Prescription Elimination Policies: Evidence from the Contraception Market

Draft of Third-Year Paper

Gabriel Cruz

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1 Introduction

The evidence demonstrates that increased access to contraception significantly reduces women's fertility rates, positively affecting education and labor market outcomes (Goldin and Katz 2002; Bailey 2006; Guldi 2008; Bailey et al. 2012). In response, many governments have expanded access to various contraceptives, including daily pills, IUDs, and emergency contraception, especially where abortion access is restricted. A common approach to lowering contraceptive access costs has been eliminating prescription requirements for emergency contraception. More recently, some US states have allowed pharmacists to prescribe contraceptives without a physician's visit (Grossman et al. 2025). These policies aim to enhance contraceptive access, minimize the need for regular physician visits, and reduce the time cost associated with obtaining contraceptive products.

Most evidence related to these access policies has focused on their potential effects on birth rates and consumer behavior. However, the responses of firms are also crucial, as they can significantly influence the desired outcomes. For instance, reduced access costs leading to rising

sales might increase competition among products, though this effect can vary depending on the market structure. In a concentrated market, a decrease in costs that boosts sales could actually drive prices up. Conversely, in markets with many competitors, eliminating prescription requirements could enhance competition, as consumers would have a broader array of choices and could substitute between different contraceptives without being tied to specific prescriptions.

This paper examines the impact of policies that eliminate the prescription requirement for contraception, focusing on their effects on consumer purchases, firm pricing, new product entries, and consumer welfare. My approach integrates descriptive analysis with a demand and supply model for contraception to quantify these impacts. Specifically, I explore two policy changes implemented in Chile: (i) the 2015 elimination of the prescription requirement for emergency contraception; and (ii) the policy allowing pharmacists to prescribe regular contraceptives without a physician's visit in 2021.[1]

Additionally, I include a separate section analyzing the correlation between birth rates and the market structure of emergency contraception. This analysis examines market concentration, product variety, and pricing before and after the policy change, aiming to understand how market factors influence decisions regarding childbirth.[2]

To study how regulation affects consumers, I utilize private data from IQVIA, a company that globally collects pharmaceutical market information. This dataset encompasses monthly local drug prices and sales for each product at the local market level from 2010 to 2023, containing details on prices, quantities, manufacturers, and active ingredients. Additionally, I am enriching this dataset with demographic data such as population density, income, and age for each local market. For birth outcomes, I use administrative vital statistics data, which records all births along with detailed maternal characteristics such as age, education, and county of residence across 350 municipalities.

This draft is organized as follows: Section two explains the setting of the study. Section three

[1] I am not sure whether to focus solely on one policy or both.

[2] These topics could form separate projects.

describes the data sources used. Section four presents a descriptive analysis of the effects on demanded quantities, prices, and market entries, divided into two subsections: (i) the 2015 policy change regarding the prescription requirement for emergency contraception, and (ii) the 2021 regulation related to regular contraception. Section five introduces a potential model to incorporate findings from the descriptive analysis, focusing on the emergency contraception market. Section six analyzes the relationship between the emergency contraception market and birth rates. The final section discusses the next steps.

2 Setting

In 2023, the contraceptive market generated anual revenue exceeding US$ 115 million from pharmacy alone. This market has a relevant impact on the health expenditure due to their high level of consume. Ninety-nine percent of women in the US use birth control at some point during their reproductive years (Daniels and Jones 2013). Additionally, in Chile, pharmaceuticals are the most significant component of out-of-pocket health expenditures in the country (OECD 2015; Benítez et al. 2018).[3] In this line, using a representative survey by the Consumer Protection Agency, shows that 73% of contraceptive product consumers purchase them in pharmacies, while 23.6% obtain them from public institutions. Using IQVIA and administrative data, in the case of emergency contraception, 96% of women obtained them in pharmacies.

Moreover, abortion access was completely banned during the studied period. Therefore, the only legal way to prevent an unplanned pregnancy after having sex was through emergency contraception. Note that partial abortion has been legal since 2018.

Regarding the prescription process, individuals seeking to purchase prescription drugs need to have an appointment with a physician who prescribes the specific drug with a particular active ingredient. Since 2014, legislation has allowed consumers to substitute branded drugs with bioequivalent

[3]There is no comprehensive prescription drug insurance market in Chile. Instead, there are a few disjointed programs that primarily cover medications in the public network or for a limited set of conditions.

generics, with pharmacies required to offer these alternatives. Substitution is permitted only for products with identical active ingredients. In the case of emergency contraception, this is less relevant since all emergency contraception products typically contain the same active ingredient. However, for regular contraceptives, the type of active ingredient is crucial because there are more than 20 different combinations of active ingredients available.

Another feature of the market to consider is that direct-to-consumer advertising of prescription drugs is forbidden. This restriction could make consumers more price-sensitive, as expensive branded drugs cannot use advertising to boost demand.

3 Data

I will utilize data from various sources, including private-sector pharmacy data, administrative records on contraception delivery from public institutions, and birth records, among others. The private data comes from IQVIA, a company that collects pharmaceutical market information worldwide. This data includes monthly local-market (83 local-markets) drug prices and sales for 2010–2023, collected from two main sources: the four largest pharmacy chains, which account for more than 90% of the market share and report retail prices and sales directly to IQVIA, and data for other pharmacies collected from wholesalers. I observe all products at the ATC-G03 (molecule) level, which includes all drugs related to ”sex hormones and modulators of the genital system”. However, the subgroup of drugs classified as contraceptives is defined by the code ATC-G03A, which represents ”hormonal contraceptives for systemic use”. The remaining drugs (108 different products) in the ATC-G03 category could be considered as control groups or instruments.

Table 1 lists the 122 different contraceptive products available in 2014. I have classified these products following the approach used by Pennington and Venator (2023), with the addition of the emergency contraceptive pill, which is the only method to prevent pregnancy after unprotected sex.[4] The various contraceptive methods differ in terms of failure rate and method of application,

[4]Emergency contraception (EC) can be used as often as needed to prevent unplanned pregnancies without significant

whether the method is "forgettable" or requires repeated action. Moreover, some products are more likely to cause side effects, such as weight gain, acne, or impacts on menstruation. In the case of the daily contraceptive pill, there are additional attributes to consider among products.

Table 1. Contraceptive Products

	Frequency	Failure Rate	Number of Products	Different Components	Different Labs	Number of Bioequivalents	Mean Price	Within SD	Between SD
Emergency Pill	Each time	0.15	3	1	2	3	13.42	5.26	2.20
Daily Pill	Daily	0.08	104	16	17	73	14.53	5.46	0.56
Patch	Weekly	0.08	1	1	1	0	23.14	1.13	0.61
Ring	1-3 months	0.08	3	2	2	0	25.64	5.04	2.57
Injection	1-3 months	0.03	7	3	4	4	21.95	16.00	2.58
IUD/Implant	3-6 years	0.0005	4	2	2	0	274.11	14.64	16.64

Notes: Prices are adjusted for inflation, using 2023 as the base year. The failure rate is based on the typical use of contraceptive products. The table reports rates for generic and brand-name drugs only; the remaining drugs are bioequivalent.

