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Abstract

This paper investigates the impact of direct-to-consumer advertising (DTCA) on women's prescription contraceptive choices using television advertisement data and health insurance claims. I leverage quasi-random variation in exposure to local television advertising to identify the causal effect on women's decisions. The findings indicate that a 10% increase in DTCA for short-term contraceptive methods, such as pills, increases demand for the advertised product by 2.7% and generates positive spillovers to branded and generic products in the same category. At the same time, DTCA for short-term methods reduces demand for long-acting reversible contraceptives (LARCs), such as intrauterine devices (IUDs) and implants. After the Affordable Care Act reduced out-of-pocket costs for prescription contraceptives for insured women, advertising shifted from short-term to long-term methods. The television advertising for permanent methods increased demand for LARCs and decreased demand for short-term products. These results provide new causal evidence on how television advertising influences consumer decisions in a market where patients have wide discretion and products vary by type, cost, and effectiveness.[1]

JEL Classifications: I12, M37, D12, J13

Key words: Advertising, Contraceptives, Health Behavior, Insurance

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1 Introduction

This paper investigates the effect of direct-to-consumer advertisement (DTCA) on women's prescription contraceptive decisions. The market for prescription contraceptives comprises a large set of consumers,[2] and the decision is usually patient-driven (Wu et al., 2016). Unlike anti-cholesterol drugs, which were commonly studied to evaluate the effects of DTCA, women can choose products of different types, varying considerably in price, efficacy, and mode of administration. Therefore, it is not clear if DTCA creates product differentiation by directing women only to the specific advertised brand and/or if it generates spillovers to other prescription contraceptives, affecting the decision among the different methods. I address this question using television advertisements and claims data and apply the border approach by Shapiro (2018) to measure the causal effect of advertisements. I find that DTCA increases the demand for short-term drugs, such as pills, but reduces the demand for long-acting reversible contraceptives (LARCs), such as intrauterine devices (IUDs) and implants, promoting substitution for less effective methods.

Television advertisement on prescription drugs is allowed in only two countries, the United States and New Zealand, and despite being extensively regulated, there is still controversy around this topic. In the United States, until 50 years ago, any information on contraception was considered obscene and banned under federal and many state laws (Bailey and Lindo, 2017). So, DTCA appeared in the 80s as a tool to overcome the stigma that prevented many women from getting information. However, an advertisement can also be misleading. Bayer, producer of the pill YAZ, one of the most popular contraceptive pills in the United States, was punished by the Federal Drug Administration (FDA) for a deceptive television campaign where the manufacturer overstated the effects and minimized the risks of the drug.[3]

This market also faced major changes in the trends of television advertisement in the past decade. Before 2012, advertisements were dominated by brands of short-term methods, such as pills and vaginal rings, and after, there was an increase in advertisements by brands of

[2]According to the National Survey of Family Growth (NSFG) 2015-2017, 80.5% of women between 15 and 49 have ever taken contraceptive pills and 23.5% have ever used IUDs or implants https://www.cdc.gov/nchs/nsfg/key_statistics/c-keystat.htm#contraception.

[3]In 2009, the FDA required Bayer to spend $20 million on corrective advertisements for its television campaign for the pill YAZ. https://www.nytimes.com/2009/02/11/business/11pill.html.

LARCs, such as implants and IUDs, and permanent methods. Wu et al. (2016) suggests that this change is related to the reduction in out-of-pocket costs for prescription contraceptives mandated by the Affordable Care Act (ACA) that took place in January 2013,[4] since it allowed more women to get access to methods with higher upfront costs. While several studies examine how the ACA provision influenced method adoption (Becker, 2018; Heisel et al., 2018; Sonfield et al., 2015), this is the first to provide evidence of the effect of advertising in this context.

The main challenge in estimating the causal effect of advertising on consumer behavior is that firms target their campaigns to areas where consumers are already more likely to purchase their products, leading to endogeneity concerns. To address this, I adopt the border approach proposed by Shapiro (2018), which leverages quasi-random variation in exposure to local television advertisements. These local commercials are screened only in selected media markets, creating variation in advertising exposure among women living near media market borders. This strategy allows me to isolate the causal impact of advertising on contraceptive choices.

Using television advertisement data and commercial claims from a large health insurer, I find that advertising for short-term methods, such as pills, increases demand for the advertised product but also for other branded and generic products in the same category. I also find that these effects on the advertised product are driven by older women. These results suggest that advertisements may have an informational component, attracting women to products that were not directly advertised.

However, a portion of this increased demand comes from women switching away from LARCs, which are generally more effective. While this substitution may raise concerns, contraceptive choices reflect a range of considerations beyond efficacy—including cost, health status, lifestyle, and personal preferences—so selecting a less effective method is not necessarily suboptimal. I find no significant effect of LARC advertisements on demand for the advertised product or related methods.

