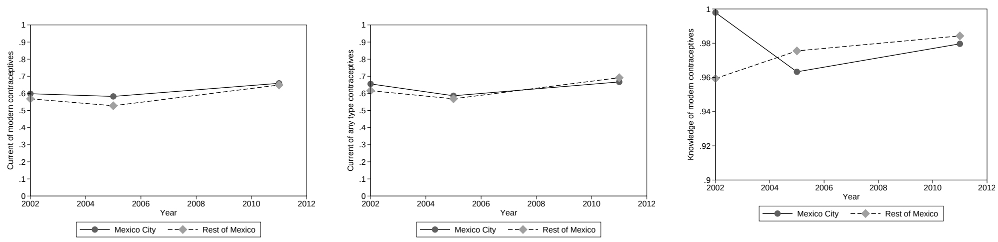


Figure A2: MxFLS data

(a) Current use of modern method

(b) Current use of modern or traditional method

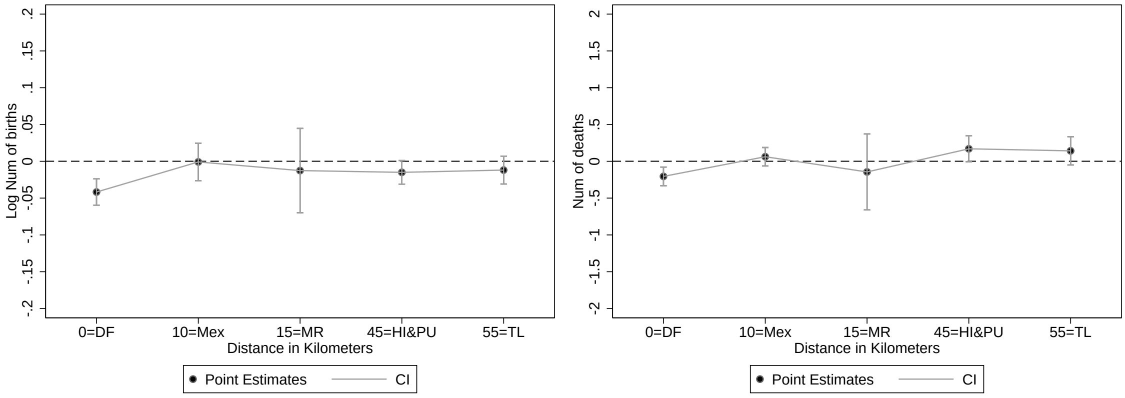
(c) Contraceptive knowledge



Note to Figure A2: The data is obtained from the Mexican Family Life Survey (MxFLS) conducted in 2002-2003, 2005-2006 and 2009-2012. The sample consists of all women aged 15-44 who completed the reproductive health questionnaire resulting in a total of 15,114 individuals. The data for the years between when the surveys were conducted is linearly interpolated. Modern contraceptives are condoms, oral or/injectable/implants of hormones preventing ovulation, IUD, sterilization and emergency contraception. Traditional or less safe methods are calendar method or rhythm method, coitus interrupts, herbs or teas.

Figure A3: Spillover Effects

(a) Fertility (b) Maternal mortality



Note to figure A3: The coefficient plot shows point estimates and confidence intervals estimated according to Equation (A1) using OLS regressions (Figure A3a) and Poisson regressions (Figure A3b). The sample consists of all births and maternal deaths among women aged 15-44 for the period 2002-2011. We include multiple treatment variables equal to unity (9 months) after the law was passed for states with the minimum distance intervals 0-5, 6-10, 11-15 up to 51-55 kilometers to Mexico City, in order to examine spillover effects. DF=Mexico City, Mex=State of Mexico, MR=Morelos, HI=Hidalgo, PU=Puebla and TL=Tlaxcala. A full set of fixed effects, time varying controls and state-specific linear time trends are included in each regression (see note to Table A4).

References

Barros, R. (2008): "Wealthier But Not Much Healthier: Effects of a Health Insurance Program for the Poor in Mexico," Discussion Papers 09-002, Stanford Institute for Economic Policy Research.

Becker, D. (2013): "Decriminalization of Abortion in Mexico City: The Effects on Women's Reproductive Rights," *American Journal of Public Health*, 103, 590–593.

Bosch, M., M. B. Cobacho, and C. Pages (2012): "Taking stock of eight years of implementation of Seguro Popular in Mexico," *Washington, DC, United States: Inter-American Development Bank. Mimeographed document.*

Consejo Nacional de Población (2012): "Proyecciones de la población de México 2010–2050," Tech. Rep. Documento Metodológico, CONAPO.

Conti, G. and R. Ginja (2014): *Evaluating a Universal Health Insurance Program: Evidence from Mexico*, Unpublished Manuscript.

Darney, B. G., S. Sosa-Rubi, E. Servan-Mori, M. I. Rodriguez, D. Walker, and R. Lozano-Ascencio (2016): "The relationship of age and place of delivery with postpartum contraception prior to discharge in Mexico: A retrospective cohort study," *Contraception*, In Press.