Each product contains a unique combination of molecules (active ingredients), and substitution across molecules is possible at the ATC-3 molecule level. However, drugs with identical components are more easily substitutable, particularly after a prescription is issued. Consumers can substitute within the same molecule category with a valid prescription.[5] Moreover, daily pills feature diverse component combinations, with numerous laboratories contributing to the market. The majority of these products are bioequivalent, aligning with findings from Atal et al. (2022). The accompanying table displays the average price in USD for each contraceptive method and the standard deviation within and between markets for identical products as of January 2014.[6] Furthermore, in the emergency contraception market, there are only two brands (manufacturers), three products, and one molecule. This indicates a highly standardized product range, which is available in two formats: single-pill and two-pill packages. The single-pill format is more expensive than

health risks. However, it is not recommended as a regular method of birth control due to its lower effectiveness compared to other options. For instance, the failure rate of EC is nearly twice as high as that of daily contraception methods. Additionally, EC's side effects—such as bleeding between periods or nausea—are temporary and harmless but may be bothersome. Frequent use of EC can also make menstrual cycles irregular and cause spotting between periods. From an economic perspective, EC is typically more expensive and less convenient than regular methods of birth control.

[5]Other studies, such as those by Dubois and Lasio 2018 and Dubois et al. 2022, define markets at the ATC-4 level to better account for potential substitutions across molecules.

[6]Prices are adjusted for inflation using 2023 as the base year.

the two-pill format.

3.1 Birth Data and Linkage with Contraceptive Market Data

I utilize administrative vital statistics data, which records all births along with detailed characteristics of both mothers and fathers (if applicable), such as age, education, and county of residence across 350 municipalities. A significant challenge involves aligning this data with the contraceptive market data, which is organized by market rather than by municipality. Following Atal et al. (2024), I aggregate municipalities and market data to the local-market level. Additionally, I could have the option to calculate a proxy for sales by store location, as I have access to each pharmacy's location and the population distribution, allowing me to estimate sales by municipality. Within the IQVIA framework, sales and prices are further segmented by chain and independent pharmacies, enabling me to approximate prices by municipalities. This consideration is crucial as municipalities vary in their prevalence of chain versus independent pharmacies. Finally, the linked data encompasses 69 local markets. In this arrangement, more densely populated municipalities include multiple markets, while less populated areas merge multiple municipalities into a single market.[7]

One of the main next steps I have is to construct demographic data for each market, including income, age, and rural/urban classifications. Additionally, I will add the locations of hospitals and other key characteristics relevant to each market.

4 Descriptive Analysis

This section provides descriptive evidence of the impact of the 2015 regulation that eliminated the prescription requirement for emergency contraception on market outcomes. Additionally, I will explore the effects of the 2021 regulation that allowed pharmacists to issue prescriptions in a separate section. This analysis utilizes IQVIA data on drug prices and sales across local markets.

[7] In future updates, I aim to refine this linkage.

4.1 Prescription Requirement for Emergency Contraception

In this section, I quantify the effects of eliminating the prescription requirement on quantities and prices using an event study design in the emergency contraception market, which is characterized by low competition. The main specification is as follows:

$$Y_{mlt} = \sum_{k} \beta_k \cdot L_j \cdot \mathbf{1}\{k = t\} + \lambda_{mt} + \delta ml + \varepsilon_{mlt} \tag{1}$$

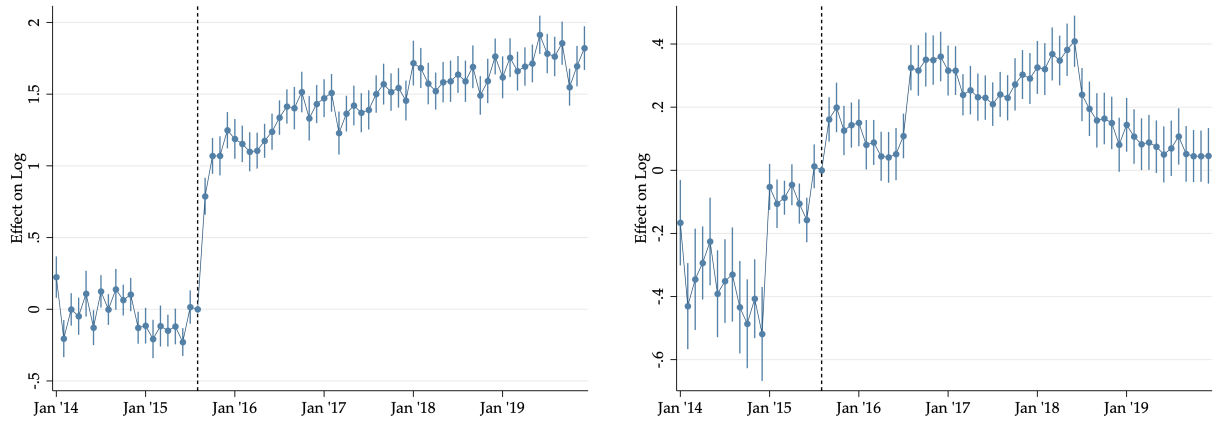
where the dependent variable y_{mlt} is either log of drug price or the log of drug sales for molecule m in local market l in period t.[8] L_j is an indicator variable set to one if the molecule corresponds to emergency contraception. The control group consists of molecules from daily contraceptives, which include 14 different combinations of active ingredients. As an alternative, I will use ovulation drugs, which encompass 12 different molecules, as another comparison group. Additionally, δ_{ml} represents molecule-market-event fixed effects, and λ_{mt} denotes molecule-month fixed effects. Standard errors are clustered at the molecule-market level. I normalize the β_k coefficients so that their average value over the month prior to the policy implementation is equal to zero.

Figure 1 presents the coefficients from the event study regressions of Equation (1). Panel (a) shows the coefficients estimated for quantities, where a relative increase in demand for emergency contraception of more than 100% on average, compared to other forms of contraception, is observable. For prices, it is observed that there was an anticipatory price increase of approximately 30% when the regulation was initially discussed publicly. Following the implementation of the policy, prices increased by an additional 20%. Figure A.1 presents the same estimations using ovulation drugs as the control group. These drugs are typically used by women seeking to become pregnant. The observed trends remain consistent. Additionally, Figure 2 displays the raw sales data and prices

[8] I define the market-level prices following Atal et al. (2024), where the log prices are weighted by the sales share of drug i in market l represented by w_{i0} in 2014: $\hat{P}_{ml} = \sum_{i \in I_{ml}} w_{i0} P_{it}$. Here, I_{ml} represents the set of drugs of molecule m in local market l, and P_{it} is the log price per gram of product i in period t and market l. Since these weights remain constant, changes in the index reflect variations in prices rather than shifts in market shares or market structure. For sales analysis, I utilize residuals from the projection of the outcome variable on month-of-the-year fixed effects by market to account for seasonality specifically related to contraceptive sales in some markets.

for each emergency contraceptive product. Panel (b) shows that prices react to the entry of new competitors.

