Does the Power of the Pills Endure? The Effect of Increased Access to Emergency Contraception

Gabriel Cruz

University of Maryland, College Park

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Abstract

The ”power of the pill” literature has demonstrated how the introduction of oral contraceptives in the late 1960s led to a decrease in women's fertility, which, in turn, positively impacted women's educational attainment and labor market outcomes. Half a century later, we are witnessing another significant reduction in fertility, but in a completely different context: a vast contraceptive market and a society where women are more integrated into the educational system and labor force. This paper focuses on the impact of increased access to the emergency contraceptive (EC) pill on fertility and educational outcomes. Utilizing a quasi-experimental design, the study leverages the removal of the prescription requirement for the EC pill in Chile in 2015. By analyzing a novel dataset that includes pharmacy sales, pharmacy locations, and administrative records, I find that the birth rate decreases significantly by 7% in areas with high access to the pill (measured as areas with greater access to pharmacies). This effect is primarily driven by the youngest population (15–19 years old), where increased access decreases the birth rate by 16.3%. Additionally, I find an unexpected significant negative effect of 0.2 percentage points on graduation rates among students with high access to the pill, especially in public schools. However, I do not observe significant changes in college enrollment. These effects seem to be driven by a law protecting pregnant and parenting students in high schools, revealing that while increased access to contraception may reduce teen births, it does not address the underlying factors that cause disadvantaged women to drop out of high school.

1 Introduction

In the late 1960s, the U.S. experienced a significant decline in fertility. The "power of the pill" literature explains how the introduction of oral contraceptives led to a substantial decrease in women's fertility during this period, which, in turn, had a positive impact on women's education and labor market outcomes (Goldin and Katz 2002; Bailey 2006; Guldi 2008; Bailey et al. 2012). Some literature even describes the pill as "the drug that changed the world" (Asbell 1995). Over the past 50 years, there has been steady progress in contraception products, starting with the first oral contraceptive pill in the 1960s, the Emergency Contraceptive pill in the late 1990s, and more recently, emerging technologies such as the contraceptive vaginal ring (Sitruk-Ware et al. 2013).

Half a century later after the introduction of the oral contraceptive pill, we are witnessing another significant decline in fertility in high- and middle-income countries, particularly among younger populations. Two of the most extreme cases are South Korea and Chile, countries on different continents but experiencing the same phenomenon. South Korea is trending toward a fertility rate of just 0.68 births per woman in 2024, down from 1.24 in 2015. Chile is projected to have a fertility rate of just 0.88 in 2024, compared to 1.78 in 2015.[1] In the U.S., since 2007, birth rates have plummeted, reaching 55.8 per 1,000 women in 2020—a 20% decline from 2007 to 2020 (Kearney et al. 2022).

It is not clear what is driving the decline in births; however, multiple factors are involved. The literature has explored various factors that influence pregnancy decisions, which can be categorized into three main groups. First, economic factors such as income (Lindo 2010; Kearney and Wilson 2018). Second, social policies like child support enforcement (Aizer and McLanahan 2006) also impact decisions. Lastly, reproductive health policies, including abortion (Myers 2017) and contraceptive products (Goldin and Katz 2002; Bailey 2006), are crucial determinants.

Moreover, the education system and labor market have changed significantly from the 1960s to the present. Women are now more integrated into the labor force, and educational attainment is much higher than it was 60 years ago. However, inequality against women persists. For instance, recent literature has shown that childbearing negatively impacts women's participation in the labor market (Kleven et al. 2019), highlighting the existence of a 'child penalty' for women. In this context, it is crucial to examine the relationship between contraceptive use, women's decisions regarding motherhood, and the impact on their educational and labor market outcomes in this evolving environment.

Bailey et al. (2023) highlight two distinct approaches to understanding this relationship. The first emphasizes demand

[1]The Total Fertility Rate (TFR) is a demographic measure used to estimate the average number of children a woman will have during her reproductive years. A TFR of approximately 2.1 children per woman is considered the replacement level, meaning it sustains the population size without growth or decline, assuming no significant migration impacts.

factors, contending that pregnancies and contraceptive use are primarily determined by preferences, wages, and income (Blake 1969; Easterlin 1987). The second approach considers factors that hinder access to contraception, suggesting that barriers such as costs or lack of information play a crucial role in preventing undesired childbearing for females (Harkavy et al. 1969).

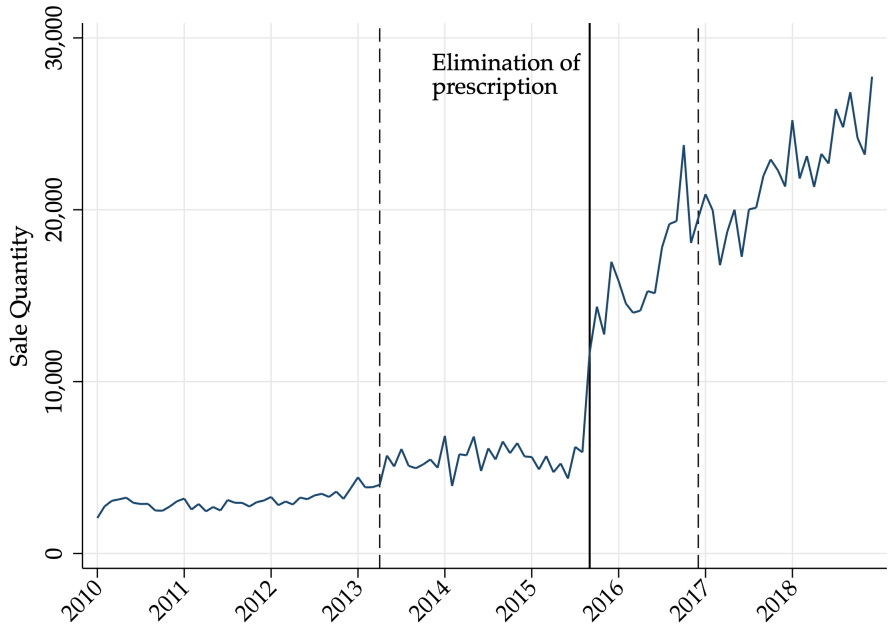
In this paper, I explore the relationship between access to the contraceptive pill, fertility, and educational outcomes by exploiting a reduction in the cost of access to the emergency contraceptive (EC) pill in Chile. In 2015, the prescription requirement for the EC pill was eliminated, leading to a significant increase in sales (Figure 1). The EC pill is most effective within 72 hours after unprotected sex, with its efficacy being highest within the first 24 hours. Therefore, quick access is a key factor in its effectiveness. This quasi-experimental setting allows me to study the impact of increased access to a contraceptive product in a context completely different from that of the 1960s. Specifically, I measure the impact on birth rates and female outcomes when the pill became available over the counter (OTC) in pharmacies nationwide.[2] I use administrative data to track each birth over time, linked with pharmacy locations as a proxy for areas with greater access to the pill. Additionally, by using administrative data on students and schools, I can observe the distance between each school and pharmacy to determine which students were more exposed to the policy of easier access to the pill. With this setup and data, I implement a difference-in-differences (DID) analysis to assess whether increased access to the EC pill affected fertility and female student outcomes.

I find that the birth rate decreases significantly by 7% in municipalities with high access. This effect is primarily driven by the youngest population (15-19 years old), where increased access to the EC pill leads to a decrease in the birth rate by 16.3%. This result aligns with Bailey (2006), who found that early access to the pill in the 1960s reduced the likelihood of a birth before age 22 by roughly 14%. Regarding educational outcomes, I observe a small but significant negative effect on the female high school graduation rate, with a decrease of 0.2 percentage points. This effect is more pronounced in public school students, where the decrease reaches 0.4 percentage points. Furthermore, the average effect on college enrollment is negative (0.7 percentage points), although this is not statistically significantly different from zero. However, this effect is much more pronounced and statistically significant among public school students, with a decrease of 2.6 percentage points. These results are largely influenced by a law protecting adolescent mothers in high schools and are contrary to what I would expect based on the ”power of the pill” literature.

Regarding the literature on EC pills, studies are relatively scarce, and the results are inconclusive, primarily exploring only birth and abortion outcomes. Gross et al. (2014) observed that expanded access to the EC pill in the US has not

[2]Abortion was not allowed when the EC pill became available OTC. In November 2017, abortion was legalized on three grounds: when a woman's life is in danger, in cases of fetal anomalies incompatible with life, and in cases of rape.

Figure 1. Sales of Emergency Contraceptive Pill



Notes: This figure displays the monthly sales of all emergency contraceptive pills through pharmacies. The first dashed vertical line marks the date when the EC pill became reliably available in pharmacies by prescription. The second dashed vertical line indicates the date when abortion was legalized on three specific cases.

statistically influenced birth and abortion rates. They note that access expansion has primarily altered the locations where the drug is obtained, transitioning from hospitals to pharmacies. They further argue that reducing the cost of EC pills can mitigate the risks associated with sexual activity and potentially influence women's behavior. Analyzing the prescription-free introduction of morning-after pills in Europe, Pfeifer and Stockburger (2023) report no substantial decrease in abortion rates; instead, they note an unexpected rise in fertility, particularly among women aged 25-34. This result, they suggest, may be attributable to a decline in the use of daily birth control pills as a consequence of more accessible morning-after pills. Cintina (2017) shows that its increased availability in Washington, measured by the distance to the nearest pharmacy offering the EC pill without a prescription, is associated with a statistically significant, though economically moderate, decrease in abortion rates in counties where women had access to the EC pill.

In the Chilean context, Bentancor and Clarke (2017) reported a decrease in fertility and late fetal deaths corresponding with the greater availability of emergency contraception from 2009 to 2011. Clarke and Salinas (2021) similarly observed that enhanced access to emergency EC pills in the public sector significantly improved women's reproductive health outcomes, leading to reduced abortion-related morbidity rates. Additionally, Rau et al. (2021) demonstrated substantial effects on the number of children born to unmarried mothers and mothers in their early twenties following a significant price increase for contraceptive pills due to collusion among pharmacies.

This paper makes several contributions. First, it enhances our understanding of the factors that hinder access to contraception by demonstrating that barriers such as cost play a crucial role in the decision to have a child (Bailey et al. 2023). Second, it shows that the emergency contraceptive pill is a key factor in explaining the recent decline in fertility and confirms that contraceptive pills continue to influence decisions about having children. Third, the literature on the EC pill has identified factors that might explain the inconclusive effects of reducing the cost of access to the EC pill on birth rates. I explore each of these factors to understand why significant effects are found in the Chilean context. Fourth, the unexpected results on educational outcomes suggest that the effects of the 'power of the pill' are contingent on the current context, where women are increasingly integrated into the labor market and educational system, and laws that protect adolescent mothers in high schools play a significant role. Finally, this paper contributes to the literature on adolescent motherhood, showing that reducing adolescent motherhood does not necessarily have a positive impact on educational outcomes (Kruger et al. 2009; Ashcraft et al. 2013).

The paper is structured as follows: Section two explains the institutional background of the EC pill in Chile. Section three describes the various sources of data used in the study. Section four details the empirical strategy used to measure the impact on birth rates, demonstrating how pharmacy locations serve as a reliable proxy for identifying areas with high levels of access to the pill. Then, I explore factors that may explain the significant effects observed in this context. In section five, I present the identification strategy and results for educational outcomes. Additionally, I explain the institutional background that protects adolescent mothers, which drives the results. In the final section, I conclude the paper.

