



**“THE EFFECT OF FREE EMERGENCY CONTRACEPTION
AVAILABILITY ON ADOLESCENT PREGNANCY AND FEMALE
LABOUR FORCE PARTICIPATION IN CHILE”**

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THE EFFECT OF FREE EMERGENCY CONTRACEPTION
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LABOUR FORCE PARTICIPATION IN CHILE

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Abstract

This document analyzes the effect of the expansion in availability of the emergency contraceptive pill (ECP) between 2011 and 2017 in a middle income country setting. Exploiting variation in ECP availability across municipalities in Chile caused by a series of legislative decisions I estimate the impact of free access to ECP on two different outcomes: (1) the likelihood that an adolescent woman is pregnant and (2) female labour force participation. I find a negative effect on teenage pregnancy only for relative poor women. This result suggests that these individuals are affected by the reform as their access to other contraceptive methods is limited. When analyzing female labour participation, I find that previous ECP availability did not affect adult women's likelihood of participating in the labour force. It is argued that the effect of this contraception technology might be observed in the long-term.

Keywords: Emergency contraception, adolescent pregnancy, fertility, labour force, public health.

JEL classifications: J13, J21, I18

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1 Introduction

Adolescent motherhood is considered a risk factor that has a severe adverse effect on economic outcomes (Odu et al., 2015). Mainly, when experiencing this, women are prone to limit their educational and labour opportunities as they are likely to abandon school, which reduces human capital accumulation. Consequently, their access to the labour market is restricted (Molina et al., 2004). As a result, teenage pregnancy may affect women while teenagers and may be harmful during adulthood (Berthelon and Kruger, 2011).

However, fertility and birth rates among teenagers, have decreased considerable around the globe and contraceptive technologies have played a significant role. Evidence has shown that early access to contraceptive technologies has generated important consequences at social and productive levels in developed countries, e.g. delays in motherhood and marriage (Goldin and Katz, 2002); greater human capital (Bailey, 2006); greater participation of women in the labour market and the number of hours worked (Bailey et al., 2012), and reduction of the gender gap at the salary level (Chiappori and Oreffice, 2008).

In the case of Chile, efforts have been made on family planning and fertility regulation. Leal and Molina (2021) suggest that some strategies have affected better results in terms of adolescent fertility ¹. Among these, they highlight the role of differentiated health care services for adolescents and Law 20.418 ² which establishes the right to sexual education, information and confidentiality regardless of age. Additionally, they mention that a cultural shift has been perceived over the last decades that might have also affected reproductive decisions. In particular, they focus on the increased use of contraceptive.

Despite progress, there is evidence that the country has faced several political and social barriers on women’s sexual and reproductive rights (Dides and Fernández, 2016). One of the major demands that has taken centre of stage over the two last decades in Chile is the access to Emergency Contraception Pill (“ECP”) (Dides et al., 2018). This refers to a hormonal method that can be used within the following days after unsafe sexual intercourse with risk of pregnancy. However efficacy of ECP is better the sooner is taken (von Hertzen and Godfrey, 2009). After a lengthy discussion and struggles surrounding ECP (which will be explained in section 3), it became partially available in some municipalities in 2009 and has been fully legal and distributed since 2014.

This paper studies the causal effect of the availability of ECP on adolescents’ fertility and on labour force participation in Chile using cross-sectional public data. It takes advantage of the expansion of ECP availability and exploits its variation across municipalities from 2009 to 2017. Notice that ECP is the first legal post-coital method in Chile. If significant effects are found, this could anticipate effects of expanding reproductive rights. The literature regarding the effect of ECP in Chile is scarce. This study aims to

¹When referring to adolescents, this document will use the definition of “older adolescent” provided by the World Health Organization (WHO), which includes women from 15 to 19 years old.

²It was approved in 2010 and enabled partial distribution of ECP in the public sector.

contribute to it by analyzing the effect of ECP availability on teenage pregnancy differentiated by income level, and on female labour participation using more recent year. It is argued that, among the main cultural factors that influence women to participate in the labor force in Chile, is the decision to become a mother and sexism (Contreras and Plaza, 2010). Therefore, if ECP has an effect on teenage pregnancy and delays motherhood, an indirect effect on labor force participation might be observed.

First, I find a negative effect on teenage pregnancy for relative poor teenagers only. Second, I estimate the effect of ECP previous availability on adult women’s likelihood of participating in the labour force. The results suggest that previous ECP availability did not affected adult women’s likelihood of participating in the labour force. It is argued that the effect of contraception technologies might be observed in the long-term.

This document is structured as follows: Section 2 provides a literature review. Section 3 explains the background regarding ECP introduction in detail. Section 4 presents the data and descriptive statistics. In section 5, the methodology is explained, and section 6 shows the results. Section 7 discusses the results and limitations, and, finally the last section presents the conclusion.