Figure 1. Event Study for Quantities and Prices: Elimination of the Prescription Requirement for Emergency Contraception

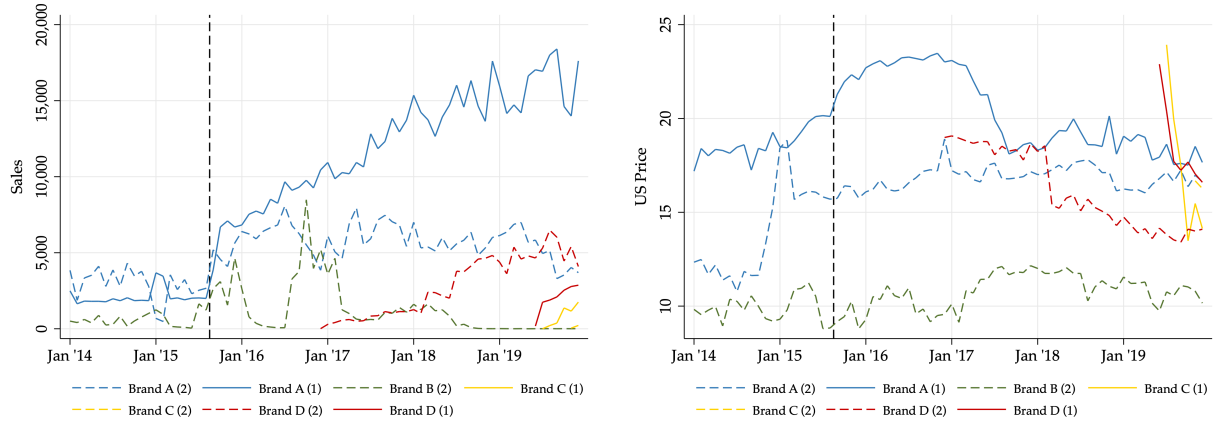


(a) Effect on Quantities

(b) Effect on Prices

Notes: This figure presents the coefficients from the event study regressions of Equation (1). Panel (a) displays the coefficients estimated for quantities, while Panel (b) shows the results for prices. The regression is based on a sample of 70,322 observations, where one molecule-product is treated as the treatment group (emergency contraception), and the control group consists of 14 different combinations of daily contraception.

Figure 2. Sales and Prices for each Emergency Contraceptive Product



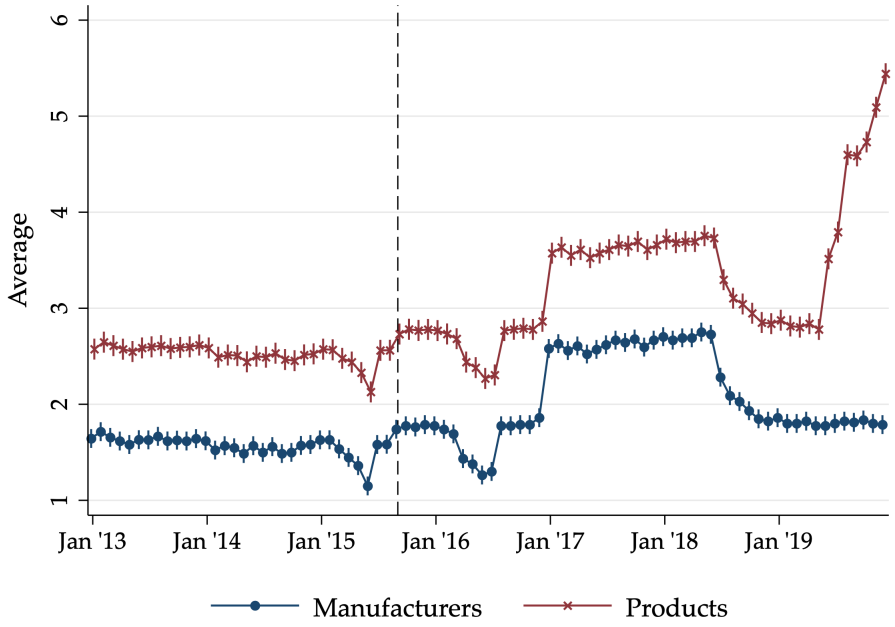
(a) Sales

(b) Prices

Notes: Each color represents a different brand; however, the dashed line indicates a format of two pills, while the solid line represents a one-pill format. Brands A (blue lines) and C (yellow lines) are owned by the same manufacturer.

Due to increased sales, the market likely became more attractive to new competitors. Before the policy change, the emergency contraception market was dominated by two manufacturers offering three products, with one firm offering the same product in two formats (one or two pills). After the policy change, a new firm entered the market in 2016. However, as Figure 3 shows, these firms and products were not uniformly available across all local markets.[9] The volatility in product availability is further evidenced in Panel (a) of Figure 2, where the sales of one incumbent product are notably unstable. In 2016, a new brand entered the market with a two-pill format, coinciding with a sales decline for a previously dominant incumbent. By 2019, this entrant introduced a one-pill format, prompting another incumbent to launch a new brand in both formats. Subsequently, at least three new brands entered the market in the following years.

Figure 3. Changes in number of manufacturers and products



Notes: Figure shows the results of regression $N_{mt} = \beta_t + \delta_m + \varepsilon_{mt}$, where N_{mt} represents the total number of manufacturers/products available in market m during period t. β_t and δ_m denote fixed effects for the period and market, respectively.

[9] Figure 3 presents results from the regression $N_{mt} = \beta_t + \delta_m + \varepsilon_{mt}$, where N_{mt} is the total number of manufacturers/products available in market m during period t, with β_t and δ_m as period and market fixed effects, respectively.

Overall, the event studies suggest that the elimination of prescription requirements led to increased demand, a higher number of products, and rising prices in the short-term, which may seem counterintuitive. This can be explained by a concentrated market with products that differ mainly in pill count, rather than substantial differences in formulation.

In the next section, I will discuss market responses to the 2021 policy that allowed pharmacists to prescribe contraceptives. This policy enabled consumers to obtain regular contraceptives without the need to visit a physician, thereby reducing access costs.

4.2 Pharmacists Prescription Policy

In April 2021, a policy was introduced to enhance access to contraception during the pandemic. This regulation permitted pharmacists to prescribe regular contraceptives without requiring a physician's visit. Prior to this, in September 2020, a temporary measure allowed the use of prescriptions up to six months old or or use an electronic prescription to obtain medications due to the pandemic challenges. However, by September 2023, this temporary regulation was phased out, and consumers were once again required to have a physician's prescription to access their contraceptives.

Since 2013, legislation has allowed consumers to substitute branded drugs with bioequivalent generics, with pharmacies required to offer these alternatives. Substitution is permitted only for products with identical active ingredients. For example, if a physician prescribes Brand A with active ingredient X, consumers may switch to any bioequivalent generic that also contains X. Between 2012 and 2014, there was a significant increase in the availability of new bioequivalent contraceptives. Figure A.2 shows the number of manufacturers and products in the daily contraceptive market. Since 2012, the number of new products and firms in the market has significantly increased, primarily due to the rise in bioequivalent products. This increase can be attributed to the quality regulation concerning bioequivalents (branded generic drugs) implemented that year (Atal et al. 2022).