Given that LARCs and permanent methods have higher upfront costs, I explore whether

[4]According to the provision, all private health insurers must cover contraceptive methods without copayments or any other out-of-pocket costs, with exceptions for grandfathered plans and specific employers.

the reduction in out-of-pocket expenses brought by the ACA altered the impact of advertising. After the ACA, advertising for permanent methods increased demand for LARCs and reduced demand for short-term methods, highlighting how cost-sharing interacts with advertising in shaping contraceptive choices.

This study makes three key contributions. First, it extends the DTCA literature to a setting where consumers have greater autonomy and are not constrained by a medical diagnosis. The results for the direct effect of DTCA on the product being advertised for short-term methods are in line with the results found by Sinkinson and Starc (2019), Shapiro (2018), Shapiro (2022), and Jayanti (2019) in the markets for cholesterol drugs, anti-diabetics, and antidepressants. However, in those studies, they investigate products that are closer substitutes and that consumers need to take continually, which makes it harder to compare with the results found for long-term contraceptive methods. Second, the paper contributes to the literature on contraceptive use and health behavior (Delavande, 2008; Myers, 2017; Miller et al., 2025), offering new evidence on how advertising influences both product-specific and method-level demand. Third, it explores how cost-sharing reductions from the ACA interact with advertising to affect contraceptive decisions, particularly showing spillovers to LARCs from advertisements for permanent methods.

2 Prescription contraceptives

There are a variety of contraceptive methods available to women. These options can be divided into non-prescription methods, which are sold over the counter, such as condoms, and prescription methods, which are the focus of this study. I explore the prescription contraceptive market due to the controversial nature of television advertisements for these products and the availability of information on these prescription choices through claims data.

Prescription contraceptives can be grouped into three categories depending on the length of time for which the patient can use the product. The first type is short-term methods that must be used daily or weekly, for which a prescription provides a supply that lasts up to three months. The second group is long-acting reversible contraceptives, composed of

devices that are inserted once by a physician and provide protection against pregnancy for three to ten years, depending on the product chosen. The last group includes permanent methods that last indefinitely. Given the different frequency of prescriptions for these three types, I investigate the effect of DTCA on these groups separately in the empirical analysis.

Besides the length of use, the methods are delivered to patients in different forms and provide varying levels of protection against unintended pregnancies, as shown in Table 1. In general, LARCs are more effective than short-term methods, but are also more expensive, not only because of the price of the devices but also because they require procedures for their insertion. The permanent method is also considerably more expensive than the other types because it involves a surgical process. The prices shown in Table 1 are a reference of the maximum cost a woman would pay if she were to pay the entire cost of the method, but these costs may vary substantially depending on where she gets the product, and given that I only observe insured women in my data, most of them have at least some level of coverage for those products.

Table 1 – General Information - Prescription Contraceptives

Type	Method	Delivery method	Effectiveness[*1]	Price[*2]
Short-Term	Diaphragm/Cap	Barrier	12%	$75
	Injection	Injection	6%	$150
	Pill	Oral	9%	$50
	Patch	Cutaneous	9%	$150
	Ring	Intravaginal	9%	$200
LARC	Implant	Subcutaneous	0.05%	$1300
	IUD	Intravaginal	0.2% (Hormonal) 0.8% (Copper)	$1300
Permanent	Sterilization	Surgical	0.5%	$6000

Note: [*1] Effectiveness is defined as the percentage of unintended pregnancies per 100 women in the first year of use (Source: CDC).
[*2] Maximum prices displayed for reference (Source: Planned Parenthood).

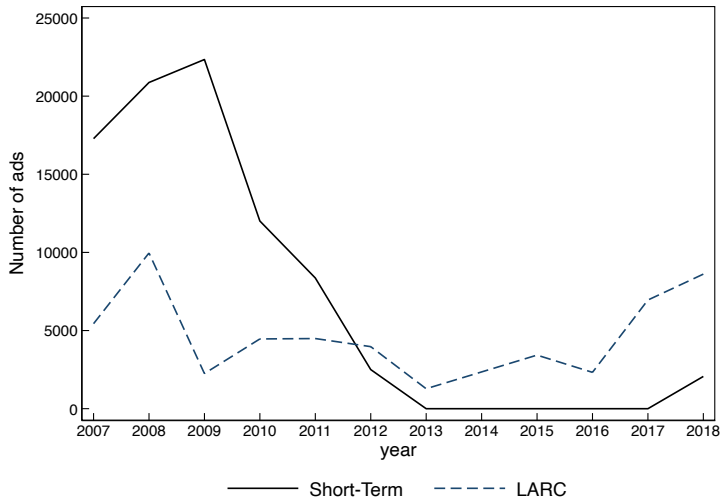
There is considerable product variety within each short-term contraceptive method, especially among pills, which are the most commonly used prescription method among American women, according to the National Survey of Family Growth (NSFG). The claims data from Optum's de-identified Clinformatics Data Mart database used in this study reflects this diversity. I identify approximately 160 different contraceptive pill products, including generics,

compared to just five brands of intrauterine devices (IUDs).

