Birth Control on Every Corner: The Impacts of Pharmacists' Prescription of Birth Control

Andie Hall*

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Abstract

While oral contraception has been legal in the United States in some form since the 1960s, access to the pill has varied greatly over time based on marital status, age, socioeconomic status, and proximity to physicians or federally-funded family planning clinics. Since the advent of the pill, legislators have worked to change laws regarding access to the pill—and over time it has become more available to women of all backgrounds—yet unintended pregnancies remain high. Until recently, women across the country had to visit a physician (through private practice or federally funded family planning centers) to obtain a prescription for the pill. With this barrier to access to contraception under the standard, physician-prescribing approach, allowing women to access the pill through pharmacist prescriptions could provide women with better control over their family formation decisions. Using pharmacists zip codes at the time of licensure and county-level birth and abortion data in Oregon, I find that pharmacist prescription of birth control reduces the county-level abortion rate by an average of 4-7% (approximately 0.04 fewer abortions per 1000 women of childbearing age) across all post-period quarters. Births, on the other hand, seem to stay the same or increase — suggesting that pharmacists' prescriptions may cause false confidence and user error among patients or that people of childbearing age are better able to plan the timing of their pregnancies.

JEL Classification: I18, J13, J18

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*This is brand new! Can't wait to get feedback and have wonderful discussants and conference participants to thank!

1 Introduction

Access to contraception and reproductive control technologies more generally is constantly shifting in the modern legal landscape. While many recent legislative acts have reduced access to reproductive control technologies, some acts have increased access. One such changing landscape involves access to hormonal contraception. Prior to the big legal changes around the dispelling of Roe v. Wade, localized efforts to reduce barriers to hormonal contraception were seen in many parts of the country. A reduction in barriers to methods like the pill included the emergence of telehealth and shipping discreet packages to consumers as well as the push for non-physician prescriptions of hormonal contraception. Home delivery of the pill through online services and telehealth appointments more generally rose in popularity especially during the Covid-19 pandemic. Even before the pandemic, though, some states were working to reduce patients' need to physically visit a physician's office for birth control and began to allow pharmacists to prescribe some of the most common forms of birth control: oral contraception ("the pill") and the monthly hormonal contraception shot. The first locality to move toward this expansion in access was Oregon, which passed a law permitting pharmacists' prescription of hormonal contraception to take effect in January of 2016.

In order to be able to prescribe birth control, pharmacists were required to undergo board-certified training. Pharmacists in Oregon seemed to be excited to participate — before the bill even took effect on January 1, 2016, nearly 150 pharmacists had completed their requirements to prescribe birth control, and within the first year, over 800 pharmacists had completed their training. As of December 2018, over 1,300 of the state's pharmacists[1] had passed the requirements to prescribe birth control. Additionally, in 2017, the state passed another house bill, HB 2527, allowing pharmacists to provide injectable hormonal contraception ("the shot"), further expanding access to contraception. Most of the pharmacists who had already begun prescribing birth control went on to

[1]I do not currently have administrative counts of pharmacists, but a 2016 publication noted that of the 3,041 pharmacists practicing in Oregon, only 1,579 worked in retail pharmacies, which would be the individuals most likely to increase access for patients. Of those 1,579, at the time of publication, over 1,200 of those 1,579 had registered for the licensing course (Rodriguez et al., 2016).

complete the requirements to be able to administer the shot, and in 2017 the Board of Pharmacy in Oregon rolled out a training unit that combined the training requirements for the pill and the shot (Jones, 2023).

Economics literature has long documented the impact of access to reproductive control technology — such as birth control pills, long-acting reversible contraception such as IUDs or implants, or abortion — but much of the work focuses on the monumental change from extremely limited access to somewhat easier prescription access. For example, Goldin and Katz (2002) demonstrates that women born in times and locations in which the birth control pill was accessible to young, single women were more likely to obtain higher education and marry later than their peers born in slightly earlier cohorts or in states with stricter regulations around the pill. Other studies, namely Ananat and Hungerman (2012), Bailey (2006), and Bailey (2012), add to our understanding from Goldin and Katz (2002) that access to the pill had a major impact on women's and infants' outcomes, and that many of those effects persist into reductions on poverty, next-generation health outcomes, and labor market outcomes. These studies document the impact of new access to the pill for young, single women in the 1970s — but legislation around reproductive control technology has been changing even since the pill's diffusion. Does an increase in access to family planning technology in 2016 have similar impacts to that in the mid- to late-twentieth century?

With all of these differences in the landscape around reproductive control technology, one may wonder whether intervention to increase access to the pill would make any difference. If governments move toward allowing pharmacists to prescribe hormonal birth control — or even toward making birth control available over the counter — will there be any detectible change in outcomes for child-bearing-aged people, infants, or governmental budgets? Or, if there is no detectible impact, could it be the case that child-bearing-aged people are benefitting from this increase in accessibility of birth control in other ways?

I find that, at the county-level, changes in birth and abortion rates caused by changes in access to pharmacist prescribed birth control are noisy. Depending on the approach I use to define treatment, results are more or less precise — and it seems that pharmacist

prescription of birth control reduces abortions and perhaps increases births, though the results using a county-level analysis for birth data are noisy at best.[2] In next steps for this study, I will obtain birth certificate data with zip code of residence in order to better assess the potentially very localized impacts of access to pharmacists' prescription of birth control. I will also use back-of-the-envelope calculations to assess whether the availability of pharmacist prescription of birth control saved physician work-hours in the state since 2016. Initial estimates, using data from 2017, suggest that approximately 180 physician hours were diverted to pharmacists every two years, suggesting a potential reduction in over 700 hours of physician labor.[3] This suggests that pharmacists' prescription of contraception (and potentially other "low-risk" medications) could be one low-cost avenue to address concerns around demand for physician care exceeding supply.

The rest of this paper is organized as follows: I will first introduce you to the background of the Oregon House Bill that established the legality of pharmacist prescription of birth control and the general landscape faced by pharmacists and people of child-bearing age in Oregon. Next, I will describe the data I am using in my current analyses, as well as the data I hope to obtain for subsequent analyses. I will then describe the identification strategies I use along with the main results. After sharing results, I will move into a set of robustness tests that I am either able to complete today and discuss their results, or will discuss future plans for robustness tests. Finally, I will conclude and discuss the relevance of this sort of policy change in the broader, post-Roe landscape.

2 Background

In June of 2015, Oregon Governor Kate Brown signed into law Oregon House Bill (HB) 2879, which streamlined a process to allow pharmacists to prescribe birth con-

[2] I argue that the birth data at the county-level are too broad for this study.

[3] At the time of this draft, the best data suggest that 10% of all Medicaid users who started on the pill between 1/1/2016 and 12/31/2017 did so using a pharmacist (367 individuals in 2016 and 2017). If all of those patients would have gone to a physician instead, and birth control appointments typically take 30 minutes, and new patient takeup remaind consistent across all 8 years since the start date, 720 physician hours or more were diverted to pharmacists, with a given hour of physician labor costing approximately $40 more than an hour of pharmacist labor. These calculations are based on several assumptions, which I hope to investigate further with better data.

trol. Through this initiative, licensed pharmacists would be able to complete a Board approved training program, then begin prescribing hormonal contraceptive patches and oral contraception starting in January of 2016. This made Oregon the first-mover among the United States in increasing access to hormonal contraception through pharmacies. California began a similar initiative later in 2016, and at the time of writing, 24 states and Washington, D.C. allow pharmacists to prescribe hormonal contraception. Since this is a state-level initiative, each state's process looks slightly different, but for the purposes of this study we will focus first on Oregon's implementation.

In Oregon, a working group representing a variety of stakeholders met to create a standard procedure for the state's pharmacists to prescribe hormonal contraceptives while maintaining adherence to existing health guidance. This group decided on a five-hour online training module that "covers general information on contraception, medically necessary screenings, and referrals" and established a process for referrals for patients who had medical contraindications or could not afford the pharmacists' fees (Jones (2023); Rodriguez et al. (2016)). It is perhaps unsurprising that Oregon would be a first-mover in pharmacists' prescription of birth control: Oregon has long been on the frontlines of increasing access to reproductive healthcare (Rodriguez et al. (2016); others?).