Since the 2021 regulation, a physician's prescription is no longer necessary to obtain contraceptive

products. Consequently, consumers can choose among different types of contraception based on a pharmacist's recommendation, without being restricted to substituting products with the same active ingredient.

Due to this regulation, we could expect an increase in the substitution among contraceptives. Additionally, supply-side responses are anticipated, as manufacturers may lower prices to attract potential buyers and retain clients. Specifically, branded drugs are expected to undergo more significant price reductions due to their initially higher costs (the average price for branded oral contraceptives in the US is $23.6, compared to $16.1 for bioequivalents in 2019). In line with this, I will conduct the following regression for both branded and bioequivalent regular contraceptives:

$$Y^g_{mlt} = \sum_k \beta_k \cdot \mathbf{1}\{k = t\} + \lambda_{mt} + \delta_{ml} + \varepsilon_{mlt} \tag{2}$$

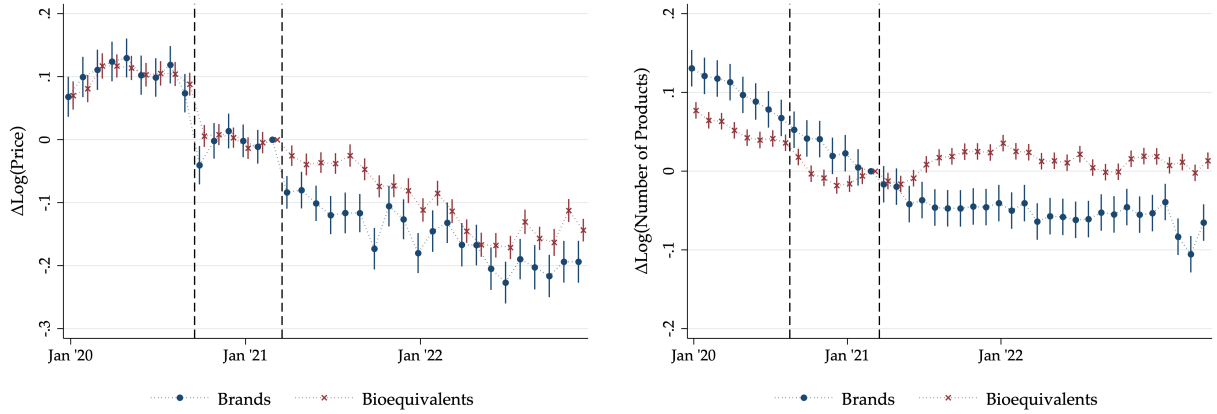
where the dependent variable y^g_{mlt} represents either the log of drug prices or the log of drug sales for molecule m in local market l during period t, and g indicates whether the drug is a branded or bioequivalent contraceptive product.[10] In this study, I will not use a control group; instead, I aim to observe the average changes relative to the month before the policy implementation (March 2021). The construction of the dependent variables is detailed in Equation 1.

Panel (a) of Figure 4 displays the results of Equation 2. It reveals two observations: first, both branded and bioequivalent contraceptives reduced their prices following the regulation that allowed the use of old prescriptions. This reduction can be explained by competitors wanting to capture sales and reduce potential stockpiles during the pandemic. This regulation helped to mitigate the effects of the pandemic, given that demand was restricted. Note that this policy did not change the range of choices available to consumers. Secondly, following the regulation that expanded consumer choice, it is observable that both branded and bioequivalent contraceptives reduced their prices; however, branded products saw a more significant price reduction. Panel (b) performs the same analysis as

[10]This analysis currently covers only oral contraceptives. Plans to include other forms of regular contraception require normalization of prices and sales to 'one month of protection.' Preliminary analysis suggests that the results hold.

Figure 3, where I examine the percentage change in the number of regular contraceptive products for both branded and bioequivalent contraceptives. It is observable that both product types initially followed a trend of reduction. However, after the policy change, the number of bioequivalent contraceptives increased significantly, while the number of branded products continued to decline.

Figure 4. Average Change in Prices and Product Assortment for Branded and Bioequivalent Contraceptives



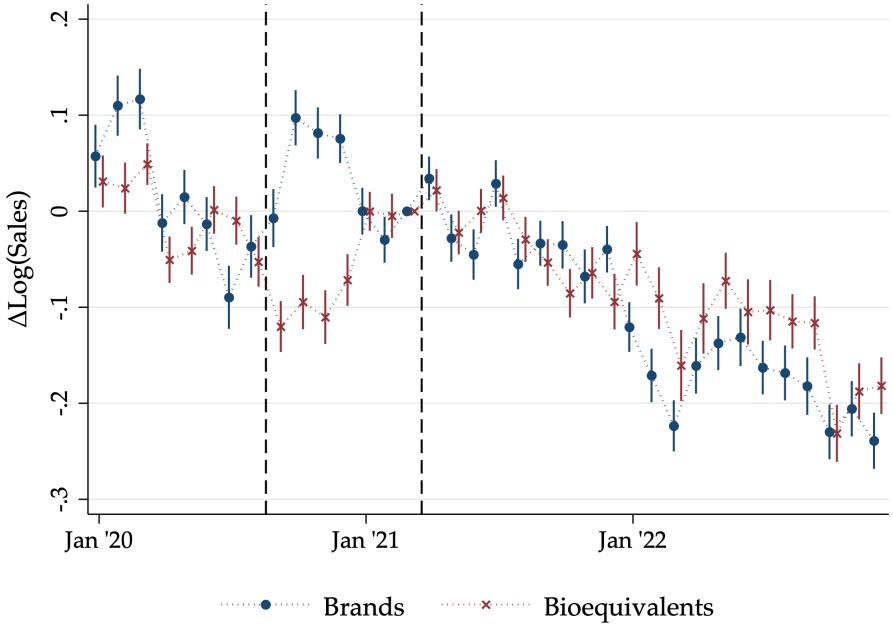
(a) Prices

(b) Number of Products

Notes: Panel (a) displays the estimates from Equation 2, while Panel (b) presents the estimated number of products using the same regression model explained in Figure 3.

For the demand side, we can anticipate increased substitution both within and across contraceptive categories. Unlike the policy that eliminated prescription requirements for emergency contraception—leading to a rise in total sales—we may not observe a similar trend with regular contraception due to the variety of available alternatives, each differing in price and attributes. Panel (a) of Figure 5 presents the results of Equation 2 for sales. It reveals that after the initial regulation and a significant price decrease, sales of branded contraceptives significantly increased in the month of implementation, while bioequivalents showed a mirrored trend. Following the policy that expanded consumer choices, both types of contraceptives exhibited similar trends, suggesting that consumers may begin to switch to more efficient alternatives. Future analyses will examine other types of contraceptives. Currently, I am focusing on daily contraceptives, which represent 90% of the market.