2 Literature Review

There is a vast literature that evidences the negative consequences of teenage pregnancy and motherhood on socio-economic outcomes³. Chevalier and Viitanen (2003) examined the effect of teenage motherhood on the long-run labour market in Britain using panel data from 1958 to 1991. Results obtained with matching and instrumental variable methodologies revealed that having a child at an early age, on the one hand, decreased the chances of achieving a higher education level by 12-24%. On the other hand, labour market experience was reduced by up to three years, and their penalty pay ranged from 14% to 22%. The authors suggest that these outcomes might be mitigated by adopting policies that encourage school reintegration and female labour participation. Similar results were found in the United States in the 1970s. Adolescent fertility had significant adverse effects on formal education, female work experience for both teenagers and early adults, and market wages (Klepinger et al., 1999).

Regarding contraception methods, extensive literature studies the effect of these on different economic outcomes. Goldin and Katz (2002) examined the relationship between the introduction of the first contraceptive pill in 1960 (Enovid) and two demographic changes observed in the United States after 1970: a considerable increase in college women’s representation in professional occupations and later age at first marriage. State-level changes expanded access to the pill, reducing the threshold (from 21 to 18 years old) and extended ”mature minor” decisions. Hence, the authors exploited cross-state and cross-cohort variation using standard differences-in-differences specification, including controls for state and year of birth fixed

³Variables such as education, employment and economic status have been commonly studied (Bissell, 2000).

effects. They found that early access to the pill lowered the cost of career investment by delaying the age at first marriage.

Following the same framework and strategy as Goldin and Katz (2002), Bailey (2006) argued that the pill had "more power", as its effect on women's labour-force participation might have been durable and far-reaching. Taking advantage of plausibly exogenous variation across states, the author estimates the pill's effect on the timing of first births and the intensity of women's labour-force participation. She found that for women who had access to the pill at an early age, the likelihood of first birth before 22 was significantly reduced. Additionally, early access to the pill positively affected the number of women in the paid labour force and the number of annual hours worked. The paper, in conclusion, suggests that the mechanism behind greater female labour-force participation is the delay in childbearing.

In contrast, Myers (2017) argued that previous literature (Goldin and Katz 2002; Bailey 2006) overestimates the effect of policies governing access to the pill on demographic changes and does not provide evidence of non-demographic mechanisms via which early access to the pill affected economic outcomes. Additionally, this literature did not consider that many laws that allowed early access to the pill also granted access to abortion. That might have conflated the results. Considering this, the author examined the causes of change in fertility and marriage trends in the United States in the 1960s and 1970s. Cross-level variation caused by differences in the timing of adoption of reproductive policies is exploited using standard difference-in-difference. Finally, the author estimated the effect of the introduction of the pill, legalization of abortion and laws permitting young women to access each method confidentially on first marriage and birth. The results suggested that, rather than contraception methods, it was liberalized access to abortion that caused a significant reduction in first births and marriages.

There is a lack of literature focusing on postcoital and non-abortive methods' effects on labour market outcomes. Most of it corresponds to studies in developed countries. For example, in the case of England, Girma and Paton (2011) estimate the effect of increased access for adolescents to emergency birth control (EBC) on pregnancies and sexually transmitted infections (STI) from 1998 to 2004. Using panel data and difference-in-difference methodology, the results prove that increased access to EBC only positively affected teenage STI rates. However, they did not find any effects regarding the reduction of teenage pregnancy. They suggested two explanations: First, EBC might not be as effective as believed. Second, greater use of EBC might induce more significant sexual activity, cancelling out the decrease in teen pregnancy rates.

Similar results were found in the case of the United States. Access to emergency contraception has been expanded since 2006, when the Food and Drug Administration (FDA) allowed over-the-counter provisions. However, some states previously provided it. Exploiting county-level variation and using a difference-in-difference framework, Durance (2013) and Gross et al. (2014) estimated the effect of expanded access to emergency contraception. Both found no evidence that birth rates were reduced by pharmacy access.

Evidence is different for those developing countries where abortion is illegal, which is the case of Chile ⁴. Bentancor and Clarke (2017) examined the effect of free access to ECP on fertility, abortion and aggregate human capital outcomes between 2006 and 2012 in Chile. They used vital statistics and took advantage of the legalization process, which led to a scenario where the mayor of each municipality in Chile could decide whether to provide ECP (resulting in variation across municipalities and over time). The quasi-experimental nature of the reform's implementation provides a difference-in-difference framework. The authors control for municipality and year fixed effects, and municipality-specific time trends are included in some specifications. They found that ECP availability reduces pregnancy and early gestation foetal death (a proxy for illegal abortion). They found that the availability of ECP reduced the birth rate by 1.4 births per 1,000 women. However, this effect is not statistically significant at typical levels. Early gestation foetal death (proxy for illegal abortion) was reduced by 40%. They did not find a significant effect of ECP on aggregate human capital indicators of pregnant women and new-born babies over such a short time frame.

Following the same strategy, Nuevo-Chiquero and Pino (2019) studied the effects of availability of ECP on contraceptive behaviour for individuals from 15 to 29 years old in Chile. The expanded access to ECP in the public sector caused an increase in the use of pre-coital hormonal methods (2.9 percentage points) and a decrease in traditional methods. They also find that in scenarios with low starting levels of contraceptive use there is a potential to adopt more policies in order to increase the use of regular contraception. This means that the availability of ECP had a spillover effect that could change the sexual behaviour of teenagers and therefore, the likelihood of having a child at an early age could decrease.