2 Institutional Background

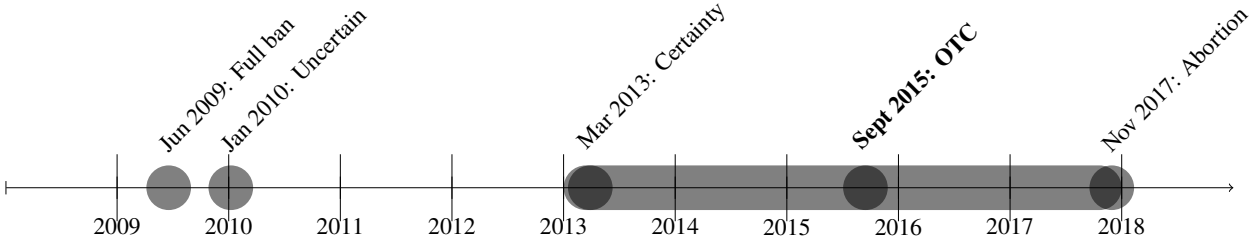
The history of the EC pill in the Chilean context has been controversial, with many policy changes that are summarized in Figure 2. Until 2008, the EC pill was either entirely unavailable in Chile or accessible only within short windows and under limited circumstances (e.g., in cases of rape). However, in June 2009, the distribution of the pill was banned until January 2010, during which time its distribution was uncertain in both the public and private sectors. From 2013 onwards, the EC pill was freely distributed and could be purchased with a prescription. Since September 2015, the EC pill has been available OTC in all pharmacies across the country.[3] The EC pill is provided free of charge through Chile's public health system.

An important point to highlight in the Chilean context is that abortion was banned when the EC pill became available

[3]See Nuevo-Chiquero and Pino (2019) for more details of EC pill in the Chilean context.

over the counter (OTC). In November 2017, abortion was partially decriminalized under three conditions: when a woman's life is in danger, when there are fetal anomalies incompatible with life, and in cases of rape. This context allows me to isolate the effect of access to the EC pill from the possible effects of abortion, as discussed in Myers (2017). For the main analysis, I focus on the period from 2013 to 2018 to isolate the effect of the removal of the prescription requirement.

Figure 2. Timeline of EC Pill in the Market



The variation in access to the EC pill has been studied using data from 2009 to 2011. Bentancor and Clarke (2017) shows a decrease in fertility and late fetal deaths in municipalities that had access to the EC pill. Similarly, Clarke and Salinas (2021) observe that enhanced access to EC pills in the public sector significantly improved women's reproductive health outcomes, leading to reduced abortion-related morbidity rates.

3 Data and Descriptive Analysis

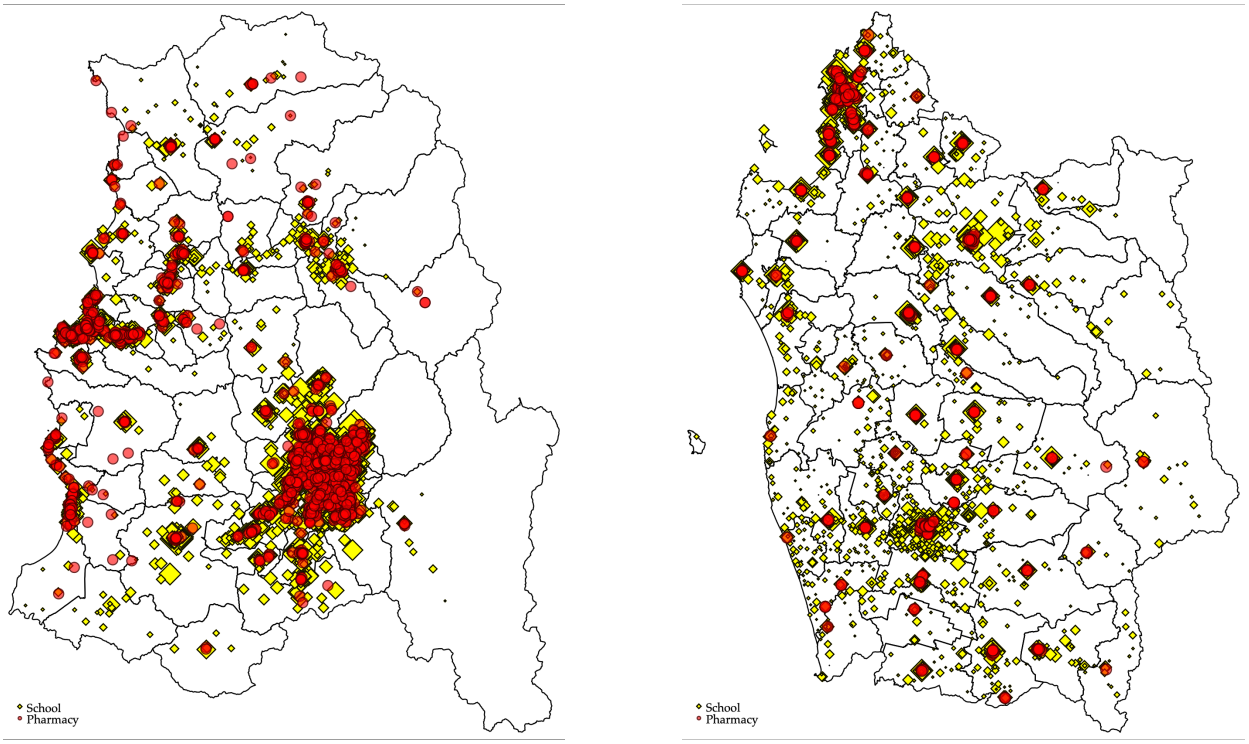
To address the research questions, I will utilize data from various sources, including private-sector pharmacy data, administrative data on drug sales from public institutions, administrative birth records, student-level school data, and more. In this section, I will explain and present some descriptive data from these different sources of information.

3.1 Private Sector

I use data from IQVIA, a company that collects pharmaceutical market information worldwide. This dataset contains monthly local EC pill sales from 2010 to 2018, sourced from two main channels. The four major pharmacy chains, which represent over 90 percent of the market share, directly report retail prices and sales to IQVIA. Data from other pharmacies are sourced from wholesalers. IQVIA consolidates this data at the level of 87 local markets, covering the entire pharmacy market of the country. Figure 1 shows the aggregated sales data for the EC pill from 2010 to 2018, indicating that sales increased significantly once the prescription was no longer necessary to obtain the pill.

In 2015, 280 out of 345 municipalities had at least one pharmacy (81.2%), representing 98.1% of the female population between 15 and 40 years old. Figure 3 shows the distribution of pharmacies in two different areas that represent more than half of the female population between 15 and 40 years old in Chile.

Figure 3. Pharmacies and Schools Distribution



(a) Metropolitan and Valparaiso Regions

(b) Bio-Bio and Araucania Regions

Notes: Each red point represents a pharmacy, while yellow diamonds represent schools (primary, middle, and high schools), with the size of each diamond indicating the number of students enrolled. Larger diamonds correspond to schools with higher enrollment. In 2015, the area represented in Panel (a) accounted for 51.7% of the female population between 15 and 40 years old, while Panel (b) represented 14.4%.

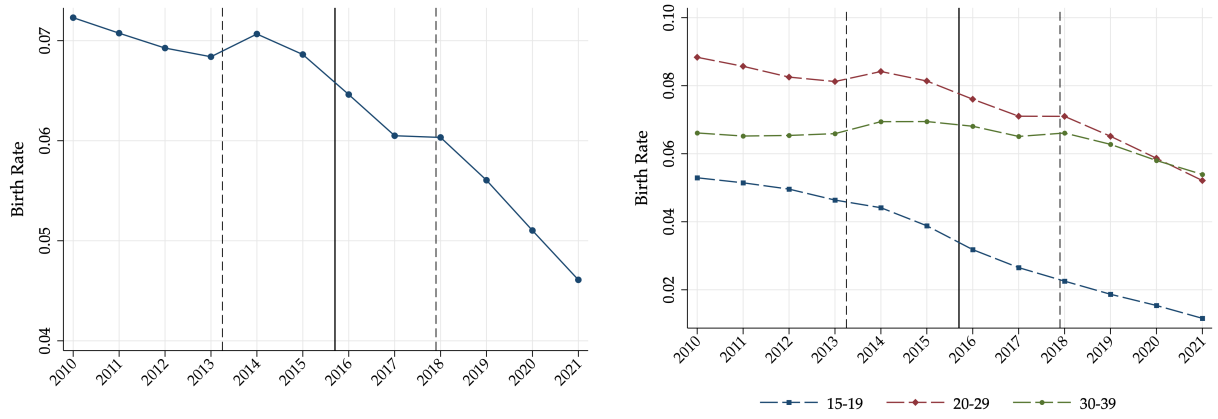
3.2 Births

The administrative vital statistics data, which records all births, is provided by the National Institute of Statistics (INE). Each birth record includes characteristics of the mother (and father, if applicable), such as age, education, marital status, and municipality of residence. It also provides details about the birth, such as birth weight, gender, gestation period, and birth order. Additionally, the INE provides population data by age and municipality over time, allowing for the calculation of birth rates by municipality and age on an annual basis.

Panel (a) of Figure 4 displays the birth rate over time among women aged 15 to 40. In this age range, the number of births in 2015 was 246,314 (see Figure B.1). It is observable that the birth rate began to decrease when the

EC pill became available OTC and continued to decline until 2017. Afterwards, the birth rate remained constant until abortion was partially decriminalized, at which point it began to decrease again. Panel (b) shows the same data for three different age groups. For the youngest group, the decreasing trend seems to have started before the prescription elimination but became more pronounced after the policy change. For the other two groups, the percentage change remained relatively stable until 2016, when the birth rate decreased, followed by another decrease after 2017.

Figure 4. Birth Rate



(a) Birth rate

(b) Birth Rate by Age

Notes: Both figures include women between 15 and 39 years old. The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds.

Table 1 presents the birth rates for three age groups before and after the prescription elimination. For the entire population of women aged 15 to 40, the birth rate decreased by 9.1 percent following the policy change. The most significant decline occurred among women aged 15 to 19 years, whereas the birth rate in the oldest group saw the smallest decline.

3.3 Education Data

School and student administrative information is sourced from the Ministry of Education (MINEDUC) and Chile's System for Measuring the Quality of Education, known by its Spanish acronym SIMCE. MINEDUC provides monthly details on student attendance and performance from 2012 to 2017. It is also possible to observe if students fail or successfully graduate to the next grade, as well as which students apply to college and their college enrollment after high school. Additionally, information on the location and characteristics of each school, including enrollment and financing (public, voucher, or private), is obtained. SIMCE includes a student survey offering insights into their

Table 1. Changes in Birth Rates

	Before	After	Difference	% Change
Panel a: All women				
Rate Births	0.066	0.060	-.006	-0.091
	(0.019)	(0.018)		
Panel b: 15-19 year-olds				
Rate Births	0.045	0.032	-.013	-0.289
	(0.021)	(0.014)		
Panel c: 20-29 year-olds				
Rate Births	0.085	0.078	-.007	-0.082
	(0.038)	(0.043)		
Panel d: 30-39 year-olds				
Rate Births	0.059	0.057	-.002	-0.034
	(0.018)	(0.016)		
Observations	692	692		
Number of Municipalities	346	346		

Notes: Each observation represents the birth rate in each municipality by year. Moreover, this table includes data from two years before and after the prescription elimination, specifically from 2014 to 2017.

background.

Table 2 presents summary statistics for both students and schools. The average attendance rate for all students in Chile in their last year of high school is 0.888, and 51.9% are female, while the graduation rate is 0.971. The college enrollment rate is 0.360, while the community college enrollment rate is 0.188. On the side of schools, 13.3% are private, 28.3% are public, and 58.4% operate under a voucher system. Finally, the average distance from a high school to the closest pharmacy is 1.107 miles, and half of the schools have at least one pharmacy within 0.219 miles.

Table 2. Summary Statistics for Students and Schools

	Mean	Median	SD
Panel A: Students			
Attendance rate	0.888	0.920	0.140
Graduation rate	0.971	1.000	0.166
GPA	5.643	5.700	0.873
Female students rate	0.519	1.000	0.500
College enrollment rate	0.294	0.000	0.456
Community college enrollment rate	0.188	0.000	0.391
Total observations		769,422	
Panel B: Schools			
Private schools rate	0.133	0.000	0.340
Public schools rate	0.283	0.000	0.450
Voucher schools rate	0.584	1.000	0.493
Distance to the closest pharmacy (miles)	1.107	0.219	5.299
Total observations		2,730	

Notes: This table includes data from two years before and after the prescription elimination, specifically from 2014 to 2017.

