Reproductive Policy Uncertainty and Defensive Investments in Contraception^{*}

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PRELIMINARY - PLEASE DO NOT CITE. COMMENTS WELCOME.

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Abstract

We investigate the role of the volatile reproductive healthcare policy environment in women's choice of a contraceptive method. We model contraceptive choice as a dynamic discrete choice under uncertainty about future pregnancy, abortion access, and contraceptive method costs. Using de-identified patient records from Planned Parenthood of Wisconsin and Planned Parenthood of Northern New England, we evaluate the impacts of four shocks to the policy environment: Wisconsin's 2015 announcement and then passage of its 20-week abortion ban, Maine and Vermont's 2016 reproductive healthcare expansions, and the 2016 presidential election. We find that women are forward-looking, switching to lower failure-rate methods when they expect abortion access may fall and to longer-lasting methods when they expect costs may rise. Next, we build a structural model to explore the policy counterfactuals of fully unconstrained and fully constrained access to contraception and abortion. These counterfactuals show that policy constraints meaningfully shift women away from their preferred method in an unconstrained world, creating large welfare losses for all women – not just those who experience a pregnancy or birth.

Keywords: Dynamic discrete choice, Health, Contraception, Abortion, Family Planning JEL: D81, I12, I18, J13

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1 Introduction

Ninety-nine percent of American women use birth control at some point during their reproductive years (Daniels and Jones, 2013). The ability to time and limit births is crucial for nearly every aspect of women's lives, including health, relationships, financial stress, educational achievement, labor market participation, and their children's well-being. In the aggregate, contraceptive choice influences national economic activity and social structures through its impact on demographics.¹

Yet despite its universal importance, the regulation of reproductive healthcare has become a volatile issue. In the absence of clear federal policy, narrow majorities in state legislatures can pass laws that dramatically change women's access to affordable family planning services and abortion (Myers, 2022).² Within 30 days of the Supreme Court's overturning of the federal protection for abortion established in Roe vs. Wade (1979), thirteen states had banned nearly all abortions³ and some states are debating restricting access to contraceptives like Plan B and intrauterine devices (IUDs) that would end a pregnancy if used soon after conception. This intensification of policy uncertainty follows decades of state laws that encroached on the protections described in Roe (Myers, 2022). Indeed, more than 1,300 abortion restrictions were passed between the deciding of Roe vs. Wade and June of 2021.⁴

This paper examines the role of this volatile policy environment on women's choice of a contraceptive method. We model contraceptive choice as a dynamic discrete choice under uncertainty not only about future pregnancy, but also about future abortion access and contraceptive method costs. In a reduced form analysis of individual panel data, we show that women respond to shocks to beliefs about future policy by making defensive investments in methods that can shield them from adverse policy change. Next, we build a structural model to calculate welfare impacts from policy counterfactuals. We show that restrictive reproductive healthcare regulation reduces the welfare of all women, including those who do not experience a pregnancy. This welfare reduction is driven by the weak substitutability of contraception and abortion. When abortion is available, women can prioritize other attributes of contraceptive methods beyond their failure rates. However, if abortion is unavailable, the need to choose a method with a low failure rate pushes women to select methods whose other attributes are less suitable. This means that the welfare impacts of an abortion ban are not fully measured by a change in births: many women will stabilize their probability of an unwanted birth by switching to a more effective method that imposes other costs. In this paper, we directly measure these welfare impacts.

Intuitively, women in our model choose a sequence of contraceptive methods to maximize utility over their reproductive years, based on utility from method attributes, disutility from unintended pregnancy and

¹See for example Bailey (2012); Cesur et al. (2019); Kearney and Levine (2009); Kelly et al. (2020); Guldi (2008); Goldin and Katz (2002); Radhakrishnan (2010); Bailey et al. (2012); Bailey (2013), and Bhattacharya and Chakraborty (2017); Liao (2013); Guilkey and Jayne (1997), discussed further below.

 $^{^{2}}$ Throughout, we use the term 'woman' to refer to cisgender women of reproductive ages who have sex with cisgender men. Due to limited data on the contraceptive and abortion decisions of trans and gender-diverse people, we are unable to extend our analyses to cover these populations as well.

³Guttmacher Institute, August 2022.

⁴Guttmacher Institute, June 2022.

unwanted birth, and disutility from out of pocket costs. The choice of a method today affects future pregnancy, births, and costs. Women form beliefs over future access to abortion that inform their expectations about the probability of carrying an unwanted pregnancy to term conditional on choosing a given method. They also form beliefs about future contraceptive method costs based on policy discussions about health insurance coverage. In this dynamic setting, we can identify how a political shift which does not change current abortion or contraceptive costs could still impact women's reproductive choices today if it changes *expectations* about the future.

This framework predicts that women respond to shocks to their expectations about future contraceptive costs and abortion access by switching to methods that insulate them from risk. First, negative shocks to expectations about future abortion access will cause an increase in switches to more effective methods. Second, positive shocks to expectations about future contraceptive costs will increase the probability of switching to long-lasting methods. Long-Acting Reversible Contraceptives (LARCs), such as intrauterine devices (IUDs) and implants, last 3-10 years, insulating users from changes in cost and providing near-zero failure rates.

We test these predictions using data on the universe of visits to Planned Parenthood of Wisconsin and Planned Parenthood of Northern New England health centers from 2014-2020. These data include the full reproductive health histories of 280,983 women at all Planned Parenthood health centers in Wisconsin, Maine, New Hampshire, and Vermont, including contraceptive method, pregnancy, and abortion history. This variation over space and time allows us to test the model predictions using four shocks to the reproductive healthcare policy environment: the Wisconsin governor's 2015 promise to implement a 20-week abortion ban, its passage into law, Maine and Vermont's 2016 expansion of insurance coverage for reproductive care, and the 2016 presidential election.

While the first three shocks clearly affect beliefs about the reproductive policy environment, the presidential election requires some explanation. There is strong qualitative evidence that women were worried about reduced access to reproductive healthcare after the 2016 election. The winning candidate campaigned on restricting abortion access and repealing the Affordable Care Act (ACA), which had widely expanded health insurance coverage including coverage for contraception. Although neither campaign promise came to pass at the federal level, the possibility was widely reported. In an online survey of 2,158 US women ages 15-44, 42% said they worried that contraception would become harder to get after the election due to rising prices, closures of Planned Parenthood and other family planning health centers, and reduced access to abortion (Judge and Borrero, 2017). Nearly one in ten switched to a new contraceptive method after the election, and 5.3% chose a LARC. Ninety percent of these new LARC users said that the election directly influenced their decision. They wanted a method that would last longer (86%) and/or worried they wouldn't be able to get a LARC in the future (68%). Using commercial health insurance data, Pace et al. (2019) document a 21.6% increase in LARC insertions among enrolled women aged 18 to 45 years in the month after the 2016 election compared to the month before. We validate this in our own data using Google trends. Monthly LARC insertions are positively and significantly correlated with searches for the terms "Repeal and Replace," "ACA," "ACA," "ACA Birth Control," "Trump Abortion Executive Order," and "Roe v. Wade."⁵

These events allow us to test the model predictions using a series of event studies. First, Wisconsin's abortion ban allows us to test whether an increase in the expected probability of losing access to abortion in the future caused women to switch to lower-failure rate methods. Second, Maine and Vermont's healthcare expansion allows us to test whether reducing out-of-pocket costs for contraception leads more women to choose more expensive (and usually more effective) methods. Finally, the 2016 presidential election allows us to test whether shocks to expectations about future costs and abortion access caused women to preemptively switch to methods that could shield them from future policy change.

We find that switches to more effective methods spiked by 202% in Wisconsin in the three months between the ban's announcement and passage. After the ban passed, switches increased by an additional 22%. We also find that switches to more expensive, more effective methods increased in Northern New England as soon as the healthcare expansion passed. Finally, we find that switches to LARCs increased everywhere in the six months after the 2016 election by an average of 19%. All estimates are significant at the one percent level and survive a variety of robustness checks. These results suggest that expectations about the loss of reproductive healthcare causes women to make defensive investments in contraceptive methods that can shield them from future shocks.

These findings offer important insight into how women trade off key attributes of different contraceptive methods and how restrictions on access to reproductive care may shift women away from the methods that best suit their body and lifestyle. Over the past 30 years, a wider variety of methods has become available in the US. These methods vary greatly in attributes that women care about: price, failure rate, frequency of application, forgettability, side effects on acne, weight, and menstrual cycle, STI protection, and duration (Fiebig et al., 2011; Madden et al., 2015). If all contraceptive methods were freely available and abortion were universally accessible, then women would choose the method that best fits their body and lifestyle.

However, loss of access to abortion induces women to prioritize methods with lower failure rates because the probability of unwanted birth is a function of both unintended pregnancy and abortion access. We show that women who want to avoid births shift to methods with lower failure rates when they fear abortion may become less available. This result is consistent with several earlier papers which characterize contraception and abortion as weak substitutes. Levine and Staiger (2002) model abortion as an insurance policy against unwanted pregnancies, predicting that freer access to abortion would cause pregnancy to increase and births to decrease because women would have less incentive to avoid pregnancy in the first place. Similarly, Kane and Staiger (1996) find that small reductions in abortion access can lead to small reductions in births, suggesting that women try harder to avoid pregnancy when abortion is not available. Jones (2015) finds

⁵See Appendix Table 10. We report coefficients from regressing the count of monthly LARC insertions at each health center on the prevalence of searches for the terms "Repeal and Replace", "ACA", "ACA Birth Control", "Trump Abortion Executive Order", and "Roe v. Wade." Prevalence is measured on a scale from 0 to 100, where 100 is peak prevalence. Each search term is positively and significantly correlated with the number of LARC insertions, controlling for health center and year fixed effects and state-year trends.

that Ghanaian women use abortion as a substitute for reduced access to contraception as they try to achieve a target fertility goal. Finally, Sabia and Anderson (2016) show that parental involvement laws, which require parental consent for a teenager's abortion, cause teens to increase their use of birth control.

Motivated by these reduced form results, we develop a structural model of contraceptive and abortion choices to better understand the consequences of policies that expand or restrict access to contraception or abortion. One limitation to the reduced form analysis is that we cannot fully isolate whether the policy impacts work through changes in access to abortion, access to contraception, or changes in beliefs about future access. Policy changes in the real world tend to be correlated across time: a state which passes a law restricting abortion access might reasonably be expected to restrict funding to Planned Parenthood in the future, which would reduce access to contraception. By making some assumptions about the choice structure faced by agents making reproductive health decisions, we can use the model to test how agents respond to a single shock holding all else constant relative to a correlated shock to both contraception and abortion access. In particular, the structural model allows us to explore the impacts of policy scenarios which are currently being implemented following the 2022 Supreme Court ruling in Dobbs v. Jackson Women's Health Organization, which struck down the federal protection for the right to abortion established in Roe v. Wade. Though it is too early to to observe the long-term impacts of this decision in data, we can explore the impact of simulations of similar abortion restrictions with our model.

We model the contraceptive choices of women aged 20 to 29 who have sex with men and want to avoid birth. In each period, a woman chooses which contraceptive method to use. This choice impacts both their current utility through its monetary cost and the non-pecuniary value of its other attributes, and their future utility through the likelihood that they get pregnant in the next period. If pregnant, they must then decide whether to carry the pregnancy to term or seek an abortion, where we allow the costs of getting an abortion to vary by region. Using maximum likelihood, we estimate the model on the pre-2016 election subset of the data. The model predictions closely match the pre-period data.

We then use this model to estimate how large a shift in beliefs about future access must be to induce the contraceptive choice changes seen in the reduced form. In the model, women believe there is some probability π_c that in future periods they will no longer have contraception covered by insurance and some probability π_A that they will not be able to access an in-state abortion. Holding the preference parameters estimated on pre-2016 data constant, we use simulated method of moments to estimate the values of π_C and π_A that induce the level of switching seen post-2016 election. We find that women's contraceptive choices are explained by women believing there is now only a 60% chance of having insurance coverage for contraception in the future and a 75% change of having access to in-state abortion. These changes in beliefs alone are associated with an average decline in utility of 1.1%.

Next, we use the model to explore several policy counterfactuals: free, unconstrained access to all contraceptive methods and abortion; free contraceptives but no access to abortion; costly contraceptives but free abortion; and costly contraceptives and no access to abortion abortion. We show that policies which make contraception free while shutting down the option of abortion induce women to switch away from ineffective methods such as no method, reducing the pregnancy rate by 2.1pp. When both contraception and abortion are free, some women choose to switch away from methods that are effective at preventing pregnancy but not preferred for other reasons like side effects, ease of use, or required visits to the doctor. This results in a small increase in the pregnancy rate, but a larger increase in the abortion rate.

In contrast, policies that shut down abortion decrease both the pregnancy rate and the abortion rate, in part because women switch to methods that provide lower utility but are more effective. In the counterfactual with no access to abortion, women increase LARC usage by 0.8pp (5%) and decrease usage of no method by 2.7pp (79%). When both contraception and abortion are more costly, there is an increase in use of over-the-counter methods that is larger than in scenarios when only abortion is costly. This suggests that some women cannot afford more expensive, more effective methods even though the reduction in abortion access means they value efficacy more highly.

Lastly, we use the structural model to conduct welfare comparisons across these counterfactuals. Our model suggests that welfare in the fully unconstrained model improves by approximately \$4,448 (1.8%) per woman during their 20s alone, whereas welfare declines by approximately \$10,726 (4.3%) per woman during their 20s in the scenario in which both abortion and contraception are made more costly.⁶ The welfare costs imposed by a more restrictive reproductive healthcare policy environment are driven by more than just the additional monetary costs. We show that 80% of women in our model change their behavior in some way in response to the costly contraception and abortion scenario, and the loss in welfare stems in large part from women switching to methods that are more effective but provide less utility for others reasons (e.g., side effects, increased doctor visits, ease of use). Multiplied by the population of women in their 20s, the restrictive policy environment causes welfare losses of \$225 billion compared to a \$93 billion welfare increase in the unconstrained environment.

