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Behind-the-counter, but Over-the-border? The Assessment of the Geographical Spillover Effect of Increased Access to Emergency Contraception

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Abstract: Washington was the first state to ease the prescription requirements making emergency contraception (EC) available behind-the-counter at pharmacies to women of any age in 1998. I hypothesize that the increased availability of EC affects fertility rates beyond the borders of the state that allows it. In contrast to the literature, I show that increased access to EC is associated with a statistically significant albeit economically small decrease in abortion rates in Washington counties where women had access to no-prescription EC pharmacies. Yet, there is no effect on pregnancy rates. These results are robust in a number of specifications. Finally, I find some evidence in support of the spillover effects in Idaho, but not Oregon. However, after accounting for changes in the availability of abortion services, the decrease in fertility rates in "treated" Idaho counties is rather small and models lack sufficient power to detect it.

Keywords: Emergency contraception; Plan B; Abortion; Pregnancy; Border-hopping; Travel distance

JEL classification code: I1; I18; J13

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I. Introduction

The introduction of the contraceptive pill in the 1960s and the nationwide legalization of abortion in 1973 reduced the risk as well as the cost of unwanted pregnancies, affecting various aspects of women's lives far beyond the fertility decisions.[1] Although some forms of emergency contraception (EC) were available on the off-label basis for nearly 30 years, formally, it has received the FDA's approval on a prescription basis only since the late 1990s.[2] Since the EC also reduces the risk of unintended pregnancy, one could expect it might have similar effects to the contraceptive pill on fertility rates and other relevant outcomes.

The effectiveness of the EC pill in pregnancy prevention is inversely related to the duration between when the unprotected intercourse takes place and the time the EC pill is taken. Any requirements that delay the pill's intake, such as a doctor's prescription, reduce the effectiveness of EC and increase the risk of unwanted pregnancy. In an attempt to reduce unwanted pregnancy rates, several states increased the availability of EC by loosening up the prescription requirements. In 1998 Washington was the first state to make EC available at pharmacies to women of any age without a prescription. Specifically, the access to EC was facilitated by delegating the prescriptive authority to the trained pharmacist to carry out the screening and provision of the EC pills as appropriate to any woman who presents with either an immediate need or in advance of a need for it.

Since EC access at a pharmacy was not conditional on the residency status, I hypothesize that, in addition to the effects in Washington (the direct effects), an increased availability of EC might have had a spillover effect on the neighboring Oregon and Idaho, where EC was available on a prescription basis only (the indirect effects). If that is the case, then one would observe changes in the abortion and the pregnancy rates in the neighboring states, particularly in counties that are within a close proximity to the Washington pharmacies that dispense EC without a prescription. However, the effect of EC availability on abortion and pregnancy rates could be ambiguous, as the availability of EC could also increase the sexual risk-taking behavior, resulting in larger fertility rates. The net effect is thus to be determined empirically. Furthermore, the effect (if any) is expected to diminish with an increase in distance required to travel to the

[1] For example, Angrist and Evans (1996), Goldin and Katz (2002), Bailey (2006), Ananat and Hungerman (2012).
[2] In 2006, FDA approves Plan B as no prescription form of EC for women 18 years and older; the age restriction is changed to 17 years and older in 2009. Boumil and Sussman (2008) provide a detailed overview of various aspects of EC, including history.

closest no-prescription EC location. The existence of spillover effects is plausible for two reasons. First, the “border-hopping” phenomenon or cross-border mobility aimed to avoid local restrictions has been documented in abortion demand literature, as well as in alcohol consumption literature (Cartoof and Klerman 1986, Henshaw 1995, Joyce and Kaestner 1996, Blank et al 1996, Haas-Wilson 1996, Bitler and Zavodny 2001, Saffer and Grossman 1987, Figlio 1995, Clapp et al 2001). If the cost of obtaining EC locally outweighs the cost of obtaining EC in Washington, then the existence of border-hopping with respect to EC is possible. Second, the Washington EC experiment has received extensive media coverage both in the national level and local media outlets, and has likely facilitated the dissemination of relevant information beyond Washington state limits into the neighboring states such as Oregon and Idaho.

The empirical estimation of the effects relies on the difference-in-difference framework, where treatment counties are identified based on the travel distance from the county population centroid to the closest zip code location with a pharmacy that does not require doctor’s prescription for EC (EC pharmacy). To test whether the effect diminishes with the distance required to travel, I consider three treatment group definitions for each state: 10, 20, and 25 miles for Washington and 20, 25, and 50 miles for Idaho and Oregon. Additionally, I show that the results are not driven by data and I can obtain the qualitatively similar estimates reported in a related study by Durrance (2013).

In contrast to the literature, results for Washington indicate that abortion rates among young women were substantially lower in counties that had access to no-prescription EC pharmacies within 10 miles of the county population centroid. Depending on the age group, the direct effects vary between 5% to 7% change (or 1-3 abortions per 1,000 women). These are the upper bound estimates as an alternative model that accounts for the number of EC pharmacies within the same radius produces a much smaller estimate, indicating that the presence of one EC pharmacy does not have a large economic effect on abortion rates. As expected, the magnitude of the effect drops once the treatment group is defined using a 20 miles radius. I also find a negative but not economically or statistically substantial change in pregnancy rates for all age groups. These results might be consistent with no change in the risk taking: a decrease in abortions is likely not sufficient to change the pregnancy rate significantly as abortions represent a small share of all pregnancies.

I find weak evidence in support of the spillover effects in counties that have EC access within 20 miles in Idaho, but not Oregon. Controlling for the availability of abortion services to Idaho residents reduces estimates (making the magnitude more credible), and inflates standard errors reducing the statistical power nearly for all age groups and both considered outcomes. Overall, comparing to Oregon residents, the border-hopping for EC might have higher benefits to Idaho residents, but the effects on fertility rates are rather small to be detected.

II. Background and Literature Review

The implementation of behind-the-counter access to EC without a prescription, also known as the Washington State Emergency Contraception Collaborative Agreement Pilot Project (the EC Project), was possible due to the Pharmacy Practice Act provisions that permit a formation of voluntary collaborative drug therapy agreements between physicians and pharmacists. Generally, collaborative agreements are used in well-defined situations characterized by a very low risk associated with drug therapy and a high need for patient access. Such an agreement, if formed with respect to EC, allows a trained pharmacist to assess a need for EC and make an independent decision about the provision of EC pills without a prescription. The pharmacist must follow the established drug therapy protocol that specifically defines prescribing activities and refer women who need contraceptive services or who fall outside of the scope of the agreement to the independent prescriber or another health care provider. For example, the pharmacist will refer a patient to see a physician or a family planning service provider if the elapsed time since intercourse is greater than 72 hours or if established pregnancy cannot be ruled out during the initial screening.[3]

To increase awareness of EC availability, the two-year EC Project launch was supported by a three-month media campaign that included radio and print advertisements in various media outlets, as well as promotional materials on public buses. The EC Project itself received a national coverage with more than a hundred stories aired on television and many more appearing on radio and in the newspapers (Gardner et al 2001). Following a favorable reception in the community, pharmacies continued to file for new EC collaborative agreements as well as renew

[3] Even in the absence of participation in the EC Project, pharmacies can carry EC pills and sell them to customers who have a doctor's prescription. The additional participation in the EC Project arguably puts a relatively low burden on pharmacies. Gardner et al (2001) provides an overview of the EC Project. A detailed description, including the pharmacist's screening and counseling time compensation provisions can be found in PATH (1999).

the existing EC collaborative agreements well after the end of the EC Project in 1999. Not only did the number of participating pharmacies increase dramatically, but also coverage across Washington state increased from about 30% of counties in 1998 to over 75% in 2005.

The response of fertility rates to changes in the overall price of oral contraceptives as well as abortion services is well studied. Kearney and Levine (2009) show that teen fertility rates are sensitive to changes in the price of oral contraceptives. Fertility rates are also responsive to changes in the price of abortion services (Medoff 2008) and to changes in requirements that aim to raise the overall costs of abortion, such as the parental involvement laws for minors (Levine 2003, Tomal 1999, Haas-Wilson 1996), the mandatory waiting and counseling requirements (Althaus and Henshaw 1994), and the restrictions on the Medicaid funding for abortion (Cook et al 1999, Blank et al 1996, Levine et al 1996, Haas-Wilson 1996).

The overall cost of obtaining EC includes the monetary costs of the EC pills, the time cost associated with the search activities and the actual time of obtaining EC, as well as the psychological and emotional costs associated with a visit to the doctor's office to obtain the EC prescription. The latter costs might be higher for minors who might want to hide the fact and the aim of the visit from their parents or in small, rural areas where information disseminates quickly through word of mouth. Although the EC pill remained in "behind-the-counter" status, the elimination of the "middle man" (the doctor who provides the prescription) increased the availability of EC and decreased the effective EC cost through the decrease in the time of searching and obtaining EC. Across county variation in the number of participating pharmacies between 1998 and 2005 and within county variation across time create a distribution of costs, associated with an acquisition of EC, for potential customers. A reduction in the cost for a particular woman depends on the location of her residence (or work site) relative to the closest EC pharmacy. If an EC pharmacy is nearby, then the drop in the overall cost of EC can be substantial. The cost reduction, however, diminishes with the distance one needs to travel to the closest EC pharmacy location. For some women there might be no gains at all as the time gained by not going to the doctor's office will be spend on travelling to the closest EC location.

The change in the availability of EC can affect only the number of unwanted pregnancies. However, the direction of the change in the unwanted pregnancy rate and its components, as well as the overall pregnancy rates, cannot be easily established. An unwanted pregnancy can result in an unwanted birth or be terminated via an abortion. The EC pill, if taken promptly, allows a woman to prevent a conception after unprotected intercourse. If the EC pill is effective, then an unwanted pregnancy will not take place and hence neither be terminated via abortion nor will result in unwanted birth. Since the unwanted pregnancy does not take place, there will be fewer unwanted pregnancies, fewer unwanted births and abortions in places where the cost of EC has decreased via a practice of EC collaborative agreements. However, it is possible that lower cost of obtaining EC induces a change in sexual behavior resulting in a higher willingness to engage in unprotected sexual intercourse. If so, then the number of unwanted pregnancies among those whose behavior has changed could increase. The net effect on the entire female population is ambiguous, as it depends on the relative differences in responses of women whose sexual behavior has not changed by the EC availability and women whose behavior has changed. A potential increase in the conception rate due to an increase in the incidence of unprotected sex can be counteracted by an increased use of EC. In that case, the number of unwanted pregnancies that occurs among women whose sexual behavior responded to increased EC availability may not change substantially. However, one should keep in mind that the EC pills are only about 90% effective, even when taken as recommended. Similarly, the net effect on abortion rate is also ambiguous. The identification of these effects is an empirical exercise.