3 Data

To answer my research question, I use television advertisements and commercial claims data for prescription contraceptives. The advertisement data from Kantar Media contains information on DTCA expenditures and the number of advertisements screened at the product and month levels for the 101 major television markets (DMAs) in the United States. Between 2007 and 2018, advertisements for prescription contraceptives were screened nationally and in different selected television markets, as shown in Figures 1 and 2.

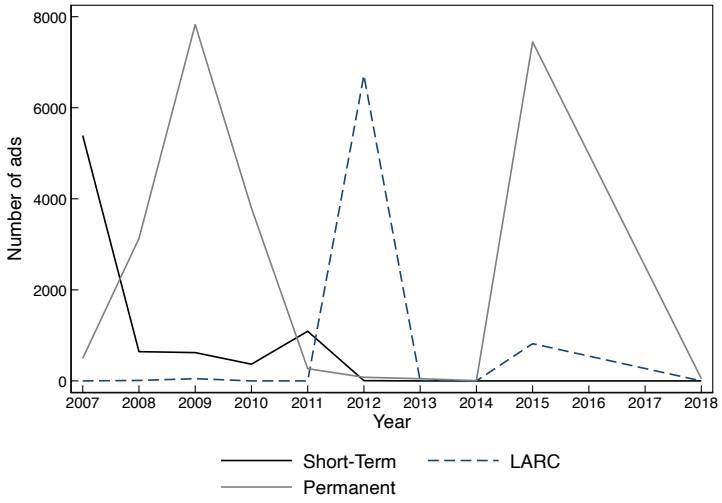
FIGURE 1. National Television Advertisements by Contraceptive Type



Note: Data from Kantar Media; it includes national advertisements screened on network, cable, and spot TV.

Before 2011, short-term methods dominated the national DTCA for prescription contraceptives, with mostly pills being advertised. Between 2007 and 2010, the products advertised were Femcon Fe and Loestrin 24 Fe from Allergan, Seasonique from Duramed Pharmaceuticals, and YAZ from Bayer. The 2009 increase in national advertisements for short-term methods is explained by the regulatory action by the FDA that required Bayer to spend 20 million dollars on corrective advertisements for a misleading campaign that was screened in 2008 for the pill YAZ. In the years following 2009, the national and local advertisements

FIGURE 2. Local Television Advertisements by Contraceptive Type



Note: Data from Kantar Media; it includes local advertisements screened on network, cable, and spot TV.

were mostly directed to launching new products, with Beyaz by Bayer and Lo Loestrin Fe by Allergan being released in 2011. The same brands also had local advertisements targeted at specific DMAs during this period.

For the LARCs, Bayer dominated the advertisements in the sample period with sequential campaigns for its three IUDs Mirena, Kyleena, and Skyla. In 2012, there was a spike in local advertisements for LARCs led by a campaign for the copper IUD Paragard from CooperSurgical, which was accompanied by an increase in advertisements for Mirena. For the permanent methods, the only product that was advertised over the period was Essure, also from Bayer, and it was only screened in targeted markets. Table 8 in the appendix presents the number of total advertisements per product advertised in the period of analysis.

I present the trends of television advertisements screened nationally and locally to show the general context, but with the border approach, I use only the variation in local advertising to identify the effect of the DTCA. Table 2 shows that advertisements were screened in different DMAs for all methods during the period of analysis. In particular, from the 101 DMAs included in my data, nearly half had at least one DTCA instance for contraceptives in the period of analysis.

For the drug choices, I am using commercial claims data from Optum's de-identified

Table 2 – Local Prescription Contraceptive DTCA

Type	DMAs	Products	Avg. Number Local Ads	Avg. Spending Local Ads (million $)
Short-Term	100	7	8,118	11.40
LARC	41	3	7,591	2.40
Permanent	48	1	23,147	12.00

Note: Averages computed at the DMA level.

Clinformatics Data Mart database which contains information from a major national health insurance provider. My sample includes all women enrolled with ages between 15 and 44 from 2007 through 2018, and I have access to all of their pharmacy and medical claims. In particular, I capture their contraceptive choices via pharmacy prescriptions for short-term contraceptives such as pills and via medical procedure claims for LARCs and permanent methods. My sample includes more than 16 million claims for prescription contraceptives, and almost 90% of them are for pills (Table 3). The patients can have multiple claims throughout enrollment and, in the case of short-term methods, they can have refills for the same product.

Table 3 – Claims by Contraceptive Method in the Sample

Type	Method	Number of Claims	Share (%)
Short-Term	Diaphragm/Cap	2,825	0.02
	Injection	329,037	2.01
	Pill	14,741,891	89.99
	Patch	199,205	1.22
	Ring	972,773	5.94
LARC	Implant	42,001	0.26
	IUD	88,281	0.54
Permanent	Sterilization	6,482	0.04
Total		16,382,495	100.00

Note: Claims data for prescription contraceptives from Optum's de-identified Clinformatics Data Mart database. Each patient can have multiple claims in the period during which they were enrolled in the insurance.

An important feature of the data is the patient's residence at the zip code level, which I use to match patients to the television markets where the advertisement was screened. However, to maintain confidentiality, I do not have access to any demographic information besides age, which limits the investigation of heterogeneous effects among different types of

consumers. For the estimation, I restrict the sample to those who lived in the DMAs for which I have advertisement data.