This paper contributes to a literature examining how people adapt to adverse environmental shocks through defensive investments in costly technology. To date, the literature on defensive investments has focused mainly on adaptation to environmental bads like tropical cyclones (Hsiang and Narita, 2012), heat waves (Barreca et al., 2016), air pollution (Deschenes et al., 2017), and water quality violations (Zivin et al, 2011). Our findings on the use of contraception as a defensive investment allow us to consider how people adapt to an adverse policy environment rather than physical environment.

This work also contributes to the understanding of contraception as a dynamic discrete choice. Economists began modeling fertility decisions using dynamic frameworks in the 1980s, exploring how couples achieve a target number of children under uncertainty about infant survival (Wolpin, 1984; Newman, 1988) and fecundity (Rosenzweig and Schultz, 1985). In their seminal paper introducing conditional choice probabilities as a way to estimate dynamic discrete choice models, Hotz and Miller (1993) use couples' contraceptive choice to achieve optimal fertility as the example application. Carro and Mira (2006) model Spanish couples'

 $^{^{6}}$ Welfare in our setting is defined as total utility from reproductive outcomes from age 20 to 29.

dynamic discrete choice of contraceptive method to maximize utility from the number and timing of children. Radhakrishnan (2010) studies the role of tradeoffs between the costs and benefits of having a child on women's contraception and employment sector choice in Indonesia. Most of these models address optimal fertility among committed female-male couples.⁷ In contrast, we focus on the decisionmaking of women seeking to avoid pregnancy.

A clear understanding of how women choose a contraceptive method is important because of its tremendous impact on life outcomes. A large literature establishes that increasing access to family planning drives significant, persistent reductions in fertility, especially among poor women (Bailey, 2012; Cesur et al., 2019; Kearney and Levine, 2009; Kelly et al., 2020; Guldi, 2008). Better control over the number and timing of children helps women achieve more in their careers (Goldin and Katz, 2002; Radhakrishnan, 2010; Bailey et al., 2012). Access to the pill drove 10% of the convergence of the gender wage gap in the 1980s and 30% in the 1990s (Bailey et al., 2012). The benefits accrue to the next generation, too: the children of women with access to contraception are more likely to graduate college, have a job, and earn higher incomes (Bailey, 2013). On the other hand, policies that restrict access to contraception and abortion cause significant reductions in the abortion rate and increases in the birth rate (Lindo and Packham, 2017; Kelly, 2019; Fischer et al., 2017; Venator and Fletcher, 2020; Packham, 2017), disrupting educational attainment and career paths. Out-of-pocket costs also continue to prevent uninsured, low-income women from purchasing their preferred contraceptive (Bailey et al., 2023). In the aggregate, the policies that affect contraceptive choice influence national economic activity and social structures through their impact on demographics (Bhattacharya and Chakraborty, 2017; Liao, 2013; Guilkey and Jayne, 1997).

This paper fills an important knowledge gap by identifying the impact of reproductive policy change on 1) contraceptive method choice and 2) on women who do *not* experience an abortion or birth. Most of the existing literature examines impacts on abortion and births and then traces the effect of those events on other life outcomes. These outcomes are important, but they provide an incomplete picture of policy impacts because they are experienced by relatively few people. In contrast, our model predicts that 80% of women would change their method if abortion were banned and contraception were no longer covered by insurance, and estimates large reductions in welfare even for women who do not experience pregnancy due to switches to methods with lower failure rates but less-preferred other attributes. By bringing individual-level data to a dynamic discrete choice model, we provide new insight into how individual women choose a contraceptive method in response not only to their preferences over its attributes, but also to the changing policy environment. Understanding the tradeoffs women face in making this choice has important implications for federal and state policymakers, as well as reproductive healthcare providers.

The next section of this paper will overview contraceptive methods in the US, the policy environment during the study period, and the theoretical framework that generates our predictions about women's contraceptive choice behavior. Section 3 presents the research design and data. Section 4 discusses reduced

 $^{^{7}}$ An exception is Arcidiacono et al. (2012), which models teenagers' joint dynamic discrete choice of sexual activity and contraceptive method.

form results. Section 5 introduces the structural model of contraceptive and abortion decisions and discusses the impacts of several policy counterfactuals. Section 8 concludes.

2 Contraceptive methods in the United States

By the start of the study period in 2014, contracepting women in the United States could choose from a wide variety of methods. These methods fall into six broad categories: over the counter, scheduled hormonal (pill/patch/ring/injection), LARCs (intra-uterine device (IUD)/implant), partner sterilization (vasectomy), and sterilization.

Over the counter methods can be bought at a pharmacy; they include male and female condoms, spermicide, and the sponge.⁸ Scheduled hormonal options like the pill, patch, ring, and injection must be used on a precise schedule so that they can release small doses of hormones that prevent pregnancy. LARCs, including the IUD and implant, are small devices inserted into the body that work by continuously releasing small doses of hormones or copper ions toxic to sperm. Vasectomy refers to male sterilization via a minor surgery that prevents sperm from entering semen. Female sterilization refers to tubal ligation, a surgery in which a woman's fallopian tubes are sealed so that the egg cannot be fertilized.

Each of these methods varies meaningfully in key attributes that women value. Clinical research shows that women care about the failure rate, side effects such as weight gain and acne, the impact on menstruation,⁹ frequency of application, whether the method is 'forgettable' or requires repeated action, the difficulty of obtaining it, and the ease of stopping use (Madden et al., 2015; Fiebig et al., 2011). Table 1 summarizes attributes and Table 2 summarizes costs based on Planned Parenthood's sliding scale. The least effective category is over the counter methods. Conservatively, these methods have a typical use failure rate of 15% and a perfect use failure rate of 2%. The pill, patch, and ring have a typical use failure rate of 8% and a perfect use failure rate of 0.3%, and the rates for injections are 3% and 0.3%. LARCs are much more effective because they eliminate the gap between typical and perfect use. Once inserted, they are fully 'forgettable' and the user does not need to do anything to promote effectiveness. The failure rate for LARCs is 0.05%. Similarly, vasectomy and female sterilization are highly effective, with failure rates below 0.04%.

Although LARCs and sterilization are the most effective methods, there are tradeoffs that mean some women prefer other methods. Table 1 also summarizes side effects on menstruation, how to obtain the method, and the ease of stopping use. Methods that are not 'forgettable' are easy to stop – you just stop administering them. In contrast, LARCs must be removed by a nurse and sterilization is permanent. Costs also vary significantly, and there is ample evidence that cost barriers prevent many women from choosing more expensive, more effective methods (Trussell et al., 2009; Foster et al., 2015; Lindo and Packham, 2017;

⁸We observe more specific contraceptive methods in the data and aggregate them into these categories. We assign natural family planning to the over the counter category rather than 'no method' because it is more effective than no method. We also assign abstinence to the over the counter category because we still observe some pregnancies to people who say they are abstinent. This makes any estimates of the risk of pregnancy reduction due to switching away from over the counter more conservative.

⁹Some hormonal methods reduce or eliminate menstruation, although the impact varies across women.

Secura et al., 2010), even though they may be more cost-effective over time when considering the costs of unintended pregnancy and birth (Trussell et al., 2009).

Since the technology improved in the 1980s, more women have been choosing to use LARCs, especially women aged 25-34 and women who have already had at least one birth (Branum, 2015). Although LARCs have a high up-front cost, that barrier fell for many women with the passage of the Affordable Care Act in 2010. The ACA expanded healthcare coverage dramatically, reducing the number of uninsured Americans by an estimated 20 million by 2016 (Garrett and Gangopadhyaya, 2016). The ACA lowered the cost of an IUD to \$0 for 87% of women by March 2014, compared to only 42% of women in January 2012 (Bearak et al., 2016). If cost and knowledge barriers were fully eliminated, experts predict that LARC use would more than double (Foster et al., 2015). However, even without any barriers, many women would still prefer another method due to variation in body and lifestyle suitability (Foster et al., 2015; Secura et al., 2010).

2.1 Policy environment

From 2011-2019, Wisconsin repeatedly restricted access to reproductive care. In 2011, Act 32 denied state and federal family planning funding to entities that provide abortion. Planned Parenthood, Wisconsin's sole federal Title X grantee¹⁰ at the time, lost roughly \$1 million in state funding. In 2012, Act 217 required women to make multiple, in-person appointments prior to an abortion. In 2013, Act 37 implemented a series of Targeted Regulation of Abortion Providers (TRAP) laws that created new barriers to abortion. The law requires women to undergo fetal ultrasounds and listen to a verbal description of the fetus, and requires physicians to have admitting privileges at a hospital within 30 miles, although a court injunction blocked the state from fully implementing the admitting privileges requirement. From 2009-2017, two out of Wisconsin's five abortion health centers closed (Venator and Fletcher, 2020).

These earlier policy changes provide important context for understanding women's perceptions about the risk of losing future access to reproductive care during the study period, from 2014-2020. The threat of policy change was highly credible when Scott Walker announced his intention to enact a 20-week abortion ban on March 3, 2015 Kertscher (2015). This legislation, Act 56, was introduced in the state legislature in May 2015 and passed in July 2015. Under the law, doctors who terminate pregnancies after 20 weeks in non-emergency situations can be charged with a felony and face up to three years in prison and a \$10,000 fine (Wisconsin, 2015).

In contrast, Maine, New Hampshire, and Vermont provide relatively expansive reproductive healthcare. They have all either expanded their Medicaid programs under the ACA or introduced their own plans to extend reproductive healthcare to low-income state residents, and they do not restrict coverage for abortion in private insurance plans or have TRAP laws.

In 2016, both Maine and Vermont introduced policies that significantly reduced the cost of reproduc-

¹⁰Title X of the federal Public Health Service Act is a program of federally-funded family planning health centers. Passed in 1970, the Act funds health centers to provide contraceptive services to "all persons desiring such services...without regard to religion, creed, age, sex, parity, or marital status" (Public Health Service Act 1970; 1978).

tive healthcare. Maine extended free family planning coverage to low-income Mainers with the MaineCare Limited Family Planning Benefit, expanding access to an estimated 12,000-14,000 additional people (Maine Department of Health and Human Services, 2016). Vermont codified the ACA birth control benefit into state law so that even if the ACA were repealed, state residents would continue to enjoy the same comprehensive birth control access. The law guarantees every resident access to no-cost federal birth control benefits as well as vasectomies, which are not covered federally (Vermont, 2016). It also enabled women to fill a full year's prescription for the pill at once and eliminated financial barriers for LARCs. Given their geographic proximity, integrated Planned Parenthood system, and joint shocks, we treat all of Northern New England (NNE) as experiencing a negative shock to contraceptive costs in 2016.¹¹

Finally, the 2016 presidential election created a national shock to expectations about future reproductive policy. Women worried that the new administration would reduce access to abortion and health insurance coverage for contraception (Judge and Borrero, 2017) and some women switched to more effective, longer-acting contraceptive methods (Judge and Borrero, 2017; Pace et al., 2019).¹²

In June 2022, the Supreme Court's decision in Dobbs vs. Jackson removed the federal protection for abortion access established in Roe vs. Wade (1973) and upheld in Planned Parenthood vs. Casey (1992). The removal of these protections immediately reverted Wisconsin to an 1849 law banning abortion except when three physicians agree it is necessary to save the life of the mother (Wisconsin State Legislature, 1849). Abortion policy in Maine, New Hampshire, and Vermont has not changed. Although Dobbs vs. Jackson was decided after our study period, our structural model can speak directly to its impact on both contraceptive choice and abortion in Wisconsin.

2.2 Conceptual Framework

In this changing policy environment, the choice of an optimal sequence of contraceptive methods is a dynamic discrete choice under uncertainty. The choice is dynamic because the choice of a method today affects the probability of pregnancy and birth in the future, and because long-lasting contraceptives can lock in the price paid for contraception in the future.

The choice is made under three sources of uncertainty. First, the probability of unintended pregnancy conditional on choosing j is given by its failure rate. We assume that women know these failure rates. Second, the probability of remaining pregnant, if unwanted, depends both on having become pregnant and on abortion access. Women form beliefs over future access to abortion that inform their expectations about the probability of carrying an unwanted pregnancy to term conditional on choosing j. Finally, women form

 $^{^{11}}$ The data include the health center that each woman visited, but not their residence. This means we cannot observe whether some Vermont residents visited a New Hampshire health center, for example.

¹²We document evidence of this effect among women in our sample using data on trending Google search terms. Appendix Table 10 reports coefficients from regressing the count of monthly LARC insertions at each health center on the prevalence of searches for the terms "Repeal and Replace," "ACA," "ACA Birth Control," "Trump Abortion Executive Order," and "Roe v. Wade." Prevalence is measured on a scale from 0 to 100, where 100 is peak prevalence. Each search term is positively and significantly correlated with the number of LARC insertions, controlling for health center and year fixed effects and state-year trends.

beliefs about the future monetary costs of each contraceptive method based on policy discussions about health insurance coverage.

Consider each contraceptive method to have four dimensions: monetary costs; non-pecuniary costs and benefits such as side effects, ease of use, requiring a doctor's visit; duration; and failure rate. The first two dimensions impact current utility, but the duration and failure rate affect future utility. If costs vary across periods, choosing a long-lasting method locks in the current price with certainty. The failure rate impacts utility through the likelihood of getting pregnant in the next period. For people who want to avoid births, a lower failure rate is preferable and its weight relative to costs in the current period will vary depending on the cost of birth, the cost of avoiding a birth through abortion, and how they compare a current, certain cost against an uncertain future cost. As described above, the most effective methods often cost more up-front and have non-monetary characteristics that some people disprefer, such as requiring the insertion of an IUD or implant by a nurse rather than taking a daily pill at home.