A number of studies have shown that the EC availability has no effect on fertility rates. Results from randomized control trials, where often the assignment of treatment allows for a crossover between groups, report that increased access to EC has no impact on abortion rates (Glasier et al 2004) or unintended pregnancy rates (Raymond et al 2007, Raine et al 2005). However, some of these studies suffer from the sample selection and attrition problems, and have a poor statistical power to identify the effects as the inference is based on small samples. Yet, similar results are reported in the economic studies. For example, Durrance (2013) tests the intended and unintended consequences of the Washington EC Project using a difference-in-difference model. She finds no significant association between the percent of pharmacies with EC collaborative agreements and the county level abortion and birth rates. Gross et al (forthcoming) exploit across state variation in the EC pharmacy laws and ED-access laws also find little evidence of an impact on either abortion or birth rates. Similarly, Girma and Paton (2011) have not found a significant change in teen abortion rates in response to the increased EC availability, via a free of charge provision of EC at the pharmacies implemented across the local authorities, in England between 1998 and 2004. However, one should keep in mind that the timing of implementation of the program in England was close to the 2001 law that made EC available over-the-counter to all women 16 years and older in all parts of England. It is possible that the increased availability might have had an impact on a specific subgroup of population and the overall effect was too small to detect using their triple-difference approach. Additionally, the mobility of potential EC users across the local authorities has not been addressed.

Finally, there is some evidence that easy access to EC may increase sexual risk taking often measured by changes in the sexually transmitted diseases (STD) rates. Durrance (2013) finds that the percent of pharmacies with EC collaborative agreements in Washington is associated with a 12-17% increase in county level gonorrhea rates per 100,000 females. Mixed results that are sensitive to model specifications are reported in Paton (2006). An assessment of the effect of EC on the STDs is beyond the scope of this study. However, the effect of changes in the risk-taking sexual behavior associated with an increased availability of EC is assessed via changes in the county level pregnancy rates.

III. Data and Empirical Strategy

Pharmacies that participated in the EC Project were encouraged to submit relevant information to the Emergency Contraception Website and the associated Not-2-Late Hotline maintained by the Office of Population Research at Princeton University. The objective of the hotline was to make available to potential callers general information about EC and about specific locations of participating pharmacies in the callers' immediate area. I assess the potential effects of the changes in the availability of EC in Washington on women in Washington, Idaho, and Oregon by examining location specific data on participating pharmacies, identified by a provider id-address combination, obtained from the EC Hotline database.

Although the EC Hotline database contains detailed location data it has two main limitations. First, it is an opt-in database and, therefore, the total number of EC pharmacies is understated. A more complete list of participants could be constructed using data from the Washington State Board of Pharmacy which approves all collaborative drug therapy agreements. However, data on these collaborative agreements are not publicly available.[4] If there are more EC pharmacy locations than those observed in the EC Hotline dataset, then estimated distances to the closest EC pharmacy are overstated. This might bias my estimates. Second, the EC Hotline

[4] Upon a request the Washington State Board of Pharmacy declined to share these data.

database was not set up to provide a consistent year-to-year tracking of participating pharmacies, but it contains records for dates when pharmacy updated its information with the EC Hotline. Based on the frequency and dates of the pharmacy location updates in the database, it is possible to track the participation status of each location. Participating pharmacies were required to renew their collaborative agreements after a two-year expiration period. Similar to the literature where historical information on location is limited, I assume that once a pharmacy location appears in the EC Hotline dataset that pharmacy is participating in the EC Project for at least two years. A similar assumption is applied to all consequent dates when the pharmacy updated its information with the EC Hotline. Although the vast majority of pharmacies updated their information with the Hotline in later years, there might be gaps in the pharmacy participation status over time. However, the lack of updates for a specific pharmacy does not necessarily mean that this specific zip code location does not have an EC pharmacy. In addition, it is likely that some pharmacies that did not update their status with the EC hotline continued to participate in the EC Project (i.e. renew their collaborative agreements). Figure 1 reports locations of the participating pharmacies at the zip code level for 1998 and 2005. To test whether the data limitations affect the quality of the analyses, I estimate models reported in Durrance (2013). The mean values of the main EC availability measure – the percent of pharmacies with the EC access in a county – are slightly below the means reported in Durrance.[5] The empirical analysis confirms that the percent of pharmacies with the EC access does not affects county level abortion or birth rates. Supplementary Appendix A contains the replication results for a model identical to Durrance (2013) and a specification augmented with two additional years of data. An alternative measure – the number of participating pharmacies per 1,000 people – yields qualitatively similar results (not reported, but available on request).

To estimate the travel distance to an EC pharmacy, I utilize the US Census Gazetteer files which provide the latitude/longitude coordinates of the internal point of zip codes and the US Census data on latitude/longitude of county population centroids. The location of an EC pharmacy is identified by the geographical coordinates of the zip code centroid that pharmacy is located in. Then I estimate the travel distance from each county in Washington, Idaho, and Oregon to the closest pharmacy location in Washington as the distance between county's i

[5] Durrance reports that access increased from about 6% of pharmacies in 1998, to 23% in 2002, to 40% in 2005. The corresponding means in my datasets are 5%, 22%, and 36%.

population center and the geographical centroid of the nearest zip code with an EC pharmacy.[6] The estimated distances could be measured with error. Nevertheless, a reasonable alternative approach is not available, and this method of estimating distances is commonly used in the literature. For example, Kane and Staiger (1994), Joyce and Kaestner (2001), and Joyce et al (2011) proxy access to legal abortion services by distance from the population centroid of a woman's county of residence to the population centroid of the nearest county with an abortion provider. I believe the use of zip code centroids, rather than county centroids, to approximate the location of the pharmacy reduces the measurement error. This approach seems reasonable given the clustering of participating pharmacies within a county as shown in Figure 1. The average travel distance within Washington is 16 miles, ranging from 0.9 miles to over 100 miles; the travel distance from Idaho and Oregon counties to the closest EC pharmacy varies from 7 miles for counties close to the Washington border to over 400 miles with an average distance of 162 miles. Figure 2 shows travel distance by county for Idaho and Oregon in 2005.[7]

I use the variation in the travel distance to identify counties where the changes in the EC availability in Washington might have changed fertility outcomes. Counties with a reasonably short travel distance will constitute a "treatment" group. The baseline empirical specification of the model is given by

$$Y_{ct} = \beta_0 + \beta_1 TREATMENT_{ct} + \gamma X_{ct} + \lambda_c + \tau_t + \xi_c trend + \varepsilon_{ct}\,, \tag{1}$$

where c indexes counties and t indexes years 1991 through 2005. The standard errors are clustered at the county level. All regressions are weighted using county female population in the appropriate age group.

The dependent variable Y is the abortion rate (or pregnancy rate) per 1,000 women age 15-19, 20-24, 15-24, 15-29, and 15-44 in county-year.[8] Although the fertility data are available by 5-year age groups, aggregation into larger age bands helps to mitigate the problems associated with a high fluctuation in abortion rates based on the small numbers in some age-county-year cells. The latter is an artifact of reporting peculiarities and a rare event occurrence in general.[9]

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[6] If an EC pharmacy entered in the EC Hotline database in the fourth quarter of year t then this location is considered for distance calculation starting with $t+1$.

[7] In 2002 California has passed legislation allowing for the pharmacy access to EC. For years after 2002 the travel distance to the closest EC pharmacy accounts for locations in both Washington and California. The legislation affects travel distances only for Oregon, but even for affected counties those are substantial and exceed 75 miles.

[8] Following the lead of Levine et al (1996) and Levine (2003), pregnancy rate is calculated as a sum of births and abortions. These data by place of residence are available from the annual state vital statistics reports.

[9] For several years data are not reported by age for some Oregon counties due to confidentiality concerns.

The analysis focuses on younger women as both abortion and pregnancy rates are substantially lower for older women.[10]

The dummy variable, *TREATMENT*, indicates whether the closest EC pharmacy location for a given county is within a 20 miles radius. Values are set to zero for years prior to 1998, since prior to the start of the EC Project none of the counties in Washington, Idaho or Oregon had access to EC without a prescription. The effect of increased availability (if any) is identified by β_1. As discussed in a previous section, the sign of the coefficient cannot be determined a priori. The summary statistics for all variables with the corresponding data sources are reported in Table 1.

The vector X_{ct} includes county level unemployment rate, per-capita personal income in 2010 dollars, and percent of population age 15-24. A full set of county fixed effects captures permanent differences between counties and a set of year fixed effects captures year specific impact that is common to all counties. County-specific linear trends are included in the model, but to evaluate the sensitivity of results all models are also estimated without trends.

As the number of participating pharmacies was growing over time across Washington counties (including in the state border areas), the travel distance to the closest EC pharmacy was decreasing over time for more residents in all three states, allowing them to capture the potential benefits from the increased availability of EC. It is also possible that there might have been lags in information dissemination across potential customers. Therefore, the effect on the treatment group can vary across years as the timing of treatment varies across counties. To take this into account, I estimate an alternative model where the treatment indicator is replaced with a set of interaction terms between the treatment dummy and 1998-2005 year dummies. Given a larger number of parameters in the model, the inclusion of trends might lead to the incidental parameters problem and inflate the standard errors. In order to identify whether county-specific linear trends belong to this model, I analyze the residuals from the model estimated without county trends. The decision to include a particular county's linear trend is based on the regression results where county-specific residuals are regressed on a linear trend. If residuals for county *c* exhibit increasing or decreasing drift then I add county's *c* linear trend to the model. If the variation in residuals for county *c* cannot be explained by a trend then the linear trend for that county is not included in the model. This approach effectively imposes a zero coefficient on all

[10] Fertility rates by age group and state are shown in supplementary Appendix B.

parameters in the trend component that are not statistically different from zero and helps to increase the efficiency of other estimates.

First, I estimate equation (1) for Washington. This exercise produces a baseline or a "direct effect" of EC availability, which can be used to assess the credibility of the results for the neighboring states and put the magnitude of the effects (if any) in perspective. Then, I estimate separate models for Oregon and Idaho. The "spillover effect" on the fertility rates in the neighboring states is expected to be of a smaller magnitude if the characteristics of the treated Oregon and Idaho counties are similar to the ones in Washington. However, if there are substantial differences across treated counties across states (e.g., metropolitan areas in Washington and rural areas in the relevant parts of the neighboring states), the magnitude of the direct effect becomes less informative, as the relative costs and benefits of the increased access to EC will differ across states for affected women.

Finally, to test the hypothesis whether the effect decreases with an increase in the travel distance, for each state I re-estimate both models with the alternative definitions of the treatment group. For example, travel distances to the closest EC pharmacy for Washington residents are much shorter compared to those for Idaho and Oregon residents. Therefore, the following treatment groups are considered for the analysis: less or equal to 10, 20, and 25 miles. The treatment of 50 miles is not considered as nearly all counties in Washington have EC pharmacy access within 50 miles (over 95% of all county-year observations). For Idaho and Oregon, in addition to a 20 miles radius, I consider EC pharmacy locations within 25 and 50 miles.[11] If the increasing travel distance hypothesis is true, then the estimated coefficient on the treatment dummy in model (1) for larger radii should gradually diminish and not be statistically different from zero. In addition, everything else constant, the effect of the closeness of EC in Washington might be stronger in areas where women have a limited access to reproductive health facilities.