Juarez, F., S. Singh, I. Maddow-Zimet, and D. Wulf (2013): "Unintended Pregnancy and Induced Abortion in Mexico: Causes and Consequences," Tech. rep., Guttmacher Institute, New York.

King, G., E. Gakidou, K. Imai, J. Lakin, R. T. Moore, C. Nall, N. Ravishankar, M. Vargas, M. M. Téllez-Rojo, J. E. H. Ávila, et al. (2009): "Public policy for the poor? A randomised assessment of the Mexican universal health insurance programme," *The lancet*, 373, 1447–1454.

Knaul, F. M., H. Arreola-Ornelas, O. Méndez-Carniado, C. Bryson-Cahn, J. Barofsky, R. Maguire, M. Miranda, and S. Sesma (2007): "Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico," *Salud Pública De México*, 49, S70–87.

Knox, M. (2008): "Health Insurance for All: An Evaluation of Mexico's Seguro Popular Program," Unpublished manuscript, Department of Economics, University of California Berkley.

Sosa-Rubi, S. G., O. Galarraga, and J. E. Harris (2009): "Heterogeneous impact of the "seguro popular" program on the utilization of obstetrical services in mexico, 2001–2006: a multinomial probit model with a discrete endogenous variable," *Journal of health economics*, 28, 20–34.

Winikoff, B. and W. R. Sheldon (2012): "Abortion: what is the problem?" *The Lancet*, 379, 594 – 596.

World Health Organization (2015): "Family planning/Contraception," Fact sheet Number 351, accessed at http://www.who.int/mediacentre/factsheets/fs351/en/ (consulted April 26, 2016).

CINCH working paper series

1 Halla, Martin and Martina Zweimüller. **Parental Responses to Early Human Capital Shocks:** Evidence from the Chernobyl Accident. CINCH 2014.

2 Aparicio, Ainhoa and Libertad González. **Newborn Health and the Business Cycle:** Is it Good to be born in Bad Times? CINCH 2014.

3 Robinson, Joshua J. **Sound Body, Sound Mind?:** Asymmetric and Symmetric Fetal Growth Restriction and Human Capital Development. CINCH 2014.

4 Bhalotra, Sonia, Martin Karlsson and Therese Nilsson. **Life Expectancy and Mother-Baby Interventions:** Evidence from A Historical Trial. CINCH 2014.

5 Goebel, Jan, Christian Krekel, Tim Tiefenbach and Nicolas R. Ziebarth. **Natural Disaster, Environmental Concerns, Well-Being and Policy Action:** The Case of Fukushima. CINCH 2014.

6 Avdic, Daniel, **A matter of life and death? Hospital Distance and Quality of Care:** Evidence from Emergency Hospital Closures and Myocardial Infarctions. CINCH 2015.

7 Costa-Font, Joan, Martin Karlsson and Henning Øien. **Informal Care and the Great Recession.** CINCH 2015.

8 Titus J. Galama and Hans van Kippersluis. **A Theory of Education and Health.** CINCH 2015.

9 Dahmann, Sarah. **How Does Education Improve Cognitive Skills?:** Instructional Time versus Timing of Instruction. CINCH 2015.

10 Dahmann, Sarah and Silke Anger. **The Impact of Education on Personality:** Evidence from a German High School Reform. CINCH 2015.

11 Carbone, Jared C. and Snorre Kverndokk. **Individual Investments in Education and Health.** CINCH 2015.

12 Zilic, Ivan. **Effect of forced displacement on health.** CINCH 2015.

13 De la Mata, Dolores and Carlos Felipe Gaviria. **Losing Health Insurance When Young:** Impacts on Usage of Medical Services and Health. CINCH 2015.

14 Tequame, Miron and Nyasha Tirivayi. **Higher education and fertility:** Evidence from a natural experiment in Ethiopia. CINCH 2015.

15 Aoki, Yu and Lualhati Santiago. **Fertility, Health and Education of UK Immigrants:** The Role of English Language Skills. CINCH 2015.

16 Rawlings, Samantha B., **Parental education and child health:** Evidence from an education reform in China. CINCH 2015.

17 Kamhöfer, Daniel A., Hendrik Schmitz and Matthias Westphal. **Heterogeneity in Marginal Non-monetary Returns to Higher Education.** CINCH 2015.

18 Ardila Brenøe, Anne and Ramona Molitor. **Birth Order and Health of Newborns:** What Can We Learn from Danish Registry Data? CINCH 2015.

19 Rossi, Pauline. **Strategic Choices in Polygamous Households:** Theory and Evidence from Senegal. CINCH 2016.

20 Clarke, Damian and Hanna Mühlrad. **The Impact of Abortion Legalization on Fertility and Maternal Mortality:** New Evidence from Mexico. CINCH 2016.

DOI: 10.17185/duepublico/70955
URN: urn:nbn:de:hbz:464-20191209-104606-8