This framework in which women choose between high-cost, high-efficacy and low-cost, low efficacy methods generates clear predictions about how changes to these costs would impact women's decisions. First, a policy which reduces expected future access to abortion should cause women to switch to more effective methods, because it increases the expected future costs associated with pregnancies. Second, a policy that subsidizes the monetary cost of contraceptives, holding non-pecuniary costs, efficacy, and abortion access constant, should cause women to switch to more expensive methods. In practice, this means we will observe women switching to more effective methods because of the strong correlation between prices and efficacy, although it may also cause switches to a method that has more favorable non-pecuniary characteristics for a given person (e.g., a switch from the Pill to an injection, which have similar failure rates but an injection does not require remembering to take a pill on a daily basis, or a switch to a method that has beneficial side effects). Lastly, a policy which increases uncertainty about future costs for contraceptives (e.g., repeal of the ACA) should increase switches specifically to LARCs because uncertainty over future costs increases the value of locking in a certain price for contraceptives now relative to paying a new, unknown price every period.

3 Research design

To test these predictions, we exploit four shocks to expected abortion access and costs. Scott Walker's announcement of his intention to pass a 20-week abortion ban provides a negative shock to expectations about future abortion access in Wisconsin only; similarly, its passage reduces abortion access in Wisconsin only. We treat Vermont's healthcare expansion as a negative shock to costs and a positive shock to abortion access across all three states in Northern New England, since we do not observe women's state of residence and women may seek care in any nearby health center. Finally, the 2016 presidential election created a positive shock to expected future costs and a negative shock to expected future abortion access in every

state.

We identify the impact of these shocks using event studies that capture changes in the monthly probability of switching to a given type of method. For woman i visiting health center c in state s in monthly t,

$$y_{icst} = \sum_{t}^{T} \beta_t d_t + X_{it} \alpha + X_i \delta + \gamma_c + t_s$$
(3.1)

where X_{it} includes age, insurance status, number of past pregnancies, number of past abortions, a dummy for being pregnant at time t, and a dummy for having an abortion at time t, and X_i includes race and ethnicity. We include health center fixed effects γ_c and cluster standard errors at the health center level. We run these specifications separately for each policy context to test each model prediction, adding state time trends t_s for the two shocks involving multiple states: the Northern New England healthcare expansion (Maine, Vermont, New Hampshire) and the 2016 presidential election (all states). We report coefficients beginning five months before the shock and ending twelve months after to avoid confounding the effects with the effects of other policy shocks.

The identifying variation in these event studies comes from the timing of the policy shocks. It is possible that other unobserved events could be driving or confounding the results if they coincided with the healthcare expansion, abortion ban, or presidential election. As robustness checks, we run two additional specifications. First, we run a difference-in-differences style event study comparing the treated states to the untreated states around each state-level event, restricting the event window to make sure it is not contaminated by events in other states:

$$y_{icst} = \sum_{t}^{T} \beta_t d_t \cdot T_s + X_{it} \alpha + X_i \delta + \gamma_c + t_s$$
(3.2)

where T_s is a dummy for being in the treated state.

This difference-in-difference specification exploits differences in exposure to the policy shock at the same point in time by comparing treated states to untreated states.¹³ It controls for any common trends or events shared across states, but it does not address the concern that the treated state may have experienced an additional unobserved shock concurrent with the state-specific shock.

We address this concern by exploiting within-state variation in the intensity of exposure to the Wisconsin abortion ban. The abortion ban is more binding for women who live far away from the nearest out-of-state health center. We use the following specification to study heterogeneity in the response to the Wisconsin abortion ban by distance from women's observed health center to the nearest out-of-state health center:

$$y_{icst} = \sum_{t}^{T} \beta_t d_t \cdot km_{ct} + X_{it}\alpha + X_i\delta + \gamma_c$$
(3.3)

 $^{^{13}}$ In Appendix Figure 14, we also show that there was no change in county-level employment around the timing of the presidential election.

where km_{ct} is an indicator for health center c being in a given distance bin in monthyear t.

Finally, we contrast the change in switches to methods that our framework predicts should and should not respond, by estimating by Equation 3.1 for different methods. For example, our framework predicts that switches to all lower failure methods should increase after the Wisconsin abortion ban (a shock to abortion access), but switches specifically to LARCs should increase differentially after the 2016 presidential election (a shock to expected future costs). In other words, LARCs should make up a larger share of observed switches to lower failure methods after the 2016 election than after the abortion ban. Similarly, we expect the election to have a large impact on LARC uptake relative to methods that reduce the risk of pregnancy but do not protect against cost increases. These robustness checks test the mechanisms proposed by our conceptual framework.

3.1 Data

We use data on the universe of visits to Planned Parenthood of Wisconsin and Planned Parenthood of Northern New England health centers from 2014-2020, subsetting to women ages 15-45 who do not report having a same-sex partner. These data include the full reproductive health histories of 280,983 women at Planned Parenthood health centers in Maine, New Hampshire, Vermont, and Wisconsin, including contraceptive method, pregnancy, and abortion history. In each of these states, Planned Parenthood is a major provider of reproductive care, serving approximately 36,000 individual women age 15-44 (15.4% of all women age 15-44) in Maine, 43,000 (17.5%) in New Hampshire, 56,000 (48.5%) in Vermont, and 126,000 (10.0%) in Wisconsin from 2014 to 2019. Figure 1 maps health center locations over the county population of women age 15-44.

Tables 3, 4, and 5 reports summary statistics for these women for the windows surrounding the events we study, beginning six months before and ending twelve months after each shock. Overall, Planned Parenthood clients range in age from 15 to 45, with an average age of 26 years. Most visitors had either health insurance or access to a state family planning program at the time of their visit, although only around a third had private insurance. The majority of visitors reported their race as White, though Black and Hispanic patients are overrepresented relative to the general population in these states.¹⁴ Only 12.0% of visits were for care while pregnant and only 8.9% were for abortion care. The most common motivation for a visit is contraceptive care, with relatively high rates of switching methods and of switching to LARCs. Figure 2a shows the number of visitors using each method in each study month for the full sample, and Figure 2b shows the number of women who switched to a LARC.

Rates of pregnancy and abortion vary widely by contraceptive method, as shown in Figure 3a. The most effective contraceptive methods are sterilization, partner sterilization, injection, and LARCs. Rates of pregnancy are higher in this sample than in clinical trials due to selection – women often go to Planned

 $^{^{14}}$ In the 2010 Census, the share of White residents was 86.6% Wisconsin, 94.4% in Maine, 92.8% in New Hampshire, and 94.0% in Vermont.

Parenthood *because* they became pregnant unexpectedly.

Although Planned Parenthood provides prenatal care and fertility therapy, women seeking to avoid pregnancy are likely to be overrepresented relative to the general population. Many women with private insurance are likely to visit another provider for pre- and postnatal care during desired pregnancies. That selection works in our favor since our goal is to study the decisionmaking of women seeking to avoid pregnancy. The inclusion of some women who do want pregnancy introduces downward bias, making our estimates conservative.

4 Reduced form results

The empirical results strongly support the model predictions. First, our framework predicts that a decrease in expected access to abortion will increase the number of women choosing methods with lower failure rates. We test whether switches to methods with lower failure rates increased differentially in Wisconsin after the announcement of the abortion ban agenda in 2015 (a decrease in expected future abortion access) and after its passage later that year (a realized decrease in abortion access). This outcome depends on women's current method and new method, so that a switch from the Pill to injection and a switch from a LARC to sterilization both count as a switch to more effective methods. Figure 4 shows that switches to more effective methods jumped by 26.78pp (224%) after the abortion ban. Switches to LARCs increased as well, but only comprise a small share of the total increase.

Second, our framework predicts that a decrease in out-of-pocket costs will increase the number of women choosing more expensive methods. In practice, the strong correlation between prices and effectiveness means that we can also test this hypothesis using switches to more effective methods (see the Appendix for very similar results using higher cost methods). We test whether switches to more effective methods increased differentially in Northern New England immediately after Maine and Vermont's healthcare expansion in 2016. Figure 5 shows that this prediction holds: switches to more effective methods jumped by an average of 2.06pp (11.12%) in Northern New England in the six months after the healthcare expansion. Again, switches to LARCs comprised only a small share of these switches.

Finally, our framework predicts that an increase in expected future out-of-pocket costs will increase the number of women choosing LARCs. While we do not have a policy experiment that we can use to separately test this hypothesis, we can examine the 2016 presidential election as a joint shock to expectations about future costs and abortion access. We pool the data from all four states to test whether switches to LARCs increased everywhere after the 2016 presidential election, relative to less effective methods and relative to shorter-lasting methods. Only LARCs provide protection from both policy shocks. Figure 6 shows that switches to LARCs increased by an average of 1.68pp (19.01%) in the six months after the election compared to the six months before.

In contrast to the previous two policy shocks, switches to LARCs comprised the majority of switches to

lower failure methods after the presidential election. We take this as additional evidence in support of the model predictions. LARCs are the only reversible method that can shield against future cost increases, and LARC uptake increased most after the only policy shock that increased expectations about future costs.

4.1 Robustness checks

Our main results provide initial evidence that women are price sensitive and forward-looking about both abortion and costs in their choice of contraception. We run a series of robustness checks to validate our main findings.

First, we run difference-in-differences event studies to pinpoint the differential effect of the Wisconsin abortion restriction and the Maine and Vermont healthcare expansion, using each region as a control for the other region around their respective event windows following specification 3.2. Figure 8b shows the differential effect of the Wisconsin abortion ban on switches to lower failure rate methods compared to Northern New England. The abortion ban caused a sustained 16.7 percentage point (162.6%) increase in the probability of switching to a lower failure rate method. Figure 8a plots coefficients from this specification for Northern New England's healthcare expansion. Switches to more effective methods spiked in Northern New England relative to Wisconsin in the four months immediately after the healthcare expansion. On average, women were 1.4 percentage points (10.0%) more likely to switch to a more effective method for those four months.

Next, we test whether the presidential election caused a change in switches to methods that our framework does not predict should respond. In Figure 9, we show that the presidential election did not cause a change in the probability of switching to injection or to sterilization. Injections offer a similar low failure rate to LARCs, but no protection from potential future price increases. Sterilization is highly effective but not reversible. These results show that the election did not change women's preferences over the possibility of parenthood; rather, it increased the importance of contraception in achieving desired timing.

We also explore heterogeneity in the response to the Wisconsin abortion ban by distance to the nearest out-of-state health center. If women switch to lower-failure methods in response to changing expectations about future abortion access, then the response should be larger for women whose future abortion access will fall more. We test this using variation in health center distance from the nearest out-of-state health center. The idea is that a Wisconsin abortion ban would increase the cost of an abortion more for the women who live further away from unaffected out-of-state health centers. Figure 7 compares the rate of switching to lower-failure methods and switching to LARCs for women who live at different distances from the nearest out-of-state health center. As predicted, women who live further away are significantly more likely to switch. Women living at least 350km from the nearest out-of-state health center are nearly 50ppt more likely to switch to a lower failure method and 5ppt more likely to switch to a LARC, while women near unaffected health centers do not significantly change their behavior.

Finally, we conduct a leave-out test to make sure that the results are not driven by changes in particular

clinic behaviors. It is possible that staff in some clinics responded to the shocks by advising patients to switch methods. This would not change the conclusion that women chose to make defensive investments in contraception in response to policy shocks, but it would mean that the mechanism was a change in healthcare providers' behavior rather than women's self-advocacy. The point estimates from running the event studies after dropping any of 44 of the 46 clinics from the data remain within the 95% confidence intervals from the full sample. The confidence intervals for Manchester and Portland overlap. Including them reduces the point estimates. Their 95% confidence intervales overlap.

These results confirm the model predictions that 1) a reduction in expected future abortion access causes women to substitute towards lower-failure rate methods; 2) a reduction in out-of-pocket costs enables more women to choose more expensive, more effective methods; and 3) an increase in expectations about future costs cause women to switch to long-acting methods. The effect of the healthcare expansion also demonstrates that in the absence of policy restrictions on abortion, women choose a variety of methods according to individual preferences over attributes other than the failure rate.

These changes in contraceptive method choice are large and meaningful, with cascading impacts on rates of unintended pregnancy and abortion. The event studies suggest that the presidential election caused an additional 3,953 women, 16.8% of all unique visitors over the study period, to switch to a LARC at Planned Parenthood health centers in Wisconsin and Northern New England from November 2016 to November 2017. A conservative estimate for the failure rate of women's previous method is 8% (the mean in the data is 12%). Then in that first year, the additional switches to LARCs prevented roughly 316 unintended pregnancies. Taking the abortion rate for pregnant patients from the data, this drop in unintended pregnancies prevented 202 abortions.

These additional switches to LARCs represent a defensive investment against an adverse policy shock. We next build a structural model to explore how other policy scenarios, ranging from the extremes of full access to abortion and free contraception to no abortion and no coverage for contraceptive care, would affect method choice.

5 A model of contraceptive method choice under uncertainty

The reduced form results strongly support the conceptual framework from section 2.2: women respond to changes in their beliefs about future policy change when they choose a contraceptive method today. Next, we want to know: how do these defensive investments in contraception change welfare? Are these defensive investments driven more by concern about abortion or contraceptive costs? How would welfare change in plausible policy scenarios, from a national abortion ban to universal access to free contraception and abortion? How do we think the reversal of the Roe vs. Wade judicial decision has affected welfare? While previous work has shown the effects of restrictive policy environments on fertility outcomes, our model will allow us to capture the welfare costs faced by women who never experience a pregnancy but are induced to

change contraceptive methods.