3 The Roll-out of ECP in Chile

This section provides a brief explanation of ECP introduction and availability process. The last decade witnessed serious debate over ECP accessibility, which was even deemed an abortive method until 2007. Therefore, the roll-out of the ECP faced some barriers and reflected the struggle around moral values that exists in the field of reproductive rights in Chile (Dides et al., 2011). Since 2001, when initial discussions and controversies started, public policies aimed at women and, in particular, adolescent and young women have been greatly affected by this context (Dides et al., 2011). Consequently, from 2001 to 2005 the distribution of the ECP was completely forbidden in both, public and private healthcare centres.

After this period, ECP was provided in public centres in case of rape only until 2007, while pharmacies were allowed to sell it, albeit a substantial share of them refused to do so (Casas Becerra, 2008). In order to regulate this situation, the Ministry of Health allowed free distribution of ECP in the public health service through hospitals and local clinics. The Supreme Court promptly challenged that regulation in 2008 which established that its distribution needed to be authorized by law. This situation ended in a "partial ban"

⁴In 2017, a bill legalized abortion in three cases only: rape, mother's life is at risk and fatal foetal impairment.

of the ECP period, where, depending on the local mayor’s decision, the pill was available (or not) in some municipalities. Again, in 2009 a new obstacle emerged. The *Contraloría* (government’s auditor) banned the ECP’s public distribution, arguing that a previous Supreme Court decision was applicable at the municipality level. Later, a period of uncertain distribution started in 2010 when the Chilean Congress approved the ‘Regulation Fertility Law’ which granted free distribution of ECP in public health centres. However, its availability in each municipality still depended entirely upon the mayor’s decision who had jurisdiction over them. *”The lower rank norm that put these dispositions (Law No. 20418 of 8 January 2010) into effect was delayed, yielding a period of uncertainty, sometimes avoiding the EPC’s distribution.”* (Nuevo-Chiquero and Pino, 2019). Finally, in May of 2013, a new law became operational. This law guaranteed that the pill must be available and dispensed free of charge for all beneficiaries of the public system who requested it.

4 Data

The database used is the National Socioeconomic Characterization Survey (CASEN), a cross-sectional public survey carried out every two or three years since 1987. It contains relevant individual and family information about education, health, employment and income, and the household’s demographic composition. It also contains fertility questions ⁵ which will be the focus of this research as it is the channel through which the “availability of the pill” would affect labour force participation. CASEN also provides municipal-level economic variables such as average income per capita in the municipality, average years of education, unemployment rate, and poverty rates.

Data for the availability of the pill by municipality is provided by an independent survey carried on since 2009 (Dides et al., 2009, 2010, 2011, 2013, 2015, 2017). The information was collected by phone calls, asking random health centres of each municipality whether there is free access to ECP.

When observing the outcomes variables, the period covers years from 2011 and 2017 (period characterized by showing differences at the municipality level depending on majors’ decisions), which means that four waves of survey data are used. ECP availability data covers the period 2009-2017.

The sample is split into two age groups of fertile-aged women. First, the sample considers teenagers (15-19 years old) only to estimate their likelihood of becoming pregnant. Older women will be included when examining heterogeneity of effects across cohorts. Second, when estimating labour force participation, the sample is restricted to 23-27 year-old women. This cohort is the oldest group of individuals, observed in 2017, that might have been affected by ECP availability when they were teenagers. Specifically, from 2009 onwards, the ECP became available in some municipalities and this might have affected women’s likelihood of participating in the labour force when they became adult by avoiding unintended pregnancy. Table A1

⁵Such as age at first birth and current pregnancy situation.

in Appendix shows ECP availability for every year and indicates whether women from 20 to 27 years old (in 2017) were teenagers at that time. Accordingly, for other years, the same age group will be analyzed considering its respective teenage years (Table A2 indicates whether women from 20 to 27 years old in 2013 were potentially affected by ECP). Additionally, 23-27 year-old women are more likely to participate in the labour force (see table A3 in Appendix).

Table 1 presents descriptive statistics for the primary outcomes of interest and ECP availability over time. Teenage pregnancy is a dummy variable that takes value one if an adolescent woman (15-19 years old) is pregnant or breastfeeding. Labour force participation is also a binary variable indicating if a 23-27 year-old woman is participating in the labour force. Particularly, this variable takes value one if the individual worked the week before the data collection, is currently employed but temporarily absent from work or if she is currently looking for a job. And it takes value zero if the individual is neither employed nor looking for a job. Finally, column (3) shows the average of municipalities that provides ECP in public health centres over the years. The likelihood of a teen becoming pregnant has gradually decreased from 2011 to 2017, whereas a slow increase in the likelihood of an adult woman participating in the labour force is observed. Column (3) shows the growth of the number of municipalities that provide ECP. Notice that from May of 2013 forward, ECP has been freely distributed. For that reason, this number has rapidly increased, particularly between 2011 and 2013. The growth is more remarkable if previous years are observed, as the ECP was available only in half of 346 municipalities in 2009. Figure A4 in Appendix shows ECP availability evolution from 2009 to 2017 and contains information of municipalities with no data. This study aims to find whether there is a causal relationship between these outcomes and the expansion of ECP availability over the time.