2.1 Potential Effects

The natural experiment of the broad diffusion of the pill in the 1960s and 1970s is undeniably a different experiment than any we can see in the 2000s. First, the birth control pill was one of the earliest highly-effective forms of reversible contraception available to people, meaning that gaining legal access to the pill in the 60s brought many individuals from a status of having no highly-effective, reversible contraception into a status of having such medicine fairly easily available. Since access to the pill has remained quite high for most individuals, and Oregon has generally been supportive of reproductive health care efforts, expanded access to the pill in the modern landscape will likely have smaller (if any) impact. This suggests that any impacts on births and abortions may not be detectible, or will be small relative to impacts from the original diffusion of the pill. To

assess this point, I would like to check All Payer All Claims data for contraception — ideally, if there is any geographic information, I may be able to test for a first-stage effect. In other words, do areas with participating pharmacies actually see increases in overall birth control prescriptions?

Second, social settings have changed drastically, with support for young, single people using the pill increasing drastically since the 1950s. Between 1959 and 1983, public support for birth control information being legally available to anyone who wanted it rose from 73% to 90%, and the share of people who believed birth control information should *not* be legally available to anyone who wants it fell from 14% to (and a high in 1962 of 21%) down to 8% (NORC, 2022). This suggests that at least some of the barrier that women of the 1960s may have faced — that of judgment, criticism, or condescension from medical experts, partners, friends, or family members — is likely to be lower in the 2000s. In this case, an increase in access to the pill could have larger, smaller, or similar effects to those seen in prior generations. If it is the case that an expansion in birth control access is taken up by more of the population in 2016 than it was in 1966, then perhaps impacts on births and other outcomes will be even larger now. On the other hand, if social stigma never really presented barriers to women seeking abortion, the expansion in the 60s — from no access to relatively wide access — should have larger impacts than the relatively smaller expansion in 2016, when pharmacists began to prescribe to Oregonian women. The overall impact of the change in social landscape around birth control is an empirical question, which may at least be partially answered through public opinion surveys and Google trends, but which may also be partially answered through comparing changes in fertility outcomes from each era.

Finally, technology improvements have made the pill more accessible and, perhaps, less optimal than before. In 2014, the American Academy of Pediatricians released a policy statement recommending long-acting reversible contraception, or LARCs, as "first line contraceptive choices" due to their "safety, efficacy, and ease of use" (Ott et al., 2014). LARCS, such as intrauterine devices (IUDs) and implants, are more than 99% effective in preventing pregnancies with typical use, while the birth control pill is only

91% effective in typical use — and access to LARCs increased substantially between 2003 and 2013 — moving from 0.4% of Title X facility-using teenagers selecting a LARC as their preferred method in 2003 to 7.1% in 2013 (Romero et al., 2015), and overall LARC usage has increased to about 16% of women of childbearing age in 2019 (Eeckhaut et al., 2021).[4] Still, the pill remains a popular choice, and changes in technology have made the pill easier to access. Telehealth companies (such as Nurx, Lemonaid, and Hers) provide birth control options shipped directly to patients' home address. Some of these companies have been around for a while — Nurx started in 2015 and is one of the more popular companies for contraception, STI testing, and treatment for conditions such as acne, migraine, and mental health (Dresden and Iavarone, 2023) — but the prevalence of telehealth use and insurance support for telehealth increased drastically during the Covid 19 pandemic. In fact, prior to the pandemic, only 2 states allowed Medicaid coverage of telehealth care; since then, 49 states and Washington, D.C., allow Medicaid coverage of telehealth services (Berg, 2021).[5] Finally, the FDA approved a new, over-the-counter (OTC) form of birth control. This new OTC option for birth control is different from the options available through pharmacist or physician prescription (it is progesterone only — slightly less effective than combination pills) and is expected to be available for purchase in 2024 (Carter, 2023). To assess the expected impact of this expansion, I would like to see state- and/or county-level data on contraceptive choice in Oregon.

In all, it is unclear how effects of increased access in 2016 in Oregon would compare to effects of increased access in the 1960s in the US as a whole. In this initial stage of the paper, I am only examining birth and abortion rates. It is entirely possible that pharmacists' prescription of birth control may not impact birth or abortion outcomes at a statistically-distinguishable population-level. If further tests continue to demonstrate noisy or counterintuitive results, it could mean that pharmacists' prescription of birth

[4]With perfect use, the pill is nearly as effective as an IUD or an implant and is less invasive. Unfortunately, perfect use can be tricky — especially for women with inconsistent schedules or who may have a desire to keep their contraception private — resulting in a typical use effectiveness of about 91% — suggesting that 9 out of every 100 people who use the pill with average accuracy will become pregnant (NHS, 2020).

[5]States have increased Medicaid coverage of telehealth generally, but coverage of services related to reproductive health — especially services like medical abortion — remains varied across state lines.

control does not significantly impact access to the pill and the shot, but it could also be the case that the improvements in access are more subtle and are actually impacting quality of life, time use, or other outcomes related to spending less time waiting at a physician's office.

3 Empirical Approach

3.1 Data

For this initial draft of this project, I use data publicly available from the Oregon Health Authority. This dataset captures the count of births and abortions experienced by residents of each of Oregon's 36 counties each month, from 1998 to present.[6] I supplement these data with information about when pharmacies began to prescribe birth control through two strategies: first, I use pharmacist registration data from 2016–2018; second, I use a map of participating pharmacies available online (Birth Control Pharmacies, 2018).[7] I believe both strategies have their strengths and weaknesses, and hope to gain All Payer All Claims data to get a more precise, administrative record of prescriptions. The pharmacist registration data were found in 2018 and I have been unable to relocate the updated version, and the Board of Pharmacy does not release such information to researchers. These data include the pharmacists' name, employer, zip code of their workplace, and the date the pharmacists' licensure information was approved. These data do not have any indication of how often the pharmacist worked (a very part-time pharmacist that gained certification would appear exactly the same as one who worked 60 hour work weeks), whether the pharmacist stayed at their pharmacy or moved to a different location (if Pharmacist A gets their licensure while in zip code 12345 and moves to work in zip code 12346 a month later, I would never know), or whether the pharmacist actually went on to prescribe oral contraception. Additionally, even if a pharmacist in zip

[6]Due to availability of pharmacist licensure data ending in 2018, the initial analysis only uses births through 2019.

[7]See Figure 1 for a current screenshot of the website. The locations shown can be mis-numbered due to duplicate entries, and the author notes that without a precise directory of these hospitals or an ability to scrape the locations, it is possible some locations were missed.

code 12345 can prescribe birth control, access to the pill is unlikely to change for residents of that zip code unless they are aware the pharmacist can now prescribe. In an attempt to incorporate publicly available information, I use birthcontrolpharmacies.com. This website maintains current information about pharmacies across the US that self-report offering birth control services. This is, perhaps, a more accurate representation of what an individual seeking birth control may see — but a pharmacy that has not yet updated its website to include birth control services could be very publicly providing services in its community and still not be detected by this measure. Additionally, internet archives only document the website's existence from June 2018 to present, which may not be consistent with the initial availability of pharmacists and does not contain information about when the pharmacy began to prescribe or how many of the pharmacists prescribe.