3.4 Public Sector

The information on pharmaceutical product purchases by the public system is obtained through Mercado Publico, the Chilean public procurement system. Specifically, the dataset allows for the observation of monthly purchases of products by any public entity from 2011 to 2021. Figure 9 shows the purchases of the EC pill through this system, which distributes the pill to public health institutions. After the elimination of the prescription requirement, there is a significant increase in the system's purchase volumes of the EC pill, suggesting that increased access to the pill occurred in both the public and private sectors.

3.5 Sexual Behavior

The Chilean National Surveys of Youth (Encuestas Nacionales de Juventud, ENJUV) is a cross-sectional survey conducted at three-year intervals since the 1990s. I utilize data from the most recent waves, covering the years 2009 to 2022. This survey interviews a nationally representative sample of men and women aged 15 to 29, providing information on personal characteristics, residence, and socio-economic status. Additionally, young participants complete a self-administered questionnaire covering topics such as sexual behavior, contraceptive use and other sensitive matters. This allows me to analyze potential behavioral changes due to increased access to the EC pill.

4 Empirical Strategy for Birth Rate

This section details the strategies for estimating the causal effects of increased access to the EC pill on birth rates. The elimination of the prescription requirement for the EC pill was implemented nationwide, meaning the entire female population of childbearing age was treated. However, the population was not treated at the same level due to varying access. The EC pill is effective within the first three days after unprotected sex, with the highest efficacy within the first 24 hours. Therefore, women with a closer pharmacy are more impacted by this policy. In this context, the empirical strategy will depend on the level of access to the pill.

Since I only observe the mother's municipality of residence for each birth, I will first explain how the level of access is measured by municipality, then describe the identification strategy, and finally present the estimation results.

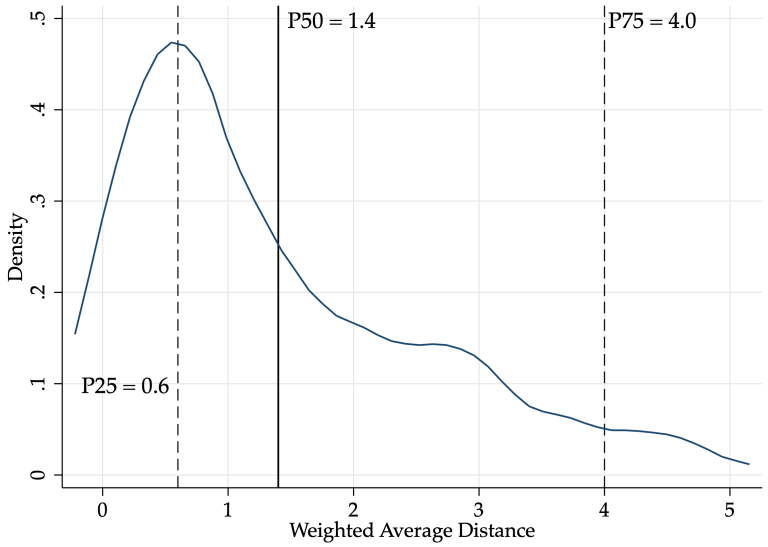
4.1 Access to the Pill

Figure 3 shows the distribution of pharmacies and schools in two different areas that represent more than half of the female population aged 15 to 40. While one might assume that municipalities with more pharmacies have better access to the pill, access also depends on the distribution of pharmacies within the population. Some municipalities may

have many pharmacies, but they are concentrated in specific areas, leaving many schools (and a significant portion of the population) without nearby pharmacies. One might consider normalizing the number of pharmacies by the population of each municipality, but this approach still does not address the issue of uneven distribution. To address this issue, I calculate the distance from each school to the closest pharmacy and then determine the average distance by municipality, weighted by the total number of students at each school. In other words, I give more importance to the distance in areas with more students (higher population) and less weight to areas with fewer students. This analysis includes primary, middle, and high schools with at least one student. In this sense, a lower average distance in a municipality indicates a higher probability of having a pharmacy nearby for those who live or study in that municipality.

Figure 5 shows the distribution of the municipality-weighted average distance for 80% of the municipalities.[4] Fifty percent of the municipalities have an average distance of 1.4 miles or less. I consider a municipality with an average distance of one mile or less to have a high level of access to pharmacies, representing 40% of the municipalities. Additionally, I use an alternative threshold of two miles to check if the results remain consistent.

Figure 5. Municipality Average Distance to the Closest Pharmacy



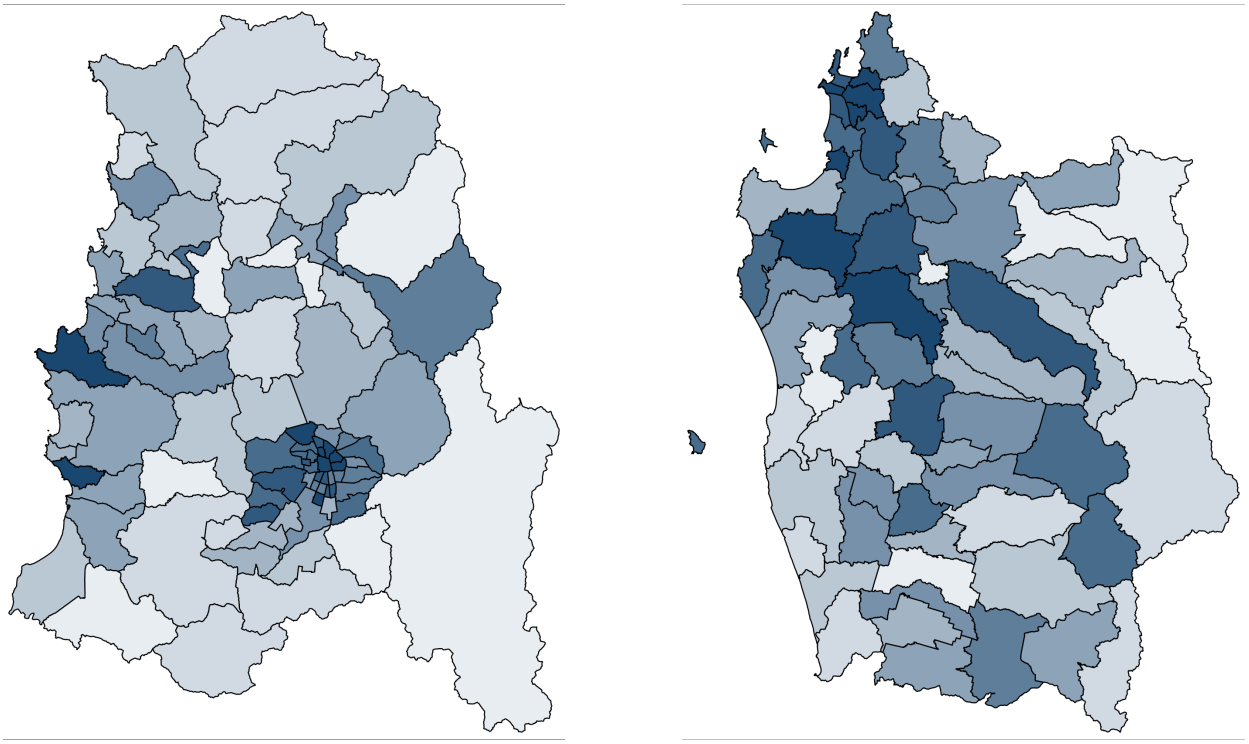
Notes: This figure considers the 80% of the distribution of the municipality average distance. Twenty percent of the municipalities have an average distance greater than five miles. The average is calculated by taking the distance from each school to the closest pharmacy and then determining the average distance by municipality, weighted by the total number of students at each school.

Figure 6 shows the same areas as Figure 3, but using the weighted average distance to highlight the variation in access across municipalities. Darker areas indicate higher access to pharmacies, and consequently, greater access to the EC pill. In the identification strategy, I also use a continuous treatment to verify if the results remain consistent. Figure A.2

[4]Twenty percent of the municipalities have an average distance greater than five miles, which are considered to have lower access to the pill.

presents a map showing which municipalities are considered to have high or low access across the entire country, using one mile as a threshold. Table 6 displays the characteristics of both types of municipalities. Low-access municipalities have an average of 4 pharmacies and a birth rate of 0.062, while high-access municipalities have 29 pharmacies and a birth rate of 0.043. Additionally, high-access municipalities have, on average, ten percentage points fewer low-income students.[5]

Figure 6. Access Level to the Pill by Municipality Using the Weighted Average Distance



(a) Metropolitan and Valparaiso Regions

(b) Bio-Bio and Araucania Regions

Notes: The area represented in Panel (a) accounts for 51.7% of the female population between 15 and 40 years old in Chile. Darker areas indicate higher access to pharmacies, and therefore, greater access to the EC pill. The access level is calculated by measuring the distance from each school to the nearest pharmacy. I then calculate the average distance by municipality, weighted by the total number of students at each school.

4.2 Identification Strategy for Birth Rate

The primary approach for estimating the effects of eliminating the prescription requirement for the EC pill is a difference-in-differences design. This design compares municipalities with high levels of pharmacy access to those with low levels of access. The key identifying assumption in this approach is that, prior to the policy implementation, there were no significant differences in birth rates between municipalities with low and high levels of access to

[5]The low-income student rate is calculated using the school vulnerability index (IVE-SINAE), which reports the percentage of students in a school classified as priority based on their socioeconomic status.

pharmacies. Additionally, in the absence of increased access to the EC pill, birth rate trends in both groups should follow the same pattern as before the policy implementation. Based on this, I estimate the difference between the two types of municipalities using the following identification:

$$log(r_{mat}) = \sum_{k \neq 2015} \beta_k \cdot P_m \cdot 1\{k = t\} + \delta_m + \theta_a + \alpha_t + \epsilon_{mt} \tag{1}$$

where r_{mt} is the birth rate in the municipality m for the age a in year t.[6] P_m is an indicator variable that equals one if the municipality m has high level of access. δ_m is a municipality fixed-effect, θ_a is an age fixed-effect, and α_t is year fixed-effect. The standard errors are clustered at the municipality level. β_k is going to identify the difference between both groups before and after the policy in percentage changes.

Figure 7 shows the results of the identification strategy for the birth rate using equation 1. There are no differences in birth rates between the two types of municipalities before the prescription elimination. After the policy change, there is a significant decline in birth rates in municipalities with high access compared to those with low access to pharmacies. Panel (a) Figure B.2 presents the results using a 2-mile threshold to distinguish between the treatment and control groups, while Panel (b) shows the estimation using a Poisson model to account for municipality-age-year cells with zero births. In both cases, the identification strategy holds. Moreover, Figure B.3 presents the results of the identification strategy using the weighted average distance as a continuous treatment variable, showing the same trend as that observed when using the treatment as a dichotomous variable.

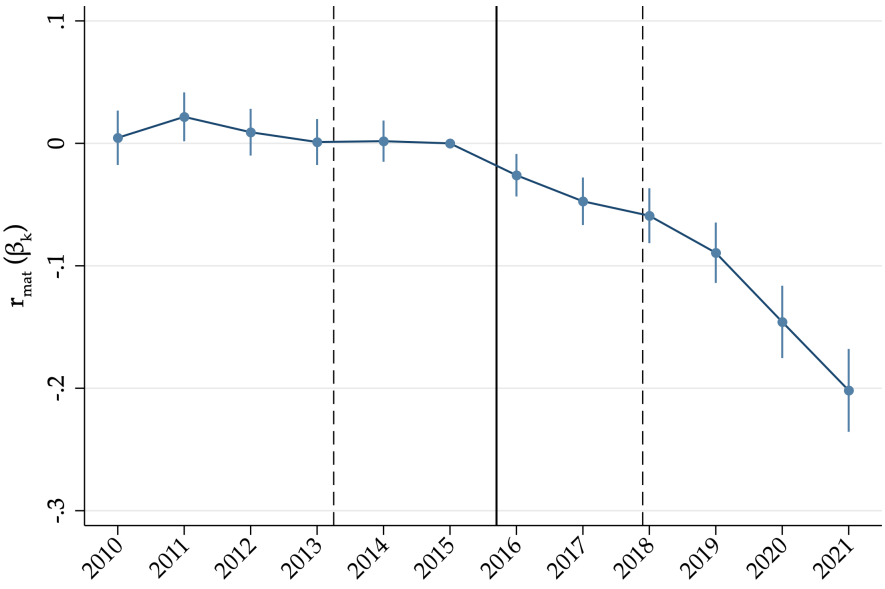
These results show that the parallel trend assumption holds in different specifications. This means that before the policy implementation, there were no significant differences in birth rates between municipalities with low and high levels of access to pharmacies. In this context, I will use a difference-in-differences approach to estimate the causal effect of increased access to the EC pill on birth rates:

$$log(r_{mat}) = \beta \text{Access}_{mat} \cdot \text{Post}_{mat} + \omega \text{Access}_{mat} + \lambda \text{Post}_{mat} + \delta_m + \theta_a + \alpha_t + \epsilon_{mat} \tag{2}$$

where $\log(r_{mat})$ is the logarithm of the birth rate in municipality m in age a at time t, β captures the interaction between the access to pharmacies (Access_{mat}) and the post-intervention period (Post_{mat}). This coefficient is key as it measures the differential effect of the intervention on municipalities with high access to pharmacies compared to low access, after the intervention. ω is a coefficient for the variable Access_{mat}, which indicates whether a municipality has

[6] Given the discrete nature of births, and because some municipality-age-year cells have zero births, I add one to the count of births for all municipality-age-year cells. Moreover, as an alternative approach, I implement a Poisson specification.