Descriptive statistics for individual and municipality characteristics are presented in Table A5 in Appendix. Regarding adolescent motherhood, the literature gives insights of appropriate control variables. Berthelon and Kruger (2011)⁶ highlighted the inclusion of number of elderly, number of children aged 6 to 14, sex and years of education of the head of the household, household income and whether the individual lives in a rural area. Additionally, they included density as a proxy of household wealth arguing that density is correlated with sexually promiscuous behaviors in Chile. On the other hand, regarding labour force participation, Loyola (2010) argued that individual and municipal variables such as: age, living in a rural area, education, socio-economic group and municipal average income, are determinants of female labour force participation in Chile. These variables, in addition to others, are used as control variables.

⁶They estimated the effect of the availability of full-day high schools (FDS) in the municipality where she resides on the likelihood that an adolescent girl in Chile is a mother using CASEN data (1990-2006).

Table 1: Descriptive Statistics

	Teenage Pregnancy (1)	Labour Force Participation (2)	ECP Availability (3)
2011			
Mean	0.061	0.403	0.705
SD	0.239	0.490	0.456
Observations	8,834	13,482	346
2013			
Mean	0.056	0.415	0.875
SD	0.230	0.492	0.330
Observations	8,952	14,887	346
2015			
Mean	0.049	0.427	0.902
SD	0.215	0.494	0.430
Observations	10,165	17,412	346
2017			
Mean	0.035	0.428	0.924
SD	0.183	0.494	0.264
Observations	7,585	13,693	346
All years			
Mean	0.051	0.420	0.852
SD	0.219	0.493	0.383
Observations	35,536	59,474	346

Source: Own elaboration based on CASEN data and Dides et al. (2011, 2013, 2015, 2017).

5 Methodology

The quasi-experimental nature of the expansion of ECP across municipalities in Chile from 2009 to 2017 provides a scenario with variation across municipalities and years. Notice that some municipalities were not necessarily consistent when providing ECP. There were cases where municipalities switched from free ECP distribution to not distribution, back and forth, and then definitely providing it after it was legal in May of 2013. Taking advantage of this variation and using availability of ECP at the municipality level, I

estimate the impact of free access to ECP on two different outcomes: (1) the likelihood that an adolescent girl becomes pregnant and (2) female labour force participation. For both estimations, a dummy variable indicating whether the municipality provides ECP is the variable of interest.

5.1 Adolescent pregnancy

First, I estimate the effect of ECP on adolescents' likelihood of becoming pregnant, denoted as Y ⁷. I include individual and family characteristics that are correlated with adolescent pregnancy (X_{ict}), as well as municipal time-varying characteristics denoted as M_{ct} . I add a control for municipal fixed-effects to capture time-invariant municipality characteristics (μ_c). To capture changes over time at the national level I add a control for year dummies γ_t . Finally, I include municipality-specific linear time trends, $\mu_c \times t$, that control for changes of municipality characteristics. Standard errors are clustered at the municipality level.

Therefore, the following OLS equation estimates the effect of ECP on adolescents' likelihood of becoming pregnant for individual i in municipality c at time t :

$$Y_{ict} = \alpha + \beta ECP_{ct} + \lambda X'_{ict} + \phi M'_{ct} + \mu_c + \gamma_t + \mu_c \times t + \epsilon_{ict} \quad (1)$$

Different effects depending on socio-economic context of each individual are expected. Higher rates of teenage pregnancy and lower use of contraceptive technologies of any kind are associated with lower socio-economic groups (Dides and Fernández, 2016; León et al., 2008). Hence, in addition, the sample will be grouped by households' income quintile.

5.2 Female labour force participation

Second, following the previous identification strategy, the effect of ECP availability on adult women's likelihood of participating in the labour market will be estimated. Notice that this study focuses on how teenage women are affected by free provision of ECP. Thus, the independent variable is redefined as a dummy that takes value one if women were exposed to ECP when they were teenagers. On the other hand, the dependant variable, denoted as Y , is a dummy variable that indicates whether individual i is participating in the labour force in year t .

First, I will estimate the effect of ECP availability in 2005 and 2009 on women's likelihood of participating in the labour force in 2013 and 2017, respectively. As it was mentioned in section 4, some municipalities started to provide ECP in 2009, therefore the oldest cohort of women that might have been affected by initial ECP availability includes women who are 23-27 years old in 2017. 2013 is included as in between this year

⁷This variable takes value one if the individual reported that she is pregnant or breastfeeding.

and 2017 there is an important difference in previous availability of ECP ⁸. This means that ECP_{t-8} , which is the variable of interest, will take value one if individuals had free access to the pill when they were 15-19 years old. Therefore, the OLS estimation equation is as follows:

$$Y = \alpha + \beta ECP_{t-8} + \lambda X'_{ict} + \phi M'_{ct} + \mu_c + \gamma_t + \epsilon_{ict} \quad (2)$$

Individual characteristics are denoted as X_{ict} , whereas municipal time-varying characteristics are denoted as M_{ct} . (μ_c) is a municipal fixed effects and (γ_t) is a year fixed effect. Standard errors are clustered by municipality. In this estimation municipality-specific time trends are not included as the specification includes two points of time only. In order to avoid any measurement error related with women's location during the study period, the sample is restricted to women who live in the same municipality as five years ago.