5.1 Model Timing

We build a model where the policy environment directly influences women's choice of a contraceptive method. Agents are fertile women who have sex with men and who do not want a pregnancy. An agent enters the model at age 20 with a starting state given by their current contraception $(j_0 \in J)$, pregnancy status $(p_1 \in \{0, 1\})$, region $(\ell \in \{Northern New England, Wisconsin\})$, and insurance status $(ins \in \{Private, Public, None\})$.

Each one-year period has two stages. At the start of the period, an agent realizes their pregnancy status, the policy environment they would face if they got an abortion, and their period-specific preferences over having an abortion. If pregnant, they then decide whether to get an abortion or not. If not pregnant, there is no decision. Next, they realize their period-specific preferences over the contraceptive methods and the policy environment for insurance coverage. Finally, they choose contraception.

The agent enters the next period with a set of state variables which includes both deterministic characteristics (e.g., age increases by one year) and choice characteristics (e.g., starting contraceptive in period 2 is j_1). Pregnancy is a function of the contraceptive decision made in the prior period. This process repeats for ten years, ending at age 29. We end the model at age 29, rather than menopause, because data coverage is better among people in their 20s. Intuitively, the model captures utility from reaching age 30 without an unintended pregnancy, though the comparative static predictions for a model ending at menopause are the same.

5.2 Model Decisions

Each period, an agent makes decisions with certainty about their current preferences and the current costs of accessing contraception and abortion, but uncertainty about future preferences and costs. Uncertainty about costs is driven by the two sources analyzed in the reduced form exercise: uncertainty about future contraceptive costs and uncertainty about future abortion access.

First, there is some probability that the agent will lose insurance coverage for contraception and face the full price for a method in future periods. If there are frictions which make switching methods costly, this uncertainty about future costs may induce them to choose a less costly method or a long-lasting method such as an IUD which has a high up-front cost but lower per-period maintenance costs. For example, if an agent believes there is a π_c chance that the contraceptive coverage mandate of the ACA will be repealed next year, they may opt for an IUD rather than the injection method which requires high out-of-pocket costs every period.

Second, agents cannot perfectly control their fertility and are uncertain about the abortion policy setting in future periods. They choose a contraception method j based on both their expectation of pregnancy with the method (its probability of failure π_j) and their expectations about whether they will be in a high-cost or low-cost abortion policy environment. This high cost state of the world can nest any number of policy environments: a state that bans abortion after 10 weeks, living too far from an in-state clinic to get there easily, credit constraints that make the monetary cost is too high, etc. Unlike the contraception scenario, we do not have a specific real world analog for quantifying how a policy that limits abortion access changes costs. As a result, we cannot separately identify a change in perceived probability of the bad state versus the level of costs paid in a bad state. Instead, we define a high-cost state of the world as one in which the costs of getting an in-state abortion are infinite and consider policy changes as shocks to the probability that this state of the world is realized.

An agent's value function can be described as follows:

$$V(j_{i,t-1}, P_{it}, X_{it}) = \max_{\text{Abort, Not Abort}} \left[\frac{F_{it}^{1-\sigma}}{1-\sigma} + \varepsilon_{it}^A + \mathbb{E}\max_j \left(\frac{U_{ijt}^{1-\sigma}}{1-\sigma} + \varepsilon_{it}^{Cj} + \beta \mathbb{E}V(j_t, P_{i,t+1}, X_{i,t+1}) \right) \right]$$
(5.1)

where

 $F_{it} = \begin{cases} 0 & \text{if not pregnant at time } \iota \\ \gamma_1 + \gamma_2 \cdot age_{it} + \zeta' X_{it} + \beta_1 \text{price}_A & \text{if pregnant, low-cost setting, and choose in-state abortion} \\ \gamma_1 + \gamma_2 \cdot age_{it} + \zeta_A^{HC} + \zeta' X_{it} + \beta_1 \text{price}_A & \text{if pregnant, high-cost setting, and choose in-state abortion} \\ \gamma_2 + \gamma_2 \cdot age_{it} & \text{if pregnant and don't choose in-state abortion} \end{cases}$

$$U_{ijt} = \beta_1 \operatorname{price}_j^{ins} + \theta'_j X_{it} + (\beta_2) \,\mathbb{1}(j_t \neq j_{t-1})$$

We assume a quasi-linear utility structure in which risk averse agents have CRRA preferences over the fertility outcomes $\left(\frac{F_{it}^{1-\sigma}}{1-\sigma}\right)$ and over the contraceptive choice outcomes $\left(\frac{U_{ijt}^{1-\sigma}}{1-\sigma}\right)$, but the taste shock for abortion ε_{it}^A and taste shock for contraceptive decisions ε_{it}^{Cj} are additive.¹⁵ The parameter σ measures the degree of relative risk aversion.

Stage 1: Fertility decision 5.2.1

An agent enters the period knowing their previous contraceptive method $(j_{i,t-1})$, their pregnancy status $(P_{it} = [0, 1])$, their persistent characteristics that impact their choices (X_{it}) , and the realization of both the policy state of the world and their individual specific preferences for abortion (ε_{it}^A). If pregnant, they decide whether or not to get an abortion at an in-state facility. Because we only observe abortions that occur at Planned Parenthood locations within the regions of interest, we do not know whether a pregnant woman who visits a health center and does not get an abortion ultimately carries the pregnancy to term or if they instead get an abortion at an alternative location, such as an out-of-state clinic. In practice, this means that the value of an abortion in the model is the value of getting an abortion at an in-state Planned Parenthood relative to the next best alternative (e.g., giving birth, going out of state to get an abortion, etc.).

¹⁵This quasi-linear structure is primarily for computational tractability; following standard dynamic discrete choice models (de Palma et al., 2008), we will be assuming that the taste shocks are drawn from a Type I Extreme Value distribution which allows for a closed form solution to the expectations.

We normalize utility from fertility to be zero in the state of the world where the agent is not pregnant. The utility from a pregnancy, irrespective of whether or not it is carried to term, is then given by $\gamma_1 + \gamma_2 \cdot age_{it}$. The additional utility from an in-state abortion relative to the next best option includes the monetary cost $(\beta_1 price_A)$ and the non-pecuniary value ζ which we allow to vary by characteristics of the woman $(X_{it} = [age, region, insurance status])$ as well as the policy state of the world.¹⁶ In this setting, our assumption that $\zeta_A^{HC} = \infty$ is equivalent to the 'high-cost' policy setting being a world in which no in-state clinics currently offer abortion services. This corresponds to the July 2023 policy setting in Wisconsin following the Dobbs ruling.

Based on their pregnancy status, the monetary cost of abortion, and the non-pecuniary value of abortion, the agent makes their fertility decision.

5.2.2 Stage 2: Contraceptive decision

After making the fertility decision, the agent realizes the state of the world for their contraceptive decision: 1) whether their insurance will cover contraception and 2) their taste shock for contraception this period. The agent then chooses from five different method groups: none, over-the-counter (condoms, diaphragm, spermicide, natural family planning, withdrawal¹⁷), hormonal short-term (the Pill, the patch, and the ring), hormonal medium-term (injection), and long-acting reversible contraceptives (LARCs, including IUDs and implants). We group these together to allow for enough data coverage across age and method, and choose groups based on similarities in cost and timing of use (e.g., hormonal short-term all require regular use while over-the-counter are used at time of intercourse).

Each method varies in its failure rate π_j which determines the probability of pregnancy in the next period, monetary cost with and without insurance coverage $(price_j)$, and other attributes such as ease of use, doctor visits required, and side effects. Because many of these other attributes are difficult to quantify, we capture these non-pecuniary characteristics with method fixed effects (θ_j) that we allow to vary by observable agent characteristics (see Table 1 for a summary of different method attributes and how they vary together).

The policy state of the world impacts the cost of contraception, $price_j$. In the 'good' state of the world, the insurance provider covers contraception and the agent faces the prices from the final column of Table 2. In the bad state of the world, the insurance provider does not cover contraception and the woman faces prices from the sliding scale described in Table 2. All methods except LARCs last only for a single period, so the agent must pay the monetary cost every period.

We model LARCs as lasting for three periods¹⁸ so that an agent only pays the costs in the first period and pays zero for the next two. They can still choose to switch off the LARC at any point. Thus, we can

¹⁶Note that for a risk neutral agent where $\sigma = 0$, this ζ corresponds to the mean of the taste shock.

¹⁷We categorize natural family planning and withdrawal as over-the-counter rather than none because their failure rates are more similar to over-the-counter methods than to truly using no method. This category could alternatively, and more accurately, be called "on-demand contraception" but we use "over the counter" because it is more familiar to most readers.

 $^{^{18}}$ Newer hormonal LARCs often last for 5-7 years and copper IUDs last for 10 years, but doctors recommended replacements every three years for many of the popular hormonal options available during the study period. We chose three periods to be conservative.

think of the choice of a LARC as a choice either to start a LARC or to continue to year two or year three.

Lastly, agents face non-pecuniary switching costs when they change methods. Women who choose to change methods incur cost β_2 which represents the average non-monetary cost associated with leaving your current method for any other method, net of the taste shock. These non-monetary costs include factors like the need to visit the doctor, hormonal disruption from stopping or starting a new hormonal method, discovering the side effects of the new method, and the cognitive load of making a new decision, for example.

5.2.3 Solving the agent's problem

In our model, the fertility decision does not impact future utility. However, the choice of contraception, j_t , impacts the continuation value $V(j_t, P_{i,t+1}, X_{i,t+1})$ both directly through switching costs and indirectly through the likelihood of pregnancy in period t+1. This means that beliefs about future states of the world will impact contraceptive choice in the present. To illustrate how this dynamic process works, let us first consider the solution to the model in a two-period setting.¹⁹

To begin, we need to make some assumptions about the agent's beliefs about the distribution of shocks. First, we will assume that the two taste shocks are IID across individuals and time periods and are drawn from Type I EV distributions where the scale of the contraceptive shock is normalized to 1 and the scale of the abortion shock is ς_A . This gives us a nicely simplified model similar to a nested Type I EV distribution, resulting in a closed form for both the continuation values used in the model solution and the likelihoods in our estimation. We will assume that the three uncertain states of the world are draws from a uniform distribution in which an agent is in the 'good' state of the world if their draw is lower than some threshold value. For contraception and abortion, these are constant thresholds π_C and π_A to be estimated in the model. For pregnancy, we define the 'good' state as the non-pregnant state and the threshold value is $1 - \pi_j$.

The final decision of the second period is a choice of contraception. Since $V_3 = 0$ by construction, the agent is choosing the j_2 which solves

$$j_{2} = argmax \left[\frac{U_{ij2}^{1-\sigma}}{1-\sigma} + \varepsilon_{i2}^{Cj} \right] \quad s.t. \quad U_{ij2} = \beta_{1} \text{price}_{j}^{ins} + \theta_{j}' X_{i2} + (\beta_{2}) \,\mathbb{1}(j_{2} \neq j_{1})$$

Using the functional form assumptions about the structure of ε_{i2}^{Cj} , the probability that a woman chooses method \hat{j} is given by

$$Pr(j_{2} = \hat{j}) = \frac{exp\left(\frac{(\beta_{1} \text{price}_{\hat{j}}^{ins} + \theta_{j}' X_{i2} + (\beta_{2}) \mathbb{1}(\hat{j} \neq j_{1}))^{1-\sigma}}{1-\sigma}\right)}{\sum_{s \in J} exp\left(\frac{(\beta_{1} \text{price}_{s}^{ins} + \theta_{s}' X_{i2} + (\beta_{2}) \mathbb{1}(s \neq j_{1}))^{1-\sigma}}{1-\sigma}\right)}{1-\sigma}$$

¹⁹This solution generalizes to a T-period model in which we are describing the solution to the decision in period T-1.

The expected value of the second period contraception choice prior to observing ε_{i2}^{Cj} is:

$$VF_2^{[C,NC]}(j_1, P_2, X_2) = \log \sum_{j=1}^5 exp \left[\frac{U_{ij2}^{1-\sigma}}{1-\sigma} \right]$$

where the value differs depending on the insurance state [C, NC] where C indicates insurance does cover contraception and NC indicates contraception is not covered.

Moving backwards, at the start of period before realizing the contraceptive decision, there are three possible states that the women enters period 2, resulting in three distinct expected continuation values.