[11] Results for the latter are available on request. Longer distances are not considered as it is unlikely that women will travel more than 50 miles (one way) to obtain the EC pills. Although there are no data on how far women are willing to go for EC, one can use the actual travel distance that women travel to obtain an abortion as a reference. The actual travel distance represents the revealed preference. Henshaw and Finer (2003) report that only a quarter of women, who had abortions in non-hospital facilities, travel above 50 miles for service. Given a definite nature of pregnancy resolution associated with an abortion, it is not surprising that some travel 50-100 miles (15%) or more than 100 miles (below 10%), especially when there are no closer alternatives. The EC pills are a preventive measure that is available with a prescription at a local pharmacy. Therefore, a decision on how far to go will depend on the time costs associated with obtaining EC locally versus obtaining it in Washington.

The identification strategy in all cases relies on the assumption that the underlying trends in fertility rates are the same for both treatment and control group, implying that in the absence of the treatment the average changes in fertility rates would be the same for both groups. To validate the plausibility of this assumption, I inspect pre-1998 trends in pregnancy and abortion rates in treatment and control counties. Figures 3-4 confirm that abortion and pregnancy rates appear to follow the same pattern for treatment and control groups for all states and all considered age groups. (Trends for alternative definitions of the treatment group are reported in supplementary Appendix C). Another potential identification issue is the endogeneity of participating pharmacies in a given county. The pharmacy participation in the EC project might be driven by the changes in abortion rates. To test for the endogeneity of pharmacy participation, I model the number of participating pharmacies in the EC project within a specific radius as a function of county specific characteristics, a set of time and county fixed effects, county-specific linear trends, and abortion rates at time *t*, *t-1*, *t-2*, and *t-3*. Results of this identification test are reported in supplementary Appendix D and indicate that the number of EC pharmacies is not determined by fertility rates.

IV. Results

A. Washington State

The baseline effect of increased EC availability on fertility rates in Washington by age group is reported in Table 2. All regressions include county-level socio-economic characteristics, year and county fixed effects, and county-specific linear trends. Standard errors are clustered at county level; observations are weighted by the female population in a given age group. Panel A, shows results for treatment group defined as EC pharmacy is within 10 miles, Panel B - 20 miles, and Panel C - 25 miles away or less. Similar to Durrance (2013) the magnitude of the effects is discussed relative to the average of pre-treatment years.

Results indicate that past 1998 abortion rates among women of all ages in counties with a close EC pharmacy access are generally significantly lower than in control counties. Among women age 15-19, there were on average 22.3 abortions per 1,000 women between 1991 and 1997 (the pre-EC Project period). The EC pharmacy access within 10 miles decreases abortion rates in the treated counties by 5.3%. Among women age 20-24 a decrease in abortion rate is about 2.7 abortions per 1,000 women or 6.8% relative to the pre-treatment average. The effect on women age 25-29 (not shown) is much smaller and not statistically significant. A corresponding drop in the abortion rate for aggregated age groups 15-24, 15-29, and 15-44 is 6.4%, 5.7%, and 6.0% relative to the pre-1998 average of 29, 27, and 16 abortions per 1,000 women in the respective age group. As expected, the corresponding changes in abortion rate are smaller for treatment groups with a larger radius (i.e., EC pharmacy within 20 and 25 miles) and also nearly for all age groups the estimates are not statistically different from zero. These results are at odds with Durrance (2013) who does not find an association between the percent of EC pharmacies in a county and abortion or birth rates. As shown in the previous section, the differences are unlikely to be driven by differences in data. It might be a case that the percent of pharmacies in a county-year that participated in the EC Project might be a less adequate measure of EC availability and one needs to account for the proximity of EC locations to the majority of customers.

The coefficient estimates for treatment indicators for pregnancy rates are rather small relative to the estimated standard errors, resulting in nearly meek relative changes. Statistically, nearly all effects are not different from zero at the conventional level of significance. The only exemption is a marginally statistically significant decrease in pregnancy rates among women age 15-44 in counties with EC pharmacy access within 10 miles (a change of 1.7% or 1.4 pregnancies per 1,000 women). In comparison, the corresponding effect on abortion rate is a decrease of 6% or 1 abortion. A lack of substantial changes in pregnancy rates for most age groups is not surprising as the number of births greatly exceeds the number of abortions, so a decrease in the number of abortions could be insufficient to change the pregnancy rate significantly.

All results reported here are robust to the inclusion of an additional control for distance to the closest county with an abortion provider within Washington or neighboring states (the sensitivity of results to various specifications is reported in supplementary Appendix E).[12] Qualitatively, the results are mostly not sensitive to the exclusion of county-specific linear trends (supplementary Appendix E specifications (4) – (5)). Results for the event-study model, reported in supplementary Appendix F, reveal that for almost all considered ages (exception age 15-19) the point estimates for year-treatment interaction terms are statistically significant after 2001. For

[12] With a little variation across time, about 95% of all abortions obtained by Washington residents occurred in Washington; another 3% (cumulatively) in Idaho and Oregon. Abortion providers are identified using abortion data by county of occurrence rather than residence.

the overall abortion rate, and to a lesser extent age 15-29, the estimates are statistically significant also in years prior to 2002.

To reconcile differences in results reported in the literature and this study, I estimate an additional model where instead of a dichotomous indicator for presence of EC pharmacy within a given radius I utilize information on the number of no-prescription EC pharmacies within that radius. This exercise also helps to identify the driving force of the observe effects for abortion rates (e.g., heavy populated counties that are likely to have many participating pharmacies might dominate smaller counties with only a few participants). The results reported in Table 3 indicate that the number of EC pharmacies within a 10 miles radius leads to a rather modest decrease in abortion rate for all considered ages (with an exception of 15-19 for which point estimate is not statistically significant), indicating that the magnitude of the observed effects reported earlier is driven by counties with a large number of EC pharmacies. There are on average 3 no-prescription EC pharmacies within a 10 miles radius. A corresponding decrease in abortion rate based on the average number of EC pharmacies for women age 20-24 is about 0.4 abortions per 1,000 women. For a comparison, the presence of 10 pharmacies yields about 50% of the estimated effect for this age group reported in Table 2 (the corresponding point estimate is -2.653). In contrast, for age group 15-29 the same 10 pharmacies yield about 80% of the estimated effect. In addition, for age groups 20-24, 15-29, and 15-44 the number of EC pharmacies within 20 and 25 miles also have a negative and statistically significant effect on abortion rates, although the point estimates become smaller with an increase in the distance.[13] Overall, the results from this model indicate that EC availability has a negative and statistically significant effect on abortion rates. However, the magnitude is rather small.

B. Neighboring States

The point estimates for Idaho and Oregon are reported separately in Panels A and B of Table 4. The discussion is focused on results from the model that includes a full set of county-specific linear trends reported in column (2). Similar to Washington, abortion rates in Idaho counties with EC pharmacy access within 20 miles are statistically significantly lower than in

[13] Results for pregnancy rates (not reported) produce negative estimates that are not statistically significant for all age groups and treatment definitions. These results are also sensitive the exclusion of trends which substantially reduces standard errors and the effect of the number of EC pharmacies becomes statistically significant for ages 20-24, 15-29, and 15-44 (numerically the estimates are smaller compared to the abortion estimates in Table 3).

control counties. Specifically, a pre-1998 average abortion rate of 9.7 abortions per 1,000 women age 15-24 decreases by about 12.8% (or 1.2 abortions per 1,000 women) after 1998. A similar effect is observed for the abortion rates among women age 15-29: a decrease of 1.4 abortions relative to the pre-treatment average of 9.5 abortions per 1,000 women. However, one should keep in mind that the pre-1998 average abortion rates in *treated* Idaho counties are at least double of the Idaho's overall pre-1998 average, meaning that the effects relative to the average in the treated counties are smaller (a 5.9% and a 7.2% reduction for ages 15-24 and 15-29).[14] The model specification that allows for time variant effects on treated counties (supplementary Appendix G) shows that the strongest effect, in both statistical and economic senses, is observed in years when more pharmacies become involved in the EC Project in the Spokane area (1998, 2000-2002, and 2004-2005). Peculiarly, for a few years the point estimates for women age 15-19 are positive.

I do not find strong evidence in favor of an association between risk-taking sexual behavior and increased access to EC. If the proportion of women who engage in risk-taking sexual behavior becomes larger, then one would expect to observe an increase in the pregnancy rates in treated counties after 1998 relative to control counties. In contrast, I find a statistically significant decrease in pregnancy rates between 1998 and 2005 in counties that had an EC pharmacy within a 20 miles radius compared to the control group. Relative to the pre-treatment average rate this corresponds to a decrease of 3.6% and 6.4% for 15-24 and 15-29 age groups. The event-study specification (supplementary Appendix G) indicates that women age 15-19 were affected as early as 1998, for other age groups there was a lag in the response, with a substantial reduction in the rate for ages 15-24 and 15-29 occurring after 2002.

In Oregon, the point estimates on the treatment indicator have large standard errors and are not statistically significant in nearly all models (Table 4 Panel B). Results from the event-study specification (not shown but available on request) similarly show that the majority of estimates are statistically no different from zero. A marginally statistically significant positive change in abortion rates is observed for age groups 20-24 in 2000-2002, but the statistical power is sensitive to inclusion of trends. A similar positive effect is observed for abortions in 2000-2001 among women age 15-24 and pregnancies among women age 15-29. It is possible that the

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[14] Similarly, the pre-1998 averages in treated Oregon counties are about 50% larger compared to the overall average. In contrast, in Washington differences in rates are small and the choice of a baseline does not affect the relative magnitude.

quality of estimates for aggregated age groups is corrupted by data gaps in abortion statistics (i.e. the underlying abortion counts for 5-year age groups, that are used for aggregation, have numerous missing values specifically in counties that represent the control group for years 1995-2000 and 2005).