In the analysis, I only consider women who were continuously enrolled for at least six months. As shown in Figure 3 in the appendix, there is a decrease in the number of women in my sample from 2007 to 2013, and the number starts to increase again after 2014. Also, there is a change in age composition: At the beginning of the period most of the women in the sample were between 35 and 44 years old, and across time the majority shifted to women between 25 and 34 years old. These enrollment and age composition patterns are not unique to my sample; they are also observed among all women and men covered by the same insurance provider. In my empirical analysis, I control for enrollment across age groups to guarantee that these changes are not driving the results.

4 Empirical analysis

4.1 Endogeneity of television advertisement

Estimating the causal effect of DTCA requires addressing the endogeneity of advertising exposure. Firms strategically allocate their marketing resources to regions where they anticipate higher returns (Gordon and Hartmann, 2013). As a result, simply comparing demand between individuals exposed to advertisements with those unexposed would likely overstate the true effect, since the former group may have had higher baseline demand regardless of the advertising.

Given this non-random selection of where advertisements are aired, directly regressing the quantity demanded Q_{jdt} for product j, in DMA d at time t, on the stock of advertisements A_{jdt} would yield biased estimates of the advertising effect γ_1, as shown in equation 1. The literature typically models advertising as a stock variable, since consumers are exposed to commercials repeatedly over time and the effects accumulate.

$$\log(1 + Q_{jdt}) = \gamma_1 \log(1 + A_{jdt}) + \epsilon_{jdt} \tag{1}$$

A substantial literature has examined the effects of DTCA on the demand for prescription drugs, with various strategies used to address endogeneity depending on the context. Recent studies exploit quasi-random variation in exposure to local television advertisements to identify causal effects (Shapiro, 2018; Li et al., 2024; Tuchman, 2019). Other work uses exogenous variation in DTCA generated by political advertising (Sinkinson and Starc, 2019; Jayanti, 2019), which displaces commercial advertisements during election cycles.

In this paper, I adopt the border strategy proposed by Shapiro (2018) to estimate the causal effect of DTCA on prescription contraceptive use. This approach leverages substantial variation in advertisements that are aired exclusively in local markets, making it well-suited to the setting studied here. Moreover, since contraceptive choices may be correlated with political preferences, using variation from political advertising could introduce bias, making the border approach a more appropriate identification strategy in this context.

4.2 Border approach

The border approach exploits the fact that households located near the boundaries of television markets (DMAs) are likely to be similar in observable and unobservable characteristics but may be exposed to different sets of local advertisements. While Nielsen defines DMAs based on common television viewing patterns, these administrative borders generate quasi-random variation in ad exposure among comparable populations.

Therefore, I link the women in the claims data to the advertisements screened where they live. I compare their contraceptive choices across those borders, and the differences between their choices are the effect of the advertisement. More precisely, by grouping the information as a panel of border counties this approach is very similar to the difference-in-differences estimator, where the main assumption is that by comparing the counties on the two sides of a DMA border, any differential trends in the number of claims for a specific product are due to differences in the local advertisement.

This framework allows me to separately estimate the effect of advertising on demand for the specific product being advertised, as well as spillover effects on other prescription contraceptives. These estimates help distinguish between brand-specific responses and broader shifts in demand across product categories.

Using the border approach, each DMA border pair is treated as a separate experiment for each product. So, I estimate the elasticity of demand with respect to the number of advertisements screened using the following equation with fixed effects.

$$\log(1+Q_{jbdt}) = \gamma_1 \log(1+A_{jbdt}) + \gamma_2 \log(1+\sum_{k\neq j} A_{kbdt}) + \beta_1 \log(E^{ages}_{bdt}) + \xi_{jbt} + \xi_{jbd} + \epsilon_{jbdt} \tag{2}$$

$$A_{jbdt} = \sum_{\tau=t-2}^{t} a_{jbd\tau} \tag{3}$$

Where Q_{jbdt} is the number of claims for product j at the border b, DMA d, and month t. A_{jbdt} is the stock of advertisements for product j in the past two months at this DMA-border-time, and $\sum_{k\neq j} A_{kbdt}$ is the sum of the stock of advertisements of all other products at the same level. In the results, I further split $\sum_{k\neq j} A_{kbdt}$ among products of different types (Short-term, LARC, and Permanent), but the idea of capturing spillovers from advertisements of product j remains the same.

Here, the product-border-time fixed effect ξ_{jbt} captures shocks in demand common to both sides of the border, for example, national advertisements and changes in policies that apply to both sides, such as the ACA. The product-border-DMA fixed effect ξ_{jbd} captures persistent differences between the demand for product j on the two sides of the border; for example, if on one side of the border women are always more likely to take pills of a certain brand despite the advertisements, this term will account for that. I also control for the number of enrolled women with ages 15 to 24, 25 to 34, and 35 to 44 years old (E^{ages}_{bdt}) to account for changes in age distribution in the data. Therefore, all remaining variation between the number of claims from the two border DMAs is due to the television advertisement, allowing us to identify the own effect of the advertisement γ_1 and the spillovers to rival products γ_2 in equation 2.