Equation (3) shows an alternative approach, which estimates the effect of the intensity of ECP availability i.e. the effect of a longer exposure to ECP on female labour participation between 2013 and 2017. I generate a new variable of interest which contains the sum of years that an adult woman from 23 to 27 years old was potentially exposed to ECP ⁹. This cohort of women, again is the first group that might have been exposed to ECP.

$$Y = \alpha + \beta Intensity_{ct} + \lambda X'_{ict} + \phi M'_{ct} + \mu_c + \gamma_t + \epsilon_{ict} \quad (3)$$

6 Results

6.1 Adolescent pregnancy

Table 2 reports the OLS estimated coefficients for different cohorts and specifications. Column (1) shows that, among teenagers, the effect of ECP availability is negative and small. Similar effects are reported when demographic controls, year and municipality fixed effects, and municipality-specific time trends are gradually added. When including full set of controls, ECP availability is estimated to reduce the likelihood of becoming pregnant by 1.2 percentage points. However, these coefficients are not statistically significant at typical levels. Among adult women, a negative and small, but not significant effect of ECP availability is observed when adding full set of controls. These results indicate that ECP had not a significant impact on teenagers who lived in municipalities that provided the pill in public healthcare centres.

⁸Most women who were 23-27 years old in 2013 were teenagers prior to 2009, when ECP provision was fully banned.

⁹This will include ECP availability in 2009, 2011 and 2013 depending on the case.

Table 2: Effect of ECP on Pregnancy by Age Group

	(1)	(2)	(3)	(4)	(5)
Panel (a): 15-35 year-old					
ECP	0.004	0.001	0.000	-0.001	-0.009
	(0.007)	(0.003)	(0.008)	(0.003)	(0.004)
Panel (b): 15-19 year-old					
ECP	-0.005	-0.006	-0.005	-0.007	-0.012
	(0.012)	(0.009)	(0.009)	(0.009)	(0.014)
Panel (c): 20-35 year-old					
ECP	0.007	0.004	0.000	0.001	-0.006
	(0.007)	(0.007)	(0.009)	(0.009)	(0.013)
Control variables		✓		✓	✓
Year and municipality FEs			✓	✓	✓
Municipality-specific time trends					✓

Note: Robust standard errors clustered at the municipality level are reported in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A6 in Appendix shows full results. I find that the likelihood of becoming pregnant increases with age, whereas decreases with more years of education. I also find that being single decreases the likelihood of becoming pregnant by 23.3 percentage points. Regarding household structure, the education of the head of the household has a negative but small effect. According to what Berthelon and Kruger (2011) suggested, living in female-headed households is positively correlated with teenage pregnancy (1.2 percentage points), as well as household density (1.8 percentage points). Finally, municipal average age at first birth decreases the likelihood of teenage pregnancy by 1.4 percentage points.

As it was argued in section 5, teenagers might be affected differently according to their socio-economic context. Table 3 reports the effect of ECP availability on the likelihood of becoming pregnant when splitting the sample by income quintiles ¹⁰. It is shown that ECP availability reduced the likelihood of becoming pregnant by 4.8 percentage points (significant at the 0.1 level) in Quintile 2, whereas Quintile 3 shows a negative effect as well, but not statistically significant. This result suggest that ECP availability had an effect on relatively poor women that might have limited contraception alternatives to avoid pregnancy. Notice that higher income levels show positive but not significant effect, as well as the lowest income group. These results

¹⁰The first Quintile 1 is regarded as lowest income level, and Quintile 5 as highest income level.

will be discussed in section 7.

Table 3: Effect of ECP on Teenage Pregnancy by quintile

	Teenage Pregnancy (1)
Panel (a): quintile 1	
ECP	0.024 (0.025)
Observations	5,263
Panel (b): quintile 2	
ECP	-0.048* (0.029)
Observations	6,950
Panel (c): quintile 3	
ECP	-0.001 (0.034)
Observations	6,755
Panel (d): quintile 4	
ECP	0.001 (0.028)
Observations	6,292
Panel (e): quintile 5	
ECP	0.000 (0.023)
Observations	5,328
Controls	✓
Year and municipality FEs	✓
Municipality-specific time trends	✓

Note: Robust standard errors are reported in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Finally, as a robustness check I estimate the effect of ECP on older women (36-49 years old) ¹¹. Table A7 in Appendix, shows the results for this placebo test. The coefficient is positive, however is small and not statistically significant. Thus, there is no evidence that the likelihood of becoming pregnant is affected by ECP availability in this cohort either.