Although the findings are fairly robust to the exclusion of trends, I address in more detail the variation in the response behavior across states and in the magnitude of the effects. The state specific nature of the effect of EC availability is not surprising or unique. For example, while assessing the effect of parental consent laws and the mandatory delay statutes on the proportion of abortions obtained out of state by minors in two southern states, Joyce and Kaestner (2001) find that both laws increase the incidence of out of the state abortions among Mississippi adolescent residents, but not South Carolina residents. They argue that differences in the "strictness" of the law requirements (e.g., one-parent versus two-parent consent, 24 hour waiting period versus 1 hour) explain the stronger behavioral response in Mississippi. Although I apply the same method to distance calculation and the assignment of the treatment status for all three states, there might be significant differences in the characteristics of "treated" counties that might affect the behavioral response to the increased availability of EC. For example, "treated" counties in Oregon (i.e., counties that have a no-prescription EC pharmacy within 20 miles) are located in the vibrant Portland Metropolitan area. The corresponding counties in Idaho, in contrast, represent relatively rural and highly conservative area in the northern part of the state, with a limited access to reproductive services. Due to differences in available resources and differences in constraints on women in need of EC in treated counties, the value of benefits as well as the value of costs of obtaining EC outside of Idaho might substantially differ from those to women in the corresponding counties in Oregon. It is possible that a decrease in the overall cost of obtaining EC as well as the benefits from obtaining EC in the neighboring Washington might be higher for women in Idaho compared to women in Oregon.

Alternatively, other factors that are not controlled for, rather than the availability of EC in Washington pharmacies, could affect fertility rates in treated counties in Idaho. For instance, if the access to abortion services became more restricted after 1998 (e.g., via elimination of abortion providers in treated counties or nearby counties within or outside of Idaho) then abortion rates would decrease.[15] The examination of abortions to Idaho residents by state of occurrence reveals that compared to before 1998, the proportion of abortions obtained in Idaho on average has decreased after 1998 (supplementary Appendix H). Simultaneously, the share of abortions obtained in Washington has increased by about 7% points. In addition to a change in the overall trend over time, the access to abortion providers become stricter for women in "treated" counties (i.e., EC pharmacy access within 20 miles): before 1998 the average distance to the closest abortion provider was 17 miles, after 1998 it is 62 miles. These changes in the availability of abortion services to Idaho residents indicate that the distance to the closest abortion provider should be included in the model.

Table 5 shows the estimates for Idaho that also control for abortion service availability.[16] The estimated coefficients of interest remain negative, but their magnitude decreases. In model without trends, the point estimates for all age groups are statistically significant. For example, the abortion rate per 1,000 women in treated counties decreases by about 2 abortions among women ages 15-19 and 20-24. An addition of a full set of county-specific linear trends (column 2) absorbs some of the "useful variation", resulting in larger standard errors and smaller point estimates, making nearly all effects no longer statistically significant. The only exception women age 20-24 for whom abortion rate decreases by 4.8% (or 1.2 abortions) relative to the pre-1998 average rate in the treated counties of 24.3 abortions per 1,000 women. Consistent with the literature, an increase in the travel distance to closest abortion provider is associated with a decrease in abortion rates.

The statistical power of the estimates in pregnancy model is equally sensitive to the inclusion of the additional covariate. A substantial and statistically significant negative effect remains for 15-29 year old women: the average pre-treatment pregnancy rate of 104 pregnancies per 1,000 women in treated counties is reduced by 6 pregnancies or 5.8%. Given that a change in abortion rates for this age group is relatively small (1 abortion) and statistically insignificant, the reduction in pregnancy rate is a result of the change in the number of births. Finally, since the only statistically strong effect is observed for the aggregated age group it might indicate that the effects in 5-year groups are small and models do not have enough power to identify them.

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[15] Joyce and Kaestner (1996) and Joyce et al (2011) show that the distance to the closest abortion provider has an inverse effect on abortion rate; Kane and Staiger (1996) find a similar association for birth rates among white teens.

[16] Due to lack of data on abortions by place of occurrence within the state, the analysis is not done for Oregon.

An event-study specification for abortion rate, not reported but available on request, provides results that are similar to the ones in supplementary Appendix G. A consistent negative effect across age groups is observed in 1998 and 2004-2005. In rare cases the estimates for women age 15-19 are positive and statistically significant. As for pregnancy rates, the estimates from this extended model have generally a lower statistical power and in a few cases have a positive sign (mostly during 2002-2003). Finally, the results discussed here might represent the upper bound of the spillover effect. However, since the average number of no-prescription EC pharmacies within a 20 miles radius for Idaho women is one, it is unlikely that the results are driven by the number of EC Project participants and even one location potentially can make a difference.

V. Conclusion

In 1998 Washington was the first state to relax the requirements for the access to EC in pharmacies, effectively bypassing the requirement for a doctor's prescription. The elimination of prescription requirement reduces the overall costs associated with obtaining EC for women of any age and might reduce the incidence of unwanted pregnancy. Given the high costs of unintended pregnancy the identification of factors that can reduce its instance is of high priority from the public policy view.

I use across time and county variation in EC availability in Washington state between 1991 and 2005 to identify whether easier access to EC at the pharmacies in Washington affects fertility rates in Washington and the neighboring Idaho and Oregon. The incentive to "hop" over the state border depends on the relative differences in the costs associated with obtaining EC in Washington (e.g., the time spent driving) and the costs associated with obtaining it with a doctor's prescription locally (e.g. the time spent at the doctor's office). The treatment status for each county is assigned based on the travel distance to the closest pharmacy where EC is available without a prescription (i.e., EC access within 10, 20, and 25 miles). The effects (if any) are expected to occur in counties that are in a close proximity to EC locations and to become trivial as the distance increases.

In contrast to the literature that finds no evidence of a reduction in fertility rates associated with the easier access to EC, I find that in Washington counties with EC pharmacy access within 10 miles, abortion rates were 5-7% lower in a post-1998 period compared to rates in control counties. This is an upper bound estimate as the effect of one no-prescription EC pharmacy within the same radius is much smaller. Relative to the pre-1998 average, the effect on pregnancy rates is trivial in economic and statistical sense. For all age groups, the point estimates become smaller and standard errors larger when the travel distance to the closest EC pharmacy is increased to 20 miles, confirming the hypothesis that the EC Project has rather localized effects which are determined by the closeness of EC locations.

The results for the spillover effects in the neighboring states are mixed and are sensitive to model specifications. Relative to a pre-1998 baseline average, an increase in the availability of EC after 1998 decreases abortion rate among young women by about 1 abortion (or 6-7% depending on the age group) in counties that had an EC pharmacy within a 20 miles radius. The effect on pregnancy rate is also negative: a reduction of 4-12% depending on the age group. The effects on fertility rates in the similarly defined treatment counties in Oregon are not statistically significant in nearly all specifications. Further analysis shows that a decrease in fertility rates in Idaho is partly driven by changes in the availability of reproductive health services. Controlling for the travel distance to the closest county (within or outside the state) with an abortion provider produces smaller and more credible estimates: the estimates are still negative, but generally not precise. The only exception is a statistically significant 5% decrease among women age 20-24. Similarly, the estimates for pregnancy rates are generally not statistically significant, with an exception of a 6% decrease in pregnancy rate among women age 15-29. Overall, the reduction in the number of abortion providers in the area might have increased the value of EC to Idaho residents, but the effect is rather small and the models presented here might not have enough power to establish them.

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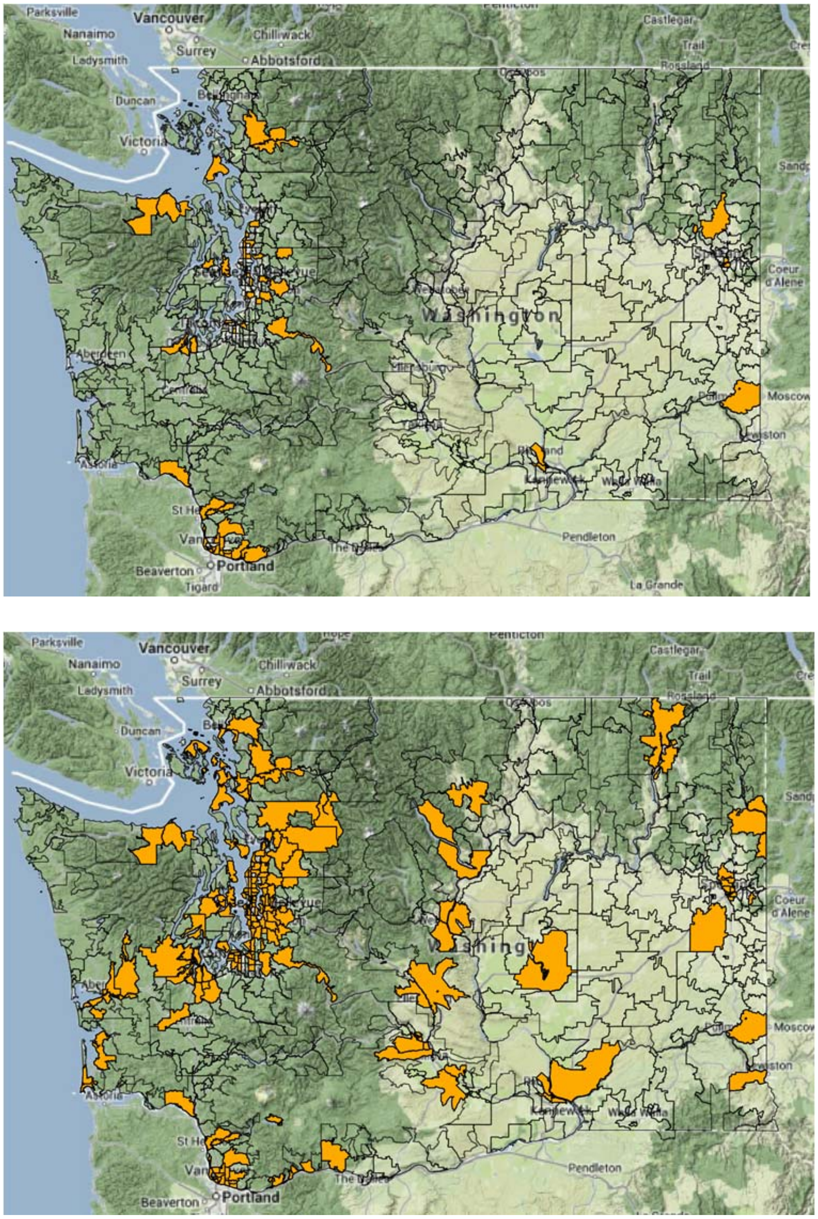
Figure 1: Zip code locations of participating pharmacies in Washington in 1998 and 2005, (color on the Web and in black-and-white in print)



Note: The highlighted areas are zip codes that had a participating pharmacy based on the year of entry in the EC Hotline database.