Figure 5. Average Change in Quantities for Branded and Bioequivalent Contraceptives



Notes: Panel (a) displays the estimates from Equation 2 for sales of daily branded and bioequivalent contraceptives.

5 Potential Model

My plan is to develop a model that incorporates findings from the descriptive evidence into an equilibrium framework to disentangle the roles of demand and supply. For this document, I am considering the following model for the emergency contraception market as a preliminary approach.

5.1 Demand Model

On the demand side, consumers choose an emergency contraception pill based on price and attributes (one or two pills). The demand for this product involves two types of costs: (i) a prescription cost, which may depend on access to hospitals or health insurance, and (ii) geographical

access, which relates to the proximity to a pharmacy, since emergency contraception is most effective within the first 24 hours.

To begin, I am considering a standard random coefficient demand model (Berry et al. 1993; Nevo 2001). I assume that the utility derived by individual i from purchasing product j can be divided into three main components:

$$u_{ijmt} = \underbrace{\delta_{ijmt}}_{\text{attributes/demographics}} - \underbrace{\alpha_i \ln p_{jmt}}_{\text{price paid}} - \underbrace{\phi_i w_{mt}}_{\text{access cost}} + \xi_{jmt} + \varepsilon_{ijmt} \quad (3)$$

The first component, denoted by δ_{ijmt}, corresponds to the utility derived from the observable attributes of the products and the demographics of consumers. The second element, $\alpha_i \ln p_{jmt}$, represents the disutility derived from paying the price p_{jmt} for product j in market m. The parameter α_i, governed by $\alpha_i \sim \log \mathcal{N}(a_b, \sigma_\alpha)$, influences price elasticity. The third component, $\phi_i w_{jmt}$, pertains to the access cost of obtaining emergency contraception. The parameter $\phi_i \sim \log \mathcal{N}(\phi_b, \Sigma_\phi)$ represents the cost of access for individual i to obtain emergency contraception in market m, which is consistent across all products j. Finally, ξ_{jmt} is a utility shock that is unobserved by the econometrician, and ε_{ijmt} is a consumer-specific demand shock that jointly follows a generalized extrem value distribution that follows are in the same nest. In the case of a model for regular contraception, I will consider a nested structure that allows for asymmetric substitution patterns within and between drug segments (Berry 1994).

5.1.1 Price Instrument

A concern in estimating demand is that pricing may be influenced by unobserved preference shocks, ξ_{jmt}. To address this, I plan to use the import price (manufacturer price) of product j at time t, noting that all emergency contraceptive products are imported.[11] The assumption behind this instrument is that foreign manufacturers' prices are exogenous to domestic retail pricing strategies

[11] I have already received the database and need to begin working on it.

and are not influenced by local market conditions.

With imported prices, I plan to construct simulated instruments using the price of each product by running the following regression:

$$p_{jmt} = \beta v_{jt} + d_j + d_t + d_m + \eta_{jmt} \tag{4}$$

where v_{jt} represents the import price of product j in period t. I will include fixed effects for product, period, and market to derive a predicted price, $\hat{p}_{mt}$.

5.2 Supply Model

On the supply side, I am considering a two-stage model. In the first stage, firms decide whether to enter the market in an incomplete information entry game, which involves incurring entry costs. In the second stage, the entrants compete on prices.

To construct the supply side of the model, it's crucial to understand which segment primarily sets prices—whether it's pharmacies, wholesalers, or manufacturers. To assess this, data from chain pharmacies (showing final prices), independent pharmacies (indicating wholesalers' prices), and import data (reflecting manufacturers' prices) will be useful.

6 Birth Rate and Emergency Contraceptive Market

This section introduces a distinct question, potentially suitable for a separate project. It analyzes the correlation between birth rates and the market structure of emergency contraception, examining aspects such as market concentration, product variety, and pricing before and after the policy change. The goal is to understand how market factors influence decisions regarding childbirth.

Specifically, I analyze the relationship between emergency contraception market and birth rates before and after the elimination of the prescription requirement for this product. I will run the

following regression:

$$\log(y_{mt}) = \alpha \log(\hat{p}_{mt}) + \gamma_m + \varepsilon_{mt} \tag{5}$$

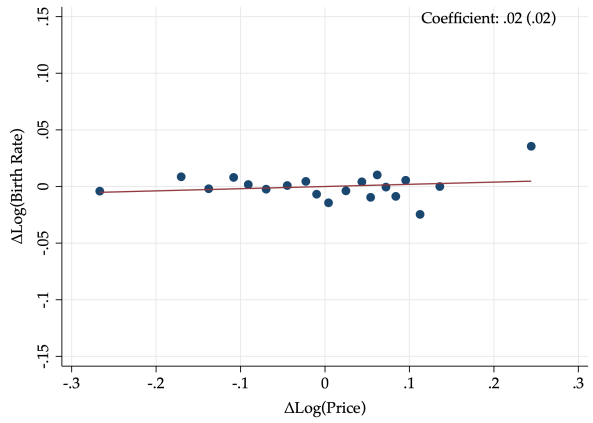
where y_{mt} represents the birth rate outcome in market m in year t, and $\hat{p}_{mt}$ is the average price of emergency contraception. The construction of $\hat{p}_{mt}$ is explained in Section 4.1. Additionally, I will use the HHI index and the number of products available to correlate with the birth rate.

Figure 6 shows the correlations between birth rates and both prices and sales before and after regulatory changes. Panels (a) and (b) display the correlations between changes in prices and birth rates, noting variations across markets. Prior to the policy change, the correlation between price changes and birth rate changes was zero, suggesting that the high prescription cost deterred contraceptive purchases, making price a non-factor in consumption and, consequently, birth rates. Post-policy, as the prescription cost was eliminated, the price began to correlate positively with birth rates. Similarly, sales changes also show varying trends across markets. Before the policy change, the correlation between sales changes and birth rates was insignificant. After the policy change, an increase in sales correlates with a decrease in birth rates. Figure A.3 illustrates the correlation between changes in price and sales. It is observable that sensitivity to price and significance also increase after the regulation.

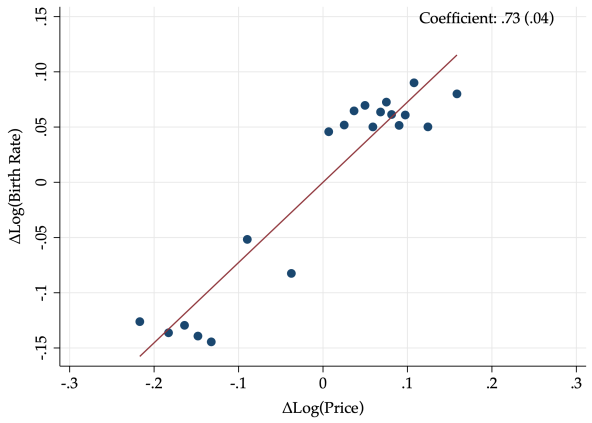
Panels (a) and (b) of Figure 7 display the correlation between the HHI and birth rates, showing that the previously discussed patterns are consistent in this case as well. Conversely, the observations in Panels (c) and (d) present a different scenario; there is a significant and negative correlation between the changes in birth rates and the changes in the number of products available before and after the policy change. This suggests that product availability influences birth rates independently of prescription costs.