Figure 7. Identification Strategy for Birth Rate



Notes: The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds. The confidence intervals are at the 95% confidence level.

a higher access to pharmacies, isolating the effect of access irrespective of the intervention period, λ is the effect of the time period after the intervention (Post_{mat}), applicable across all municipalities and ages, indicating general time trends that affect all units regardless of the intervention. δ_m is a municipality-specific fixed effect, accounting for all unobserved time-invariant characteristics of each municipality that could influence birth rates and α_t represents time fixed effects that control for common shocks or trends affecting all municipalities at time t. ε_{mat} is the error term, representing unobserved factors affecting birth rates that vary across municipalities and over time.

4.3 Results

Table 3 presents the coefficient of interest, β, from equation 2 which represents the effect of reducing the cost of access to the EC pill using two different thresholds to define the treated and control groups: one mile and two miles. Panel (a) shows that the birth rate decreases by 7% in municipalities with high access. Columns (2) to (4) further break down the sample by age group. The effect of reducing the cost of access to the pill is primarily driven by the youngest group (15-19 years old), where increased access results in a birth rate decrease of 16.3%. The effect is smaller for the other two groups, with a decrease of 6.100000000000001% for females aged 20-29 years and 3.3% for those aged 30-39 years. When using a two-mile average distance threshold instead of one mile to identify municipalities with high

access, the results remain largely unchanged.[7] This result aligns with Bailey (2006), who found that early access to the pill in the 1960s reduced the likelihood of a birth before age 22 by roughly 14%.

Table 3. Difference-in-Difference Estimation

	(1)	(2)	(3)	(4)
	All births	15-19 year-olds	20-29 year-olds	30-39 year-olds
Mean Birth Rate	0.066	0.045	0.085	0.059
Panel A: one mile threshold	-.07	-.165	-.062	-.032
	(.009)	(.022)	(.011)	(.011)
Panel B: two miles threshold	-.071	-.174	-.064	-.026
	(.01)	(.024)	(.012)	(.011)
Observations	51,900	10,380	20,760	20,760

Note: The coefficients represent the interaction between access to a pharmacy and the post-intervention period, and they should be interpreted as percentage changes. The estimations cover the years from 2013 to 2018.

The greater effect on the younger population may seem intuitive. Younger individuals may face more challenges in traveling to obtain the pill after unprotected sex. In the educational context, this suggests that when the policy allowed the pill to be obtained over-the-counter, it significantly impacted female students who had access to nearby pharmacies. In contrast, the policy had less of an effect on students without a nearby pharmacy due to their limited access. As a result, a policy that increases access to the pill is likely to have a greater impact on female students who have easier access to pharmacies. For this reason, in section five, I will analyze the effect of the policy on educational outcomes for female students in their final year of high school.

4.4 Understanding the Significant Results

In general, studies examining the elimination of prescriptions for the EC pill have found non-significant effects on birth rates. For this reason, I explore factors that can explain the significant results in the Chilean setting. Cintina, 2017 is the only study that finds a statistically significant, albeit economically moderate, decrease in abortion rates in Washington counties where women had access to no-prescription EC, using the distance to the closest no-prescription EC pharmacy as an instrument. Other papers, as mentioned in the introduction section, highlight three key points that can explain the lack of significant effects: the possible substitution between the EC pill and the daily contraceptive pill; the shift in demand for the EC pill from hospitals or public health centers to pharmacies; and sexual behavioral responses among women. In this context, I will examine these points to try to understand the significant and important

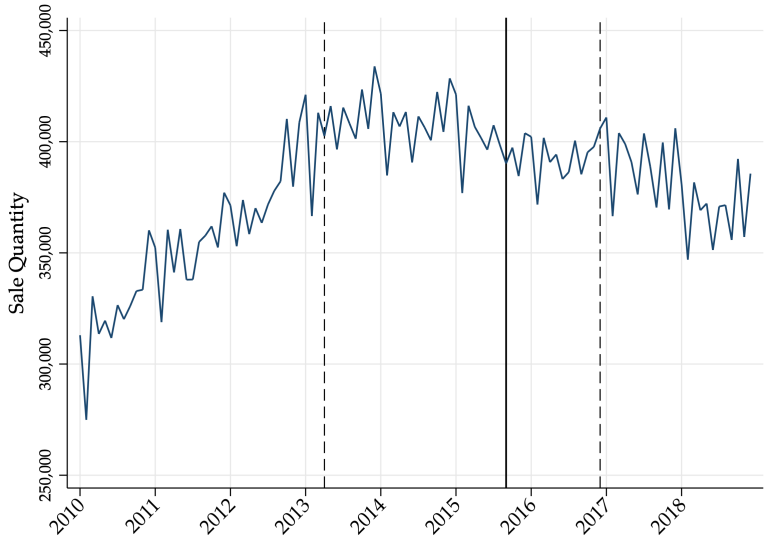
[7]Table 7 presents the estimation using a Poisson model, where the effect is stronger for the youngest group, with a decrease of between 22.7 and 27.1% depending on the threshold.

effect of increasing access to the EC pill on birth rates.

4.4.1 Daily Contraceptive Pill

To analyze the sales trend of daily contraceptive pills, I utilize IQVIA data, which provides monthly sales figures for the same period analyzed for the EC pill. Figure 8 illustrates the sales of daily contraceptive pills, showing that their sales trend remained unchanged following the removal of the prescription requirement for the EC pill. This finding contradicts the context of Pfeifer and Stockburger (2023) that the elimination of the prescription requirement for the emergency contraceptive (EC) pill had no effect on childbirth rates due to a presumed decline in the use of daily contraceptive pills as a consequence of increased accessibility to morning-after pills.

Figure 8. Daily Contraceptive Pill



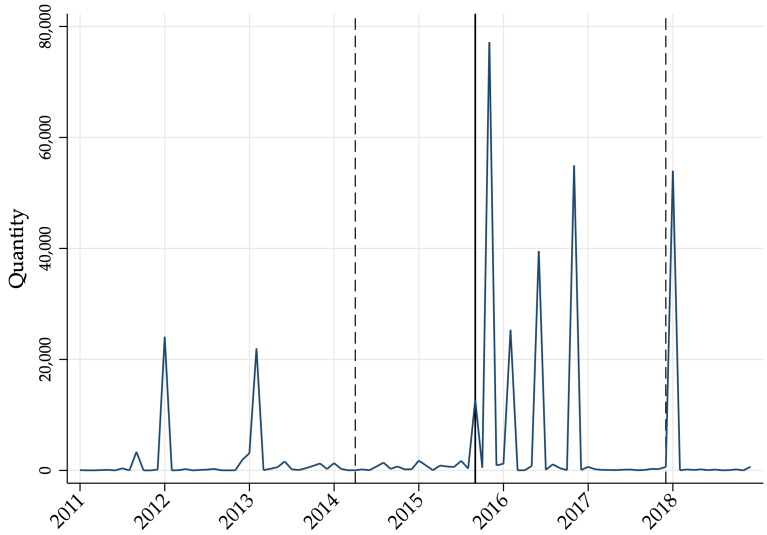
Notes: The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds.

4.4.2 Demand in the Public Sector

To see the demand for the pill within the public health sector, I will utilize data from the Chilean public procurement system. Figure 9 displays a significant increase in the system's purchase volumes of the pill following its availability over-the-counter (OTC). This evidence challenges the assertion by Gross et al. (2014) that expanded access to the emergency contraceptive (EC) pill in the US did not have a significant impact, arguing that the policy merely shifted the points of acquisition from hospitals to pharmacies. In contrast, in the Chilean context, it appears that the demand

for the EC pill has increased in both the private and public sectors.

Figure 9. Purchase of Emergency Contraceptive Pill by Public Health Sector



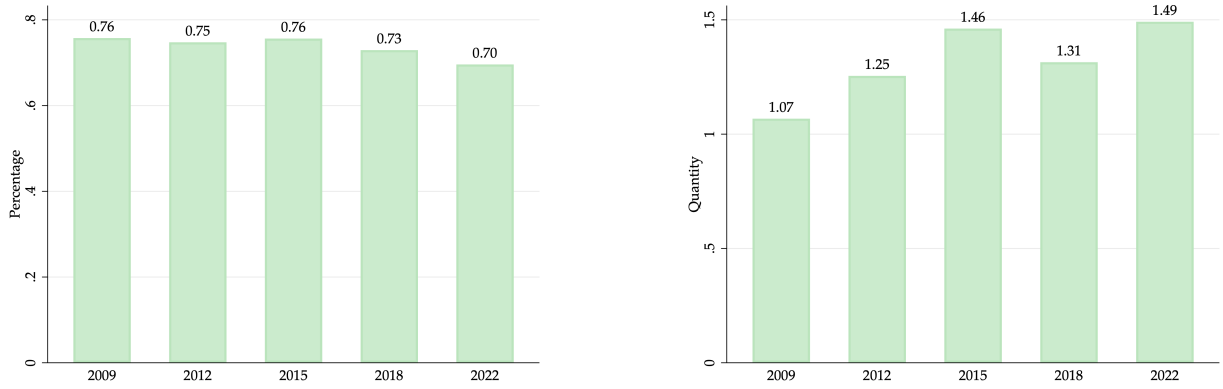
Notes: This data reflects purchases of pharmaceutical products by the Chilean public procurement system, which buys the products and then distributes them to various public health institutions across the country. The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds.

4.4.3 Sexual Behavioral Responses

To analyze the potential effects of eliminating the prescription requirement, I use a cross-sectional survey conducted at three-year intervals since the 1990s, focused on the youth population (ages 15 to 30) in Chile, which includes questions about sexual activity. Figure 10 depicts responses to two different questions about sexual activity. Panel (a) shows the percentage of women who are sexually active, while Panel (b) shows the average number of sexual partners in the last 12 months. The data indicate that there is no increase in sexual activity after the policy change, nor is there a significant change in the number of sexual partners. Based on this descriptive information, we could reject the notion that females became more sexually active following the elimination of the prescription requirement.

This evidence contradicts the argument that contraceptive pills increase sexual activity, thereby diminishing their impact on childbirth rates. Gross et al. (2014) suggest that making emergency contraceptive (EC) pills more affordable can lessen the risks associated with sexual activity, potentially affecting women's behavior. Additionally, Myers (2017) argues that the widespread availability of the pill to young women may have fueled the sexual revolution, without necessarily leading to a decrease in fertility.

Figure 10. Sexual Responses



(a) Proportion of Females Who Are Sexually Active

(b) Number of sexual partners in the last 12 months

Notes: Question Panel a): Have you had sexual intercourse with penetration? Question Panel b): How many people have you had sexual relations with in the last twelve months?. Female samples: 2009 (3384), 2012 (3550), 2015 (4071), 2018 (4441), 2022 (4228).