I estimate the model separately for claims related to short-term methods, LARCs, and permanent methods, acknowledging that the nature and frequency of claims differ substantially across these categories. The effects of advertising are likely to be heterogeneous due to

differences in delivery and use and because each method involves distinct decision-making processes. I also distinguish between the direct effect of advertising for the product being promoted and spillover effects from advertisements for other products, both within the same method type and across different types. This structure allows me to capture cross-effects and better understand whether advertising shifts demand within or across contraceptive categories.

While this methodology is well established in the literature, it is not without limitations. Because the identification relies on variation near DMA borders, the estimated effects reflect responses among populations living in those areas. As a result, the findings offer valuable insights into advertising's role in shaping contraceptive choices but may not generalize directly to consumers outside the border regions.

5 Estimation results

In this section, I present the estimated effects from the border approach, which addresses the endogeneity of television advertisements. For comparison, Appendix Table 9 shows the biased results when including only time-product and product-DMA fixed effects, without considering the border pairs. In that case, the effect is likely overestimated because firms tend to direct advertisements to local markets where they expect them to be the most effective.

Using the border strategy, I find a positive and significant effect of television advertisements on the number of claims of the product being advertised for short-term products, such as pills and injections. There are also positive spillovers from the short-term advertisements to their rivals within the same type. Table 4 shows that a 10% increase in the number of advertisements for short-term drugs increases the demand for the product being advertised by 2.66%. This result is greater in magnitude than the effects of advertisement found for anti-diabetics (2.29%) (Jayanti, 2019) and for anti-cholesterol drugs (1.47%) (Sinkinson and Starc, 2019). A 10% increase in the number of advertisements also increases the demand for its rival short-term products by 1.77%, which differs from the findings in the aforementioned studies, where there are negative spillovers between rival products of the same type. I find

a small and significant spillover from the advertisement of the permanent method, but there is no significant spillover from LARC advertisements.

TABLE 4 – Effect of DTCA on Claims for Prescription Contraceptives - Border Approach

	Claims Short-Term	Claims LARC	Claims Permanent
Own Ads	0.266***	-0.006	0.002
	(0.097)	(0.007)	(0.002)
Rivals Ads Short-Term	0.177***	-0.126**	0.004
	(0.024)	(0.055)	(0.052)
Rivals Ads LARC	0.001	-0.001	-0.001
	(0.001)	(0.002)	(0.001)
Rivals Ads Permanent	0.001*	0.000	-0.001
	(0.000)	(0.001)	(0.001)
Product-border-time FE	Yes	Yes	Yes
Product-border-DMA FE	Yes	Yes	Yes
R^2	.858	.765	.599
N	4,879,706	227,136	93,288

Notes: Observations are at the product-border-DMA-month levels. There are 169 pairs of border DMAs, including a total of 888 counties, which appear in up to 4 different borders. Includes only products that had claims between 2007 and 2018. The estimation is in log-log so the results can be interpreted as elasticities. All remaining estimated coefficients are significant at the 1% level but are omitted to facilitate reading. Standard errors are clustered at the DMA-product level and are presented in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The greater own effect and the positive spillovers for short-term contraceptives compared to other drugs might be explained by the fact that women do not need to be diagnosed with a specific disease to take these drugs. So, they might attract women who were not taking any prescription contraceptives to this type of drug. Also, this is the type of prescription contraceptive most widely prescribed, so if the advertisements direct women to visit their doctors without a specific method in mind, they are most likely going to be prescribed a short-term method.

I find no significant effect of LARC advertisements on their own claims and on permanent methods. The lack of significance might be due to the smaller number of LARC advertisements being screened in local markets. However, I find negative spillovers from short-term advertisements to LARCs. A 10% increase in the number of advertisements for short-term products decreases the demand for LARCs by 1.26%. Since LARCs and permanent contra-

ceptives require medical procedures for their insertion, it is harder to compare their results with the effects found by related papers that focused on drugs with oral administration.

For the results on short-term contraceptives in Table 4, I exclude refill claims to focus on women making an active contraceptive choice. For comparison, Appendix Table 10 presents the same estimation including refills. This distinction does not apply to LARCs and permanent methods, as these involve one-time procedures and do not generate refill claims.

I also explore whether spillover effects differ across types of short-term products. Specifically, I compare branded products that were advertised during the sample period, branded products that were never advertised, and generic products. Table 5 shows that spillovers are strongest for branded products that were also advertised. There are also significant spillover effects for generic products, and smaller but still positive effects for branded products that were not directly advertised.