Overall, we observe that the correlation between market outcomes and birth rates changes following the regulation. The next analysis examines whether changes in market structure induced by the policy correlate with changes in birth rates. To do this, I will compare outcomes from two years

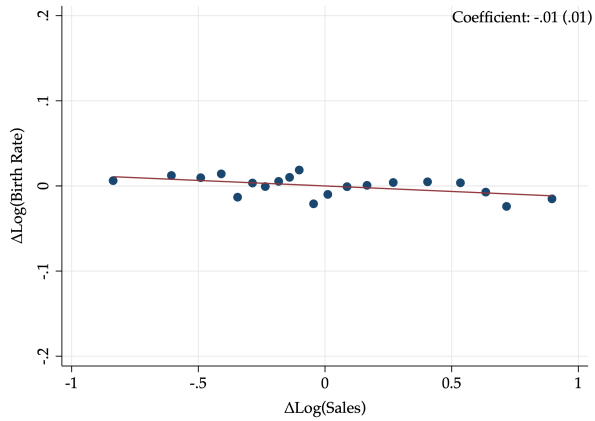
Figure 6. Correlation of Birth Rates with Prices and Sales Before and After Policy Changes



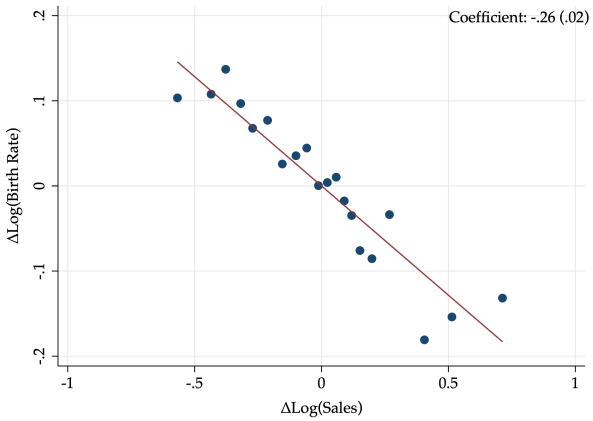
(a) Price-Birth Rate, before regulation



(b) Price-Birth Rate, after regulation



(c) Sales-Birth Rate, before regulation



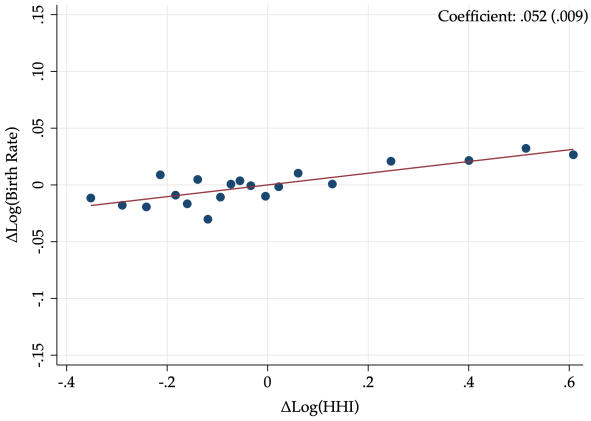
(d) Sales-Birth Rate, after regulation

before and after the regulation—2013 and 2017—and calculate the differences between these periods. This will provide a single observation per market, which I will use to run the following regression:

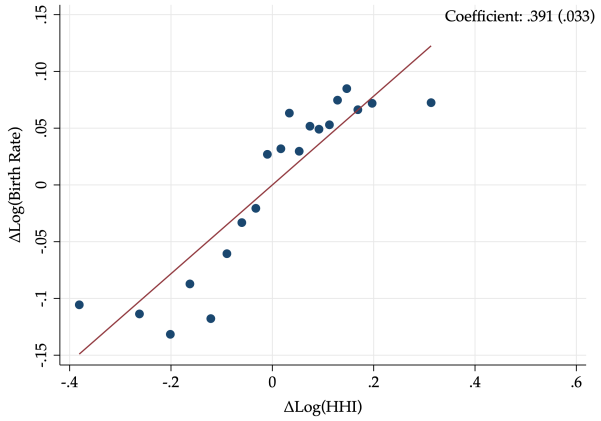
$$\Delta \log(y_{mt}) = \alpha \Delta \log(\hat{p}_{mt}) + \varepsilon_{mt} \tag{6}$$

where the parameters are the same as those described in Equation 5. Panel (a) of Figure 8 demonstrates that in markets with greater price changes, the increase in demand is smaller. Panel (b) shows that in markets with a larger increase in demand, birth rates decline more significantly. Conversely, Panel (c) indicates that in markets with a greater increase in concentration, the decrease

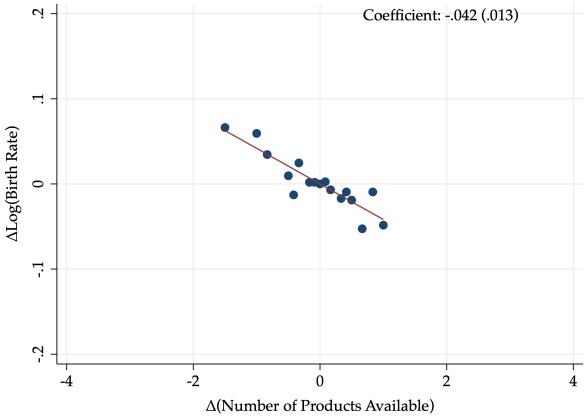
Figure 7. Correlation of Birth Rates with HHI and Number of Products Available Before and After Policy Changes