3.2 Identification Strategy

I use a generalized difference-in-differences approach to estimate the causal effects of reduced clinic capacity. This approach exploits within-county variation over time and controls for aggregate time shocks, as well as fixed differences across counties over time and differences in pre-regulation trends. In order for this approach to be valid, it must be true that changes in abortion and birth rates for comparison counties provide a good counterfactual for the changes in abortion rates that would have been observed for treated counties, if access to birth control remained unchanged – or, rather, if the pharmacists had not become eligible to prescribe birth control and taken the appropriate licensure. My approach to estimating the effects of changes in availability of pharmacist prescription of birth control on the abortion and birth rates corresponds to the following equation:

$$E[y_{cq}|pharm_{c,t-k}, \alpha_c, \alpha_t, X_{ct}] = \sum_{k=1}^{5} \theta_k pharm_{c,t-k} + \alpha_c + \alpha_t \tag{1}$$

where y_{ct} is the outcome of interest for residents of county c in time t; $pharm_{c,t-k}$ is an indicator for whether county c had a pharmacist licensed to administer birth control in time $t-k$; α_c are county fixed effects; α_t are time fixed effects. All reported standard-error estimates are clustered on the county to account for correlation within counties over

time. I use this model to estimate effects on the natural log of abortion rates for women of various age groups, abortion rates for various gestational ages, the share of abortions occurring at a given gestational age, and birth rates by mother's race.[8]

4 Results

Before discussing the results, I would like to highlight the empirical challenge I am facing with the current definitions of treatment and comparison counties. Figure 2 shows the zip codes and counties in Oregon. Zip codes are a slightly odd geographic indicator — they do not adhere to state or county lines, as they are generated by the US Postal Service for the purpose of organizing mail routes. Zip codes are smaller than counties (i.e. each county has multiple zip codes) and therefore provide a more precise location than counties. It is worth noting that only 5 counties in the state of Oregon remain 'untreated', limiting my current comparison to 31 counties that have pharmacists prescribing birth control to the 5 counties that do not. Treated counties are shown in green; treated zip codes are shown in dark/mossy green. Zip codes without a prescribing pharmacist are outlined and diagonally striped. We can see from this image that many untreated zip codes are being lumped into the treated group due to the county definition of treatment.[9] The county-level analysis is therefore quite dependent on the goings-on of those 5 rural counties. Obtaining zip code level birth data will improve the comparison groups and mitigate this dependency. Table 1 documents pre-and post-period demographics and fertility outcomes for the treated and comparison counties. While differences between treated and comparison counties are small and statistically insignificant, counties that experience a pharmacist's registration to prescribe contraception have a higher share of county population who identify as Black or Hispanic, a higher rate of unemployment, a higher proportion of the county population who are of childbearing age, and slightly

[8]Results in this draft are all taken at the quarter-level. Data are available at the month-level, and outcomes using monthly variation are available upon request.

[9]Table A1 shows the count of zip codes that are in this situation, and highlights the difference in identifying treatment status based on administrative records of individual pharmacists versus public information about pharmacy locations, though there are no zip codes that did not have a pharmacist in the administrative data that later show up in the website data.

lower birth rates.

In order to measure the impact of prescribing pharmacists on abortion and birth rates, we must be careful to address the fact that many county-months experience zero abortions. Zero-birth observations also occur, but are less common. The standard approach to measuring changes in fertility behavior is to estimate the regression (in this case Eqn. 1 using the natural log of the abortion or birth rate as the outcome. With a large number of zeroes, this approach leaves out many observations (since the natural log of zero is undefined). To combat this, I run the same regression using the inverse hyperbolic sine of the count of births or abortions as the outcome variable to approximate the natural log without dropping zero-observations.[10] Results for both the natural log of the abortion and birth rate are shown (see the odd columns in Table 2 and Panels (a) and (c) of Figure 3, as are those using the IHS transformation (see Columns 2 and 4; Panels (b) and (d)).

GENERATE RESULTS SUMMING UP ABORTIONS OVER COUNTY QUARTER.

Using the timing of a county's first pharmacist's registration to prescribe birth control, I am able to detect a reduction in abortions — whether measured as the natural log of the abortion rate or the inverse hyperbolic sine transformation of the count of abortions — beginning approximately 5 or 6 quarters, or 12-18 months, after the pharmacist's registration. Table 2 Columns (1) and (2) show the point estimates; Figure 3 Panels (a) and (b) show the graphical representation of the results from Eqn. 1. In the 5th through 7th quarters after a county received a prescribing pharmacist, abortion rates fall by approximately 8-18%. With a baseline abortion rate of XXX, this translates to XX-XX fewer abortions per county per quarter for these three quarters.

Table 2 Columns (3) and (4) show the point estimates; Figure 3 Panels (c) and (d) show the graphical representation of the results from Eqn. 1, using births as the outcome of interest. Births seem to stay the same and possibly increase in treated counties after pharmacists' prescribing begins, though the average effect in the entire post-period is slightly negative and noisy.

Taken together, it seems that pharmacist prescription of birth control reduced abor-

[10]This transformation takes on the form $sinh_z^{-1} = ln(z + \sqrt{1 + z^2})$.

tions and had an ambiguous impact on births. If there is an increase in births, it could be coming through intended or unintended pregnancies. Suppose a young woman starts taking the pill after learning her local pharmacist can prescribe. If she is switching from very careful use of another approach (such as abstinence, withdrawal, or condom use, or some combination), she may become more lenient about that approach once she begins taking the pill. If the pill is taken incorrectly, such as through mistiming daily doses or assuming the pill has become effective before it has, this increase in pill access could increase unintended pregnancies. On the other hand, if she is switching from no method (or poor use of an alternative method) to the pill, unintended pregnancies should fall. If she is switching from a more effective method, such as a LARC, because she wants the easy option to try to become pregnant in the near future, increased access to the pill could increase intended pregnancies. To understand what is going on with births, it will be important to use more geographically precise data, understand what methods pill patients had previously been using, and uncover which women's birth rates are increasing.[11]

4.1 Treatment Intensity

Next, I want to understand whether impacts are stronger in areas that have more per-capita availability of pharmacists. To do so, I take the define treatment intensity as follows:

$$intensity_{c,t} = \frac{\sum_{c,t} \mathbb{1}[Pharm_{i,c,t}]}{ChildBearingPop_{c,t}} * 1000 \tag{2}$$

where $intensity_{c,t}$ is our treatment indicator, with 0 indicating that a county has zero pharmacists (pharmacies) prescribing birth control, $\mathbb{1}[Pharm_{i,c,t}]$ represents an indicator variable for each pharmacist (pharmacy) in county c in quarter q that can prescribe birth control, and $ChildBearingPop_{c,t}$ represents the number of individuals of childbearing

[11]While demographic information about mothers will not conclusively indicate whether a birth resulted from an intended or unintended pregnancy, research typically views births to teen (or single) mothers as more likely to have resulted from unintended pregnancy than births to older (or married) mothers.

potential in county c in time q.[12,13] In practice, the intensity indicator ranges from 0–4.96 ($E(intensity|treat = 1) = 1.61$) when counting individual *pharmacists*, and 0–2.48 ($E(intensity|treat = 1) = 0.66$) when counting individual *pharmacies*. The goal of the treatment intensity measure is to identify whether effects are stronger in areas where, based on the number of potential prescribers per capita, access to the pill increased the most drastically. A one-pharmacist (pharmacy) increase in a rural county — like Wheeler County with a 2022 population of 1,456 — is likely to have a much large impact on local access to the pill than a one-pharmacist (pharmacy) increase in a more populous county, such as Multnomah County (home to Portland, with a 2022 population of 820,682, Oregon State Archives, 2023). Results using treatment intensity along with the rest of the main specification can be found in Table 3 and Figure 3. The intensity measure here is defined by the number of *pharmacists* per capita, and results suggest that when a county experienced a large change in prescribing pharmacists per capita, abortions fell and births increased. When accounting for treatment intensity, impacts on abortion rates are largely consistent with those in the previous subsection. Birth rates, however, increase more precisely than they had without considering intensity. In a county moving from zero prescribing pharmacists to 1.61 per capita *(the average for treated counties)*, birth rates increased by approximately 1.28%. In Quarter 6, which is 15-18 months after the entrance of a prescribing pharmacist, a similar increase in pharmacist availability increased birth rates by nearly 6.12%.[14]

4.2 Heterogeneity

I plan to use better birth data to understand which groups of women are driving the increase in birth rate, the geographic reach of a pharmacy, and the impact of this change in access on birth outcomes.