TABLE 5 – Effect of DTCA on Non-advertised Drugs - Border Approach

	Claims Short-Term		
	Brand Advertised	Brand Non-advertised	Generic Non-advertised
Own Ads	0.250***		
	(0.094)		
Rivals Ads Short-Term	0.464***	0.098***	0.179***
	(0.139)	(0.028)	(0.032)
Rivals Ads LARC	-0.003	0.001	0.001
	(0.003)	(0.001)	(0.001)
Rivals Ads Permanent	0.003	-0.001	0.001
	(0.002)	(0.000)	(0.001)
Product-border-time FE	Yes	Yes	Yes
Product-border-DMA FE	Yes	Yes	Yes
R^2	.905	.81	.859
N	300,482	2,522,832	2,056,392

Notes: Observations are at the product-border-DMA-month levels. There are 169 pairs of border DMAs, including a total of 888 counties which appear in up to 4 different borders. Includes only claims for products that were advertised at least once between 2007 and 2008. The estimation is in log-log so the results can be interpreted as elasticities. All remaining estimated coefficients are significant at the 1% level but are omitted to facilitate reading. Standard errors are clustered at the DMA-product level and are presented in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Advertisements for short-term contraceptive methods increase demand not only for the advertised product but also for other similar branded and generic products within the same

category. This finding challenges a common argument for banning direct-to-consumer advertising: that it drives consumers toward more expensive branded drugs. While it is true that television advertising increased demand for branded products, which are typically costlier, they also appear to boost demand for a broader set of alternatives. However, this result should be interpreted with caution. My sample includes only insured women, whose choices are influenced by their insurer's formulary. As a result, the relative out-of-pocket costs of different products may differ from their marketed prices.

Part of the increased demand for short-term methods appears to result from women switching away from long-acting reversible contraceptives, which may raise concerns given that LARCs are generally more effective. However, contraceptive quality depends on a range of factors beyond effectiveness, including health conditions, lifestyle, and personal preferences. Therefore, choosing a less effective method does not necessarily imply a worse outcome and may, in fact, better suit some women's needs.

5.1 Heterogeneous effects among age groups

I examine how the effect of advertisements varies across age groups, focusing on short-term methods given that previous results show stronger impacts for this category. Table 6 indicates that the direct effect of advertising is positive and statistically significant only for women aged 34 to 45, with no significant effect found for younger groups. In contrast, spillover effects to other short-term products are positive and of similar magnitude across all age groups.

The results suggest that the advertisements are more effective at directing older women to the specific brand being advertised, while younger women are attracted to the category more generally. This analysis does not allow me to identify the precise mechanism behind this heterogeneous effect. One conjecture is that older women watch more television than younger ones. Another, not mutually exclusive, possibility is that they communicate brand preferences more explicitly to their physicians and/or the physicians take their brand request more into account when making a prescription.

TABLE 6 – Effect of DTCA on Short-Term Products by Age Groups - Border Approach

	Claims Short-Term		
	Ages 15 to 24	Ages 25 to 34	Ages 34 to 45
Own Ads	0.111	0.074	0.155**
	(0.078)	(0.058)	(0.068)
Rivals Ads Short-Term	0.104***	0.108***	0.120***
	(0.020)	(0.019)	(0.017)
Rivals Ads LARC	0.001	-0.000	0.000
	(0.001)	(0.000)	(0.000)
Rivals Ads Permanent	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)
Product-border-time FE	Yes	Yes	Yes
Product-border-DMA FE	Yes	Yes	Yes
R^2	.816	.804	.761
N	4,879,706	4,879,706	4,879,706

Notes: Observations are at the product-border-DMA-month levels. There are 169 pairs of border DMAs, including a total of 888 counties which appear in up to 4 different borders. Includes only claims for products that were advertised at least once between 2007 and 2018. The estimation is in log-log so the results can be interpreted as elasticities. All remaining estimated coefficients are significant at the 1% level but are omitted to facilitate reading. Standard errors are clustered at the DMA-product level and are presented in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.2 Differential effects of the ACA

The extent to which television advertising influences women's contraceptive choices may also depend on the cost of the drugs for each consumer. As shown in Table 1, LARCs and permanent methods have higher upfront costs than those of short-term methods. So, this could be one explanation for why advertisements are much more effective in attracting women to short-term drugs rather than to other methods. To assess this hypothesis, I examine whether the effects of television advertisements changed after the implementation of the ACA provision on prescription contraceptives.

In August 2012, a provision of the ACA was enacted requiring all private health insurers to cover contraceptive methods without co-payments or other out-of-pocket costs, with exceptions for grandfathered plans and certain employers. While some states had already implemented contraceptive coverage mandates, cost-sharing was still common (Sobel et al., 2018). The federal provision was especially important in reducing the financial barriers to

LARC insertion (Heisel et al., 2018). Using the same dataset as this study, Becker (2018) and Sonfield et al. (2015) find that the ACA significantly lowered out-of-pocket spending on prescription contraceptives and increased the volume of claims.

Figures 1 and 2 show that this period coincides with a shift in the trends of television advertisement. Before 2012, advertisements were dominated by brands of short-term methods, such as pills and vaginal rings; after, there was an increase in advertisements from brands of LARCs, such as implants and IUDs, and permanent methods. Wu et al. (2016) suggests that this change is related to the ACA since it allowed more women to access methods with higher upfront costs.