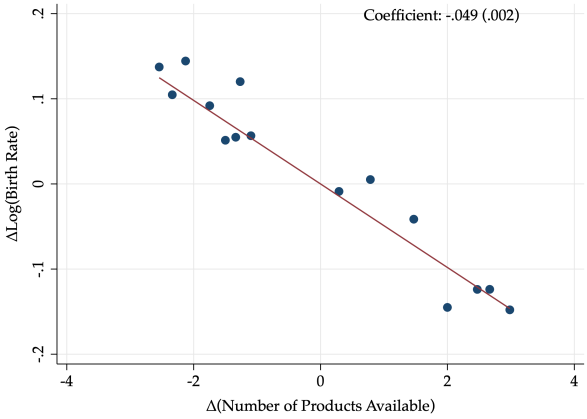
(a) HHI-Birth Rate, before regulation



(b) HHI-Birth Rate, after regulation



(c) Number of Products-Birth Rate, before regulation

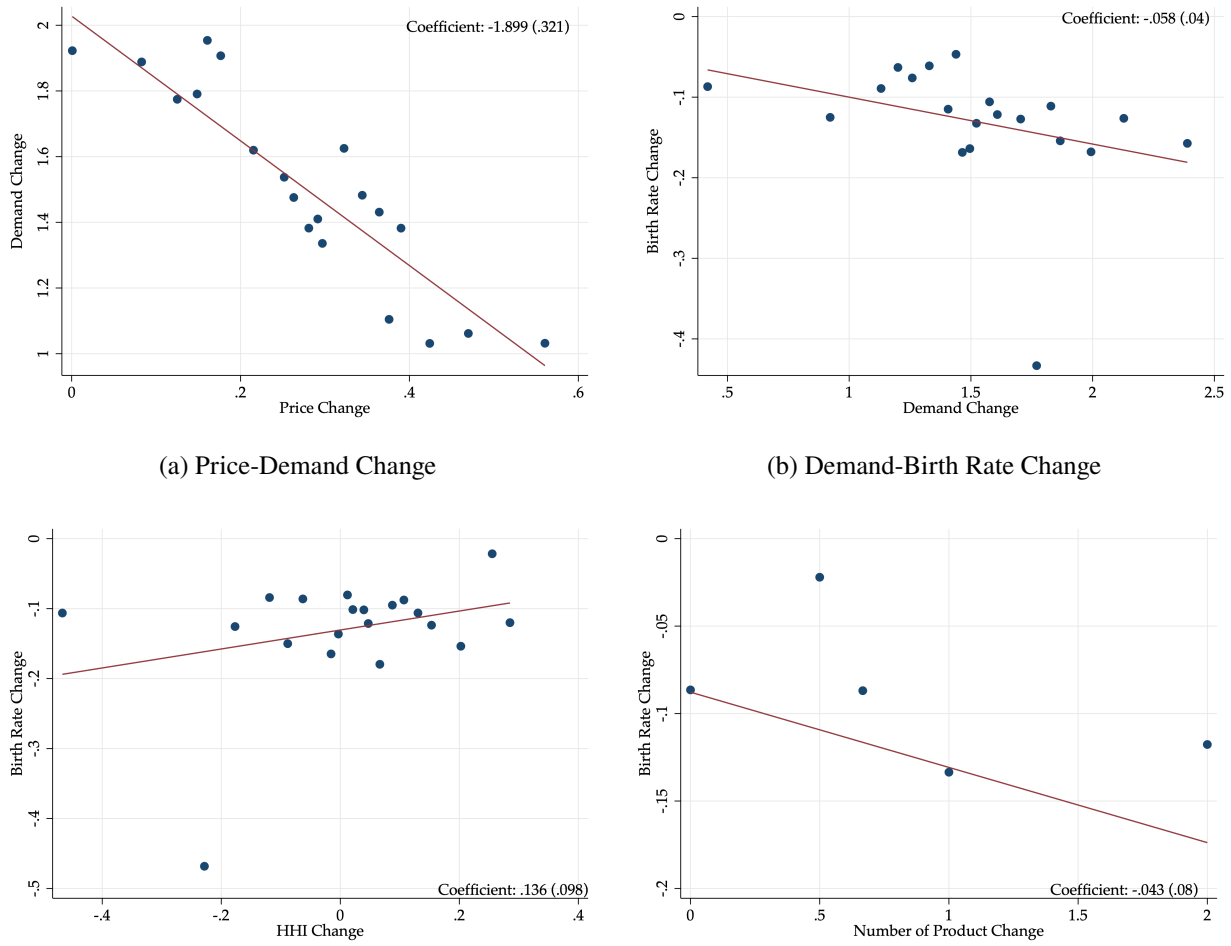


(d) Number of Products-Birth Rate, after regulation

in birth rates is less pronounced. Panel (d) reveals that in markets where the availability of products increases significantly, there is a greater reduction in birth rates. However, the correlations in the last two panels are noisier.

These results provide initial descriptive evidence of the relationship between market and birth rates. These results indicate that the price of contraceptives significantly influences the decision to have children. Moreover, this could contribute to the literature on the ”power of the pill” by measuring the effect of increased access to contraception. However, it is important to show the ”power of the market” in influencing reproductive decisions. These findings align with Rau et al. (2021),

Figure 8. Correlation of Birth Rates Change and Market Outcomes Change induced by Regulation



(a) Price-Demand Change

(b) Demand-Birth Rate Change

(c) HHI-Birth Change

(d) Number of Products-Birth Rate Change

which examines how an increase in the prices of daily contraceptive pills, due to collusion among pharmacies in 2007–2008 in Chile, affected the number of children born to unmarried mothers, young mothers in their early twenties, and primiparous women.

7 Next Steps

Regarding the descriptive evidence, I plan to explore heterogeneous effects in the descriptive analysis. Specifically, I aim to investigate whether the observed increases in demanded quantities and changes in prices are more pronounced in certain types of markets, such as more rural or

economically disadvantaged areas, smaller markets, markets with limited access to prescription or pharmacies. This insight will help me understand the market dynamics more thoroughly.

Additionally, I need to refine my research question. The analysis concerning market structure and birth rates, I will retake it summer as I wish to concentrate on the impact of policy changes on market outcomes and consumer welfare. Currently, I am focusing on the emergency contraception policy. However, I am considering extending my analysis to include regular contraception and the 2021 policy change in future work.

For the model, I aim to define my demand model and complete a preliminary estimation by the end of April. In line with this, I will also begin working with the imported data database, which includes details of each contraceptive importation such as prices, quantities, and other characteristics.

References

Atal, Juan Pablo, Jose Ignacio Cuesta, and Morten Sæthre, "Quality regulation and competition: Evidence from pharmaceutical markets," Technical Report, National Bureau of Economic Research 2022.

_ , José Ignacio Cuesta, Felipe González, and Cristóbal Otero, "The economics of the public option: Evidence from local pharmaceutical markets," *American Economic Review*, 2024, *114* (3), 615–644.

Bailey, Martha J, "More power to the pill: The impact of contraceptive freedom on women's life cycle labor supply," *The quarterly journal of economics*, 2006, *121* (1), 289–320.

_ , Brad Hershbein, and Amalia R Miller, "The opt-in revolution? Contraception and the gender gap in wages," *American Economic Journal: Applied Economics*, 2012, *4* (3), 225–254.

Benítez, Alejandra, Andrés Hernando, and Carolina Velasco, "Encuesta de presupuestos familiares y gasto en salud: una primera mirada," 2018.

Berry, Steven T, "Estimating discrete-choice models of product differentiation," *The RAND Journal of Economics*, 1994, pp. 242–262.

_ , James A Levinsohn, and Ariel Pakes, "Automobile prices in market equilibrium: Part I and II," 1993.

Daniels, Kimberly and Jo Jones, *Contraceptive methods women have ever used: United States, 1982-2010* number 62, US Department of Health and Human Services, Centers for Disease Control and . . . , 2013.

Dubois, Pierre and Laura Lasio, "Identifying industry margins with price constraints: Structural estimation on pharmaceuticals," *American Economic Review*, 2018, *108* (12), 3685–3724.

_ , Ashvin Gandhi, and Shoshana Vasserman, "Bargaining and international reference pricing in the pharmaceutical industry," Technical Report, National Bureau of Economic Research 2022.