[12]'Individuals of childbearing potential' are calculated using Census annual estimates of females aged 15–44 in a given county. I would like to note that not all people who identified as female, aged 15-44, on the Census are necessarily in a position to become pregnant (due to physical, financial, or social limitations).

[13]The fraction is multiplied by 10,000 since birth rate statistics are calculated as the number of births per 1,000 women of childbearing age.

[14]Baseline of the quarterly birth rate?!?

5 Validity, and Robustness

Ultimately, there are a handful of concerns we must have around the results of this paper at this point in time: treatment definition, rural versus urban effects, and XXX. I will address each of these concerns below with my current strategy and any future plans I have to clarify the concern.

I argue that one of the biggest concerns regards the definition of treatment. Treatment is decidedly *not* administered at the county-level, with large numbers of 'untreated' zip codes being observed in 'treated' counties. If women throughout the county are obtaining pharmacist prescriptions regardless of their zip code, this issue may not be worth much concern. However, research has shown that distance to health care services does impact takeup of those services, even when it comes to free or low-cost reproductive health care (Kelly et al., 2020). Given the rural, mountainous nature of much of Oregon, I suspect this will be a concern. In order to address this concern, I have applied for birth certificate data with mother's zip code of residence. These data will allow me to better assess the reach of the pharmacists' prescription and will allow me to observe any heterogeneous effects by age group, income level, or zip code rurality.[15]

To expand on part of the prior concern, there is certainly reason to believe that effects may be different for rural or urban areas in Oregon. Oregon, like many states in the US, has a relatively large share of its population in a relatively small number of locations — and those locations are more likely to have pharmacists who are able to prescribe birth control. Politics in the state are also quite different in urban and rural areas, which could impact which pharmacies in which areas actually become licensed to prescribe. Understanding whether effects are driven by rural or urban areas will determine any policy prescriptions; zip code information on birth data can help with this understanding. In the meantime, I estimated impacts of pharmacist prescription using a population-weighted least squares approach. The results can be found in Appendix Tables A2 — A5 (Columns 3 and 4) and Figures 1 – 4 (Panels B and D). These results

[15]I would also like to obtain better administrative data of prescribing pharmacists and/or all payer all claims data from the state of Oregon, but I have had less luck determining whether administrators will release this sort of data.

suggest that population is making a big difference for birth outcomes, but not much of a difference for abortions.

Can further discuss choice for IHS vs log, quarters vs months, WLS vs OLS (I chose OLS bc it has better pre-trends for abortion outcomes, similar pretrends for birth outcomes, and i thought consistency across birth and abortion was a good idea).

6 Conclusion and Discussion

Discuss the implications of pharmacist prescription of birth control as a strategy to improve access to bc, reduce abortions, allow people to plan their pregnancies, and save physician work-hours. Discuss the fact that rising use of telehealth could change the overall interpretation of the value of this intervention, but if individuals do not have good (or private, stable, reliable) access to internet, a pharmacist visit could still be preferable to a telehealth visit.

Taking the results of this draft, it is apparent that pharmacists' ability to prescribe birth control in Oregon caused fewer abortions to occur in areas in which pharmacists took up the opportunity to become licensed to provide birth control, relative to areas in which pharmacists did not take up this opportunity. Birth rates were not decreased in the same fashion, suggesting that increased access to the pill may have increased birth rates, perhaps due to user error (or overconfidence) or perhaps due to greater flexibility in family planning afforded to individuals by the easy access to the pill. Next steps to this project will investigate more geographically granular data in an attempt to address this question.

With reduction in abortions remaining a political talking point, an intervention such as this could be a relatively low-cost strategy for governments to implement. Of course, the stated goal of reduced abortion is not always the true political goal, so this strategy is likely to have more or less political support in different regions. This strategy could also help address shortages in supply of health care providers: of all US counties, approximately 95% are experiencing a shortage in primary care physicians; this number jumps

to 97% of non-metropolitan counties (RHI, 2023). As the Baby Boomer generation ages, states are grappling with challenges related to demand for health care exceeding supply, with the coverage gap projected to increase. Shifting some of a primary care physician's labor to another qualified health care professional could relieve some of that shortage. Allowing pharmacists to prescribe things like hormonal contraception is one such approach — expanding prescriptive or general providing privileges to other professionals, like physicians' assistants (PAs) or registered nurses (RNs) is another.

It is worth noting that even if an area has pharmacists who are able to prescribe and that area has no detectable reduction in abortion or birth rates, it is entirely possible that the increase in access to birth control is still creating benefits for area residents. Increased access to the pill through pharmacists could be improving women's non-reproductive outcomes — patients may spend less time searching for, waiting for appointments with, and seeing medical professionals; patients may spend less on transportation or time off of work; patients may receive psychological benefit from working with a pharmacist rather than a physician to address their reproductive health concerns. None of these benefits would show up in the birth or abortion data analyzed here. Additionally, failure to detect a reduction in births or abortions — and, in fact, detecting an increase in births — *could* be evidence of increased reproductive freedom.

As has been previously mentioned, LARCs are tremendously effective and generally free of user error, but there is concern around coercion due to racist, ableist, classist sterilization policies (Boydell et al., 2023; Alonso, 2020; Cappello, 2023). In the United States, there is a dark history of coercive medical practice in reproductive health. Black, Indigenous, and other people of color have been targeted by discriminatory LARC campaigns for decades; in the 1990s, policymakers suggested mandating LARCs for people receiving welfare benefits (Cappello, 2023). While mandates were not passed, at this time many Medicaid patients found, after obtaining an IUD, that Medicaid would not cover the cost to remove the LARC.[16] The messaging of this political landscape was painful,

[16]In 2014, researchers surveyed young women in Wisconsin with a history of contraceptive use and found that participants believed LARCs were disproportionately recommended to marginalized patients, providers were willing to ignore patient preferences for selecting contraception, and a patient's request for LARC removal was not always honored (Higgins et al., 2016).

dark, but clear: individuals on Medicaid — and particularly people of color, low-income individuals, and those with disabilities — were not to have the ability to conduct their own family planning efforts. Darker still, this landscape suggested that these individuals should not have children, echoing forced sterilization policies of the twentieth century.[17] With a history of forced sterilization, the landscape in the 2010s and 2020s around LARCs may seem, at first blush, to be significantly better. However, as recently as 2017 in Tennessee, reduced sentencing was offered to individuals who 'chose' to receive a LARC or a vasectomy, and in 2020 "reports emerged of forced sterilization in immigrant detention facilities" (BBC, 2017; Cappello, 2023). LARCs are tremendously effective at reducing pregnancy, but care must be taken to ensure that the individual *wants* to avoid pregnancy; part of reproductive freedom is avoiding unintended pregnancies, but part of it is to be able to decide when to try to become pregnant.

Since 2016, more states have adopted policies to increase access to prescription birth control through pharmacists. The impacts that will be felt by residents in each state will vary: in states with otherwise limited access to affordable reproductive care, allowing pharmacists to prescribe birth control may be a massive expansion in access to reproductive health care and effects could be larger; in regions where women felt coerced into LARCs, we may detect even stronger increases in births that demonstrate an increase in reproductive autonomy. It is also entirely possible that patients switching to the pill may be misunderstanding proper use, generating errors that leave them susceptible to unintended pregnancies. Areas that implement pharmacist prescription without properly educating patients could be more likely to experience unintended pregnancies than they had when pharmacists could not prescribe, if the prescriptions cause patients to abandon other methods of contraception while failing to properly use the pill. It is important to study as many settings as possible, though careful attention must be paid to understanding the true geographic reach of pharmacists' prescriptions — a national, state-by-state or county-by-county comparison may not suffice.

[17]The Eugenics Movement was a major driver of forced sterilization of women of color; this sterilization continued into the 1970s, a not-so-distant past with survivors of these policies unable to enjoy grandparenthood with their peers in the 2020s (Alonso, 2020).

Pharmacist prescription of birth control has potential to mitigate the damage of restrictions on reproductive care (such as the overturning of Roe v. Wade or decreased funding to Title X clinics), assist in easing health care shortages, improve patients' non-reproductive outcomes like time use, and increase reproductive autonomy. These analyses of Oregon's county-level outcomes must be supplemented with further work using more and more precise geographic data.