First, if a woman is not pregnant: $F_{i2} = 0$ and

$$\mathbb{E}V(j_1, P_2 = 0, X) = \pi_c V F_2^C + (1 - \pi_c) V F_2^{NC}$$

Second, if a woman is pregnant and in the bad state, under our assumption that $\zeta_A^{HC} = \infty$, they do not have the option of getting an in-state abortion and they receive $F_{i2} = \gamma_1 + \gamma_2 \cdot age_{it}$. This results in the following expected continuation value in the bad state:

$$\mathbb{E}V_B(j_1, P_2 = 1, X) = \left(\frac{(\gamma_1 + \gamma_2 \cdot age_{it})^{1-\sigma}}{1-\sigma}\right) + \pi_c V F_2^C + (1-\pi_c) V F_2^{NC}$$

Lastly, if a woman is pregnant and in the good state, they decide whether or not to get an abortion. The probability they get an abortion is:

$$Prob(A_{i2} = 1) = \frac{exp\left(\frac{\left(\gamma_1 + \gamma_2 \cdot age_{it} + \zeta' X_{it} + \beta_1 \operatorname{price}_A\right)^{1-\sigma}\right)}{1-\sigma}\right)}{exp\left(\frac{(\gamma_1 + \gamma_2 \cdot age_{it} + \zeta' X_{it} + \beta_1 \operatorname{price}_A)^{1-\sigma}}{1-\sigma}\right) + exp\left(\frac{(\gamma_1 + \gamma_2 \cdot age_{it})^{1-\sigma}}{1-\sigma}\right)}$$

In our model, this fertility decision does not affect the expected continuation value of contraception. This means that it drops out of the exponential and does not affect the contraception decision.²⁰ This results in the following expected continuation value in the good state:

$$\mathbb{E}V_G(j_1, P_2 = 1, X) = \log\left[\exp\left(\frac{(\gamma_1 + \gamma_2 \cdot age_{it} + \zeta' X_{it} + \beta_1 \text{price}_A)^{1-\sigma}}{1 - \sigma}\right) + \exp\left(\frac{(\gamma_1 + \gamma_2 \cdot age_{it})^{1-\sigma}}{1 - \sigma}\right)\right] + \pi_c V F_2^C + (1 - \pi_c) V F_2^{NC}$$

We now can move back to the first period decision of contraception and be more explicit about how the

²⁰Notice also that in a setting in which the agent is risk neutral ($\sigma = 1$), the value of the outside option would also drop out of the expression, demonstrating that the cost of pregnancy in the model is primarily identified not by the decision to carry the pregnancy to term but by the decision to choose a more effective contraceptive to avoid a pregnancy.

agent takes expectations over pregnancy and policy state shocks. The agent's decision is:

$$\max_{j_1} \qquad \frac{U_{ij1}^{1-\sigma}}{1-\sigma} + \varepsilon_{i1}^{Cj} + \beta \left[\pi_c V F_2^C(j_1, P_2, X_2) + (1-\pi_c) V F_2^{NC}(j_1, P_2, X_2) \right. \\ \left. + \pi_j \left(\pi_A \log \left[\exp \left(\frac{(\gamma_1 + \gamma_2 \cdot age_{it} + \zeta' X_{it} + \beta_1 \text{price}_A)^{1-\sigma}}{1-\sigma} \right) + \exp \left(\frac{(\gamma_1 + \gamma_2 \cdot age_{it})^{1-\sigma}}{1-\sigma} \right) \right] \right. \\ \left. + (1-\pi_A) \frac{(\gamma_1 + \gamma_2 \cdot age_{it})^{1-\sigma}}{1-\sigma} \right) \right]$$

Unlike the abortion decision, the choice of j_1 does impact the continuation value, meaning that the probability of choosing a given method depends both on the current period flow utility and the utility in future states of the world.

Now consider how a shock to beliefs about future contraceptive policy would change this decision. If the likelihood of the 'good' state for insurance coverage decreases, there is a higher weight on the continuation value VF^{NC} . The no-insurance continuation value VF^{NC} differs most from VF^{C} for methods which have a large increase in price when not covered by insurance, such as injections or the short-term hormonal methods like the pill, patch, and ring. If the agent chooses one of these methods and ends up in the bad state, they will either have to pay the utility cost of switching or the pecuniary cost of the higher price. Thus, a higher weight on the 'bad' state induces women to switch away from a methods with large price differences between the two states. In contrast, if the agent chooses a LARC in period 1 while they are still covered, they will have zero costs in period 2 regardless of which state of the world they are in. This means that the relative value of LARCs goes up when the likelihood of losing insurance coverage increases.

We can also examine the impact of shocks to beliefs about future abortion access on contraceptive choice. Assuming that obtaining an in-state abortion is preferred over the outside option (i.e., $\mathbb{E}V_G > \mathbb{E}V_B$), a decrease in the probability of the good state reduces the utility value from the terms to the right of π_j . Since this reduction is weighted by the likelihood of pregnancy conditional on the contraceptive method, the value of selecting a low efficacy method decreases more compared to a high efficacy method. This encourages women to switch to more effective methods.

6 Model Estimation

6.1 Parameter Assumptions

To estimate the model, we first make some assumptions about parameters related to risk and uncertainty.

First, because we cannot separately identify risk preferences from beliefs about risk, we must make an assumption about the degree of risk aversion. We assume in our primary specification that agents are risk neutral (i.e., $\sigma = 0$). If agents are actually risk averse, this misspecification would underestimate the costs associated with policy shocks that increase the chance of the bad state. In robustness checks, we test how our results change as we vary σ . [TBA]

Second, we also cannot separately identify the agent's beliefs about the relative likelihood that a bad vs. a good state occurs and the value of that state. Specifically, we cannot distinguish between a change in beliefs that makes the low cost abortion state more likely from a change in the relative value of the low abortion state compared to the high cost abortion state, which is determined by the parameter estimate of ζ . Both increase the cost of becoming pregnant, inducing the same observed behavior in the data.

Moreover, when we observe a woman not getting an in-state abortion in the data, we do not know which state of the world was realized. For example, women living in Northwestern Wisconsin may never have considered getting an in-state abortion since the Planned Parenthood clinics in that region do not offer abortions, and there are closer abortion clinics in Minnesota. The realized policy environment is therefore an unobservable state.

We therefore make the following simplifying assumption: we assume that women did not have uncertainty about the future policy setting before the 2016 election and thus $\pi_A = 1$ and $\pi_C = 1$. That is, they assumed that there was zero chance of losing coverage (if insured) or losing access to in-state abortion. We estimate the remainder of the model parameters on the pre-2016 data. We will then use these parameters and post-2016 election data to estimate how beliefs changed after the election, using method of moments to estimate post-2016 values of π_A and π_C and the associated welfare losses. Lastly, we will estimate a series of counterfactual scenarios to test how policies that permanently shut down abortion (i.e., $\pi_A = 0$) or insurance coverage ($\pi_C = 0$) change behavior.

6.2 Data

To estimate the model, we restrict the sample to women aged 20-29 who visited a health center before November 2016. Each year of life is a 'period' in the model. Age, insurance status, and health center location come directly from the medical records.

For women who we only observe at one visit in a given year, we set the starting contraceptive method for that period to be the method they reported using prior to the appointment. If they do not switch methods during the visit, then their next-period method remains the same. If they were pregnant at the visit, they are considered to have a pregnancy that period. If they leave the visit without getting an abortion, they are considered to have carried that pregnancy to term.

For women who make multiple visits in a given year, the starting contraceptive method is the method that they were using prior to the first visit and the ending contraceptive is the method they were using at the end of the last visit. If they are pregnant in any of the visits that year, they are considered pregnant in that period; the same holds for abortions. In total, we observe 41,332 unique women and use 76,418 women-year observations to estimate the model.

Following the reduced form, we group contraceptive choices into five categories: no method, over-thecounter (including condoms, diaphragms, spermicides, natural family planning, and withdrawal), short-term hormonal (the Pill, the patch, and the ring), injection, and LARCs (IUDs and implants). In our model, LARCs are assumed to last three periods; we therefore assign a woman to be in their first period of LARC use if they switched to a LARC in that year, in their second period if they switched in the prior year, and in their third period if they switched two years ago. We 're-start' the LARC if they stay with the method longer than three years (i.e., year four of a LARC is classified as a new LARC). Women who report trying to get pregnant, being pregnant, partner sterilization, or own sterilization as contraceptive methods are dropped from the sample.

The observable characteristics of the women that we use to estimate the non-pecuniary value of contraception (i.e, the $X_i t$ included in U_{ijt}) include whether they previously had an abortion and whether they were pregnant this period.

The observable characteristics of the women that we use to estimate the non-pecuniary value of abortion (i.e., the $X_i t$ included in F_{it}) include state of residence [Wisconsin, NNE], age, and insurance type [Private, Public, None]. The price of each method (*price_j*) is given in Table 2. The price of abortion, *price_A*, is proxied for with the mean out-of-pocket cost (\$820) reported by women in an analysis of the Turnaway Study (Roberts et al., 2014)²¹.

6.3 Pre-2016 Estimation Strategy

Table 6 lists the model parameters to be estimated. The first row lists the parameters we calibrate to specific levels (i.e., discount rate, CRRA parameter, pre-2016 beliefs about future states). The other parameters are estimated within the model using maximum likelihood.

The joint log likelihood function for contraceptive method choice and abortion for the N women in our sample, each observed for T_i periods, is given by:

$$\log \mathcal{L}(\Omega) = \sum_{i}^{N} \sum_{t}^{T_{i}} \sum_{j}^{J} d(j_{it}) \log \left(\Pr(j_{it} = j | S_{it}, A_{it}) \right) + d^{A}(1) * p_{it} \log \left(\Pr(A_{it} = 1 | S_{it}, p_{it} = 1) + \right)$$
(6.1)

$$d^{A}(0) * p_{it} \log \left(Pr(A_{it} = 0 | S_{it}, p_{it} = 1) \right)$$
(6.2)

where $d(j_{it})$ and $d^A(A_{it})$ are indicator functions equal to one if, respectively, person *i* chose j_{it} for their contraceptive method and A_{it} for their abortion decision in period *t*. p_{it} is an indicator equal to one if person *i* was pregnant in period *t* (note that if a person was not pregnant, the abortion choice falls out and their likelihood is only the probability that they chose a given contraceptive method). Ω are the set of parameters to be estimated.

Under the distributional assumptions about the structure of the preference shocks and the pregnancy shocks, for any set of parameters Ω , we can solve the model recursively to recover the value functions in all states of the world. We then use these value functions to calculate the probability that a woman chooses a given contraceptive method and abortion pair, conditional on entering the period pregnant. The parameters

 $^{^{21}}$ The Turnaway Study is a longitudinal study which compares the trajectories of 1,000 women who received a wanted abortion to those who were turned away because they were past the provider's gestational age limit.

 $\hat{\Omega}$ are the set of parameters which maximize this log-likelihood given the actual realized contraceptive method and abortion choices $d(j_{it})$ and $d^A(A_{it})$.

We maximize the likelihood using using the Nelder Mead algorithm and choosing a starting point for the algorithm by drawing 1000 draws from a Sobol hypercube.²² We compute standard errors by inverting the information matrix.

6.4 Post-2016 Beliefs Estimation Strategy

After estimating $\hat{\Omega}$, we next estimate the values of π_A and π_C following the 2016 election. As shown in the reduced form exercises, changes in beliefs about future access to contraceptive coverage and abortion access resulted in women switching to more effective and longer-lasting methods. We can estimate the change in beliefs by matching the proportion of women who switch from method A to method B after 2016 using simulated method of moments. With five methods, this gives us a total of 25 possible switch pairs, including the proportion who are non-switchers. We omit data moments based on less than 20 women, leaving us with 20 total data moments to match.

The parameter estimate is given by the expression:

$$\hat{\pi} = \operatorname{argmin} \frac{1}{N_{\text{moments}}} \sum_{i=1}^{N_{\text{moments}}} \left(\frac{m_i^s(\pi^U) - m_i^d}{m_i^d} \right)^2$$

where m_i^d are the moments calculated using the actual behavior of patients at Planned Parenthood between November 2016 and December 2017. m_i^s are moments simulated using the parameters estimated in the first step using pre-2016 data and a guess of π . $\hat{\pi}$ is then the set of belief cut-offs that minimize the distance between m_i^s and m_i^d .

We find the minimizer using differential evolution, an optimization method that uses a stochastic algorithm which does not require assumptions about the differentiability of the function and is less sensitive to starting choice than classic hill-climbing methods such as Nelder-Mead in a setting with multiple non-global minima.²³ We choose a starting point for the algorithm by drawing 100 draws from a Sobol hypercube.

7 Model results

7.1 Parameters

Table 6 reports the estimated values for the pre-2016 model parameters and their standard errors, which we calculate by inverting the Hessian of the likelihood function. The first three rows reports the parameters that are part of the utility from contraception function (U_c) . Recall that 'no method' is the omitted category,

 $^{^{22}\}mathrm{We}$ implement this with the function Optim in Julia 1.9.

 $^{^{23}}$ We implement this with the function BlackBoxOptim in Julia 1.9 and use the standard differential evolution optimizer DE/rand/1/bin.

meaning that the θ parameters can be thought of as the non-pecuniary value of a given method relative to no method for all women in the baseline. The pregnancy-specific and abortion-specific θ parameters indicate the additional value associated with a given method for a woman who is pregnant and/or gets an abortion while using that method. The remaining rows reports the parameters that are components of the switching cost parameters, the monetary scaling parameter, the parameters from the utility function for pregnancy (U_F) , the variance of the contraceptive shock, and the utility function for abortion (U_A) .

Because the parameters are measured in utils rather than dollars, it can be difficult to interpret how the magnitudes of the parameters demonstrate differences in how agents value a given contraceptive method or obtaining an abortion. To illustrate how these parameters translate into different pecuniary and nonpecuniary costs, Table 7 reports the flow utility in dollars associated with different choices for selected types of women. These utilities do not include the individual specific preference shocks (ε_{it}^A , ε_{it}^{Cj}) or the continuation value of choosing that method, but rather describe the flow utility that a person of the given type would receive if they made each choice relative to the flow utility that they would get if they chose no method (which is normalized to have utility of 0). Our parameter estimates and their interpretation in Table 7 suggest four main findings about what makes women choose different contraceptive methods.

First, the monetary costs of contraceptives are small relative to non-pecuniary considerations. The most expensive method, a LARC without private insurance, costs \$510; in contrast, the differences in utility across methods are on the order of thousands of dollars. For example, a woman with no insurance who is not pregnant, did not have an abortion, and currently uses OTC methods would receive \$8,264 less in utility from switching to a LARC compared to keeping their existing method (\$17,139 - \$8,775). The monetary cost only accounts for 6% of this decline in utility.

Second, women greatly value not having to switch methods. Notably, all types of women in Table 7 would not choose to switch methods based on flow utility alone; if they started the period using OTC methods, they would get the highest utility from continuing to use OTC methods and similarly if they started the period using a LARC, the highest utility comes from using a LARC. The switching cost parameter, β_2 , implies that women at age 20 are willing to pay around \$10,326 not to have to switch methods, net of individual-specific preferences for method (i.e., ε_{it}^{Cj}).