6.2 Female labour force participation

Table 4 presents the results for labour force participation estimation. Column (1) reports the OLS coefficient when individual and municipality-specific characteristics are included. The cohort of women age 23-27 living in municipalities where the ECP was available when they were teenagers are more likely to participate in the labour force by 21.6 percentage points. This coefficient is statistically significant at the 0.01 level. However, once year and municipality fixed effects are added, the size of the coefficient decreases and is no longer significant at any level.

Table 4: Effect of previous ECP availability on Female Labour Force Participation 2013-2017

	Labour force participation (1)	Labour force participation (2)
ECP_{t-8}	0.216*** (0.026)	0.040 (0.062)
Controls	✓	✓
Year and municipality FE		✓
Observations	5,314	5,314

Note Robust standard errors clustered at the municipality level are reported in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regarding control variables coefficients, (see table A8 in Appendix for full results) when including year and municipality fixed effects, I find that individuals in lower and middle socio-economic groups are less likely to participate in the labour force. I also find that marital status has a positive and significant effect on this outcome, as being single increases the likelihood of participating in the labour force by 15.2 percentage points. One more year of education has positive but small significant effect. Finally, I also find that living in a rural location is correlated with lower female force participation (5.1 percentage points).

An additional approach is added, which focuses on years of ECP availability (intensity). Table 5 shows the effect of a longer exposure to ECP on the likelihood of participating in the labour force. A positive but small effect is observed in both specifications. However, they are not statistically significant at any level.

¹¹This is the oldest age group that were asked whether they are pregnant or breastfeeding

Table 5: Effect of ECP intensity on Female Labour Force Participation 2013-2017

	Labour force participation	Labour force participation
	(1)	(2)
$ECP_{intensity}$	0.005	0.019
	(0.026)	(0.031)
Controls	✓	✓
Year and municipality FE		✓
Observations	5,314	5,314

Note Robust standard errors clustered at the municipality level are reported in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

I test the robustness of these results by estimating the effect of ECP availability on the likelihood of participating in the labour force for older women (35-49 years old and 50-65 years old), as a placebo test. Table A9 in Appendix shows the results for this estimation. For the first cohort of women, a positive and small effect of ECP availability is observed, whereas the coefficient turns negative when observing the second cohort. Both of these effects are not statistically significant.

7 Discussion of results and limitations

The first results of this study indicate that ECP availability had not a significant effect on the composition of the sample. Similarly to what Bentancor and Clarke (2017) suggested, I found a negative effect of ECP availability on teenage pregnancy, but not significant at any typical level. However, heterogeneous effects were observed when the sample was split by income quintiles. It is shown that there is a negative and statistically significant reduction in the likelihood of becoming a teenage mother in Quintile 2, whereas a negative and not significant effect is observed in Quintile 3. This result suggest that relative poor teenage women who have limited access to contraceptive methods (Dides and Fernández, 2006) benefit from ECP availability.

Regarding Quintile 1, 4 and 5, the effect of ECP availability is positive and not significant. First, a possible explanation for these results could be that higher income levels are not affected by the free provision of ECP in public healthcare centres as these individuals might have access to this contraceptive method (and others) through private healthcare services. Second, teenagers in Quintile 1 (lowest economic status) might face different barriers to accessing ECP. Sadler et al. (2011) highlighted the lack of information regarding the use of contraceptive methods and its public provision among teenagers. This might affect Quintile 1 substantially, as these individuals are less likely to receive sexual and reproductive education.

For this reason, the decrease in adolescent fertility over the years in Chile may have alternative explanations. Nuevo-Chiquero and Pino (2019) concluded that the decrease in fertility may be driven by the overall effect of an increase in the use of other highly effective contraceptive methods.

When analyzing female labour force, the results suggest that the cohort of women age 23-27 that might have been exposed to ECP when they were teenagers, were not significantly affected by ECP availability. This is contrary to what literature regarding other contraceptive methods in developed countries suggested (Bailey, 2006). A possible explanation for this is that the roll-out of the ECP started in 2009, which provides a short time frame that does not allow significant effects of ECP on long-term outcomes. Similarly, Bentancor and Clarke (2017) concluded that aggregate human capital indicators are not affected by ECP availability in the period 2006 to 2012.

Some limitations of this study have to be considered. First, the database does not contain data for private provision which might affect teenage fertility among high income quintiles. Second, municipality spillovers might affect the results. Women who live close to treatment municipalities may have access to ECP and may be affected by the reform even though they do not live precisely in those municipalities (Bentancor and Clarke, 2017). However, some requirements are needed in order to have access to public healthcare services. Users of local healthcare centres (*consultorios*) have to enroll themselves in their nearest center to their place of residence or work ¹². This might insure that they will get ECP only from their municipality of residence. Bentancor and Clarke (2017) also studied this possibility. They do not find that areas close to EC municipalities had large changes in rates of pregnancy following the reform.

Finally, teenage pregnancy is defined by a dummy variable that takes value one if an adolescent woman is pregnant or breastfeeding at the time of the survey. Thus, as the survey is carried out every two years, there is a time gap that might affect the results. Women may report their pregnancies even though they occurred the year before, meaning that they were actually affected by ECP availability one year prior to the survey.