5 Empirical Strategy for Educational Outcomes

Following "the power of the pill" literature, we should expect some positive effect on educational outcomes. Specifically, if the birth rate decreases due to increased access to contraceptives, especially among adolescents, we should expect an impact on educational outcomes among female students.

To measure the impact on educational outcomes, I take advantage of the available micro-level educational data. Specifically, I use the locations of each high school and pharmacy to calculate the distance from each school to the nearest pharmacy, allowing me to identify schools with high and low levels of access within municipalities. I assume that students attending schools closer to a pharmacy had easier access to the pill after the elimination of the prescription requirement. Additionally, I will explain the institutional background to provide context for the results.

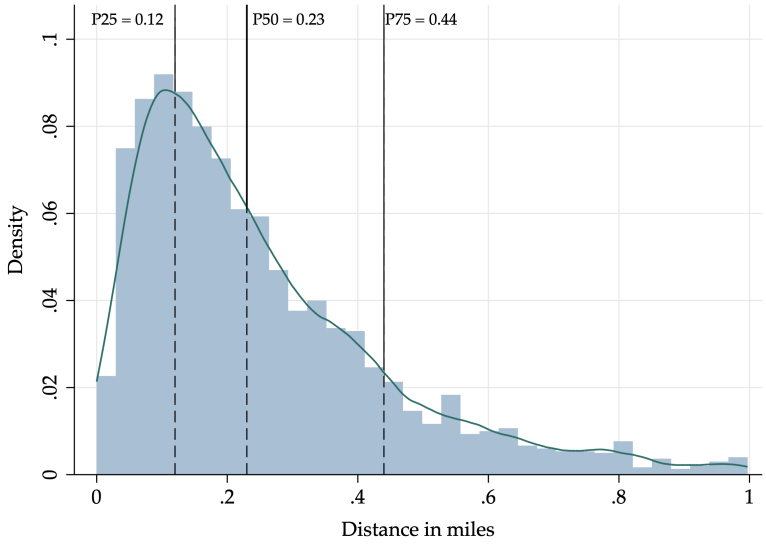
5.1 Identification Strategy

Figure 12 shows the distribution of the distance from each school to the nearest pharmacy for 91% of the schools.[8] Fifty percent of the municipalities have an average distance of 0.23 miles or less. I consider a school with a distance of 0.2 miles or less to have a high level of access to pharmacies, representing 48% of the schools. As in the birth rate analysis, I also use a different threshold to verify if the identification strategy holds.

The primary approach for estimating the effects of eliminating the prescription requirement for the EC pill is a

[8]Nine percent of the schools have the nearest pharmacy one mile or more away and are considered to have lower access to the pill.

Figure 11. School Distance to the Closest Pharmacy



Notes: This figure considers the 91% of the distribution of the school average distance. Nine percent of the schools have a distance greater than one mile.

difference-in-differences design. This design compares schools with high levels of pharmacy access to those with low levels of access. The key identifying assumption is that there were no differences in educational outcomes between students with low and high levels of access to pharmacies before the policy implementation. Additionally, in the absence of increased access to the EC pill, educational outcome trends in both groups should follow the same pattern as they did prior to the policy. Accordingly, I estimate the difference between both types of schools using the following identification:

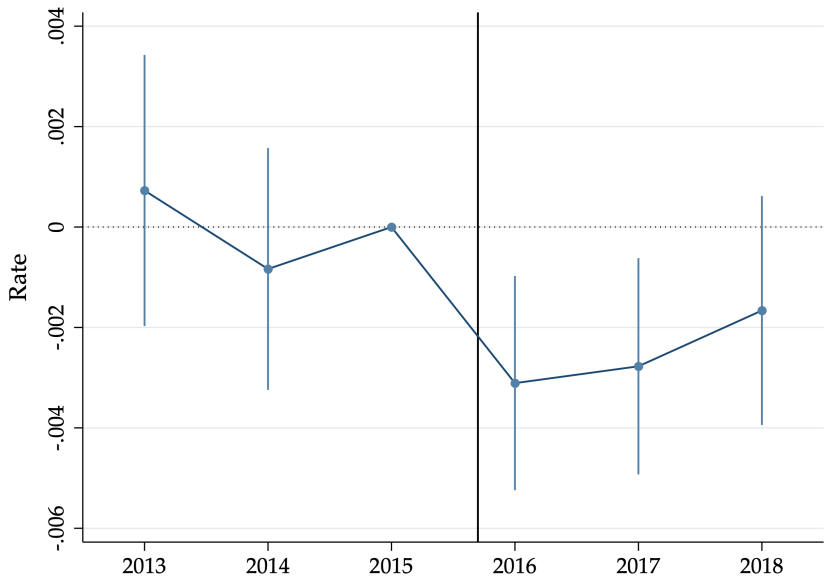
$$y_{ist} = \sum_{k \neq 2015} \beta_k \cdot I_{it} \cdot A_s + \alpha x_{it} + \gamma_s + \delta_t + \mu_{ist} \tag{3}$$

where y_{ist} denotes educational outcome of student i at the school s during the year t. I_{it} is an indicator variable taking the value of one if student i is in the year t, and A_s takes the value of one if the school has a high level of access to a pharmacy. x_{it} represents characteristics of student i, such as GPA from the previous year, a dummy variable indicating whether the student lives in the same municipality of the school, and the number of times the student has failed in previous years. Finally, γ_s refers to school fixed effects and δ_t to year fixed effects. Standard errors are clustered at the municipality level, the same as in the birth rate analysis.

I divide educational outcomes into two groups: high school outcomes and post-graduation outcomes. The first group includes graduation rates, and attendance rates, while the second group relates to the decision to enroll in college, or

community college. Figure 12 shows the results of the identification strategy for graduation rate. It can be observed that there are no differences in graduation rates between schools with high and low access before the prescription elimination. However, unexpectedly, there is a significant decrease in graduation rates following the reduction in the cost of the EC pill. Figure B.4 presents the results using a 0.3-mile threshold to distinguish between the treatment and control groups, while Panel (b) shows the estimation using distance as a continuous treatment variable. In both cases, the identification strategy holds. Additionally, Figure B.5 shows the identification strategy for male students, with no significant changes observed after the policy implementation.

Figure 12. Identification Strategy for Female Graduation Rate



Notes: The continuous black vertical line represents the month when the EC pill became available without a prescription. The confidence intervals are at the 95% confidence level.

Due to the unexpected results, I will explain the institutional background that may be driving these findings, which are not aligned with the existing literature on the effects of contraceptives on educational outcomes.

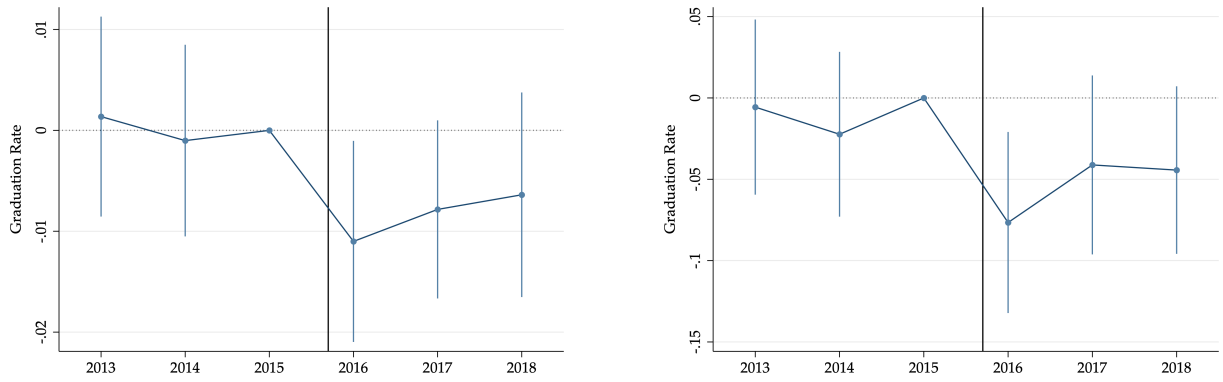
5.2 Institutional Background

Like all educational systems, Chilean students must fulfill academic requirements to graduate successfully. Additionally, high school students must meet a minimum of 85% attendance to be promoted to the next grade (Riquelme 2024). However, this requirement can be waived under exceptional circumstances, including pregnancy and maternity, as of 2004. Specifically, pregnant or parenting students are not required to meet the 85% attendance threshold to graduate.

Moreover, if their attendance falls below 50%, the school director has the authority to decide whether the student can graduate. Absences directly related to pregnancy and childbirth are considered valid with the presentation of a medical certificate. Schools are also required to offer flexible schedules for these students to take exams and provide the necessary pedagogical support through a tutoring system.

In this context, adolescent mothers receive support to successfully graduate from high school, even with less than 85% attendance. If increased access to contraceptives prevents pregnancy in students with attendance below the required threshold, it could have an unexpected impact. Therefore, I estimate equation 3 for students with attendance below 85% and 50%, considering their attendance from the previous year. Panel (a) of Figure 13 shows the results for female students with prior attendance below 85%, revealing that the decrease is much larger than when considering the entire sample. Panel (b) shows the result for students with attendance below 50%, the reduction in graduation rates is even more pronounced. These results suggest that the law protecting pregnant and parenting students is driving the negative effects on graduation rates, leading to outcomes that differ significantly from previous literature. Figure B.6 presents the same analysis for male students, showing no significant effect on their graduation rates.

Figure 13. Identification Strategy for Female Students below the Attendance Requirement



(a) Lower than 85%

(b) Lower than 50%

Notes: 91.3% of students with less than 85% attendance have graduated, while 83.2% of students with 50% or less attendance have graduated. The continuous black vertical line represents the month when the EC pill became available without a prescription. The confidence intervals are at the 95% confidence level.

Another important aspect of this analysis is understanding which students have children during their school years. Using a registration system for pregnant and mother students[9], I can identify these students and examine their characteristics prior to pregnancy. Table 4 presents the attendance rate and GPA for students in public and voucher schools in their last

[9]This system allows schools or students to report their status to the government for tracking and support. Eligible students in public or voucher schools from low SES households may receive cash transfers. However, not all pregnant or mother students are captured in this registration.

year of high school, both with and without children, before and after the removal of the prescription requirement for emergency contraception. The data show that the attendance rate before pregnancy is 0.87 for students with children, compared to 0.87 for those without children, prior to the policy change. Additionally, students with children tend to have lower previous GPAs than their peers without children. This descriptive evidence suggests that students with lower attendance and academic performance are more likely to have children during their school years compared to those with higher academic performance.

Table 4. Characteristics for Mother/Pregnant Students

	Before		After	
	With Child	Without Child	With Child	Without Child
Attendance Rate	0.87	0.90	0.88	0.91
	(0.15)	(0.11)	(0.14)	(0.09)
GPA	5.23	5.61	5.24	5.76
	(0.79)	(0.92)	(0.82)	(0.82)
Rate	0.041	0.959	0.033	0.967

Notes: This table only includes students from private and voucher schools because registration for pregnant students and mothers is voluntary for accessing related benefits. Therefore, the table may not fully represent all pregnant students and mothers. The GPA ranges from 1 to 7. Both attendance rate and GPA correspond to the year prior to having a child. The before period spans 2013 to 2015, while the after period covers 2016 to 2018.

5.3 Difference-in-Difference Estimation

Given the institutional background and adolescent mother protection policies that are influencing the impact of reduced adolescent pregnancies on graduation rates, I will use a difference-in-differences approach to estimate the causal effect of increased access to the EC pill on educational outcomes at the student level:

$$y_{ist} = \beta \text{Access}_{ist} \cdot \text{Post}_{sit} + \omega \text{Access}_{sit} + \lambda \text{Post}_{sit} + \delta_s + \theta_i + \alpha_t + s_{ist} + \epsilon_{sit} \tag{4}$$

where y_{ist} denotes educational outcome, such as graduation rate and college enrollment, of student i at the school s during the year t. β captures the interaction between the access to a pharmacy (Access_{ist}) and the post-intervention period (Post_{ist}). This coefficient is key as it measures the differential effect of the policy implementation on schools with high access to pharmacies compared to low access, after the intervention. ω is a coefficient for the variable Access_{ist}, which indicates whether a school has a higher access to pharmacies, isolating the effect of access irrespective of the intervention period, λ is the effect of the time period after the intervention (Post_{ist}), applicable across all schools and students, indicating general time trends that affect all units regardless of the intervention. δ_s is a school-specific fixed effect, accounting for all unobserved time-invariant characteristics of each school that could influence graduation rate

and α_t represents time fixed effects that control for common shocks or trends affecting all schools at time t. Finally, x_{it} represents the same characteristics of student i as in equation 3. ε_{ist} is the error term, representing unobserved factors affecting educational outcomes that vary across schools and students and over time. The standard errors are clustered at the municipality level.