Goldin, Claudia and Lawrence F Katz, "The power of the pill: Oral contraceptives and women's career and marriage decisions," *Journal of political Economy*, 2002, *110* (4), 730–770.

Grossman, Daniel, Arijit Ray, and Allyssa Wadsworth, "The pharmacist will see you now: Pharmacist prescribed contraceptives and fertility rates," *Journal of Health Economics*, 2025, *100*, 102942.

Guldi, Melanie, "Fertility effects of abortion and birth control pill access for minors," *Demography*, 2008, *45*, 817–827.

Nevo, Aviv, "Measuring market power in the ready-to-eat cereal industry," *Econometrica*, 2001, *69* (2), 307–342.

OECD, *Health at a glance 2019: OECD indicators*, Paris: OECD Publishing, 2015.

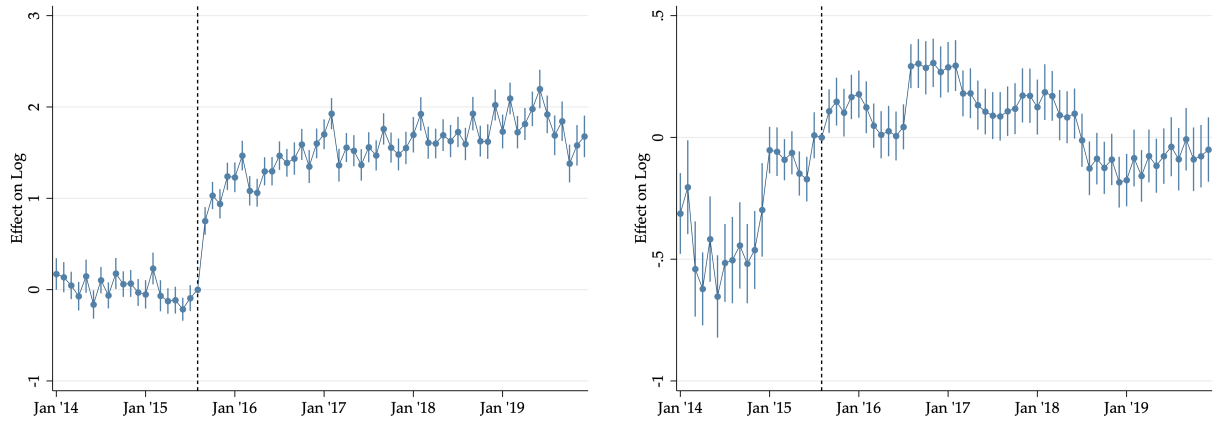
Pennington, Kate and Joanna Venator, "Reproductive Policy Uncertainty and Defensive Investments in Contraception," 2023.

Rau, Tomás, Miguel Sarzosa, and Sergio Urzúa, "The children of the missed pill," *Journal of health economics*, 2021, *79*, 102496.

Appendix

A Figures

Figure A.1. Event Study for Quantities and Prices: Using Ovulation Drugs as Control Group

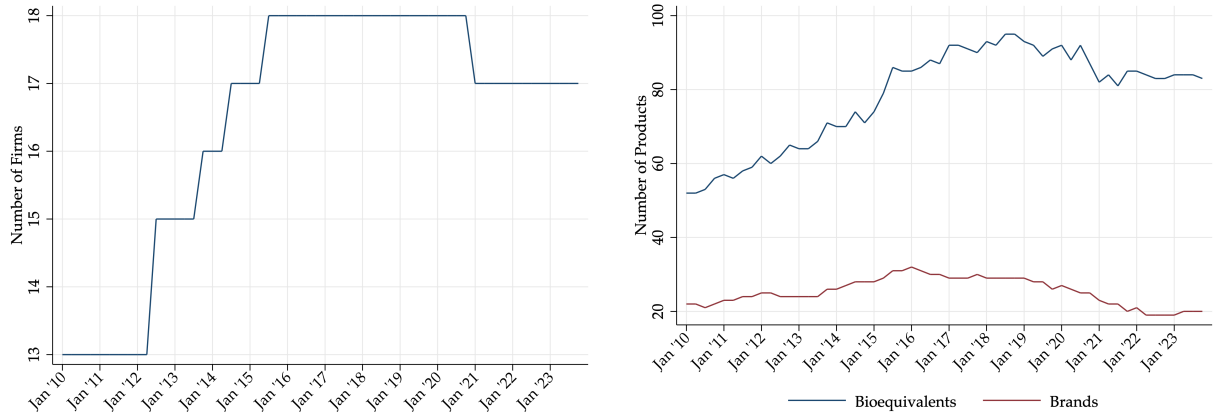


(a) Effect on Quantities

(b) Effect on Prices

Notes: This figure presents the coefficients from the event study regressions of Equation (1). Panel (a) displays the coefficients estimated for quantities, while Panel (b) shows the results for prices. The regression is based on a sample of 25,884 observations, where one molecule-product is treated as the treatment group (emergency contraception), and the control group consists of 12 different combinations of ovulation drugs.

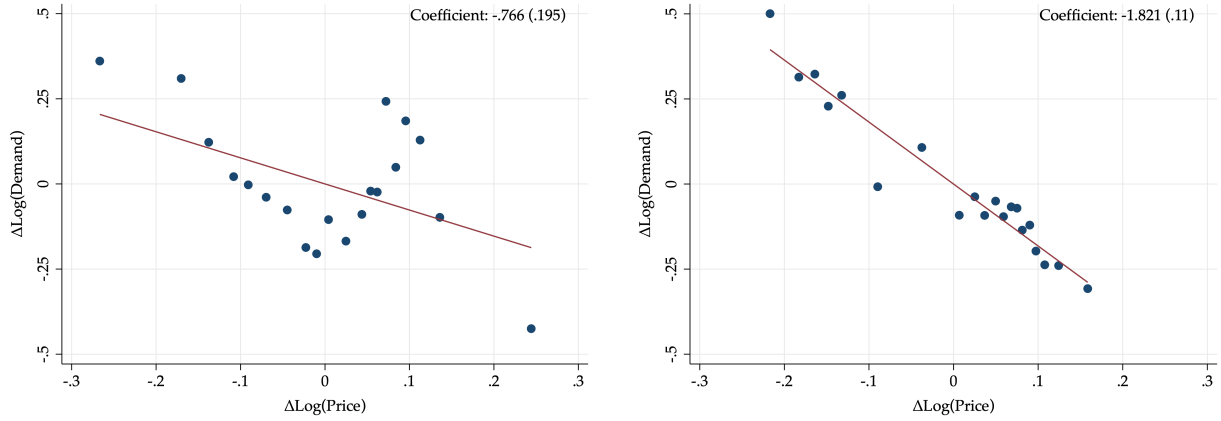
Figure A.2. Number of Firms and Products of Daily Contraceptive Products



(a) Manufacturers

(b) Products

Figure A.3. Correlation of Prices with Sales Before and After Policy Changes



(a) Price-Sales, before regulation

(b) Price-Sales, after regulation