The woman described above receives \$17,139 from staying with OTC. For any other method, they receive the utility stated in the table which includes the switching cost of \$10,326. If this switching cost were removed, they would receive \$19,101 (\$8,775 + \$10,326) in utility from a LARC, and they would prefer the LARC to the OTC method. Similarly, they would prefer hormonal and injection methods to OTC in the absence of switching costs. However, they would still prefer OTC over no method, which would deliver a utility of \$10,326 without switching costs.

While these high average switching costs may partially reflect both information barriers or access barriers like doctor's appointments, it should be noted that these are average switching costs, not the switching costs faced by women who actually change methods. These switching costs are the estimated costs for a hypothetical move to an arbitrary alternative method, whereas in the model people will only actually choose a method that has high pay-offs including the ε_{it}^{Cj} term. A more complete measure of the cost of switching is $\beta_2 + \beta_3 \times age_{it} + \beta_4 \times age_{it}^2 + \max_j \{\epsilon_{i0t} - \epsilon_{ijt}\}$ where the last term is the difference in preference shocks for staying with current method 0 relative to switching to your most preferred method j. Because the mean of ϵ_{ijt} conditional on choosing method j is higher than the unconditional mean, these average switching costs are higher than the costs a woman who actually chooses to switch methods will face once we account for the individual method preference shocks.²⁴

Third, our model demonstrates that women who have recently been pregnant and did not choose to get an abortion have different valuations of each method than either women who haven't experienced a pregnancy or women who were pregnant and chose to get an abortion. For example, if we compare the first three rows of Table 7, we see that women who had a pregnancy this period and did not get an abortion have a higher flow utility from OTC methods (\$20,790) than women who aborted a pregnancy (\$12,769) and women who were not pregnant (\$17,139). Why does our model predict these differences? Recall that the non-pecuniary preference parameters (i.e., θ , θ^P , and θ^A) are identified off of the observed likelihood of choosing a method and are higher when the other characteristics of the method – price and efficacy at preventing a future pregnancy – are not enough to explain the proportion of women observed making that choice. In our data, if a woman is pregnant and previously used OTC methods, we are more likely to observe them continuing to use OTC methods if they do not choose to get an abortion. Intuitively, this could happen if some women with very strong preferences for OTC care less about unintended births. Alternatively, this could happen if women who care very strongly about avoiding unintended births care less about the characteristics of OTC methods. Both result in the same behavioral outcome and are captured mathematically in the model through a negative coefficient on OTC methods for those who choose to get an abortion.

Notably, with the exception of OTC methods, women derive lower value from all other methods if pregnant than if not pregnant. This may seem counterintuitive, but the variation in utility while pregnant across contraceptive types is capturing variation in how women who choose different types of contraception value pregnancy. We can think of women's anticipated 'cost' of pregnancy as both the baseline non-pecuniary costs ($\gamma_1 + \gamma_2 \cdot \text{age}$) if they choose no method, as well as the decline in utility they get in their contraceptive utility. For hormonal, injection, and LARC users, the utility from pregnancy will be negative whereas for women not using any method or OTC methods the utility from pregnancy is positive. The model's estimates thus demonstrate that the more effective methods are preferred by women who have greater distaste for pregnancy, for unobserved reasons beyond just the additional efficacy of those methods.

Lastly, women have a high willingness to pay for an abortion, conditional on pregnancy. We conduct a similar exercise to Table 7 in which we compare the end-of-period flow utility for women who choose an abortion versus not across various demographic types.²⁵ The baseline parameter for abortion alone implies

 $^{^{24}}$ This is a common feature of switching cost parameters in discrete choice problems in which only a small number of agents choose to switch consumption. See Kennan and Walker (2011) for a discussion of this issue in the context of high average migration costs relative to average migration costs conditional on moving.

 $^{^{25}}$ The full table of calculated utility values is omitted for brevity. To make this calculation we compare $U_A(A = 1, P =$

that a woman who is pregnant values an abortion at around \$8,000. We find that those who end the period with a LARC have the highest average willingness to pay for an abortion of around \$8,848. Those who end the period using no contraception have the next highest willingness to pay, \$7,626, then hormonal methods users at \$4,344, and then injection methods users at \$3,796. Those who end the period using over-the-counter methods have the lowest average willingness to pay, -\$121.²⁶

7.2 Pre-2016 Model fit

To test model fit, we compare the observed data on contraceptive choice, pregnancy, and abortion to the predicted behavior of women in the model who start in the same state as the observed data. Figure 11 compares eight moments in the data to the model: the proportion of women who switch methods, the proportion who get an abortion, the proportion using each contraceptive method (5 moments), and the proportion who are pregnant. We also display the percent of pregnancies aborted (calculated as the proportion of abortions divided by the proportion of pregnancies) because it is easier to see variation across models. We currently underestimate the switching rates, but are able to match the levels of pregnancy and method use relatively well.

7.3 Post-2016 Belief Parameters

Next, we estimate π_A and π_C following the 2016 election shock to beliefs. We find that women's belief that they will have access to insurance that covers contraception drops from an assumed 100% to 60.5%, consistent with women anticipating the possibility of the ACA's contraceptive mandate being repealed. We find that women's belief that they will have access to an in-state abortion decreases from an assumed 100% to 75.4%, again consistent with increased concerns about abortion access under the Trump administration.

These changes in beliefs also correspond to changes in contraceptive use and welfare changes. Table 8 reports the estimated proportion of women who switched away from each method before and after the 2016 election (rows 1 and 2), as well as the proportion who ended the period with a LARC (row 3 and 4). Next, we calculate the total annual utility a woman receives from their contraceptive and abortion decisions in a single year and compare it pre- and post- the change in beliefs. Row 5 reports the average percent change in welfare, conditional on starting method for all individuals²⁷. Row 6 reports the change in utility for all individuals who made different contraceptive choices in the post-2016 election setting than they would have if they still were certain that they would have access to contraception and abortion.

The table shows that women who were originally using no method were the most impacted. Users of

 $^{1,} X) + U_F(A = 1, P = 1, X) + U_C(A = 1, P = 1, X)$ to $U_A(A = 0, P = 1, X) + U_F(A = 0, P = 1, X) + U_C(A = 0, P = 1, X)$ for a variety of demographic types X, where X is a vector of location, insurance type, age, and ending contraceptive method.

 $^{^{26}}$ This negative willingness to pay is the direct result of what we observe in the data: women who get pregnant while using condoms and choose to get an abortion typically switch away from using condoms. Therefore, since it is rare to observe a women choosing both to get an abortion and continue using condoms, our model predicts lower welfare to getting abortion for continuous condom users.

 $^{^{27}}$ We omit users of injectables from the table; this group did not change their contraceptive use behavior at all in response to the change in expectations.

no method were 7.1pp more likely to switch methods when they believed that future reproductive services would be less available and they were 2.4pp more likely to switch to a LARC post-election. While other users had smaller changes in behavior, there was broadly a shift towards more effective methods, with non-LARC users becoming more likely to switch to LARCs and LARC users being less likely to switch off of LARCs. On average, this shift in beliefs is associated with a 1.1% decline in utility. These utility losses are primarily concentrated among women who switched to a different method due to this change in expectation. For these women, utility declined by an average of 4.2%.

7.4 Policy Counterfactuals

The previous exercise explored how women responded to a change in beliefs about future healthcare access after the 2016 election. Now we consider a series of policy counterfactuals that model a change in realized healthcare access, again using pre-election beliefs as the baseline.²⁸ We start by asking: how would women's contraception and abortion choices change if contraception were universally free, if abortion were universally free, or if both were universally free?

There are two ways in which credit constraints might cause a woman to choose a contraceptive method that they prefer less in terms of side effects or other non-pecuniary characteristics. First, they may choose a less expensive method because they can't afford a more expensive one. Second, if abortion is prohibitively costly, they may choose a method that is more effective at preventing pregnancies but has other characteristics that they dislike.

To test this, we run three counterfactuals. In the first, we set contraceptive prices equal to 0 for all methods regardless of insurance status. In the second, we set the price of abortion equal to 0. In the third, we do both. Table 9 reports the effects of these policy counterfactuals on pregnancy and abortion rates, usage of each method type, and the number of women who switch methods.

When contraception is free (scenario 1 of Table 9), women's pregnancy rate declines by only 0.1pp and the abortion rate also drops by 0.1pp. The effects of such a policy are fairly small, in large part because the majority of women in our sample have insurance. For women with insurance, the ACA contraceptive mandate means that the only out of pocket costs are for over the counter methods and for prescription fees for hormonal methods. The primary effect of this counterfactual is to increase use of hormonal methods by 1.9pp due to the removal of the prescription fee.

The effects of making abortion free on fertility outcomes (scenario 2 of Table 9) are perhaps unsurprising: women become pregnant more often (+0.4pp or +4.5%), and a greater proportion of women get abortions (+0.7pp or +10.1%). More interesting are the effects of this policy change on contraceptive use. Women switch off of more effective and more expensive methods like hormonal, injections, and LARCs towards

 $^{^{28}}$ We choose not to use the post-2016 election beliefs as the baseline due to the concerns that the women's expected probability of losing access to contraceptive coverage was an incorrect forecast. Because the ACA did not get repealed, women were overestimating the likelihood of the 'bad' state. Rather than assume incorrect beliefs, we choose the pre-period as a baseline and assume women have rational and correct beliefs in both the baseline and in each counterfactual scenario.

cheaper and less effective methods, specifically no method which increases by 0.5 pp (16%). This supports the hypothesis that when abortions are costly, women choose more expensive methods that are more effective rather than the methods they might prefer in terms of cost.

The third scenario makes both contraceptives and abortions free. We see a similar increase in the abortion (+0.6pp) and pregnancy rates (+0.3pp) as in the free abortion counterfactual. Women switch away from LARCs and injections and into their most preferred method in terms of non-monetary characteristics including the failure rate, with an increase in hormonal method use of 1.7pp. Because women also face a tradeoff between cost and method characteristics (e.g., side effects, invasiveness, difficulty of stopping, etc.), making contraceptives free improves welfare even for women who do not have a change in their fertility outcomes. The average increase in utility in this scenario is a \$4,447 increase per women over the course of their twenties, which is equivalent to a 1.8% increase in welfare relative to the baseline.

Next, we consider policy counterfactuals in which access to reproductive healthcare becomes more constrained. Columns 4 through 7 of Table 9 report the results of these scenarios, and Figures 12 and 13 visualize the comparisons to the model baseline.

In the fourth scenario, we model the elimination of the insurance mandate for contraception by setting contraceptive costs equal to their uninsured out-of-pocket cost (scenario 4 of Table 9). While the effects on the overall pregnancy and abortion rates are small, women respond by sorting into different types of contraception, increasing their usage of no method (+0.3pp or +7.2%) and over the counter methods (+1.0pp or +7.9%) and decreasing their usage of expensive methods such as injections (-1.5pp or -10.5%) and LARCs (-0.3pp or -1.7%).

In the fifth scenario, we model a world in which all contraceptives are free, but women correctly believe that in the current and future periods, they will not be able to access an in-state abortion. Here, we see the pregnancy rate drops by 2.0pp or 22%. This change in pregnancies is primarily driven by women who switch away from no method (-2.8pp. or -83%), the method with the highest failure rates. There is an increase in the use of hormonal methods (+2.0pp or 3.6%), driven in part by the benefits of a more effective method and in part because they are cheaper in the absence of prescription fees (similar to scenario 1).

Sixth, we consider the expansion of abortion bans by shutting down the option to get an abortion but leaving contraceptive prices at their regular level (scenario 6 in Table 9). Under this scenario, the pregnancy rate falls by 2.1pp and the abortion rate drops to zero by construction. This is driven by a large rate of switching to more effective methods, especially LARCs (+0.8pp or +5%) and large declines in women using no method (-2.8pp). Notably, the increase in hormonal method use is smaller in this scenario relative to scenario 4, demonstrating that in the presence of even small pecuniary costs women are not able to choose their most preferred method.

Finally, we explore a fully constrained policy environment with no insurance mandate for contraception and restricted access to abortion (scenario 7 in Table 9). The pregnancy rate falls by 1.9pp and the abortion rate again is zero. While the use of no method falls by a similar amount to the previous scenario, the use of over the counter methods increases by a greater amount (2.2pp relative to 0.9pp in scenario 6), reflecting that some women cannot afford more expensive, more effective methods in the absence of insurance even though the reduction in abortion access means they value efficacy more highly.

To help with interpretation, the bottom panel of Table 9 compare women's average welfare over the ten years of the model under each of these policy regimes. All three policies that expand access to care would improve women's welfare substantially. Making contraceptives free would improve a woman's average welfare by approximately \$3,086 or 1.2%. Making abortion free has a slightly smaller welfare improvement of \$1,318 per year or 0.5%, in part because while all women make contraceptive choices each year, only 10% of women in our sample are pregnant and making a decision about abortion in a given year. Making both free improves women's welfare by approximately \$4,447 or 1.8% over the ten-year period. Given that the monetary cost of providing free contraception and abortion is significantly lower than this in the model– even if these woman got a new LARC each year and also got an abortion each year (an unlikely scenario), the per year cost would only be \$1,330 or \$13,330 total – the welfare gains are primarily coming not from the transfer value of the cost of the method, but from women being able to make better reproductive decisions for their well-being.

In contrast, the policies that restrict access to reproductive healthcare reduce welfare. While the costly contraception counterfactual does not have a large impact on pregnancy rates, it still reduces welfare by \$1,454 or -0.6% per woman. Shutting down abortion has even larger impacts, reducing welfare by \$9,030 or -3.7%. While making contraception free in a world with no abortion mitigates some of the welfare loss, the average welfare loss is still \$5,791 or -2.4%. Finally, increasing the cost of contraception and shutting down abortion is associated with a decrease in utility of \$10,726 or -4.4%. Notably, the welfare cost of shutting down abortion is increasing in the restrictions on access to contraception. This suggests that having access to abortion and vice versa, providing additional evidence that contraception is used as a defensive investment against pregnancy when abortion is inaccessible.