Figure 2: Travel distance to the closest EC pharmacy location in Washington or California, 2005 (color on the Web and in black-and-white in print)

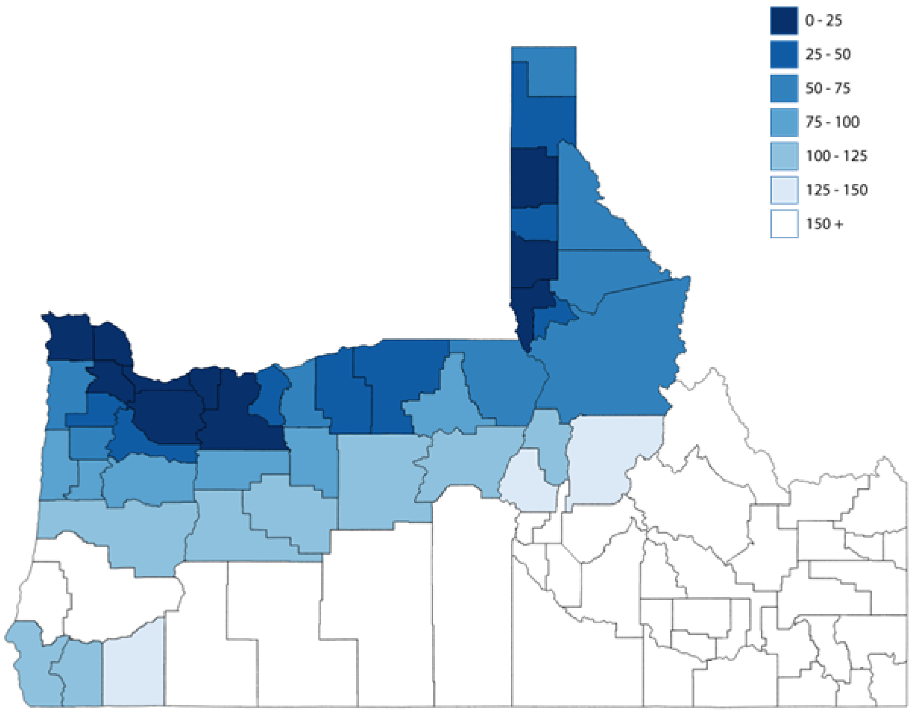
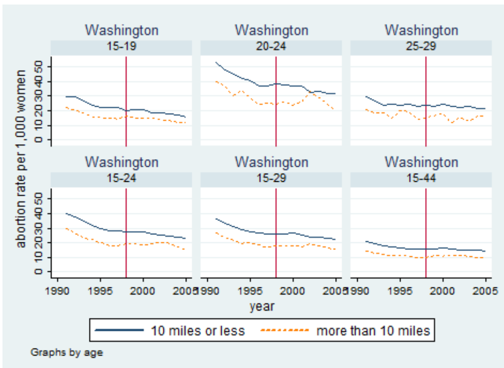


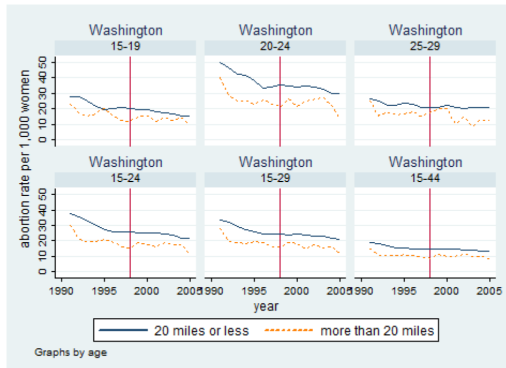
Figure 3: Trends in fertility rates in Washington, by age group and treatment status, (color on the Web and in black-and-white in print)

Abortion rate

Treatment "10 miles or less"

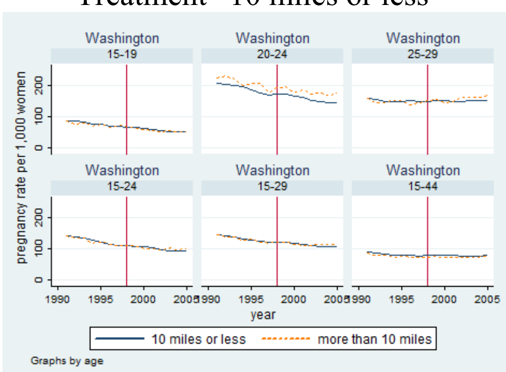


Treatment "20 miles or less"

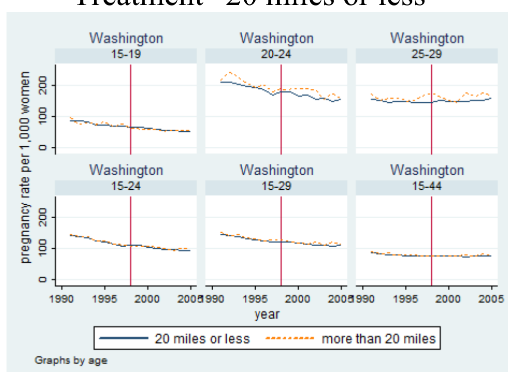


Pregnancy rate

Treatment "10 miles or less"



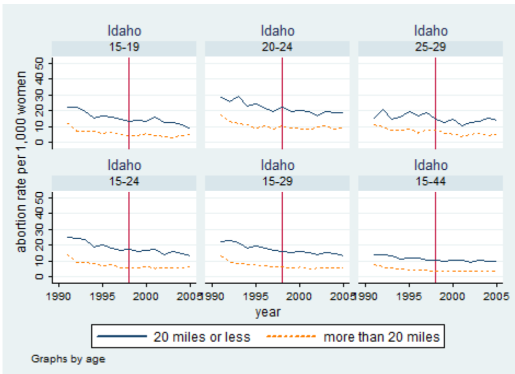
Treatment "20 miles or less"

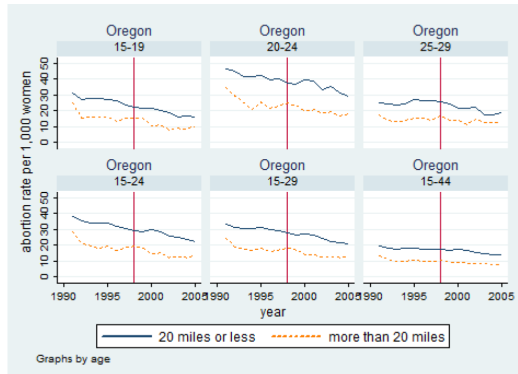


Note: Trends for treatment group "25 miles or less" are not shown as they are very similar to the treatment group "20 miles or less".

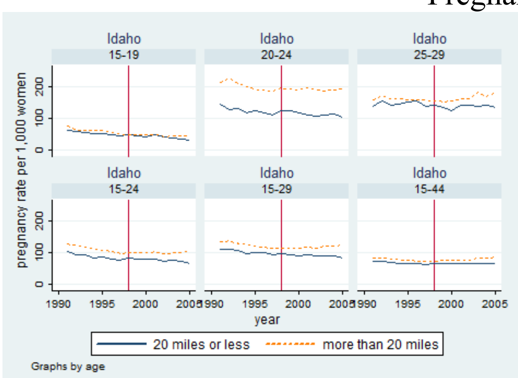
Figure 4: Trends in fertility rates in Idaho and Oregon, by age group and treatment status, color on the Web and in black-and-white in print)

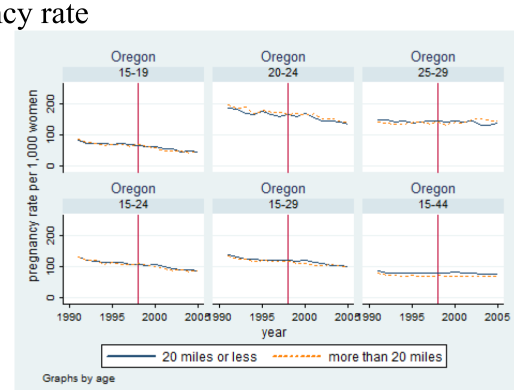
Abortion rate





Pregnancy rate





Note: Trends are not reported for a treatment definition "25 miles or less" as trends for Oregon are very similar and for Idaho are identical to the ones reported here.

TABLE 1 – SUMMARY STATISTICS

	IDAHO		OREGON		WASHINGTON	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Abortion rate, age 15-19	6.24	(6.87)	15.23	(9.45)	19.44	(8.75)
Abortion rate, age 20-24	11.10	(11.44)	25.58	(14.73)	34.95	(15.14)
Abortion rate, age 15-24	8.06	(7.48)	19.79	(10.76)	25.96	(10.58)
Abortion rate, age 15-29	7.83	(6.75)	18.36	(9.39)	24.34	(9.45)
Abortion rate, age 15-44 [a]	5.01	(3.95)	10.96	(5.55)	14.57	(5.29)
Pregnancy rate, age 15-19	53.23	(22.79)	62.47	(22.29)	67.26	(24.87)
Pregnancy rate, age 20-24	192.08	(57.27)	167.89	(47.77)	181.38	(55.98)
Pregnancy rate, age 15-24	105.84	(28.82)	106.27	(27.84)	113.84	(34.43)
Pregnancy rate, age 15-29	120.70	(26.27)	116.41	(22.84)	124.36	(29.77)
Pregnancy rate, age 15-44 [a]	78.78	(15.51)	73.20	(12.30)	79.54	(16.36)
County unemployment rate	6.17	(2.71)	7.51	(1.97)	7.53	(2.56)
Per capita personal income (2010$)	26672.64	(5881.30)	29315.89	(4577.52)	30297.97	(5888.68)
Percent of population age 15-24	0.15	(0.05)	0.13	(0.03)	0.14	(0.05)
Distance to the closest EC pharmacy [b]	223.30	(119.16)	99.62	(71.91)	16.49	(17.29)
Number of observations	660		502		585	

Note: [a] The number of observations for Oregon is 540. [b] Distance to the closest EC pharmacy is limited to the 1998-2005 time period yielding 352 observations for Idaho, 288 for Oregon, and 312 for Washington. Data sources for fertility rates: the Washington State Department of Health, the Oregon Health Authority, and the Idaho Department of Health and Welfare; population counts by age and gender are from the Census intercensal state population estimates; unemployment rates from the Bureau of Labor Statistics; income data from the Bureau of Economic Analysis.