8 Conclusion

From the first introduction of ECP until 2017, the number of Chilean municipalities that provide them increased significantly. This study analyze the effect of freely available ECP on teenage pregnancy and female labour participation in Chile by taking advantage of the country's background which allowed variation in provision of ECP across municipalities and over time.

At first instance, the results show no significant effect of availability of ECP on the likelihood of becoming a mother at any age group level. It is argued that its provision might affect differently depending on socio-economic contexts of each individual. For that reason, I focus only on teenage pregnancy and the sample is

¹²They have to show a proof of address

grouped by quintiles. The results report a negative and statistically significant effect (at the 0.1 level) of 4.8 percentage point in Quintile 2. A negative but not significant effect is found in Quintile 3, whereas positive and significant effects are observed in other Quintiles. This indicates that relative poor women are more affected by the reform as their access to other effective contraceptive methods is limited. Regarding Quintile 1, it was argued that they are less likely to be affected by ECP availability, as they might not be informed about contraceptive methods and its use. In this scenario, this might have been a several challenge, due the sporadic availability of ECP.

When analyzing female labour participation, the results suggest that previous ECP availability did not affected adult women's likelihood of participating in the labour force. It is argued that the effect of contraception technologies might be observed in the long-term.

This study contributes to previous research on ECP availability in Chile by analyzing its effect on teenage pregnancy differentiated by income level, and on female labour participation using more recent years. It provides some evidence that ECP affected relative poor women. This means that public policies on contraceptive behaviour oriented towards vulnerable teenagers should be enhanced. Additionally, these policies should look after the lack of information regarding contraception among teenagers. On the other hand, there is no evidence that ECP availability affected female labour force participation, but it should be analyzed using updated data and using a longer time frame.

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10 Appendix

Table A1: Adult women in 2017 and ECP availability

	20	21	22	23	24	25	26	27
ECP 2015	✓	✓						
ECP 2013	✓	✓	✓	✓				
ECP 2011		✓	✓	✓	✓	✓		
ECP 2009				✓	✓	✓	✓	✓

Note: The check mark indicates whether this group of women were teenagers from 2009 to 2015 (ECP availability period).

Table A2: Adult women in 2013 and ECP availability

	20	21	22	23	24	25	26	27
ECP 2011	✓	✓						
ECP 2009	✓	✓	✓	✓				

Note: The check mark indicates whether this group of women were teenagers from 2009 to 2011 (ECP availability period).

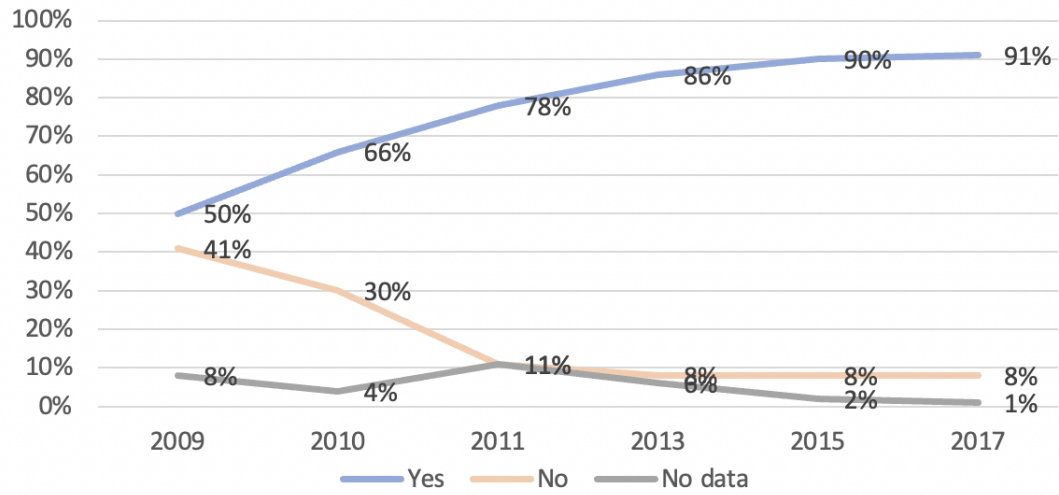
Table A3: Women participating in the labour force 2011-2017 (%)

	20	21	22	23	24	25	26	27
Labour force participation	23.93%	27.47%	33.47%	37.41%	43.43%	49.47%	52.75%	55.45%

Note: Labour force participation is a dummy variable that takes value one if the individual worked the week before the data collection, is currently employed but temporarily absent from work or if she is currently looking for a job. And it takes value zero if the individual is neither employed nor looking for a job. Each column reports the mean percentage of women participating in the labour force from 2011 to 2017.