Table 5 presents the coefficient representing the interaction between treated schools (those with high access to a pharmacy) and the post-intervention period from equation 4, quantifying the effect of increased access to the EC pill on high school and post-graduation outcomes. Column (1) of panel (a) shows the results for high school outcomes for all students, indicating a small but significant effect on graduation rates. Columns (2) to (4) present the results by type of school. A positive but non-significant effect is observed in private schools, while female students in public schools experience a significant negative effect of 0.4 percentage points. An important point to mention is that the mean attendance rate in private schools is 0.917, compared to 0.851 in public schools. This indicates that the number of students with attendance below 85% is much higher in public schools than in private schools. Consistent with the argument in the previous section, this suggests that the policy protecting adolescent mothers is driving this negative effect.

Table 5. Difference-in-Differences Estimation for Female Students

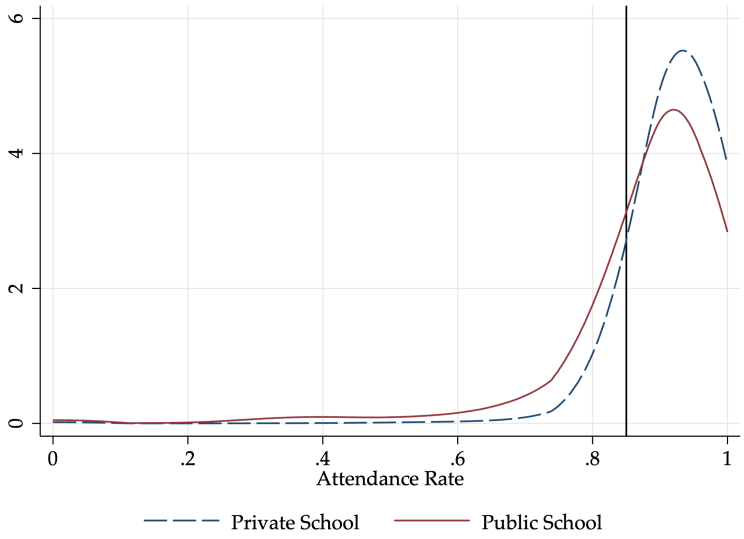
	(1)	(2)	(3)	(4)
		Type of School		
	All Sample	Private	Voucher	Public
Panel A: High School				
Graduation Rate	-.002	.001	-.002	-.004
	(.001)	(.001)	(.001)	(.002)
Mean	0.966	0.991	0.972	0.950
Attendance Rate	-.001	0	.001	-.005
	(.001)	(.002)	(.001)	(.003)
Mean	0.874	0.917	0.882	0.851
Panel B: Post Graduation				
College Enrollment	-.007	.011	-.002	-.026
	(.004)	(.006)	(.004)	(.008)
Mean	0.331	0.770	0.340	0.215
Community College Enrollment	-.006	-.001	-.005	-.01
	(.003)	(.003)	(.004)	(.006)
Mean	0.197	0.036	0.198	0.233
Observations	589,535	54,246	329,128	206,161

Note: The coefficients represent the interaction between the treated group and the post-intervention period. The treated group consists of schools with a high level of access to a pharmacy.

It is also possible to observe that the effect on attendance rates is non-significant. These zero effects suggest that

adolescents who used the pill and did not have children due to increased access are not changing their behavior in terms of attendance. This result holds across all subgroups of schools. If female students are not changing their attendance behavior when they prevent pregnancy, we would expect a decrease in the graduation rate in schools where a significant proportion of students fall below the 85% attendance requirement, as mentioned in graduation rate results. In private schools, where only 5% of female students fall below the 85% attendance threshold, there is no significant impact. However, in public schools, where 25% of female students are below the attendance requirement there is a significant negative effect. Figure 14 shows the kernel density of female attendance rates for private and public schools, confirming that the attendance rate in public schools is more skewed to the left compared to private schools. In voucher schools, 17% of female students are below the 85% attendance threshold.

Figure 14. Ex-Ante Female Attendance Rate Distribution



Notes: The black vertical line represents the attendance rate requirement for successful graduation, which is 85%. In public schools, 25% of female students have an attendance rate lower than 85%, while in private schools, only 5% of female students fall below this attendance threshold.

Panel (b) of Table 5 shows the estimations for post-graduation outcomes showing that the average effect on college enrollment is negative, but no significant different from zero and this impact is not homogeneous among type of schools. For example, column (2) shows an increase of 1.1 percentage points in college enrollment for students in private schools with higher access to the pill. Column (4) shows the opposite impact on students in public schools, with a decrease of 2.6 percentage points in college enrollment. It seems mechanically that in public schools the effect is negative due to more students are not graduated due to the law that protects pregnant and mother students. However, if we expect that the increase in non-enrollment in higher education is explained solely by the reduction in the graduation rate in public schools, we should expect the coefficients to have similar magnitudes. In fact, we observe that the effect

on post-graduation outcomes is greater than the effect on the graduation rate. Then, other factors may be influencing the impact of increased access to the pill on students in public schools. For instance, adolescent mothers might receive social benefits that help them enter higher education, which female students who prevent pregnancy might miss out on.

6 Conclusion

According to the "Power of the Pill" literature, we should expect a decrease in birth rates, especially among the youngest population, and consequently, an increase in educational and labor outcomes. In this paper, I investigate the impact of increased access to the emergency contraceptive (EC) pill on fertility and educational outcomes in a context very different from that of the 1960s (Goldin and Katz 2002; Bailey 2006; Guldi 2008; Bailey et al. 2012), where the contraceptive market has expanded in variety and access, and women are more integrated into the educational system and labor market. By exploiting the removal of the prescription requirement for the EC pill in Chile in 2015, I employ a quasi-experimental design using a novel dataset that includes pharmacy sales and administrative records to assess the effects on birth rates and female students' educational outcomes.

The results show that the birth rate decreased significantly in municipalities with high access to the EC pill, particularly among adolescents aged 15-19. These findings suggest that easier access to the EC pill effectively reduces unwanted pregnancies. However, regarding educational outcomes, the results are unexpected compared to the literature; the impact of reducing the cost of access to the EC pill is negative on graduation rates. This effect is due to a law that protects pregnant and parenting students, allowing them to graduate with less than the 85% attendance requirement. As a consequence, the negative impact is more pronounced and significant in schools with a high percentage of students below the attendance requirement, such as public schools, where an average of 25% of students fall below this threshold.

In the case of post-graduation decisions, the average effect on college enrollment is negative but not significantly different from zero, and this impact is not uniform across types of schools. For students in private schools, the effect is positive but not significant, while for students in public schools, the effect is significantly negative. This outcome may be influenced by the adolescent mother protection law, though other factors likely contribute to these unexpected results. One possibility is that adolescent mothers might receive social benefits that help them enter higher education, which female students who prevent pregnancy might miss out on. Some evidence also shows that providing free contraception may reduce teen births, but it doesn't change the underlying factors that lead disadvantaged women to drop out Kearney and Levine (2012). It is important to continue exploring these findings to inform the design of better policies that encourage female students to pursue higher education. While it is encouraging that increased access to the

EC pill is reducing adolescent pregnancies, efforts should also focus on integrating these students into the educational system

This paper contributes to the literature on how access to contraceptive products directly affects the decision to have a child. The data provide an opportunity to explore potential reasons for this significant effect, including sexual behavioral responses, substitution among contraceptive products, and the source of obtaining the EC pill (pharmacies or public hospitals). Furthermore, the evidence shows that the 'power of the pill' endures in its ability to prevent unplanned pregnancies, especially among the youngest population. The results also contribute to the literature on adolescent motherhood, demonstrating that reducing adolescent motherhood does not necessarily have a positive impact on education. For instance, Kruger et al. (2009) concludes that policies aimed at reducing early childbearing have immediate and significant effects on educational attainment. However, the lack of a positive effect is more in line with the findings of Ashcraft et al. (2013), which show that the probability of obtaining a high school diploma is unaffected by a first teen pregnancy, while the probability of completing a General Education Development (GED) test is reduced.

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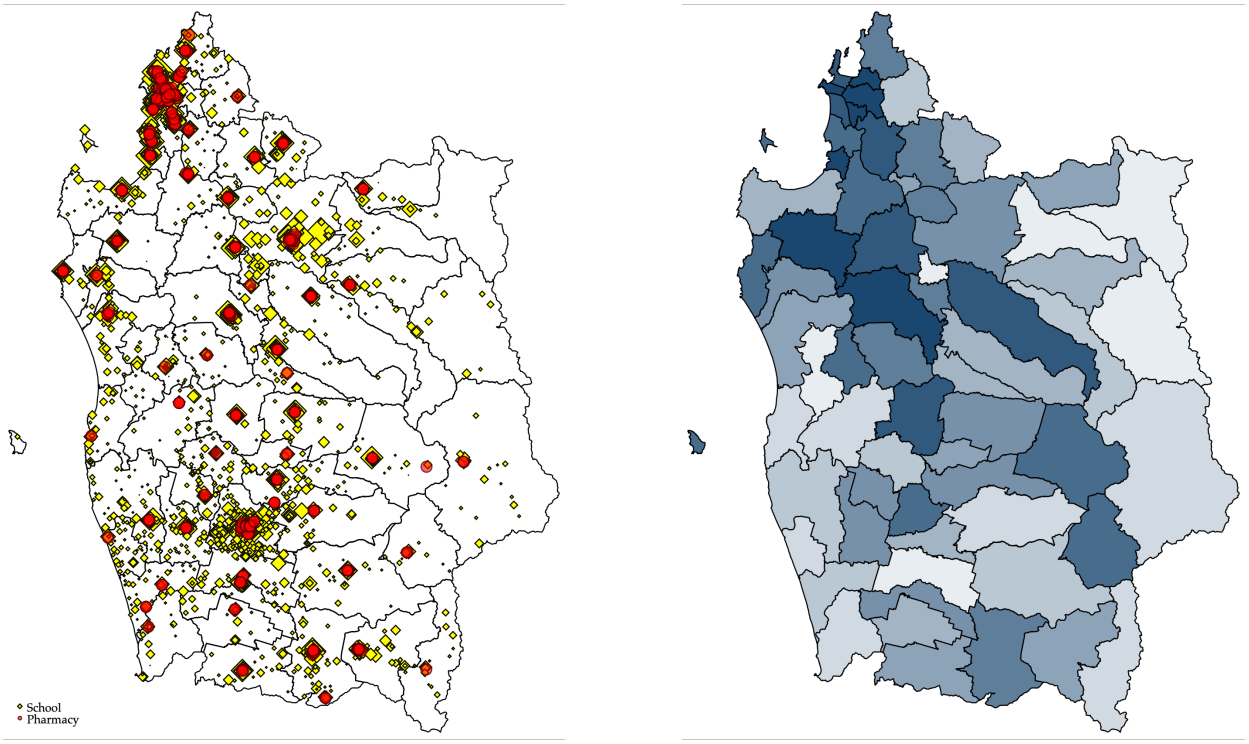
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Appendix

A Maps

Figure A.1. Access Level to the Pill by Municipality Using the Distribution of Pharmacies and Schools