TABLE 2 – EFFECT OF EC PHARMACY ACCESS ON FERTILITY RATES IN WASHINGTON

	Abortion rate					**Pregnancy rate**				
	15-19	*20-24*	*15-24*	*15-29*	*15-44*	*15-19*	*20-24*	*15-24*	*15-29*	*15-44*
Panel A										
EC pharmacy	-1.192^{+}	-2.653*	-1.883**	-1.534**	-0.928**	-0.577	-0.401	-0.385	-1.584	-1.350^{+}
within **10** miles	(0.71)	(1.27)	(0.65)	(0.56)	(0.27)	(1.50)	(2.71)	(1.65)	(1.32)	(0.76)
R-squared	0.940	0.941	0.964	0.963	0.968	0.964	0.979	0.982	0.981	0.969
Panel B										
EC pharmacy	-1.125	-0.720	-1.080	-0.840	-0.723*	1.132	2.876	1.644	0.379	-0.944
within **20** miles	(0.89)	(1.15)	(0.75)	(0.63)	(0.32)	(1.72)	(2.80)	(1.94)	(1.46)	(0.91)
R-squared	0.940	0.941	0.963	0.963	0.968	0.964	0.979	0.982	0.981	0.968
Panel C										
EC pharmacy	-0.920	-0.829	-1.045	-0.514	-0.529	0.458	3.681	1.553	0.738	-0.638
within **25** miles	(0.96)	(1.20)	(0.84)	(0.68)	(0.32)	(1.88)	(2.91)	(2.04)	(1.54)	(0.99)
R-squared	0.940	0.941	0.963	0.963	0.968	0.964	0.979	0.982	0.981	0.968
Average rate in WA 1991-1997	22.3	38.8	29.2	26.9	15.5	77.7	198.2	126.9	134.1	81.6

Note: ** significant at 1%; * at 5%; $^{+}$ at 10%. The number of observations in each regression is 585. Standard errors clustered on county are in parentheses. All regressions are weighted by county's female population in the appropriate age group and include county level unemployment rate, per-capita personal income in 2010 dollars, percent of population age 15-24, as well as county-specific linear trends, year and county fixed effects.

TABLE 3 – EFFECT OF THE NUMBER OF EC PHARMACIES ON FERTILITY RATES IN WASHINGTON

	Abortion rate				
	15-19	20-24	15-24	15-29	15-44
Panel A					
# of EC pharmacies	-0.038	-0.125**	-0.071*	-0.120**	-0.047**
within **10** miles	(0.03)	(0.04)	(0.03)	(0.03)	(0.01)
R-squared	0.940	0.942	0.963	0.965	0.969
Panel B					
# of EC pharmacies	-0.027	-0.075*	-0.043	-0.069**	-0.026*
within **20** miles	(0.02)	(0.03)	(0.03)	(0.02)	(0.01)
R-squared	0.940	0.942	0.964	0.965	0.969
Panel C					
# of EC pharmacies	-0.019	-0.054*	-0.031	-0.050*	-0.018*
within **25** miles	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)
R-squared	0.940	0.942	0.963	0.965	0.968
Average rate in WA 1991-1997	22.3	38.8	29.2	26.9	15.5

Note: ** significant at 1%; * at 5%; + at 10%. The number of observations in each regression is 585. Standard errors clustered on county are in parentheses. All regressions are weighted by county's female population in the appropriate age group and include county level unemployment rate, per-capita personal income in 2010 dollars, and percent of population age 15-24, as well as year and county fixed effects and county-specific linear trends. A corresponding table for pregnancy rates is available on request. The average number of EC pharmacies within a 10 miles radius is 3, within 20 miles – 7, within 25 miles – 10. The exclusion of trends yields qualitatively similar though generally numerically slightly larger estimates.

TABLE 4 – THE EFFECT OF EC PHARMACY ACCESS IN IDAHO AND OREGON

Panel A: Idaho

	15-19		20-24		15-24		15-29	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
	Abortion rates							
EC within	-3.28**	-1.02	-2.19**	-1.39*	-2.86**	-1.24*	-2.30**	-1.44*
20 miles	(0.73)	(1.19)	(0.69)	(0.55)	(0.45)	(0.52)	(0.39)	(0.65)
Trends	no	yes	no	yes	no	yes	no	yes
% change	-18.3	-5.7	-9.0	-5.7	-13.6	-5.9	-11.5	-7.2
	Pregnancy rates							
EC within	-5.78**	-6.24*	-6.32+	1.85	-8.82**	-3.22**	-11.95**	-6.67**
20 miles	(1.73)	(2.76)	(3.48)	(3.08)	(2.44)	(1.14)	(2.26)	(2.09)
Trends	no	yes	no	yes	no	yes	no	yes
% change	-10.7	-11.6	-5.0	1.5	-9.9	-3.6	-11.5	-6.4

Panel B: Oregon

	15-19		20-24		15-24		15-29	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
	Abortion rates							
EC within	-1.95	2.00	0.29	2.68	-0.88	2.42	-0.34	1.79
20 miles	(2.14)	(2.12)	(2.08)	(2.11)	(1.93)	(1.80)	(1.62)	(1.44)
Trends	no	yes	no	yes	no	yes	no	yes
% change	-7.2	7.4	0.7	6.3	-2.6	7.1	-1.1	5.8
	Pregnancy rates							
EC within	-2.32	-1.31	-0.65	6.20*	-1.80	2.79	-0.86	3.66
20 miles	(4.90)	(2.47)	(4.21)	(2.81)	(4.27)	(2.22)	(4.24)	(2.49)
Trends	no	yes	no	yes	no	yes	no	yes
% change	-3.1	-1.8	-0.4	3.6	-1.5	2.4	-0.7	2.9

Note: ** significant at 1%; * at 5%; + at 10%. Standard errors clustered on county are in parentheses; number of observations is 660 for Idaho, 502 for Oregon. Included covariates and applied weights as described in a note under Table 2. The percentage change is calculated relative to a corresponding pre-1998 average rate in *treated* counties in a given age group in that state.

TABLE 5 – ROBUSTNESS TEST FOR **IDAHO**

Panel A: Abortion rates

	15-19		**20-24**		**15-24**		**15-29**	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
EC pharmacy is	-2.222^{+}	-0.755	-1.890*	-1.177*	-2.112**	-0.992	-1.471**	-1.040
within 20 miles	(1.13)	(1.35)	(0.82)	(0.51)	(0.54)	(0.65)	(0.53)	(0.91)
Distance to closest	-0.032**	-0.022	-0.008	-0.013	-0.022^{+}	-0.018	-0.032*	-0.031*
abortion provider	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
R-squared	0.841	0.863	0.858	0.876	0.912	0.925	0.931	0.941
Linear trends	no	yes	no	yes	no	yes	no	yes
% change	-12.4	-4.2	-7.8	-4.8	-10.0	-4.7	-7.3	-5.2

Panel B: Pregnancy rates

	15-19		**20-24**		**15-24**		**15-29**	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
EC pharmacy is	-3.772	-5.611^{+}	0.512	2.347	-4.623	-2.626	-8.037*	-6.002*
within 20 miles	(2.66)	(3.27)	(3.28)	(3.36)	(2.81)	(1.69)	(3.21)	(2.58)
Distance to closest	-0.061	-0.051	-0.188*	-0.031	-0.120*	-0.042	-0.117**	-0.051
abortion provider	(0.05)	(0.05)	(0.08)	(0.10)	(0.05)	(0.04)	(0.04)	(0.03)
R-squared	0.882	0.903	0.883	0.907	0.901	0.936	0.899	0.933
Linear trends	no	yes	no	yes	no	yes	no	yes
% change	-7.0	-10.4	0.4	1.9	-5.2	-3.0	-7.7	-5.8

Note: ** significant at 1%; * at 5%; $^{+}$ at 10%. Standard errors are clustered at county level are in parentheses; number of observations is 660. Included covariates and applied weights as described in a note under Table 2. The percentage change is calculated relative to a corresponding pre-1998 average rate in the *treated* counties in that age group.

Appendix A: Replication of results in Durrance (2013)

Panel A: **1993-2005**

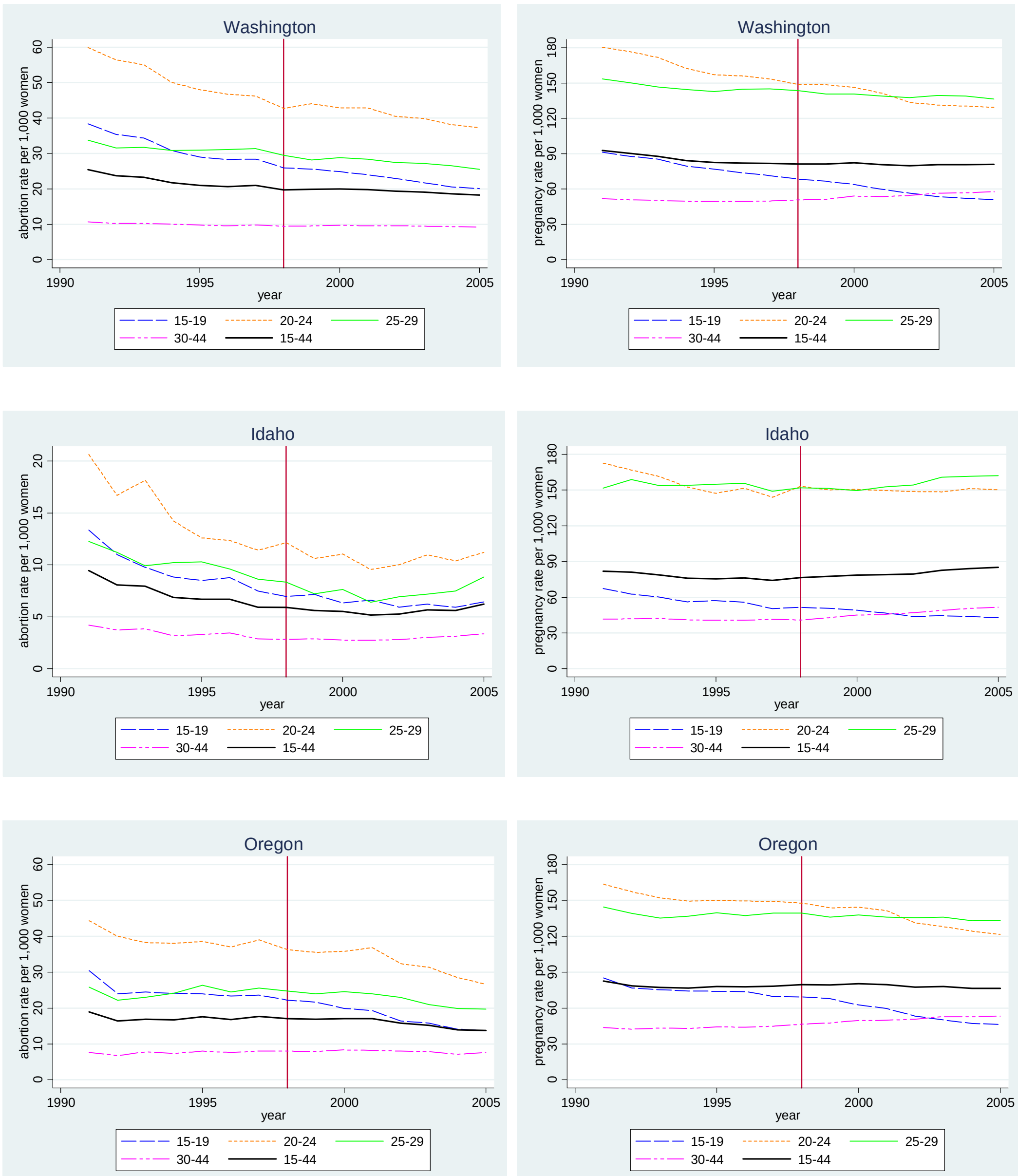
	Abortions rates					**Birth rates**				
	15-19	**20-24**	**15-24**	**15-29**	**15-44**	**15-19**	**20-24**	**15-24**	**15-29**	**15-44**
% of pharmacies	-0.009	-0.002	-0.004	-0.011	-0.001	0.023	0.016	0.014	0.003	0.007
with EC access	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.02)	(0.07)	(0.03)	(0.03)	(0.02)
R squared	0.913	0.897	0.942	0.940	0.950	0.958	0.967	0.976	0.979	0.970