These counterfactual exercises are visualized in Figures 12 and 13. Figure 12 compares the model baseline moments with the two policy extremes: universally free access to contraception and abortion, and no insurance coverage for contraception with no access to in-state abortion. Figure 13 compares the model baseline moments with eliminating one pathway at a time – first, removing insurance coverage and second eliminating in-state abortion access.

8 Conclusion

Nearly every woman in the United States chooses to use a contraceptive method during their lifetime (Daniels and Jones, 2013). The choice of which method to use is deeply consequential for both individual and aggregate economic outcomes. This paper provides a model for understanding how women make this choice, demonstrating that it depends not only on the method's attributes, but also on the policy environment. We show that women are forward-looking about future access to reproductive care. When they expect the policy environment to become more restrictive, women make defensive investments in methods that can shield them from an increase in out-of-pocket costs or a reduction in abortion access.

We first provide reduced form evidence on how women responded to three policy shocks: Wisconsin's 2015 abortion ban, Maine and Vermont's 2016 insurance coverage expansion, and the 2016 presidential election. Using a panel of de-identified patient-level method choices, we show that women switch to more expensive methods when costs fall; more effective methods when they expect abortion access to fall; and longer-lasting methods when they expect out-of-pocket costs to rise.

Next, we build a structural model to evaluate how women would respond to a set of possible policy scenarios and compare welfare effects across each one. We show that policy change drives many women to change their method, with restrictive policies shifting women away from the method they prefer in an unconstrained world. This shift imposes measurable welfare costs: while preventing pregnancy and birth are certainly very important, they are not the only important attributes of a birth control method. The structural model reveals that women value the non-pecuniary attributes of different methods very highly and that they experience high costs from switching between methods. We estimate that a policy that eliminated access to abortion and insurance coverage for contraception would decrease welfare by \$10,726 per woman during their 20s alone. Multiplied by the population of 21 million women ages 20-29 in the US, this is a total loss of more than \$225 billion. The total welfare loss throughout women's entire reproductive lives, from ages 15-44, is of course even larger. In contrast, providing free universal access to all contraceptive methods and to abortion would raise welfare by \$4,448 per woman (\$93 billion total) throughout their 20s.

We can also think of these effects as a lower bound for the effects of a national ban. We estimate the preferences for getting an abortion using a data set that tells us the likelihood of getting an abortion *at an in-state Planned Parenthood*, meaning that the implied outside option is not necessarily giving birth but could be getting an abortion at an out of state clinic.²⁹ Thus, our counterfactuals which shut down abortion are analogous to a state-wide abortion ban in which women can still access abortion out-of-state. If we assume that carrying a pregnancy to term is more costly than accessing an abortion out of state, this would bias our estimates of the value of abortion towards zero and underestimate the welfare losses associated with a national ban. Future research should explore this question using data on abortion usage across state lines to better understand the value of accessing abortion within state relative to out of state relative to carrying the pregnancy to term.

This paper is one of the first to demonstrate the effects of reproductive policy change on women who do not experience an abortion or birth. Our patient-level data allow us to provide a fuller understanding of how reproductive policy change affects women's welfare not only through its impact on pregnancy and abortion rates but also through its impact on contraceptive method choice. Uncovering the impact of the policy environment on women's welfare is urgent as American reproductive healthcare policy continues to

 $^{^{29}}$ In particular, not all Planned Parenthoods offer abortions and the closest location to access an abortion in northwest Wisconsin is not a Wisconsin Planned Parenthood, but an abortion clinic in Minnesota.

change.

9 Tables

I	Frequency	Failure rate:	Failure rate:	Forgettable	Impact on	Horr to got	E C
		typical use	perfect use	rorgettable	period	it	Ease of stopping
Over the counter H	Each time	0.15	0.02	No	None	Pharmacy	High
Pill I	Daily	0.08	0.003	No	Variable	Prescription	High
Patch	Weekly	0.08	0.003	No	Variable	Prescription	High
Ring M	Monthly	0.08	0.003	No	Variable	Prescription	High
Injection 3	3 months	0.03	0.003	No	Variable	Doctor visit	High
IUD/Implant 3	3-10 years	0.0005	0.0005	Yes	Variable	Doctor visit	Medium
Vasectomy (Once	0.0015	0.001	Yes	None	Surgery	Low^*
Sterilization (Once	0.004	0.004	Yes	Eliminated	Surgery	Can't

Table 1: Contraceptive Method Attributes

Note: Failure rates are reported from Trussell et al. (2009)'s estimates based a comprehensive literature review, package inserts, and expert opinion. These failure rates are based on failures within the first year of use. The over the counter failure rate reported here is Trussell et al. (2009)'s estimate for condoms, which is both the most effective and most common over the counter method. *The success rate for reversing vasectomies falls with time since the procedure.

	Sliding s	cale without i	nsurance base	ed on % federa	al poverty line	With insurance
	≤100%	101-150%	151-200%	201 - 250%	Full price	Out of pocket
Over the counter	-	-	-	-	80	80
Pill	0	90	180	270	360	180
Patch	0	180	360	540	720	180
Ring	0	120	240	360	480	180
Injection	0	120	240	360	480	0
IUD/Implant	0	125	250	375	500	0
Vasectomy	-	-	-	-	400	0
Female sterilization	-	-	-	-	2000	0

Note: This table displays approximate annual out-of-pocket costs for Planned Parenthood patients with and without health insurance. The actual cost may vary across health centers and insurance policies. Annual costs are calculated by multiplying methods by frequency of application per year. The full one-time costs of LARC insertion, vasectomy, and female sterilization vary widely, from \$1,000-1,500, \$350-1,000 and \$1,500-6,000 respectively. Annual costs are calculated assuming LARCs are used for 3 years and vasectomy/female sterilization are used for 5 years. This generates conservative cost estimates, since LARCs last for 3-10 years and most people who opt for vasectomy or sterilization are older than 35 (Foundation, 2018).

Table 3: Wisconsin Balance Table

		Wisconsi	n		Control	
	Pre	Post	Difference	Pre	Post	Difference
Age	25.226	25.516	0.29^{**}	26.212	26.452	0.24^{***}
Insured	0.852	0.827	-0.024^{**}	0.836	0.833	-0.002
Private	0.246	0.261	0.015	0.422	0.443	0.021^{**}
Black	0.272	0.296	0.025	0.023	0.025	0.002
White	0.602	0.555	-0.046^{**}	0.892	0.892	0
Hispanic	0.139	0.174	0.036^{**}	0.039	0.038	0
Pregnant	0.013	0.04	0.027^{***}	0.102	0.107	0.006
Past pregnancy	0.015	0.05	0.035^{***}	0.232	0.278	0.046^{***}
Contraceptive visit	0.171	0.28	0.109^{***}	0.443	0.418	-0.025^{***}
Switch	0.131	0.372	0.241^{***}	0.267	0.319	0.052^{***}
Switch to lower failure	0.097	0.285	0.188^{***}	0.197	0.22	0.023^{***}
Switch to LARC	0.012	0.053	0.041^{***}	0.095	0.105	0.009^{***}
Monthly visitors	179.475	394.262	214.788^{***}	305.477	304.572	-0.905
Monthly visits	184.886	421.641	236.755^{***}	331.846	334.105	2.259

Note: This table provides summary statistics by woman-visit for all visitors under age 45 to Planned Parenthood clinics in Maine, New Hampshire, Vermont, and Wisconsin during the event window beginning 6 months before and ending 12 months after the announcement of Wisconsin's 2015 abortion restriction. The first three columns show the pre-announcement mean, post-announcement mean, and difference in Wisconsin and the last three columns show the same information for the control states, Maine, New Hampshire, and Vermont. Contraceptive visits refer to visits whose purpose was related to contraceptives. Statistical significance of the differences in means is reported with stars, with * for p < 0.10, ** for p < 0.05, and *** for p < 0.01.

	Maine, N	ew Hampsl	nire, Vermont		Control	
	Pre	Post	Difference	Pre	Post	Difference
Age	25.284	25.708	0.424^{***}	26.3	26.427	0.127^{*}
Insured	0.834	0.816	-0.018	0.849	0.798	-0.052^{***}
Private	0.251	0.307	0.056^{***}	0.448	0.454	0.006
Black	0.29	0.307	0.017	0.024	0.027	0.004^{*}
White	0.563	0.53	-0.033**	0.897	0.877	-0.019^{***}
Hispanic	0.172	0.196	0.024^{**}	0.037	0.043	0.005^{***}
Pregnant	0.041	0.088	0.047	0.087	0.139	0.052^{***}
Contraceptive visit	0.294	0.261	-0.033**	0.424	0.379	-0.044^{***}
Switch	0.358	0.487	0.13^{***}	0.273	0.378	0.105^{***}
Switch to lower failure	0.27	0.382	0.112^{***}	0.195	0.234	0.039^{***}
Switch to LARC	0.045	0.082	0.037^{***}	0.106	0.103	-0.002
Monthly visitors	358.967	500.658	141.69^{***}	277.227	356.597	79.369^{***}
Monthy visits	381.963	547.89	165.927^{***}	299.273	398.312	99.04^{***}

 Table 4: Northern New England Balance Table

Note: This table provides summary statistics by woman-visit for all visitors under age 45 to Planned Parenthood clinics in Maine, New Hampshire, Vermont, and Wisconsin during the event window beginning 6 months before and ending 12 months after Vermont and Maine's 2016 healthcare expansions. The first three columns show the pre-announcement mean, post-announcement mean, and difference in Northern New England and the last three columns show the same information for the control state, Wisconsin. Contraceptive visits refer to visits whose purpose was related to contraceptives. Statistical significance of the differences in means is reported with stars, with * for p < 0.10, ** for p < 0.05, and *** for p < 0.01.

	Pre	Post	Difference
Age	25.958	26.232	0.274^{***}
Insured	0.806	0.817	0.01^{**}
Private	0.369	0.402	0.032^{***}
Black	0.2	0.196	-0.004
White	0.66	0.663	0.003
Hispanic	0.138	0.144	0.006
Pregnant	0.119	0.138	0.018
Abortion	0.067	0.09	0.023
Past abortion	0.118	0.197	0.079^{***}
Past pregnancy	0.257	0.345	0.088^{***}
Contraceptive visit	0.301	0.303	0.002
Switch	0.445	0.483	0.039^{***}
Switch to lower failure	0.322	0.369	0.046^{***}
Switch to LARC	0.088	0.107	0.019^{***}
Monthly visitors	459.739	437.727	-22.012
Monthly visits	508.233	486.309	-21.923

Table 5: Presidential Election Balance Table

Note: This table provides summary statistics by woman-visit for all visitors under age 45 to Planned Parenthood clinics in Maine, New Hampshire, Vermont, and Wisconsin during the event window beginning 6 months before and ending 12 months after the 2016 presidential election. Contraceptive visits refer to visits whose purpose was related to contraceptives. Statistical significance of the differences in means is reported with stars, with * for p < 0.10, ** for p < 0.05, and *** for p < 0.01.

	Calibrated par	rameters	
Discount rate	Risk aversion	π_A	π_C
0.95	1	1	1
	Contraception	baseline	
OTC	Hormonal	Injection	LARC
1.337	2.171	1.68	1.845
(0.046)	(0.051)	(0.05)	(0.052)
	Contraception i	f pregnant	
OTC	Hormonal	Injection	LARC
0.767	-0.596	-1.513	-0.804
(0.086)	(0.097)	(0.176)	(0.127)
	Contraception i	f abortion	
OTC	Hormonal	Injection	LARC
-1.686	-0.677	-0.794	0.277
(0.1)	(0.109)	(0.206)	(0.136)
Abortion \cdot WI	Abortion \cdot Age	Abortion \cdot Public	Abortion \cdot No Ins.
0.051	0.038	1.748	0.816
(0.133)	(0.008)	(0.12)	(0.005)
Pregnancy baseline	${\rm Pregnancy}\cdot{\rm Age}$	Abortion baseline	
0.5	-0.043	-0.268	
(0.046)	(0.013)	(0.056)	
Switch baseline	Contraception variance	Monetary scaling	
-2.284	0.816	0.21	
(0.011)	(0.005)	(0.071)	

Table 6: Parameter Estimates

Note: This table reports the model parameters and their standard errors, estimated via maximum likelihood on administrative data from Planned Parenthood. See text for sample construction and formation of the likelihood function.