Andie Hall, Department of Economics, Grinnell College, kellyand@grinnell.edu

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Tables

Table 1
Summary Statistics, Treated vs. Control Counties

	Treated	Comparison
Pre Period (2014-2016)		
Abortion Rate per 1000 Women aged 15-44	0.7	0.5
Birth Rate per 1000 Women aged 15-44	1.5	2.0
Pct of Population that is aged 15-44	36.2	29.8
Pct White	61.3	81.9
Pct Hispanic	23.1	11.8
Pct Black	1.7	2.1
Unemployment Rate	7.1	5.4
Percent in Poverty	18.8	15.5
Post Period (2016-2020)		
Abortion Rate per 1000 Women aged 15-44	0.7	0.5
Birth Rate per 1000 Women aged 15-44	2.2	2.0
Pct of Population that is aged 15-44	37.5	29.8
Pct White	66.2	82.0
Pct Hispanic	21.1	11.7
Pct Black	2.2	2.0
Unemployment Rate	4.9	5.3
Percent in Poverty	14.9	15.9

Notes:

Table 2
Estimated Effects of Pharmacist Prescription Abortion & Birth

	ln(Abortion Rate)	IHS trans. Abortions	ln(Birth Rate)	IHS trans. Births
First Quarter After	-0.073	-0.089	-0.032	-0.033
	(0.063)	(0.066)	(0.048)	(0.047)
Second Quarter After	-0.027	-0.065	0.013	0.013
	(0.059)	(0.065)	(0.049)	(0.048)
Third Quarter After	-0.007	-0.061	0.008	0.012
	(0.057)	(0.065)	(0.085)	(0.081)
Fourth Quarter After	0.056	0.063	-0.055	-0.050
	(0.073)	(0.076)	(0.080)	(0.074)
Fifth Quarter After	-0.068	-0.069	0.015	0.021
	(0.080)	(0.078)	(0.081)	(0.075)
6 Quarters After	-0.205**	-0.117	-0.020	-0.017
	(0.080)	(0.077)	(0.099)	(0.092)
7 Quarters After	-0.127	-0.079	0.027	0.026
	(0.085)	(0.082)	(0.099)	(0.091)
8+ Quarters After	-0.007	-0.022	-0.081	-0.078
	(0.075)	(0.062)	(0.093)	(0.084)
One Quarter Before	0.042	0.050	0.093	0.094
	(0.062)	(0.069)	(0.093)	(0.091)
Two Quarters Before	0.036	0.053	-0.112	-0.123*
	(0.071)	(0.078)	(0.075)	(0.071)
Average effect	-0.057	-0.055	-0.016	-0.013
P-value (test average effect = 0)	0.278	0.297	0.806	0.820
Observations	2590	3456	972	972
County Controls	Y	Y	Y	Y
Population Weighted	Y	Y	Y	Y

Notes: Results are from my preferred specification, an OLS model including county-level controls and year and county fixed effects.

Table 3
Estimated Effects of Pharmacist Prescription Abortion & Birth
Treatment Intensity: Pharmacists per Capita

	ln(Abortion Rate)	IHS trans. Abortions	ln(Birth Rate)	IHS trans. Births
First Quarter After	0.023	-0.021	0.018	0.020
	(0.030)	(0.041)	(0.024)	(0.024)
Second Quarter After	0.035	0.001	0.044*	0.044*
	(0.039)	(0.038)	(0.026)	(0.025)
Third Quarter After	0.022	-0.018	0.024	0.028
	(0.033)	(0.037)	(0.054)	(0.054)
Fourth Quarter After	0.057*	0.036	-0.010	-0.005
	(0.034)	(0.034)	(0.032)	(0.031)
Fifth Quarter After	0.002	-0.041	0.025	0.031
	(0.034)	(0.039)	(0.038)	(0.037)
6 Quarters After	-0.085**	-0.040	0.039	0.042
	(0.033)	(0.034)	(0.051)	(0.050)
7 Quarters After	0.013	-0.005	0.096**	0.099**
	(0.037)	(0.041)	(0.041)	(0.039)
8+ Quarters After	0.049*	0.040	-0.005	0.001
	(0.025)	(0.024)	(0.025)	(0.024)
One Quarter Before	0.077	0.087	0.127	0.128
	(0.059)	(0.060)	(0.093)	(0.090)
Two Quarters Before	0.069	0.090	-0.071	-0.081
	(0.069)	(0.072)	(0.072)	(0.067)
Average effect	0.014	-0.006	0.029	0.032
P-value (test average effect = 0)	0.505	0.790	0.210	0.147
Observations	2590	3456	972	972
County Controls	Y	Y	Y	Y
Population Weighted	Y	Y	Y	Y

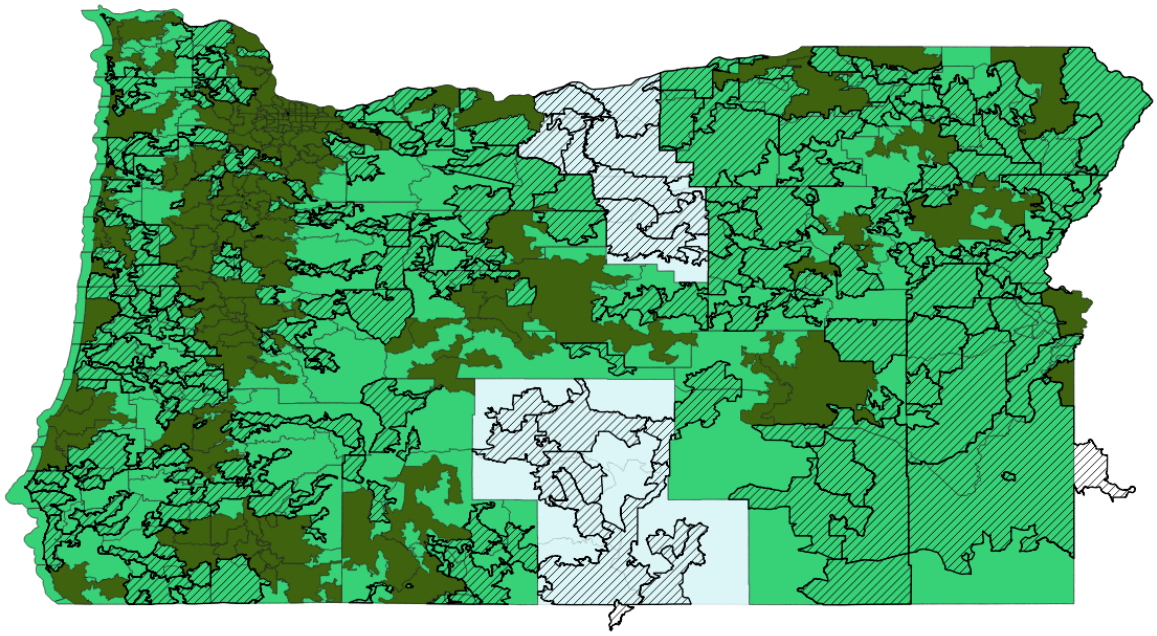
Notes: Results are from my preferred specification, an OLS model including county-level controls and year and county fixed effects.

Figures

Figure 1
Nationwide Birth Control Pharmacies

Notes: This image was taken from birthcontrolpharmacies.org on 14 Nov 2023. Prospective patients an zoom in on an area or enter their zip code to find a nearby pharmacy. Some entries are duplicates, inflating the numbers shown on the map; some pharmacists may not be listed but still be providing care, deflating the numbers shown on the map.