Importantly, the border approach controls for the effects of the ACA. Since the ACA applied uniformly to women on both sides of DMA borders, any changes resulting from the policy are absorbed by the border-time fixed effects included in the regressions.

In this section, I use the border approach to examine whether the effects of advertising differed before and after the implementation of the ACA provision on prescription contraceptives. To do so, I interact the stock of DTCA—both for the advertised product and for other products—with an indicator variable equal to 1 after August 2012 and 0 before. The results are presented in Table 7. It is not possible to estimate the post-ACA own effect for short-term methods, as local advertisements for this category ceased after 2013.

I do not find significant evidence that television advertisements for LARCs increased demand for those methods after the ACA. Instead, LARCs appear to have benefited indirectly from positive spillovers: a 10% increase in advertisements for permanent methods raised LARC demand by 0.08% relative to the pre-ACA period.

Conversely, an increase in LARC advertising after the ACA is associated with a decrease in demand for permanent methods, relative to the earlier period. However, it is unclear whether this decline reflects women switching to other contraceptive methods or a broader reduction in the use of prescription contraceptives.

The lack of a significant effect for LARC advertising may reflect the limited scope of the border approach, which captures only local advertisement exposure. Although advertising activity increased after the ACA, the volume of local television commercials remained limited relative to national campaigns, which are not exploited in this identification strategy.

TABLE 7 – Effect of DTCA Before and After the ACA - Border Approach

	Claims Short-Term	Claims LARC	Claims Permanent
Own Ads	0.266***	0.007	0.001
	(0.097)	(0.012)	(0.002)
Own Ads x ACA	0.000	-0.017	0.004
	(.)	(0.013)	(0.004)
Rivals Ads Short-Term	0.177***	-0.126**	0.004
	(0.024)	(0.055)	(0.052)
Rivals Ads Short-Term x ACA	0.000	0.000	0.000
	(.)	(.)	(.)
Rivals Ads LARC	0.002	-0.005	0.003
	(0.001)	(0.005)	(0.002)
Rivals Ads LARC x ACA	-0.001	0.004	-0.005*
	(0.001)	(0.006)	(0.003)
Rivals Ads Permanent	0.001**	-0.002	-0.001
	(0.001)	(0.001)	(0.001)
Rivals Ads Permanent x ACA	-0.001*	0.008**	-0.001
	(0.001)	(0.004)	(0.002)
Product-border-time FE	Yes	Yes	Yes
Product-border-DMA FE	Yes	Yes	Yes
R^2	.858	.765	.599
N	4,879,706	227,136	93,288

Notes: Here, the ACA is an indicator variable that equals 1 after August 2012, when the ACA provision that reduced the out-of-pocket costs for prescription contraceptives was enacted. Observations are at the product-border-DMA-month levels. There are 169 pairs of border DMAs, including a total of 888 counties which appear in up to 4 different borders. Includes only claims for products that were advertised at least once between 2007 and 2008. The estimation is in log-log so the results can be interpreted as elasticities. All remaining estimated coefficients are significant at the 1% level but are omitted to facilitate reading. Standard errors are clustered at the DMA-product level and are presented in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

6 Conclusion

This paper examines the effects of direct-to-consumer advertising (DTCA) on the market for prescription contraceptives. Television advertisements significantly increase demand for short-term methods, especially pills, increasing claims for the advertised product and generating positive spillovers to other branded and generic options in the same category. These findings suggest that DTCA may play an informational role, expanding awareness of short-term contraceptive options. However, because the prescription process also depends on providers' input, advertisements may steer women toward the category rather than a specific product, with final choices shaped by medical guidance and individual needs.

I also find evidence that advertising for short-term methods reduces demand for long-acting reversible contraceptives (LARCs), indicating substitution toward less effective methods. While this raises concerns about the unintended consequences of DTCA, it is important to recognize that contraceptive decisions reflect a range of personal, medical, and contextual factors. Choosing a less effective method does not necessarily imply a worse outcome—it may better align with a woman's preferences, lifestyle, or health circumstances.

In addition, I explore how the effects of advertising vary before and after the implementation of the ACA provision that reduced cost-sharing for contraceptives. While LARC advertisements did not significantly increase demand even after the policy change, advertising for permanent methods increased LARC demand and reduced demand for short-term methods. These results suggest that cost-sharing reductions interact with advertising to shape contraceptive choices. However, the limited volume of local LARC advertisements during this period reduces statistical power, making it more difficult to detect significant effects even if they exist.

This paper's reduced-form estimates provide causal evidence on how advertising influences product-specific and category-level demand in the contraceptive market. However, they do not capture how demand would respond to broader policy interventions, such as a complete ban on DTCA or targeted restrictions like those imposed on specific products (e.g., the FDA's action against YAZ). Future research using structural models of demand and supply could simulate these counterfactual scenarios and assess the welfare implications

of alternative advertising regulations.