Panel B: **1991-2005**

	Abortions rates					**Birth rates**				
% of pharmacies	0.003	0.012	0.010	0.001	0.006	0.018	0.010	0.009	0.000	0.010
with EC access	(0.01)	(0.03)	(0.02)	(0.02)	(0.01)	(0.02)	(0.06)	(0.03)	(0.03)	(0.03)
R squared	0.924	0.903	0.946	0.943	0.951	0.955	0.968	0.975	0.977	0.965

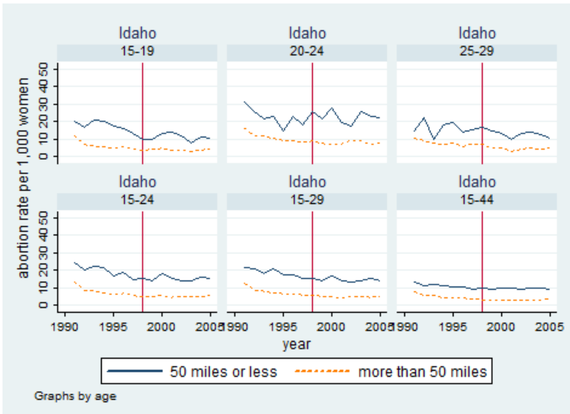
Note: ** significant at 1%; * at 5%; $^{+}$ at 10%. The number of observations for 1993-2005 is 507 (corresponds to a time frame used in Durrance, 2013); for 1991-2005 is 585. Standard errors clustered on county are in parentheses. All regressions are weighted by county's total population. All regressions include county level unemployment rate, per-capita personal income in 2010 dollars, and percent of population age 15-24, as well as year fixed effects and county fixed effects. Results are robust to inclusion of linear trends.

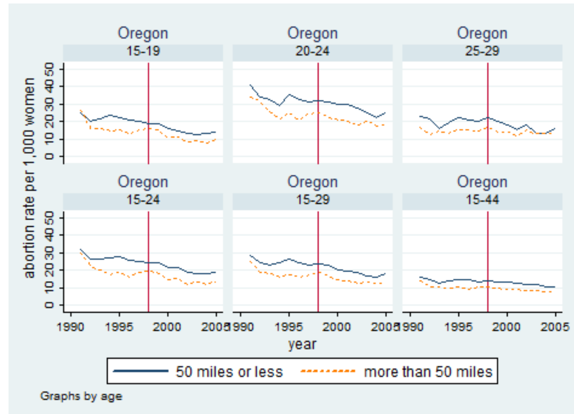
Appendix B: Abortion and pregnancy rates by age group and state



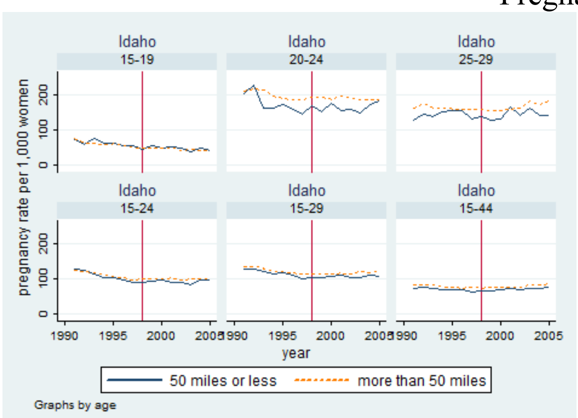
Appendix C: Trends in abortion and pregnancy rates for treatment group "50 miles or less"

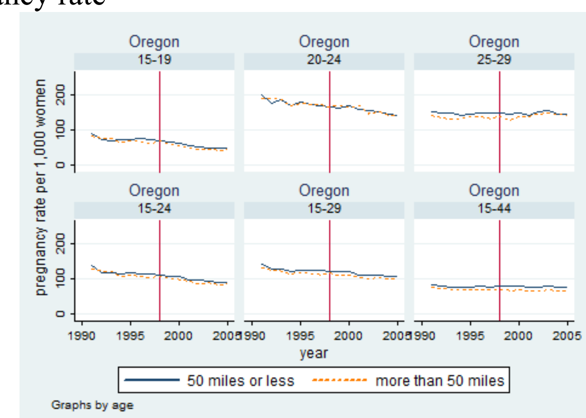
Abortion rate





Pregnancy rate





Appendix D: Identification test

	Dependent variable: a number of EC pharmacies within **10 miles**									
	Abortion rate					**Pregnancy rate**				
	15-19	**20-24**	**15-24**	**15-29**	**15-44**	**15-19**	**20-24**	**15-24**	**15-29**	**15-44**
Rate at *t*	0.091	0.015	0.072	0.098	0.239	0.015	0.029	0.061	0.057	0.205^{+}
	(0.14)	(0.05)	(0.09)	(0.10)	(0.17)	(0.06)	(0.02)	(0.05)	(0.05)	(0.12)
Rate at *t-1*	0.114	-0.008	0.056	0.022	0.130	0.022	0.008	0.039	0.036	0.060
	(0.10)	(0.07)	(0.09)	(0.10)	(0.12)	(0.08)	(0.03)	(0.05)	(0.04)	(0.09)
Rate at *t-2*	-0.026	-0.065	-0.083	-0.052	0.046	-0.027	-0.015	-0.027	-0.000	0.049
	(0.11)	(0.08)	(0.12)	(0.12)	(0.15)	(0.07)	(0.02)	(0.05)	(0.04)	(0.09)
Rate at *t-3*	-0.061	-0.065	-0.113	-0.153	-0.249	0.037	-0.022	-0.005	-0.046	-0.027
	(0.12)	(0.07)	(0.12)	(0.14)	(0.22)	(0.06)	(0.02)	(0.06)	(0.07)	(0.10)
R-squared	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997
	Dependent variable: a number of EC pharmacies within **20 mile**s									
	Abortion rate					**Pregnancy rate**				
	15-19	**20-24**	**15-24**	**15-29**	**15-44**	**15-19**	**20-24**	**15-24**	**15-29**	**15-44**
Rate at *t*	0.183	0.019	0.135	0.143	0.430	0.061	0.065	0.131	0.136	0.512^{+}
	(0.31)	(0.10)	(0.23)	(0.22)	(0.45)	(0.13)	(0.06)	(0.10)	(0.09)	(0.30)
Rate at *t-1*	0.241	-0.033	0.087	0.008	0.242	0.070	0.026	0.067	0.033	0.086
	(0.23)	(0.14)	(0.20)	(0.26)	(0.29)	(0.17)	(0.06)	(0.11)	(0.12)	(0.22)
Rate at *t-2*	0.156	-0.142	-0.082	-0.080	0.047	0.090	-0.022	-0.001	0.043	0.097
	(0.35)	(0.19)	(0.31)	(0.33)	(0.34)	(0.16)	(0.05)	(0.11)	(0.12)	(0.23)
Rate at *t-3*	-0.040	-0.130	-0.184	-0.255	-0.442	0.088	-0.056	-0.043	-0.076	-0.071
	(0.27)	(0.14)	(0.24)	(0.31)	(0.41)	(0.11)	(0.05)	(0.11)	(0.14)	(0.22)
R-squared	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.998

Note: $^{+}$ at 10%. The data are limited to 1998-2005 yielding 195 observations in the estimation sample. Standard errors clustered on county are in parentheses. All regressions are weighted by county's female population in the appropriate age. All regressions include county level unemployment rate, per-capita personal income in 2010 dollars, and percent of population age 15-24, year and county fixed effects as well as county-specific linear trends. The corresponding estimates for 25 miles are qualitatively similar to 20 miles.

Appendix E: Sensitivity of Washington results to model specification and sample

		Abortion rate						Pregnancy rate					
		1993-2005		*1991-2005*				*1993-2005*		*1991-2005*			
		(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
15-19	**10 miles radius**	-1.13	-1.14^{+}	-1.39*	-1.37*	-1.34*	-1.17	-1.29	-1.38	-0.97	-1.10	-0.85	-0.53
		(0.69)	(0.67)	(0.66)	(0.65)	(0.64)	(0.70)	(1.09)	(1.12)	(1.22)	(1.23)	(1.17)	(1.50)
	R^2	0.914	0.912	0.925	0.923	0.923	0.940	0.949	0.951	0.949	0.951	0.952	0.964
20-24	**10 miles radius**	-3.00*	-2.59*	-2.73*	-2.39*	-2.41*	-2.66*	0.08	0.32	-0.43	-0.11	-0.07	-0.44
		(1.23)	(1.10)	(1.07)	(0.95)	(0.96)	(1.27)	(3.11)	(2.79)	(2.82)	(2.55)	(2.50)	(2.68)
	R^2	0.899	0.928	0.904	0.931	0.931	0.941	0.957	0.971	0.959	0.972	0.972	0.980
15-24	**10 miles radius**	-1.93**	-1.85**	-2.01**	-1.94**	-1.94**	-1.88**	-0.89	-1.03	-0.96	-1.08	-0.92	-0.41
		(0.60)	(0.59)	(0.58)	(0.57)	(0.57)	(0.66)	(1.47)	(1.43)	(1.45)	(1.41)	(1.36)	(1.64)
	R^2	0.943	0.948	0.947	0.952	0.952	0.964	0.967	0.974	0.968	0.973	0.973	0.982
15-29	**10 miles radius**	-1.66**	-1.55**	-1.67**	-1.58**	-1.62**	-1.53*	-2.50*	-2.46*	-2.58^{+}	-2.52^{+}	-2.47^{+}	-1.62
		(0.45)	(0.44)	(0.44)	(0.44)	(0.45)	(0.56)	(1.19)	(1.19)	(1.31)	(1.29)	(1.25)	(1.30)
	R^2	0.941	0.947	0.944	0.950	0.950	0.963	0.968	0.974	0.967	0.973	0.973	0.981
15-44	**10 miles radius**	-0.94**	-0.91**	-1.00**	-0.97**	-1.02**	-0.93**	-1.67*	-1.72*	-1.91*	-1.95*	-1.96*	-1.38^{+}
		(0.23)	(0.23)	(0.25)	(0.26)	(0.26)	(0.27)	(0.72)	(0.73)	(0.85)	(0.86)	(0.85)	(0.74)
	R^2	0.951	0.953	0.952	0.955	0.955	0.968	0.954	0.957	0.949	0.952	0.952	0.969
	Pop. weights	*total*	*fem. pop.*†	*total*	*fem. pop.*†	*fem. pop.*†	*fem. pop.*†	*total*	*fem. pop.*†	*total*	*fem. pop.*†	*fem. pop.*†	*fem. pop.*†
	Providers	*no*	*no*	*no*	*no*	*yes*	*yes*	*no*	*no*	*no*	*no*	*yes*	*yes*
	Trends	*no*	*no*	*no*	*no*	*no*	*yes*	*no*	*no*	*no*	*no*	*no*	*yes*