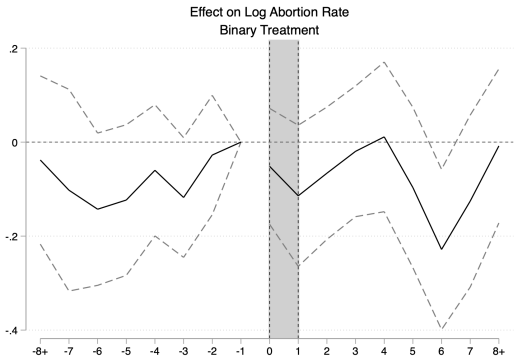
Figure 2
Location Map – Zips and Counties



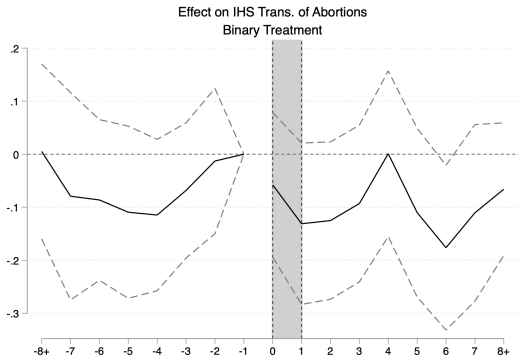
Notes: This map indicates the counties that are treated in bright green, with an overlay of the treated zip codes (based on administrative and website data) in a moss green on top. The diagonally-striped zip codes are those that do *not* have a listed pharmacy or pharmacist prescribing birth control; zip codes that are shaded green and are diagonally-striped are zip codes that are not treated but are being included in the treatment definition at the county level.

Figure 3
Effects – Preferred Specification

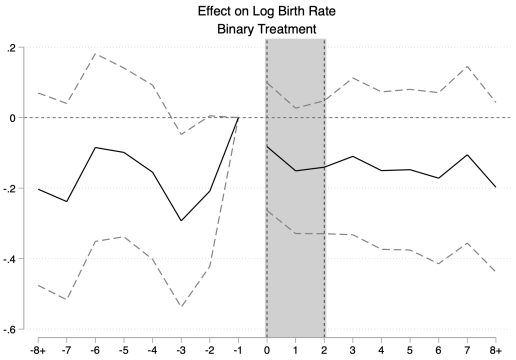
(a) ln(Abortion Rate)



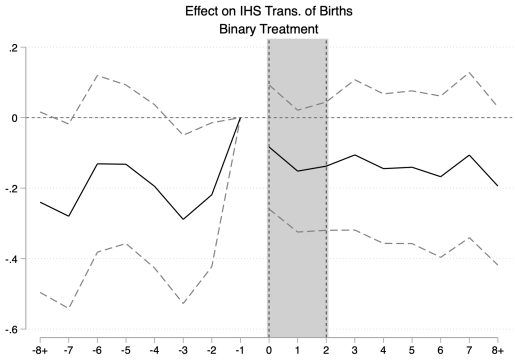
(b) IHS transformation of Abortions



(c) ln(Birth Rate)



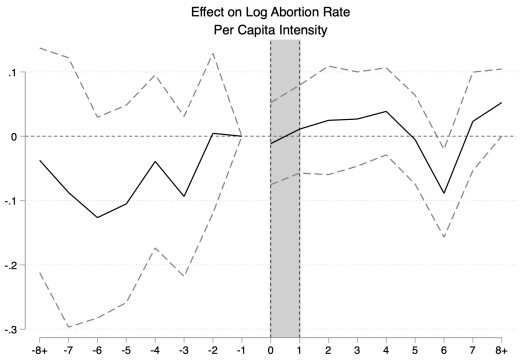
(d) IHS Transformation of Births



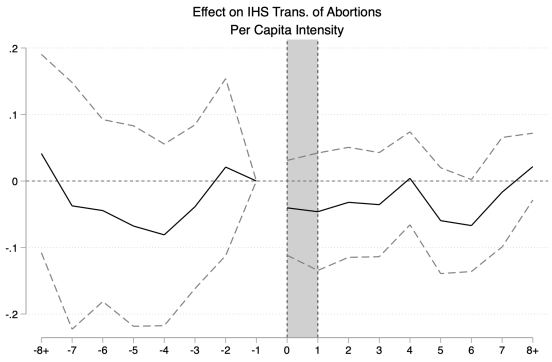
Notes: These figures plot the estimated effects of pharmacist prescription on abortion and birth outcomes. This model includes year and county fixed effects and county-level controls. The shaded region in the figures represents the time frame in which pharmacists were able to prescribe, but impacts should not yet be detected since time must pass from policy implementation to observable outcome.

Figure 4
Effects – Preferred Specification, with Per-Capita Pharmacist Treatment Intensity

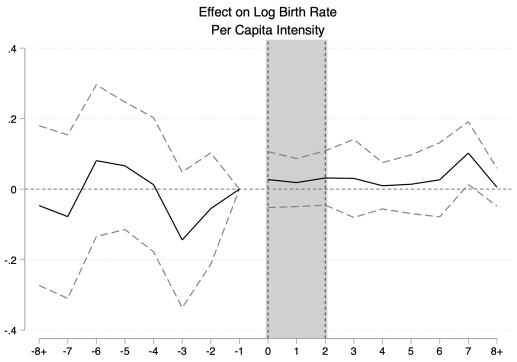
(a) ln(Abortion Rate)



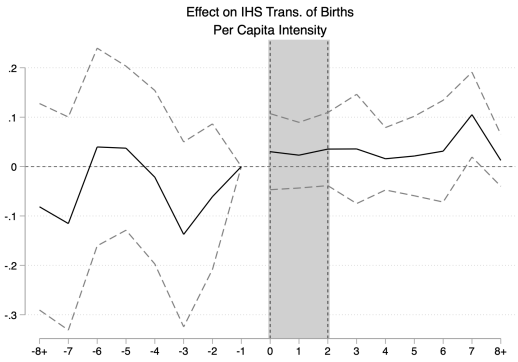
(b) IHS transformation of Abortions



(c) ln(Birth Rate)



(d) IHS Transformation of Births



Notes: These figures plot the estimated effects of pharmacist prescription on abortion and birth outcomes. This model includes year and county fixed effects and county-level controls, and the treatment indicator takes on a value of 1*(pharmacists/capita) for treated counties in the post-period. The shaded region in the figures represents the time frame in which pharmacists were able to prescribe, but impacts should not yet be detected since time must pass from policy implementation to observable outcome.

Appendix

Table A1
Treatment Definitions

	Treated	Comparison
Counties	31	5

Zip Code Treatment – Alternative Measures

	Treated	Comparison
Zip Codes (Administrative)	129	345
Zip Codes (birthcontrolpharmacies.org)	172	302
Zip Codes (any treated)	185	289

Zip Codes by County Treatment Status

	Treated	Comparison
Untreated Zip Codes	270	19
Treated Zip Codes	185	0

Notes: This table shows the number of treated and comparison counties and zip codes. Since many zip codes are untreated but exist in counties that are treated, I argue that my results may be biased against finding detectible effects.

Table A2
Estimated Effects of Pharmacist Prescription on Log Abortion Rates

	(1)	(2)	(3)	(4)
First Quarter After	-0.073	-0.073	-0.074*	-0.072*
	(0.063)	(0.063)	(0.044)	(0.044)
Second Quarter After	-0.027	-0.027	-0.123***	-0.123***
	(0.059)	(0.059)	(0.039)	(0.039)
Third Quarter After	-0.008	-0.007	-0.065	-0.060
	(0.057)	(0.057)	(0.046)	(0.046)
Fourth Quarter After	0.056	0.056	-0.046	-0.040
	(0.073)	(0.073)	(0.047)	(0.048)
Fifth Quarter After	-0.068	-0.068	-0.079	-0.071
	(0.080)	(0.080)	(0.060)	(0.060)
6 Quarters After	-0.205**	-0.205**	-0.250***	-0.245***
	(0.080)	(0.080)	(0.065)	(0.065)
7 Quarters After	-0.127	-0.127	-0.184***	-0.177***
	(0.085)	(0.085)	(0.062)	(0.062)
8+ Quarters After	-0.007	-0.007	-0.194**	-0.185**
	(0.075)	(0.075)	(0.075)	(0.075)
One Quarter Before	0.042	0.042	0.010	0.008
	(0.062)	(0.062)	(0.048)	(0.048)
Two Quarters Before	0.036	0.036	0.014	0.010
	(0.071)	(0.071)	(0.046)	(0.046)
Average effect	-0.057	-0.057	-0.127	-0.122
P-value (test average effect = 0)	0.277	0.278	0.002	0.003
Observations	2590	2590	2590	2590
County Controls	N	Y	N	Y
Population Weighted	N	N	Y	Y

Notes: Standard errors are in parentheses below the point estimates.