	Observable Chara	acteristics		Utility relative to No Method (in \$) is:			
Insurance	Starting Method	Pregnant	Abortion	OTC	Hormonal	Injection	LARC
Private	OTC	No	No	17,139	10,146	7,990	8,775
Private	OTC	Yes	No	20,790	7,313	794	4,952
Private	OTC	Yes	Yes	12,769	4,092	-2,984	6,270
None	OTC	No	No	17,139	9,966	7,510	8,265
None	OTC	Yes	No	20,790	7,133	314	$4,\!442$
None	OTC	Yes	Yes	12,769	3,912	-3,464	5,760
Private	LARC	No	No	6,277	10,146	7,990	$19,\!637$
Private	LARC	Yes	No	9,928	7,313	794	$15,\!814$
Private	LARC	Yes	Yes	1,907	4,092	-2,984	$17,\!132$
None	LARC	No	No	6,277	9,966	7,510	$19,\!127$
None	LARC	Yes	No	9,928	7,133	314	15,304
None	LARC	Yes	Yes	1,907	3,912	-3,464	$16,\!622$

Table 7: Flow Utility Associated with Different Contraceptive Methods

Note: This table reports the flow utility in dollars for choosing each contraceptive method for different types of women. A woman's type is defined by her insurance status, the method she starts the period with, whether she was pregnant this period, and whether she got an abortion this period. All utility is relative to the omitted choice, no method. Utility is calculated based on the contraceptive utility equation $U_C(j_{i,t-1}, S_{it}, A_{it}) = \theta_{-j} + \theta_j^P \cdot P_{it} + \theta_j^A \cdot A_{it} + \beta_1 \cdot \cos t_{j,t,ins} + (\beta_2 \mathbb{1}(j_t \neq j_{t-1})).$

Table 8: Impact of the post-election	changes in beliefs	on switching methods	and utility
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		Sta	rting method		
	No Method	OTC	Hormonal	LARC	Overall
	(1)	(2)	(3)	(4)	(5)
Switched methods, pre-election beliefs	0.578	0.326	0.070	0.178	0.293
Switched methods, post-election beliefs	0.649	0.326	0.069	0.171	0.308
Ending method = $LARC$, pre-election beliefs	0.151	0.088	0.028	0.822	0.149
Ending method = $LARC$, post-election beliefs	0.175	0.092	0.029	0.829	0.156
% change in utility	-0.029	-0.007	-0.006	-0.002	-0.011
% change in utility changed behavior	-0.046	-0.021	-0.026	-0.013	-0.042
Observations	17,376	25,747	19,068	6,593	76,418

Note: This table summarizes the impacts of changes in beliefs after the 2016 election on behavior and utility among women who were initially using each of the listed contraceptive methods. Rows 1 and 2 indicate the proportion (0-1) of women who switch to any other contraceptive method. Rows 3 and 4 indicate the proportion (0-1) of women who end the period with a LARC. For the women in columns 1-3, the numbers are equivalent to the proportion switching to a LARC. For the women in column 4 who already had a LARC, the numbers capture the proportion choosing to stay with a LARC. Column 5 thus indicates both a decline in switches away from LARCs and an increase in switching to LARCs. Row 5 indicates the percent change in the utility due to the post-election beliefs from a single year of reproductive decisions. Row 6 indicates the same, restricted to the sample of women who make a different decision in the post-period than in the pre-period.

		Free	E	Fully	Costly	No Abor-	No	E.II
Outcome	Model	Contra-		Uncon-	Contra-	tion, Free	Abortion	runy A · · ·
		ception	Abortion	strained	$\operatorname{ception}$	Contra-		Constrained
						ception		
		(1)	(2)	(3)	(4)	(5)	(9)	(2)
Pregnancy rate	0.093	0.091	0.097	0.096	0.096	0.072	0.072	0.074
Abortion rate	0.066	0.065	0.072	0.072	0.068	0	0	0
% Pregnancies aborted	0.711	0.709	0.749	0.746	0.709	0	0	0
% Switch	0.180	0.177	0.179	0.177	0.176	0.175	0.178	0.174
No Method	0.034	0.032	0.040	0.038	0.037	0.006	0.007	0.007
Over the counter	0.127	0.125	0.127	0.124	0.137	0.134	0.137	0.149
Hormonal	0.537	0.555	0.535	0.553	0.542	0.556	0.538	0.542
Injection	0.139	0.134	0.137	0.132	0.124	0.143	0.148	0.134
LARC	0.163	0.154	0.161	0.152	0.160	0.161	0.171	0.168
Total Utility (\$)	246, 467	249, 553	247, 785	250, 914	245,012	240, 675	237, 436	235, 741
% Women who change behavior		0.035	0.049	0.066	0.043	0.426	0.429	0.432
% of Women who had More Abortions		0.007	0.045	0.045	0.015			
Change in Util from Baseline (\$)		3,087	1, 318	4,448	-1,454	-5,792	-9,031	-10,726
Change in Util from Baseline (\$), Changed Behavior		15,303	7,991	15,685	19,832	-13,108	-17, 116	-17,671
Change in Util from Baseline $(\$)$, More Abortions		29, 191	8,561	15, 575	27, 312			
<i>Note:</i> This table reports the results of several counterfactua price of contraception and abortion to zero. CF4 sets the pr the price of contraception equal to zero. CF6 shuts down abort	uls. CF1 sets rice of contri- ortion and ke	the price of c aception equal seps contracep	contraception \in to its out-of-f tion at usual c	iqual to zero. Cocket cost with osts. CF7 sets	F2 sets the hout insurant	price of abort ce. CF6 shut ontraception	ion to zero. s down abor ¹ equal to its o	CF3 sets the ion and sets out-of-pocket
cost without insurance and shuts down abortion.								

scenarios
policy
Counterfactual
Table 9:

10 Figures



Figure 1: Map of PPNNE and PPWI health center Locations

(b) Northern New England







Figure 3: Incidence of pregnancy and abortion by method



Note: These plots tabulate the total pregnancies to term and abortions observed in the data by contraceptive method. Observed pregnancies with no abortion appointment are assumed to have been carried to term, although it is possible they were miscarried or aborted outside of the Planned Parenthood clinics in our sample.



Figure 4: Switches in Wisconsin after Wisconsin abortion ban

Note: These plots show the results from running specification 3.1 on the Wisconsin sample for the window surrounding the introduction and passage of Wisconsin's 2015 abortion ban.



Figure 5: Switches in Northern New England after healthcare expansion

Note: These plots show the results from running specification 3.1 on the Northern New England sample for the window surrounding Vermont's healthcare expansion.



Figure 6: Switches in all states after the 2016 presidential election

Note: These plots show the results from running specification 3.1 on the full sample for the window surrounding the 2016 presidential election.



Figure 7: Heterogeneity in the response to the abortion ban by distance to out-of-state health centers

Note: These plots show the total effects from running specification 3.3 on the Wisconsin subsample, using indicators for being in the labeled bins of distance from the nearest out-of-state health centers.



Figure 8: Difference in Differences: Switches to Lower Failure Methods and LARCs

Note: These plots show the results from running specification 3.2 on separate samples for each region. Standard errors are clustered at the health center level.



Figure 9: Switches to Other Methods

Note: These plots show the results from running specification 3.1 on the full sample for the window surrounding the 2016 presidential election. Standard errors are clustered at the health center level.









Note: This figure compares the moments observed in the data (green) with the moments simulated by our model (blue). The top panel tabulates the pregnancy rate per visit, abortion rate per visit, percent of pregnancies that are aborted, rate of method switches, and use rates for various contraceptives. The lower panel displays the percent difference between the observed and modeled moments.



Figure 12: Counterfactuals: Fully constrained versus fully unconstrained

Note: This figure compares the observed moments (green) with simulated moments for counterfactuals where insurance coverage for contraception and access to abortion are eliminated (blue) and where all methods are free and abortion is fully accessible (orange). The top panel tabulates the pregnancy rate per visit, abortion rate per visit, percent of pregnancies that are aborted, rate of method switches, and use rates for various contraceptives. The lower panel displays the percent change from the observed moments to the simulated counterfactuals. The unconstrained counterfactual sets the price of all contraceptives to 0 and makes abortion costlessly available. The fully constrained counterfactual sets the price of all contraceptives to their out-of-pocket cost without insurance and quintuples the cost of abortion.



Figure 13: Counterfactuals: Reducing abortion access versus increasing costs

Note: This figure compares the observed moments (green) with simulated moments for counterfactuals where either insurance coverage for contraception is eliminated (blue) or abortion access is restricted (orange). The top panel tabulates the pregnancy rate per visit, abortion rate per visit, percent of pregnancies that are aborted, rate of method switches, and use rates for various contraceptives. The lower panel displays the percent change from the observed moments to the simulated counterfactuals. The no insurance coverage counterfactual sets the price of all contraceptives to their out-of-pocket cost without insurance. The restricted abortion access counterfactual quintuples the cost of abortion.

11 Appendix

11.1 Appendix Tables

	Dependent variable: Switch to LARC				
	"Repeal and Replace" (1)	"ACA" (2)	"ACA Birth Control" (3)	"Trump Abortion Executive Order" (4)	"Roe v. Wade" (5)
N searches	$74.620^{***} \\ (21.695)$	33.519^{***} (12.466)	27.677^{***} (7.270)	$41.101^{***} \\ (11.860)$	$27.728^{***} \\ (9.509)$
N searches squared	-42.096^{***} (13.081)	22.642^{**} (10.789)	3.745 (10.007)	-11.107 (10.567)	21.168 (13.569)
N searches cubed	$52.629^{***} \\ (14.662)$	-26.465^{**} (10.456)	$19.594^{***} \\ (6.827)$	23.364 (15.609)	-12.111 (10.265)
Observations R^2 Adjusted R^2	2,816 0.797 0.793	2,816 0.797 0.793	2,816 0.797 0.792	2,816 0.797 0.793	1,973 0.764 0.758

Table 10: Prevalence of Google Search Terms and Switches to LARCs

All specifications are run at the health center-month level on observations from January 2013-August 2018, and include health center and year fixed effects and state-year trends. Standard errors are clustered at the health center level. Search term prevalence is measured on a scale from 0 to 100, with 100 being peak searches for that term. *p<0.1; **p<0.05; ***p<0.01.

Dependent variable:	Pregnant	Abortion	
	(1)	(2)	
Seeking pregnancy	0.233^{***} (0.021)	$0.015 \\ (0.015)$	
None	0.145^{***} (0.026)	0.141^{***} (0.038)	
Over the counter	0.021^{*} (0.013)	0.027^{*} (0.014)	
Pill/Patch/Ring	0.001 (0.010)	0.017 (0.013)	
Injection	-0.009 (0.012)	0.025 (0.015)	
LARC	-0.028^{***} (0.010)	-0.014 (0.013)	
Partner sterilization	-0.015 (0.012)	0.003 (0.014)	
Sterilization	-0.006 (0.011)	0.006 (0.014)	
Age	-1.655^{**} (0.724)	$0.327 \\ (0.345)$	
Age sq	$\begin{array}{c} 1.259^{***} \\ (0.376) \end{array}$	0.769^{**} (0.309)	
N past pregnancies	0.209^{***} (0.018)	$0.002 \\ (0.007)$	
N past abortions	-0.025 (0.034)	0.251^{***} (0.048)	
Asian	$0.010 \\ (0.010)$	$0.001 \\ (0.011)$	
Black or African American	-0.016^{*} (0.009)	-0.014^{*} (0.008)	
White	-0.003 (0.008)	-0.003 (0.008)	
Hispanic	$0.002 \\ (0.025)$	$0.003 \\ (0.015)$	
Not Hispanic	$0.002 \\ (0.024)$	0.006 (0.015)	
$Observations R^2$	$588,595 \\ 0.501$	$415,511 \\ 0.696$	
Adjusted \mathbb{R}^2	0.501	0.696	

Table 11: Predictors of pregnancy and abortion

Note: These regressions were run on a sample of women-month observations. The sample for abortion begins in 2016, the first year in which data on abortions are available. The omitted contraceptive method category is menopause. The omitted category for race is American Indian/Alaska Native. The omitted category for ethnicity is Declined to specify. Standard errors are clustered at the person level. *p<0.1; **p<0.05; ***p<0.01.

11.2 Appendix Figures



Figure 14: Trends in Unemployment by State

Note: This plot shows the trend in seasonally adjusted unemployment by state during our study period, using data from the US Bureau of Labor Statistics.

Figure 15: Switches to higher cost methods in Northern New England after Healthcare Expansion



Note: These plots show the results from running specification 3.1 on the Northern New England sample for the window surrounding Maine and Vermont's healthcare expansions.



Figure 16: Switches to higher cost methods in Wisconsin after Wisconsin abortion ban

Note: These plots show the results from running specification 3.1 on the Wisconsin sample for the window surrounding the introduction and passage of Wisconsin's 2015 abortion ban.





Note: These plots show the results from running specification 3.1 on the full sample for the window surrounding the 2016 presidential election.

11.3 Reduced form robustness checks

Figure 18: Switches in all states after the 2016 presidential election, omitting Manchester, NH



Note: This plot shows the results from running specification 3.1 on the full sample versus the sample omitting Manchester, NH for the window surrounding the 2016 presidential election. The pre-election rate of LARC usage in Manchester was 12.1% compared to an average of 8.9% elsewhere.





Note: This plot shows the results from running specification 3.1 on the full sample versus the sample omitting Portland, ME for the window surrounding the 2016 presidential election. The pre-election rate of LARC usage in Portland was 14.0% compared to an average of 8.7% elsewhere.



Figure 20: Switches to LARCs in NNE after the VT healthcare expansion, omitting Burlington, VT

Note: This plot shows the results from running specification 3.1 on the full sample versus the sample omitting Burlington, VT for the window surrounding the 2016 presidential election.

Figure 21: Switches to lower failure methods in NNE after the VT healthcare expansion, omitting Burlington, VT $\,$



Note: This plot shows the results from running specification 3.1 on the full sample versus the sample omitting Burlington, VT for the window surrounding the 2016 presidential election.



Figure 22: LARC switches after the 2016 election by visit purpose

Note: This plot shows the results from running specification 3.1 for switches by visit purpose during the window surrounding the 2016 presidential election.



Figure 23: LARC switches after the VT healthcare expansion by visit purpose

Note: This plot shows the results from running specification 3.1 for switches by visit purpose during the window surrounding the Maine and Vermont healthcare expansions.



Figure 24: LARC switches after the WI abortion ban by visit purpose

Note: This plot shows the results from running specification 3.1 for switches by visit purpose during the window surrounding the 2015 Wisconsin abortion restriction.



Figure 25: Difference in Differences: Switches to Lower Failure Methods and LARCs for VT vs. WI

Note: These plots show the results from running specification 3.2 using only Vermont clinics as treated, instead of including all three Northern New England states. Standard errors are clustered at the health center level.

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