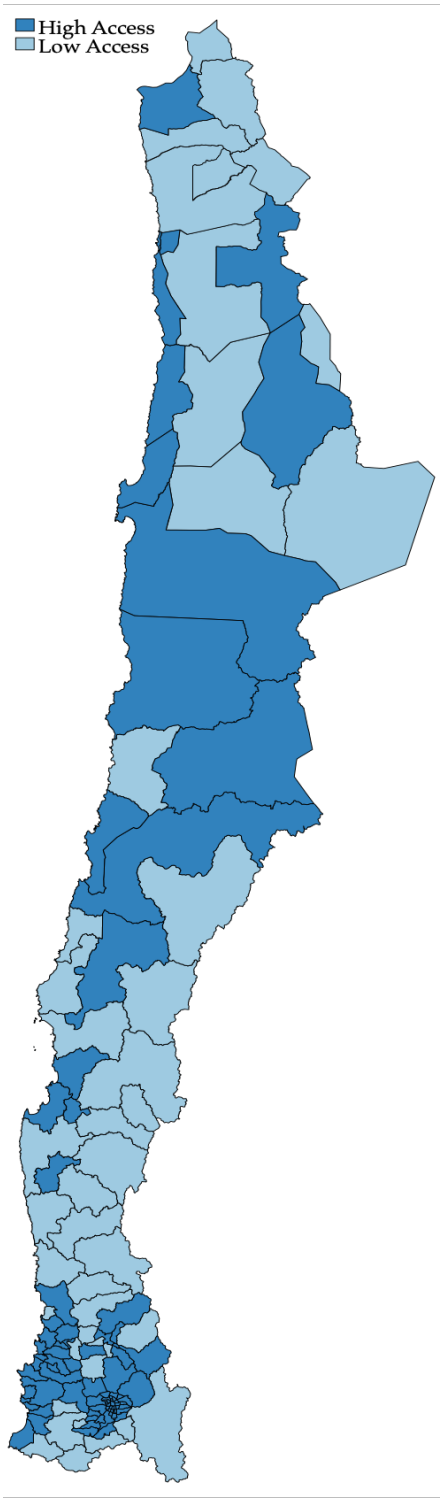


(a) Distribution of Pharmacies and Schools

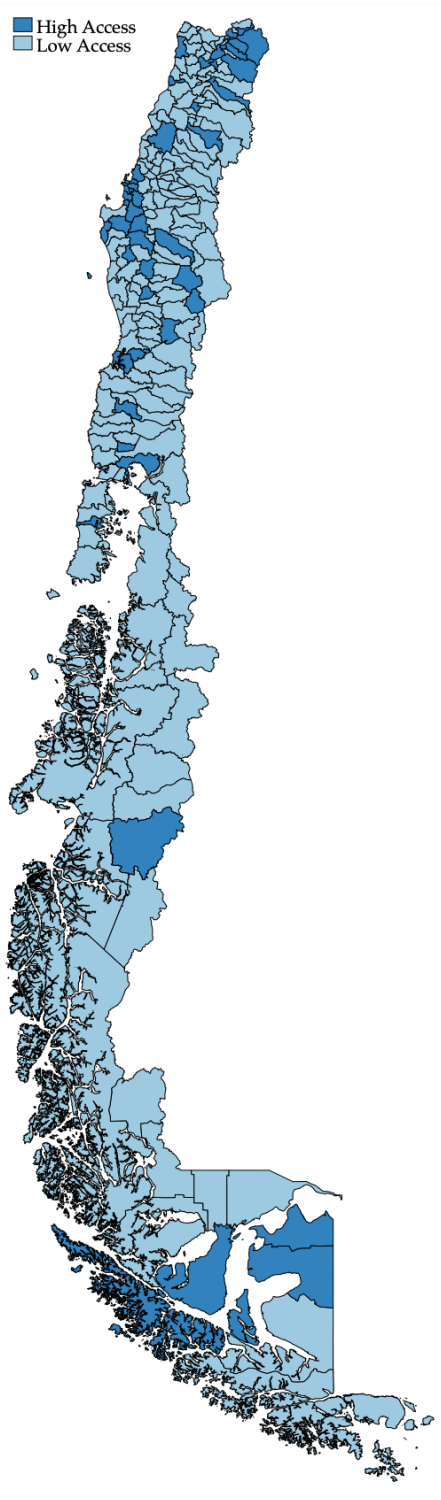
(b) Access Level

Notes: The area represented in Panel (a) accounted for 14.4% of the female population between 15 and 40 years old in Chile. In Panel (a), each red point represents a pharmacy, and the darkest blue areas represent municipalities with ten or more pharmacies. Yellow diamond shapes represent each school, and their size indicates the number of students enrolled. The access level in Panel (b) is calculated using the distance from each school to the closest pharmacy. Then, I calculate the average distance by municipality, weighted by the total number of students at each school. An average distance of less than one mile indicates a high level of access to pharmacies, representing 40% of the municipalities.

Figure A.2. Access Level to the Pill for All Municipalities



(a) North

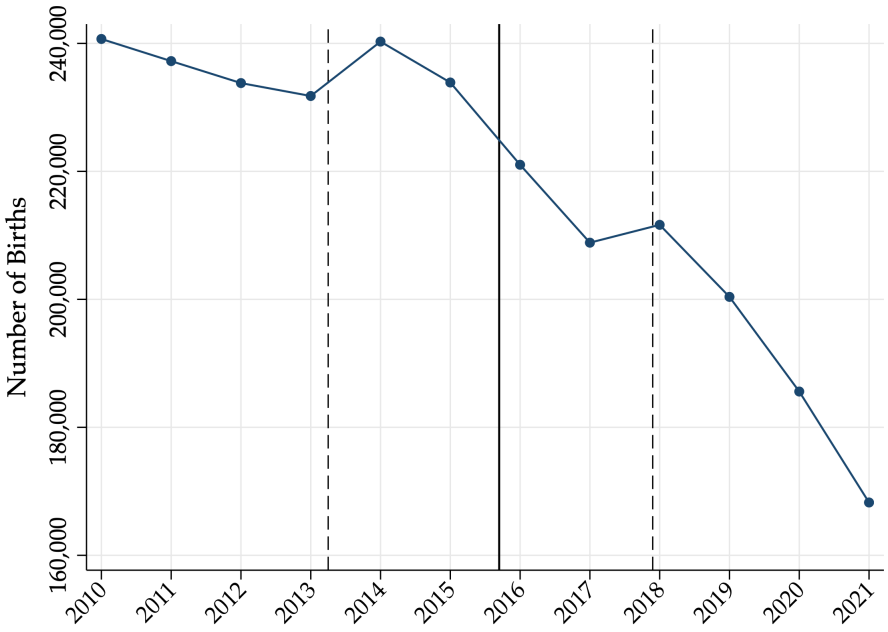


(b) South

Notes: The access level is calculated using the distance from each school to the closest pharmacy. Then, I calculate the average distance by municipality, weighted by the total number of students at each school. An average distance of less than one mile indicates a high level of access to pharmacies, representing 40% of the municipalities.

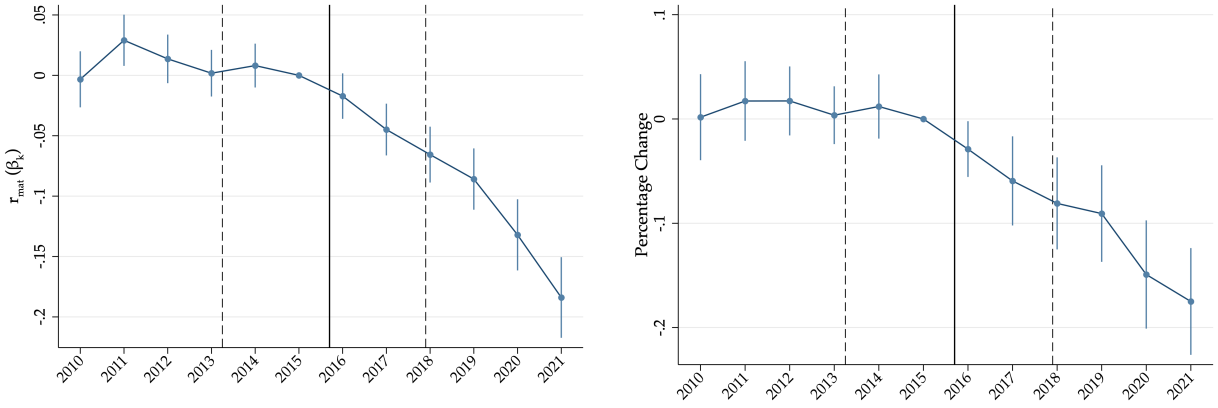
B Figures

Figure B.1. Number of Births



Notes: Both figures include women between 15 and 40 years old. The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds.

Figure B.2. Alternative Identification Strategies



(a) Estimation Using a 2-Mile Threshold

(b) Estimation using a Poisson Model

Notes: The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds.

Figure B.3. Identification Strategy with Continuous Treatment

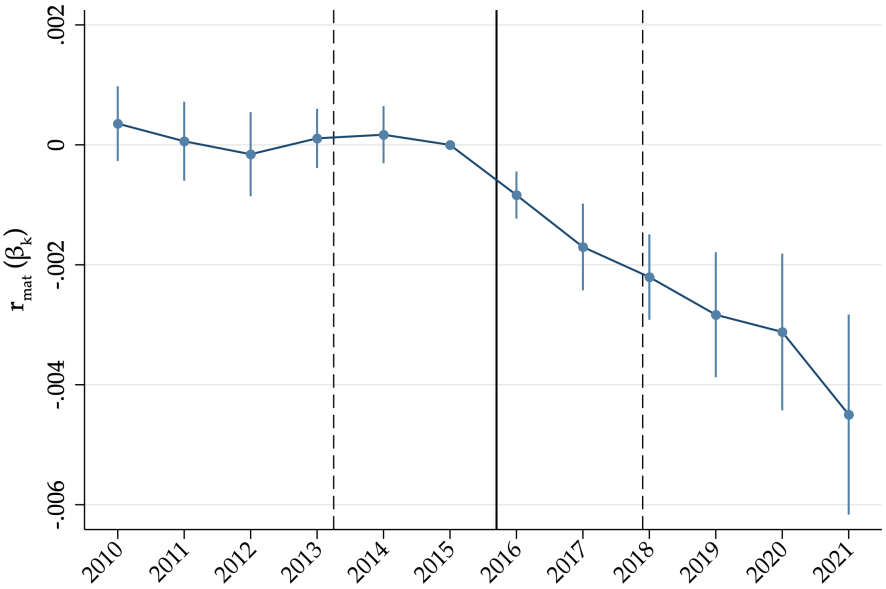
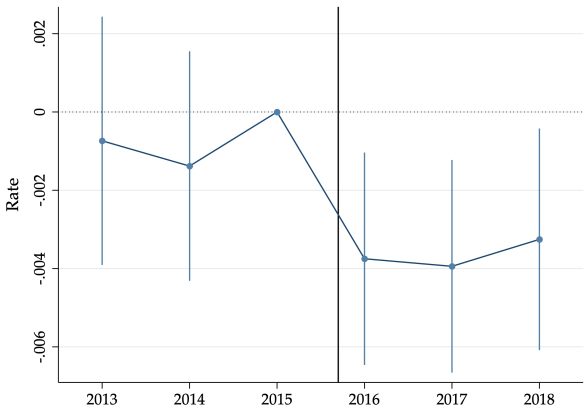
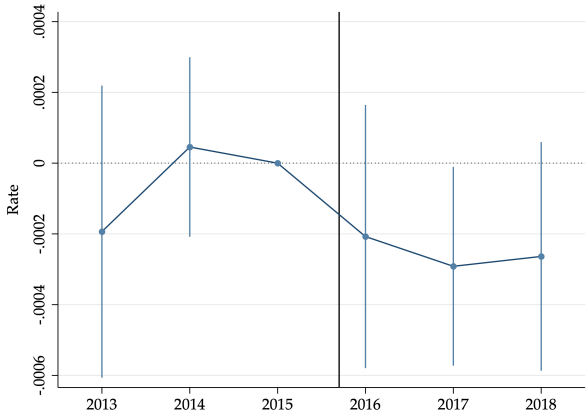


Figure B.4. Alternative Identification Strategies for Female Graduation Rate



(a) Estimation Using a 0.3-Mile Threshold



(b) Continuous Treatment effect

Notes: The continuous black vertical line represents the month when the EC pill became available without a prescription.