Appendix E (continued)

		Abortion rate						Pregnancy rate					
		1993-2005		*1991-2005*				*1993-2005*		*1991-2005*			
		(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
15-19	**20 miles radius**	-1.02	-1.14	-1.11	-1.24	-1.21	-1.09	0.77	0.30	1.10	0.62	0.82	1.20
		(0.82)	(0.79)	(0.81)	(0.79)	(0.78)	(0.88)	(1.59)	(1.61)	(1.77)	(1.77)	(1.77)	(1.72)
	R^2	0.914	0.912	0.924	0.922	0.922	0.940	0.949	0.951	0.949	0.951	0.951	0.964
20-24	**20 miles radius**	-1.63	-1.15	-1.74	-1.33	-1.33	-0.73	2.13	1.68	1.55	1.02	1.05	2.80
		(1.38)	(1.09)	(1.11)	(0.91)	(0.91)	(1.15)	(3.14)	(2.89)	(2.97)	(2.90)	(2.84)	(2.75)
	R^2	0.897	0.927	0.903	0.931	0.931	0.941	0.957	0.971	0.959	0.972	0.972	0.980
15-24	**20 miles radius**	-1.24	-1.22^{+}	-1.38^{+}	-1.40*	-1.39*	-1.07	0.33	0.68	1.21	0.53	0.65	1.61
		(0.76)	(0.71)	(0.68)	(0.66)	(0.66)	(0.75)	(1.92)	(1.92)	(1.99)	(2.03)	(2.02)	(1.93)
	R^2	0.942	0.947	0.946	0.952	0.952	0.963	0.967	0.974	0.968	0.973	0.973	0.982
15-29	**20 miles radius**	-0.85	-0.80	-0.82	-0.79	-0.81	-0.83	0.22	-0.17	-0.14	-0.24	-0.19	0.33
		(0.57)	(0.55)	(0.54)	(0.54)	(0.55)	(0.64)	(1.42)	(1.45)	(1.51)	(1.53)	(1.50)	(1.43)
	R^2	0.940	0.946	0.943	0.949	0.949	0.963	0.967	0.974	0.967	0.973	0.973	0.981
15-44	**20 miles radius**	-0.52^{+}	-0.50^{+}	-0.49	-0.48	-0.51^{+}	-0.73*	-0.91	-1.06	-1.09	-1.24	-1.25	-0.98
		(0.27)	(0.26)	(0.29)	(0.29)	(0.30)	(0.32)	(0.92)	(0.91)	(1.02)	(1.01)	(1.00)	(0.88)
	R^2	0.950	0.953	0.951	0.954	0.954	0.968	0.953	0.956	0.948	0.951	0.951	0.968
	Pop. weights	*total*	*fem. pop.*†	*total*	*fem. pop.*†	*fem. pop.*†	*fem. pop.*†	*total*	*fem. pop.*†	*total*	*fem. pop.*†	*fem. pop.*†	*fem. pop.*†
	Providers	*no*	*no*	*no*	*no*	*yes*	*yes*	*no*	*no*	*no*	*no*	*yes*	*yes*
	Trends	*no*	*no*	*no*	*no*	*no*	*yes*	*no*	*no*	*no*	*no*	*no*	*yes*

Note: ** significant at 1%; * at 5%; $^{+}$ at 10%. The number of observations is 507 for years 1993-2005 and 585 for 1991-2005. Standard errors clustered on county are in parentheses. All regressions include county level unemployment rate, per-capita personal income in 2010 dollars, and percent of population age 15-24, year and county fixed effects and county-specific linear trends. The additional covariates and model specifications (1) – (6) are described at the bottom of the table. † Regressions are weighted by county's female population in the appropriate age group. Results for "25 miles radius" (not reported) are not statistically significant with an exception of a marginally significant reduction in abortion rates among 15-44 in some specifications.

Appendix F: The event-study specification for Washington, treatment "travel distance 10 miles or less"

	Abortion rates					Pregnancy rates				
	15-19	**20-24**	**15-24**	**15-29**	**Overall**	**15-19**	**20-24**	**15-24**	**15-29**	**Overall**
≤ 10 x 1998	-1.361	-1.304	-1.837	-1.240	-0.994*	-0.956	-0.519	-0.885	-2.680	-2.461**
	(1.24)	(1.57)	(1.15)	(0.98)	(0.44)	(2.38)	(2.71)	(2.17)	(1.96)	(0.91)
≤ 10 x 1999	-1.231	-1.022	-1.750	-1.887+	-1.012*	1.158	-3.176	-0.653	-2.539	-1.624
	(1.05)	(2.01)	(1.13)	(0.93)	(0.46)	(2.70)	(3.89)	(2.71)	(2.55)	(1.45)
≤ 10 x 2000	-1.033	-0.582	-1.544	-1.568+	-1.013**	3.311+	5.634	3.624	3.061	1.479
	(0.78)	(2.60)	(1.17)	(0.80)	(0.33)	(1.82)	(4.75)	(2.39)	(1.98)	(0.97)
≤ 10 x 2001	-1.619	-2.130	-2.095*	-1.289	-1.215*	2.688	1.994	2.998	2.129	0.464
	(0.99)	(2.09)	(1.03)	(0.88)	(0.48)	(2.03)	(4.89)	(2.60)	(2.45)	(1.43)
≤ 10 x 2002	-3.298**	-3.882*	-3.807**	-2.908**	-1.676**	-2.432	1.900	-1.373	-3.700+	-2.190*
	(0.94)	(1.75)	(1.00)	(0.89)	(0.48)	(2.08)	(3.48)	(1.83)	(2.04)	(0.99)
≤ 10 x 2003	-1.115	-4.469+	-3.102+	-2.770*	-1.554**	0.022	5.122	-0.718	-3.546	-1.166
	(1.67)	(2.49)	(1.71)	(1.07)	(0.51)	(2.35)	(6.97)	(2.89)	(2.20)	(1.27)
≤ 10 x 2004	-1.062	-5.020+	-3.533*	-2.649*	-1.660*	-0.454	2.866	-3.109	-5.069+	-2.331+
	(1.32)	(2.50)	(1.62)	(1.28)	(0.63)	(3.19)	(8.31)	(4.46)	(2.77)	(1.36)
≤ 10 x 2005	-1.925	-1.914	-2.898*	-2.312+	-1.896**	-1.473	4.948	-2.917	-5.476+	-3.582**
	(1.51)	(1.73)	(1.14)	(1.29)	(0.64)	(2.23)	(5.26)	(2.98)	(2.89)	(1.24)
Constant	21.021*	40.892**	26.694**	23.446**	12.430*	79.665**	252.525**	136.932**	163.156**	111.151**
	(7.99)	(9.63)	(7.67)	(6.09)	(5.67)	(12.79)	(20.39)	(14.80)	(11.90)	(8.80)
R-squared	0.934	0.936	0.961	0.960	0.966	0.962	0.978	0.980	0.981	0.968

Note: ** significant at 1%; * at 5%; + at 10%. Standard errors clustered on county are in parentheses. Observations are weighted by county's female population. All specifications include county level unemployment rate, per-capita personal income (2010$), percent of population age 15-24, county and year fixed effects as well as a reduced set of county-specific linear trends. Results are robust to inclusion of the abortion providers. Specifications without and with a full set of trends as well as for treatment groups 20 and 25 miles are available on request.

Appendix G: The event-study specification for Idaho, treatment "travel distance 20 miles or less"

	Abortion rates				Pregnancy rates			
	15-19	**20-24**	**15-24**	**15-29**	**15-19**	**20-24**	**15-24**	**15-29**
≤ 20 x 1998	-3.292**	-2.866**	-3.031**	-1.416**	-4.962**	-2.864	-4.265*	-1.561
	(0.36)	(0.58)	(0.39)	(0.27)	(1.54)	(2.38)	(1.91)	(1.75)
≤ 20 x 1999	1.551**	-1.044	-0.015	-0.453	-0.064	5.314	1.237	-2.319
	(0.73)	(1.70)	(1.11)	(0.38)	(4.73)	(3.69)	(1.56)	(1.70)
≤ 20 x 2000	-2.093**	-1.362	-1.805*	-1.798**	-5.052	1.505	-2.983	-8.103+
	(0.77)	(1.02)	(0.80)	(0.51)	(3.21)	(4.30)	(3.49)	(4.10)
≤ 20 x 2001	1.320*	-3.670**	-2.007**	-1.987**	0.337	-4.424	-3.526	-4.192
	(0.57)	(1.04)	(0.68)	(0.59)	(1.95)	(3.88)	(2.72)	(3.06)
≤ 20 x 2002	2.664**	-4.258**	-1.620*	-1.384*	7.070**	0.848	2.352	1.329
	(0.65)	(1.13)	(0.77)	(0.67)	(1.42)	(3.98)	(2.72)	(3.19)
≤ 20 x 2003	-0.585	-0.643	-0.649	-0.981	-1.430	11.327*	2.583	-6.065+
	(2.73)	(2.29)	(2.39)	(1.38)	(4.59)	(4.27)	(4.54)	(3.19)
≤ 20 x 2004	-3.784*	-3.347**	-3.483**	-2.233*	-5.353	3.212	-4.770*	-7.848*
	(1.79)	(1.03)	(0.95)	(0.92)	(3.19)	(3.46)	(2.05)	(3.23)
≤ 20 x 2005	-4.713**	-3.717*	-4.195**	-3.253*	-7.946**	-4.741	-11.015**	-16.227**
	(1.36)	(1.53)	(1.36)	(1.24)	(1.91)	(4.39)	(3.15)	(4.05)
Constant	16.340**	26.744**	22.087**	14.957**	50.263**	141.537**	124.499**	117.142**
	(4.63)	(6.96)	(5.92)	(4.73)	(9.21)	(27.75)	(24.41)	(24.45)
R-squared	0.860	0.870	0.922	0.938	0.899	0.904	0.932	0.928

Note: ** significant at 1%; * at 5%; + at 10%. Standard errors clustered on county are in parentheses. All regressions are weighted by county's female population and include county level unemployment rate, per-capita personal income (2010$), percent of population age 15-24, county and year fixed effects as well as a reduced set of county-specific linear trends. Specifications without and with a full set of trends as well as a corresponding table for Oregon are available on request.

Appendix H: Abortions to Idaho residents by state of occurrence