Table A3
Estimated Effects of Pharmacist Prescription on the IHS-Transformation of Abortions

	(1)	(2)	(3)	(4)
First Quarter After	-0.088	-0.089	-0.083*	-0.082*
	(0.066)	(0.066)	(0.043)	(0.043)
Second Quarter After	-0.064	-0.065	-0.131***	-0.131***
	(0.065)	(0.065)	(0.039)	(0.039)
Third Quarter After	-0.060	-0.061	-0.082*	-0.078*
	(0.065)	(0.065)	(0.045)	(0.045)
Fourth Quarter After	0.063	0.063	-0.033	-0.029
	(0.076)	(0.076)	(0.048)	(0.048)
Fifth Quarter After	-0.068	-0.069	-0.069	-0.063
	(0.078)	(0.078)	(0.060)	(0.061)
6 Quarters After	-0.117	-0.117	-0.227***	-0.223***
	(0.077)	(0.077)	(0.065)	(0.065)
7 Quarters After	-0.078	-0.079	-0.162***	-0.156**
	(0.082)	(0.082)	(0.062)	(0.062)
8+ Quarters After	-0.022	-0.022	-0.179**	-0.173**
	(0.062)	(0.062)	(0.073)	(0.074)
One Quarter Before	0.051	0.050	0.025	0.023
	(0.068)	(0.069)	(0.050)	(0.050)
Two Quarters Before	0.053	0.053	0.025	0.021
	(0.078)	(0.078)	(0.048)	(0.049)
Average effect	-0.054	-0.055	-0.121	-0.117
P-value (test average effect = 0)	0.302	0.297	0.003	0.004
Observations	3456	3456	3456	3456
County Controls	N	Y	N	Y
Population Weighted	N	N	Y	Y

Notes: Standard errors are in parentheses below the point estimates.

Table A4
Estimated Effects of Pharmacist Prescription on Log Birth Rates

	(1)	(2)	(3)	(4)
First Quarter After	-0.031	-0.032	0.023	0.023
	(0.048)	(0.048)	(0.025)	(0.024)
Second Quarter After	0.014	0.013	0.085***	0.085***
	(0.050)	(0.049)	(0.020)	(0.020)
Third Quarter After	0.009	0.008	0.097	0.098
	(0.085)	(0.085)	(0.076)	(0.077)
Fourth Quarter After	-0.055	-0.055	-0.013	-0.014
	(0.080)	(0.080)	(0.046)	(0.046)
Fifth Quarter After	0.016	0.015	0.108**	0.109**
	(0.081)	(0.081)	(0.044)	(0.044)
6 Quarters After	-0.020	-0.020	0.105	0.103
	(0.099)	(0.099)	(0.081)	(0.080)
7 Quarters After	0.027	0.027	0.098	0.100
	(0.099)	(0.099)	(0.067)	(0.067)
8+ Quarters After	-0.081	-0.081	0.003	0.002
	(0.093)	(0.093)	(0.065)	(0.065)
One Quarter Before	0.092	0.093	0.095	0.091
	(0.093)	(0.093)	(0.086)	(0.086)
Two Quarters Before	-0.112	-0.112	-0.033	-0.036
	(0.075)	(0.075)	(0.052)	(0.052)
Average effect	-0.015	-0.016	0.063	0.063
P-value (test average effect = 0)	0.812	0.806	0.098	0.098
Observations	972	972	972	972
County Controls	N	Y	N	Y
Population Weighted	N	N	Y	Y

Notes: Standard errors are in parentheses below the point estimates.

Table A5
Estimated Effects of Pharmacist Prescription on the IHS Transformation of Births

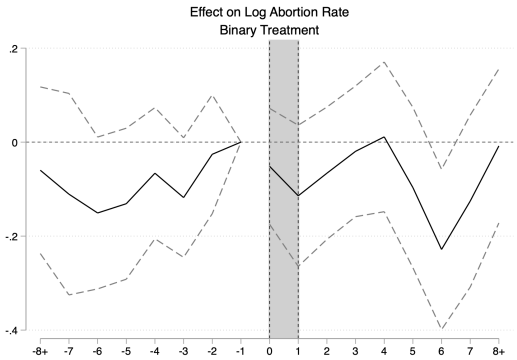
	(1)	(2)	(3)	(4)
First Quarter After	-0.032	-0.033	0.024	0.025
	(0.048)	(0.047)	(0.025)	(0.025)
Second Quarter After	0.014	0.013	0.086***	0.086***
	(0.048)	(0.048)	(0.020)	(0.020)
Third Quarter After	0.013	0.012	0.097	0.098
	(0.081)	(0.081)	(0.077)	(0.078)
Fourth Quarter After	-0.050	-0.050	-0.008	-0.008
	(0.074)	(0.074)	(0.046)	(0.045)
Fifth Quarter After	0.022	0.021	0.115***	0.116***
	(0.076)	(0.075)	(0.044)	(0.044)
6 Quarters After	-0.018	-0.017	0.112	0.110
	(0.092)	(0.092)	(0.081)	(0.080)
7 Quarters After	0.026	0.026	0.101	0.102
	(0.091)	(0.091)	(0.066)	(0.066)
8+ Quarters After	-0.079	-0.078	0.012	0.012
	(0.084)	(0.084)	(0.064)	(0.065)
One Quarter Before	0.093	0.094	0.091	0.087
	(0.091)	(0.091)	(0.085)	(0.086)
Two Quarters Before	-0.123*	-0.123*	-0.039	-0.042
	(0.071)	(0.071)	(0.052)	(0.052)
Average effect	-0.013	-0.013	0.067	0.068
P-value (test average effect = 0)	0.827	0.820	0.076	0.076
Observations	972	972	972	972
County Controls	N	Y	N	Y
Population Weighted	N	N	Y	Y

Notes: Standard errors are in parentheses below the point estimates.