Figure B.5. Identification Strategy for Male Graduation Rate

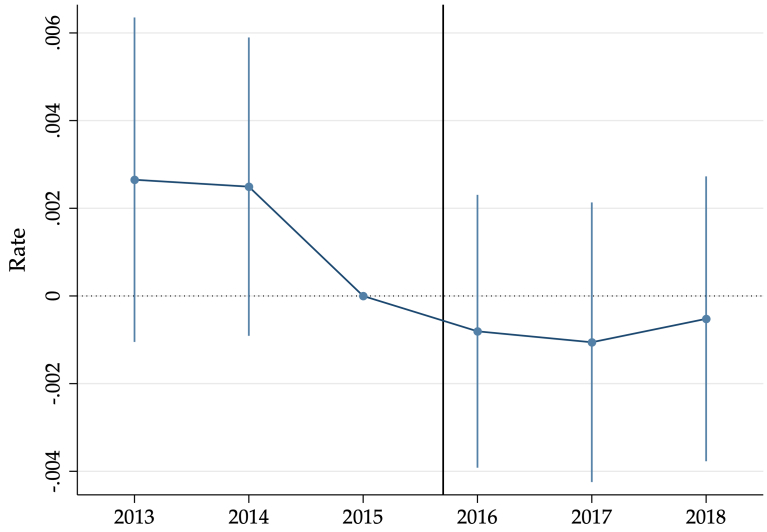
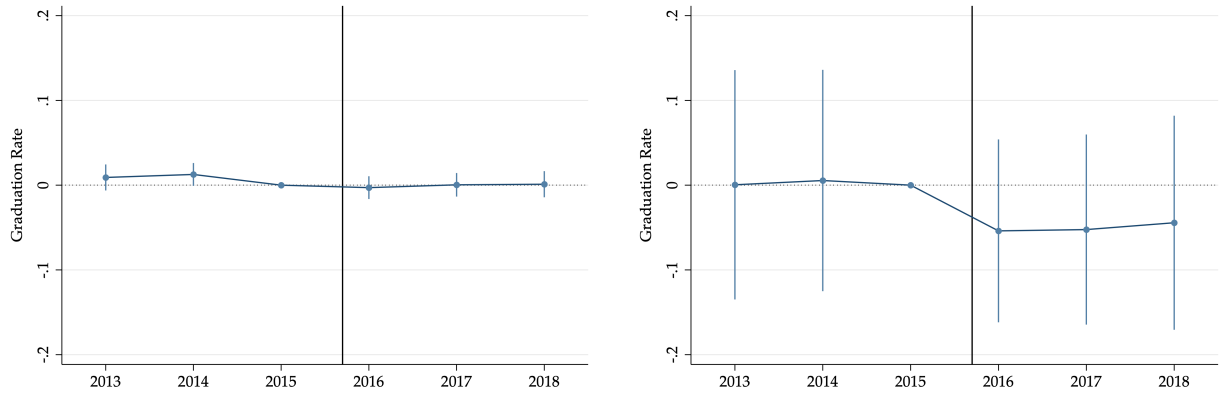


Figure B.6. Identification Strategy for Male Students below the Attendance Requirement



(a) Lower than 85%

(b) Lower than 50%

Notes: 91.3% of students with less than 85% attendance have graduated, while 83.2% of students with 50% or less attendance have graduated. The continuous black vertical line represents the month when the EC pill became available without a prescription. The confidence intervals are at the 95% confidence level.

C Tables

C.1 Data

Table 6. Characteristics of Low and High Access Municipalities

	Low Access				High Access			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Birth Rate	0.062	0.091	0.030	0.831	0.043	0.016	0.029	0.216
Number of Pharmacies	4	5	0	32	29	36	1	238
Population	6,376	8,661	59	74,051	35,714	38,126	227	216,101
Rural Student Rate	0.387	0.300	0.000	1.000	0.086	0.168	0.000	1.000
Low-Income Student Rate	0.824	0.080	0.428	0.982	0.722	0.102	0.253	0.916
Number of Municipalities	207				138			

Notes: The access level is calculated using the distance from each school to the closest pharmacy. Then, I calculate the average distance by municipality, weighted by the total number of students at each school. An average distance of less than one mile indicates a high level of access to pharmacies, representing 40% of the municipalities. The Low-Income Student Rate is calculated using the school vulnerability index (known by its Spanish acronym, IVE-SINAE), which reports the percentage of students in a school who are labeled as priority due to their socioeconomic status.

Table 7. Difference-in-Difference Estimation using a Poisson Model

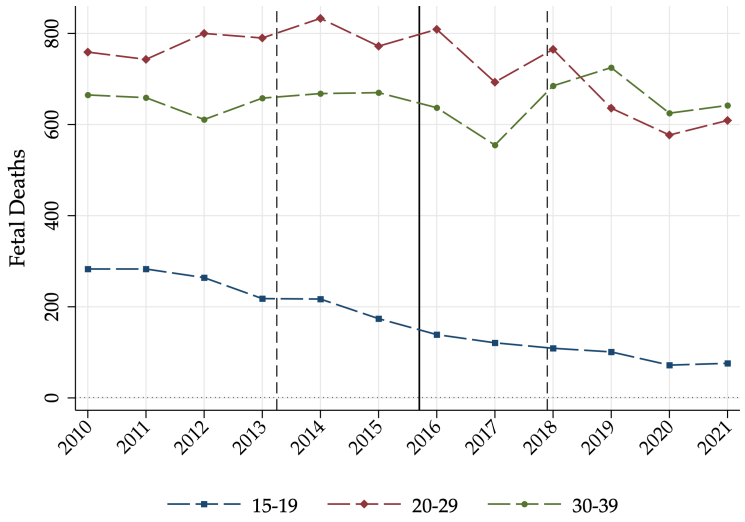
	(1)	(2)	(3)	(4)
	All births	15-19 year-olds	20-29 year-olds	30-39 year-olds
Panel A: one mile threshold	-.059	-.227	-.053	-.065
	[.016]	[.065]	[.015]	[.027]
Panel B: two miles threshold	-.072	-.271	-.059	-.074
	[.021]	[.072]	[.019]	[.038]
Observations	51,900	10,380	20,760	20,760

Note: The coefficients represent the interaction between access to a pharmacy and the post-intervention period, and they should be interpreted as percentage changes. The estimations cover the years from 2013 to 2018.

D Fetal Death Analysis

Figure D.1 depicts the number of fetal deaths from 2010 to 2021 by age group, showing a significant decrease one year after the prescription requirement for the EC pill was eliminated. There is an increase in fetal deaths in 2018 for females aged between 20 and 39 years old; however, this increase is not observed in the youngest group. This trend is also related to the use of the drug Misoprostol, which is used to induce abortion.[10] In this context, Figure **??** shows the yearly purchases of this product by any public entity in Chile from 2010 to 2021. It is possible to observe that after the prescription elimination, there is a decrease in the use of Misoprostol in the public sector, with usage starting to increase again the following year. It is important to mention that this abortive pill is sold on the black market, making it difficult to track its usage within the population. We should expect that the use of this drug decreased after the EC policy and that there was a decrease in fetal deaths, especially in gestational periods after ten weeks. This is because Misoprostol works very well if taken before eight weeks of pregnancy. After eleven weeks, there is a high chance of experiencing heavier bleeding and requiring urgent medical attention.

Figure D.1. Fetal Deaths



Notes: Both figures include women between 15 and 39 years old. The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds.

[10] Misoprostol is a versatile medication with critical applications in reproductive health, particularly in medical abortion, where it is used to safely terminate early pregnancies.

D.1 Identification Strategy for Fetal Deaths

I use the same identification strategy as in equation 1, but I use the average rates of fetal deaths as outcomes. Bentancor and Clarke (2017) use the fetal death rate with the denominator being the total number of live births occurring in the municipality and year. In my case, I use municipality-age-year as my observation level. In the previous results, I observed that increased access to the EC pill reduced the number of births in municipalities with a high level of access to pharmacies. Therefore, dividing by the number of births would mechanically increase the fetal death rate. In this context, the outcome I use is the fetal death rate with respect to the female population, and I apply the logarithm to interpret the results as percentage changes.[11]

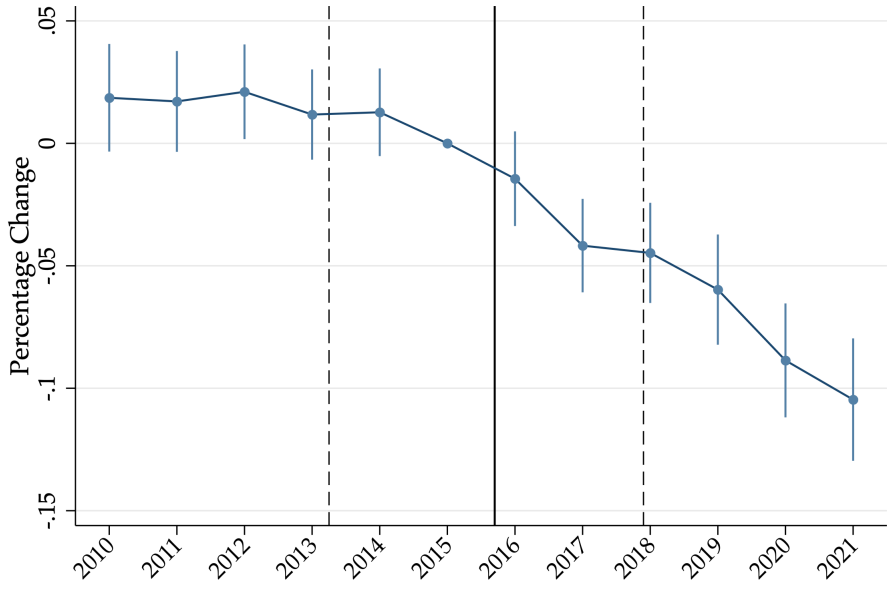
Figure D.2 depicts the estimations for women between 15 and 39 years old. Panel (a) shows that there are no significant differences in fetal deaths between the two types of municipalities before the prescription elimination. Following the policy change, there is a significant decline in fetal deaths in municipalities with high access compared to those with low access to pharmacies. Panel (b) shows the estimation divided by age group. Similar to the birth rates identification strategy, between 2013 and 2016, there are no significant differences between the two types of municipalities for all age groups, indicating a parallel trend. However, before 2013, there are significant differences due to the uncertainty of the EC pill availability, which depended on the municipality (Bentancor and Clarke 2017). After the policy change, the greatest difference in fetal deaths is among women aged 15 to 19. For women aged 20 to 39, the difference is smaller. In this context, I will use a difference-in-differences approach to estimate the causal effect of increased access to the EC pill on fetal death rate following equation 2.

D.2 Results

Fig 8 shows that the results fetal death where we observe that fetal death rate decreases by 4.2% in municipalities with higher access to a pharmacy, and the greatest impact is on the youngest group, where the fetal death rate decreases by 5.9%.

[11] Because some municipality-age-year cells have zero fetal deaths, I add one to the count of births for all municipality-age-year cells.

Figure D.2. Identification Strategy for Fetal Death Rate



Notes: The continuous black vertical line represents the month when the EC pill became available without a prescription. The first dashed vertical line represents the day when the EC pill became reliably available in pharmacies with a prescription, and the second dashed vertical line represents when abortion was allowed on three grounds. The confidence intervals are at the 95% confidence level.

Table 8. Difference-in-Difference Estimation

	(1)	(2)	(3)	(4)
	All births	15-19 year-olds	20-29 year-olds	30-39 year-olds
Fetal Death Rate				
One mile threshold	-.042	-.059	-.033	-.042
	[.007]	[.011]	[.011]	[.009]
Two miles threshold	-.038	-.051	-.034	-.036
	[.006]	[.009]	[.009]	[.008]
Observations	51,750	10,350	20,700	20,700
Mean (%)	0.046	0.032	0.054	0.044

Note: The coefficients represent the interaction between access to a pharmacy and the post-intervention period, and they should be interpreted as percentage changes. The estimations cover the years from 2013 to 2018.