Figure A4:

% of municipalities where the pill is available across the years



Source: own elaboration based on data obtained from Dides 2011, 2013, 2015, 2017

Table A5: Descriptive statistics: Control variables

	2011	2013	2015	2017	All years
Individual and household variables					
Age	17.04 (1.41)	17.07 (1.41)	17.04 (1.41)	17.08 (1.41)	17.06 (1.41)
Single	0.94 (0.23)	0.95 (0.23)	0.95 (0.22)	0.96 (0.19)	0.95 (0.23)
Years of education	10.67 (1.87)	10.67 (1.92)	10.70 (1.89)	10.80 (1.84)	10.71 (1.88)
Household income (log)	13.08 (0.98)	13.04 (0.94)	13.20 (0.95)	13.30 (0.90)	13.16 (0.97)
Household is poor	0.16 (0.36)	0.17 (0.38)	0.14 (0.35)	0.09 (0.29)	0.14 (0.35)
Rural	0.19 (0.39)	0.18 (0.38)	0.20 (0.40)	0.18 (0.39)	0.19 (0.39)
Years of education — head of household	9.71 (4.00)	9.93 (4.03)	10.22 (3.98)	10.45 (4.00)	10.07 (4.01)
Female-headed household	0.39 (0.49)	0.38 (0.49)	0.39 (0.49)	0.45 (0.50)	0.40 (0.49)
Density	1.73 (0.79)	1.67 (0.76)	1.60 (0.72)	1.50 (0.65)	1.63 (0.74)
Num. of elderly (65 years+)	0.17 (0.44)	0.18 (0.47)	0.19 (0.49)	0.20 (0.49)	0.19 (0.48)
Num. of siblings aged 6–14	0.48 (0.73)	0.44 (0.67)	0.43 (0.67)	0.41 (0.66)	0.44 (0.68)
Municipality variables					
Municipal average years of education	10.03 (1.27)	10.26 (1.23)	10.44 (1.32)	10.68 (1.26)	10.35 (1.29)
Municipal average income (log)	13.48 (0.37)	13.40 (0.33)	13.55 (0.37)	13.62 (0.37)	13.51 (0.37)
Municipal average age at first birth	21.67 (0.84)	21.77 (0.80)	21.94 (0.96)	22.32 (0.99)	21.91 (0.93)

Note Means are presented with standard deviations below in parentheses. Poverty indicates whether a Household is under the poverty line. Density refers to number of household members per number of bedrooms.

Table A6: Effect of ECP on teenage pregnancy

VARIABLES	Teenage pregnancy (1)
ECP	-0.013 (0.014)
Age	0.018*** (0.002)
Years of education	-0.008*** (0.002)
Single	-0.233*** (0.017)
Rural	-0.006 (0.005)
Household income	-0.000 (0.000)
Household is poor	0.005 (0.005)
Years of education-head of household	-0.002*** (0.000)
Female-headed household	0.012** (0.005)
Density	0.018*** (0.003)
Num. of elderly (65 years +)	-0.003 (0.004)
Num. of siblings aged 6-14	0.006 (0.004)
Municipal average years of education	0.019* (0.010)
Municipal average income (log)	0.008 (0.025)
Municipal average age at first birth	-0.014* (0.007)
Constant	13.388*** (2.104)
Controls	✓
Year and municipality FE	✓
Municipality-specific time trends	✓
Observations	30,588

Robust standard errors clustered at the municipality level are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A7: Effect of ECP on pregnancy (placebo)

	Pregnancy
	(1)
Panel (a) : 36-49 year-old	
ECP	0.002 (0.004)
Controls	✓
Year and municipality FE	✓
Municipality-specific time trends	✓
Observations	73,661

Note: Robust standard errors clustered at the municipality level are reported in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A8: Effect of ECP intensity on Female Labour Force Participation

VARIABLES	Labour force participation (1)	Labour force participation (2)
ECP_{t-6}	0.216*** (0.026)	0.040 (0.062)
4	0.027 (0.076)	0.004 (0.071)
3	-0.111 (0.079)	-0.152** (0.072)
2	-0.173* (0.094)	-0.212** (0.086)
1	-0.376*** (0.104)	-0.418*** (0.101)
Age	0.043*** (0.007)	0.040*** (0.007)
Single	0.161*** (0.022)	0.152*** (0.022)
Years of education	0.009** (0.004)	0.007* (0.004)
Mother's years of education	-0.009 (0.007)	-0.010 (0.007)
Rural	-0.041 (0.029)	-0.051* (0.031)
Household income	0.000 (0.000)	0.000 (0.000)
Municipal average income	0.000* (0.000)	0.000 (0.000)
Municipal average yars of education	-0.007 (0.016)	0.084 (0.066)
Constant	-0.633*** (0.224)	-1.484** (0.751)
Controls	✓	✓
Municipality FE		✓
Observations	5,314	5,314

Robust standard errors clustered at the municipality level are reported in parentheses.

1-4 are dummies for socioeconomic group. 1 and 2 are regarded as lower classes, and 3 and 4 as middle classes.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Table A9: Effect of ECP on lebaour force participation (placebo)

	Labour force participation
	(1)
Panel (a): 35-49 year-old	
ECP_{t-6}	0.035 (0.021)
Observations	21,956
Panel (b): 50-65 year-old	
ECP_{t-6}	-0.007 (0.022)
Observations	20,700
Controls	Y
Year and municipality FEs	Y

Note: Robust standard errors clustered at the municipality level are reported in parentheses

*** p<0.01, ** p<0.05, * p<0.1