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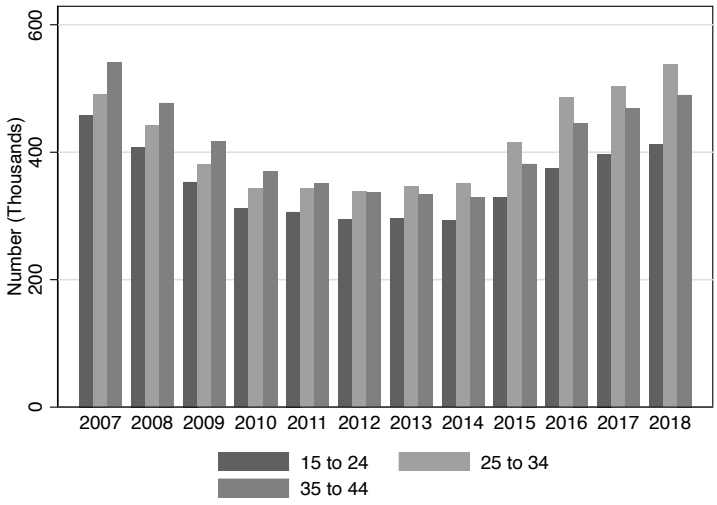
Appendix

FIGURE 3. Enrolled women by age group in the main DMAs



Note: Number of women enrolled for at least six continuous months with ages between 15 and 44 years old that appear in the Optum's de-identified Clinformatics Data Mart database and live in the DMAs for which I have television advertisement data.

Table 8 – Total advertisements by Product

Product	Method	Manufacturer	2007	2008	2009	2010	2011	2012	2013	2015	2016	2017	2018
Beyaz	Pill	Bayer	0	0	0	0	3646	0	0	0	0	0	0
Femcon Fe	Pill	Allergan	2694	0	0	0	0	0	0	0	0	0	0
Lo Loestrin Fe	Pill	Allergan	0	0	0	0	1625	0	0	0	0	0	2065
Loestrin 24 Fe	Pill	Allergan	4987	818	0	0	0	0	0	0	0	0	0
Seasonique	Pill	Duramed	4540	2421	3067	4913	1607	0	0	0	0	0	0
YAZ	Pill	Bayer	9491	10176	11932	3908	0	0	0	0	0	0	0
NuvaRing	Vaginal Ring	Merck	958	8101	7966	3556	2579	2509	0	0	0	0	0
Nexplanon	Implant	Merck	0	0	0	0	0	0	0	9	14	0	0
Kyleena	IUD	Bayer	0	0	0	0	0	0	0	0	0	6954	8611
Mirena	IUD	Bayer	5441	9974	2300	4463	4489	8357	1277	0	0	0	0
Paragard	IUD	CooperSurgical	0	0	0	0	0	2328	0	0	0	0	0
Skyla	IUD	Bayer	0	0	0	0	0	0	0	4238	2311	0	0
Essure	Sterilization	Bayer	495	3129	7827	3797	269	80	48	7445	0	0	51

Note: Table built with data from Kantar Media; it includes advertisements bought on network, cable, and spot TV.

TABLE 9 – Effect of DTCA on Claims for Prescription Contraceptives - OLS

	Claims Short-Term	Claims LARC	Claims Permanent
Own Ads	1.253***	-0.001	0.036***
	(0.181)	(0.015)	(0.009)
Rivals Ads Short-Term	0.284***	-1.307***	0.062
	(0.071)	(0.365)	(0.140)
Rivals Ads LARC	0.001	0.013*	-0.004
	(0.002)	(0.007)	(0.004)
Rivals Ads Permanent	0.002*	-0.013***	-0.004*
	(0.001)	(0.004)	(0.002)
Time-product FE	Yes	Yes	Yes
Product-DMA FE	Yes	Yes	Yes
R^2	.886	.717	.393
N	1,499,244	69,690	29,088

Notes: Observations are at the product-DMA-month levels. Includes only products that had claims between 2007 and 2018. The estimation is in log-log so the results can be interpreted as elasticities. All remaining estimated coefficients are significant at the 1% level but are omitted to facilitate reading. Standard errors are clustered at the DMA-product level and are presented in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 10 – Comparing All Claims with First Claims for Short-term Options

	Claims Short-Term	
	All Prescriptions	New Prescriptions
Own Ads	0.357**	0.266***
	(0.146)	(0.097)
Rivals Ads Short-Term	0.212***	0.177***
	(0.035)	(0.024)
Rivals Ads LARC	-0.000	0.001
	(0.001)	(0.001)
Rivals Ads Permanent	0.002***	0.001*
	(0.001)	(0.000)
Product-border-time FE	Yes	Yes
Product-border-DMA FE	Yes	Yes
R^2	.907	.858
N	4,879,706	4,879,706

Notes: Observations are at the product-border-DMA-month levels. There are 169 pairs of border DMAs, including a total of 888 counties which appear in up to 4 different borders. Includes only products that had claims between 2007 and 2018. The estimation is in log-log so the results can be interpreted as elasticities. All remaining estimated coefficients are significant at the 1% level but are omitted to facilitate reading. Standard errors are clustered at the DMA-product level and are presented in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$