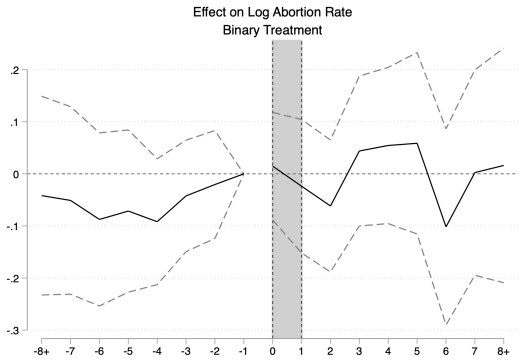
Figures

Figure 1
Effects on Abortion Rates – Natural Log of the Abortion Rate

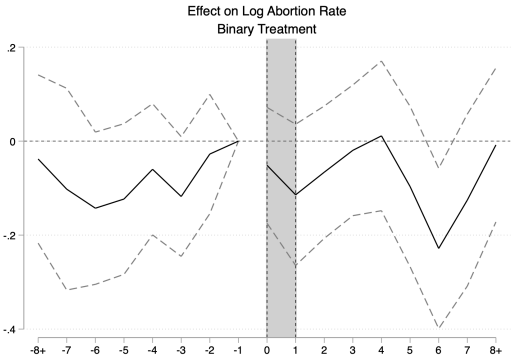
(a) OLS Quarterly



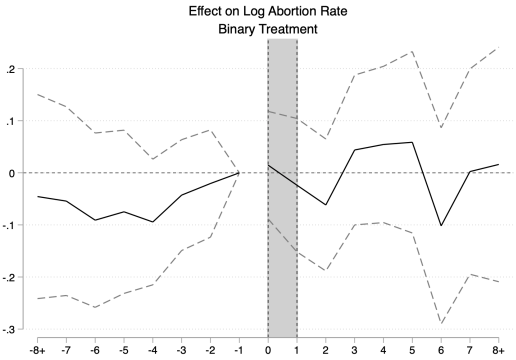
WLS Quarterly



OLS Quarterly, controls



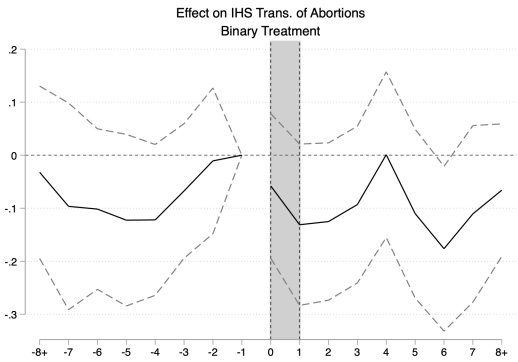
WLS Quarterly, controls



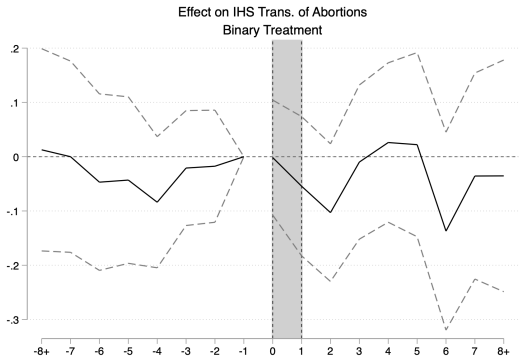
Notes: These figures plot the effects on abortion rate.

Figure 2
Effects on Abortion Rates – IHS(Abortions)

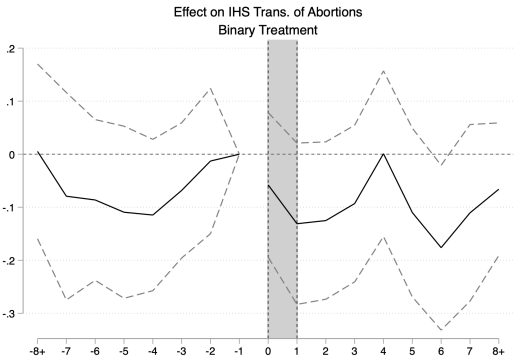
(a) OLS Quarterly



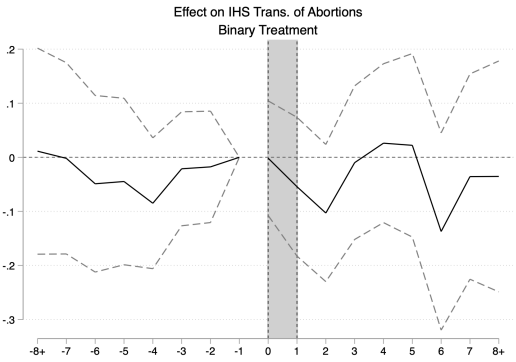
WLS Quarterly



OLS Quarterly, controls



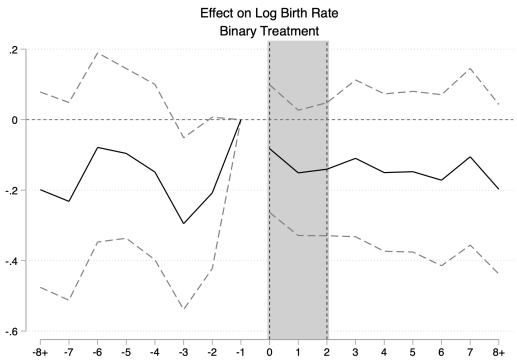
WLS Quarterly, controls



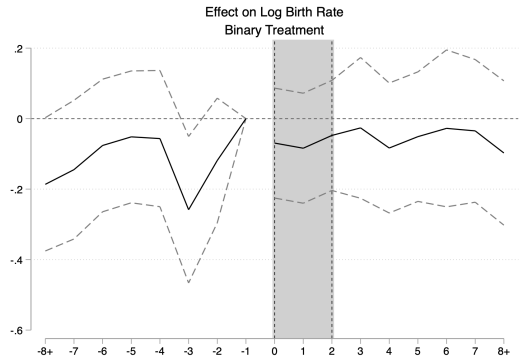
Notes: These figures plot the effects on IHS transformation of abortions.

Figure 3
Effects – Natural Log of the Birth Rate

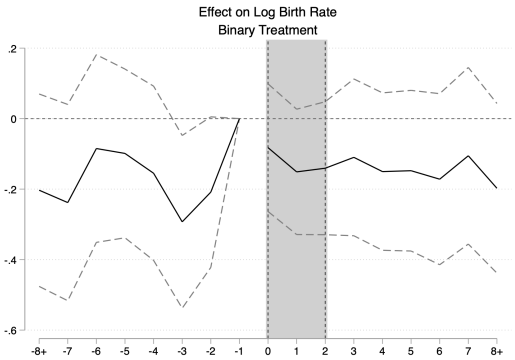
(a) OLS Quarterly



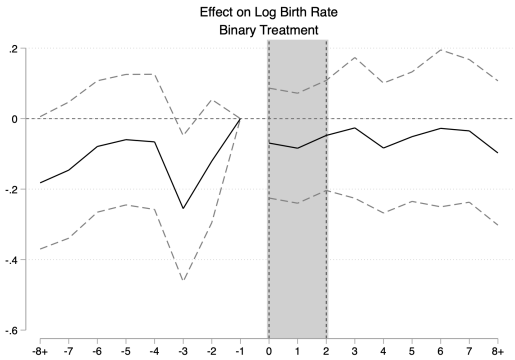
WLS Quarterly



OLS Quarterly, controls



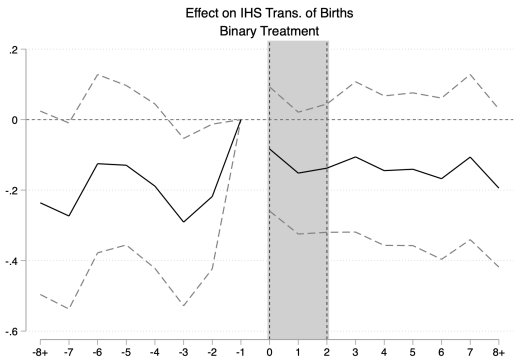
WLS Quarterly, controls



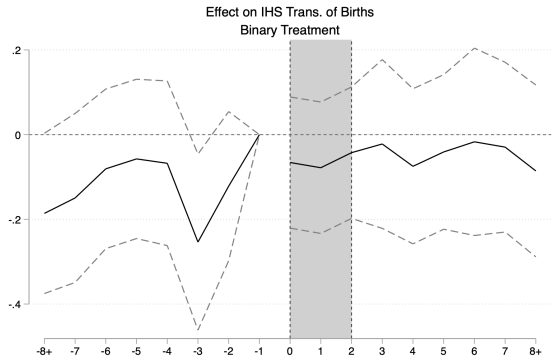
Notes: These figures plot the effects on log birth rate.

Figure 4
Effects – IHS transformation of Births

(a) OLS Quarterly

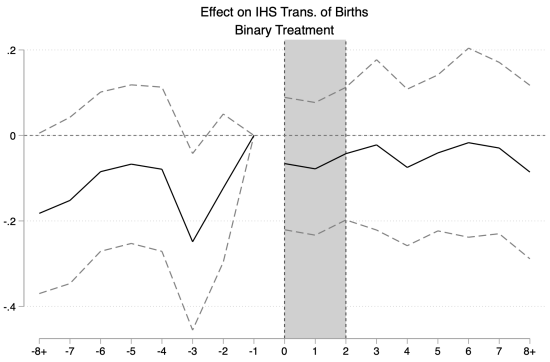


WLS Quarterly



OLS Quarterly, controls

WLS Quarterly, controls



Notes: These figures plot the effects on IHS transformation fo births.