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Behind-the-counter, but Over-the-border? The Assessment of the Spillover Effect of Increased Availability of Emergency Contraception in Washington on Neighboring States

By

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Abstract:
Emergency contraception (EC), that gained FDA's approval in the late 1990s as a prescription medicine, may effectively prevent unwanted pregnancy if taken promptly after an unprotected sexual intercourse. Because EC efficacy is inversely related to the duration between intercourse and the time it is taken, the prescription requirements can make it less effective. Washington was the first state to loosen up the prescription requirements making 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. Using the difference-in-difference methodology and 1991-2005 county level data, I find that increased access to EC is associated with a substantial and statistically significant 5-7% decrease in abortion rates and 2% decrease in pregnancy rates in Washington counties that had access to EC without a prescription within 10 miles. As expected, the effect becomes numerically smaller and statistically weaker with an increase in travel distance. I find some evidence in support of the spillover effects in Idaho, but not Oregon. 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: I1; I18; J13

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 pregnancies and abortion rates. The net effect is thus to be determined empirically. Furthermore,

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[1] For example, Angrist and Evans (1996), Goldin and Katz (2002), Bailey (2006), Ananat and Hungerman (2012).
[2] In 2006, FDA approves Plan B, a widely known brand of EC, 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.

the effect (if any) is expected to diminish with an increase in distance required to travel to the closest no-prescription EC location in Washington. 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 the neighboring 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 in Washington 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 to a no-prescription EC pharmacy, 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. Results from Washington indicate that abortion rates for both women age 15-29 and 15-44 were substantially lower in counties that had access to no-prescription EC within 10 miles of the county population centroid. Depending on the model specification, the direct effects can be as big as a 5 to 6% decrease in the abortion rate (or 2 abortions per 1,000 women) for women age 15-29 in Washington counties that have a EC pharmacy within a 10 miles radius. The upper bound for women age 15-44 is 7%. 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 substantial change in the pregnancy rates (a 2% decrease) for both age groups. Two competing explanations are possible for these findings. The results might be indicative of changes in the risk taking behavior, although among a very small proportion of women. But they can also 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 by half (making the magnitude more credible), and inflates standard errors reducing the statistical power. Overall, comparing to Oregon residents, the border-hopping for EC might have higher benefits to Idaho residents, but the effects on abortion and pregnancy rates are rather small to be detected.

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

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[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) "Expanding Access to Emergency Contraceptive Pills: Promoting Pharmacists/Prescriber Collaborative Agreements. Training Manual", at http://www.path.org/publications/files/ECT_pharm_trn_mnl.pdf (last accessed on 9/5/2012).

community, pharmacies continued to file for new EC collaborative agreements as well as renew 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 16 counties in 1998 to 31 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

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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 fewer 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, leading to an increase in the number of unwanted births and the number of abortions. 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. In addition, the EC pills are only about 90% effective, even when taken as recommended. Therefore, it is possible for the overall pregnancy rate (which includes unwanted pregnancies) to decrease, increase, or stay the same when the availability of EC increases. Similarly, the effect on abortion rate is also ambiguous. The identification of these effects is an empirical exercise.

There is no consensus in the literature regarding the effect of EC availability on abortion rates or 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, these studies generally 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. The results reported in the economic studies are generally mixed and in part are driven by the identification strategy. For example, Durrance (2012) 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. In contrast, using individual level insurance claim data from the MarketScan, Oza (2009) estimates a 37.2% (or 1.7 abortions per 1,000 women) decline in abortion among 15-29 year-old women that is attributed to the 2006 FDA's approval of Plan B as a non-prescription form of EC for women age 18 and older. However, the magnitude of the effect found, as well as the decline in the corresponding abortion rates, reflects the peculiarity of the dataset.[4] Using 1990-2006 birth certificates, Zuppann (2011) finds that changes in the pharmacy access laws that increased availability of EC lead to a decrease in the aggregated birth rates among single women by 3 births per 1,000 women. Gross et al (2011), on the other hand, using a similar across state variation in the EC pharmacy laws find little evidence of an impact on either abortion or birth rates. Further, it is argued that the established negative association in the related studies is due to a failure to account for state-specific linear trends. 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. For example, Durrance (2012) finds that the percent of pharmacies with EC collaborative agreements in Washington is associated with a 17% increase in county level gonorrhea rates per 100,000 females. 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 (if any) is assessed via changes in the county level pregnancy rates.

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[4] Abortion rates calculated using claims data are greatly understated. In Oza's dataset, the mean abortion rate in 2005 is 1.12 abortions per 1,000 women ages 15-29. The corresponding CDC statistics from the Abortion Surveillance 2005 report is 14, 29, and 22 abortions per 1,000 women age 15-19, 20-24, and 25-29 respectively.

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 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. 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 towards not finding an effect. Second, the EC Hotline database was not set up to provide a consistent year-to-year tracking of participating pharmacies. 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 going forward. This generalization might be unreasonable if pharmacies that are listed as participants have lost the approval or decided not to renew their collaborative agreements after a two-year expiration period. I address this concern by examining the frequency of pharmacy records updates. I confirm that the vast majority of pharmacies updated their information with the Hotline in later years (only 7.6% of all Washington pharmacies that submitted their information to the EC Hotline between 1998 and 2005 did not update their information in the later years). 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 fact, in over 60% of these cases there was an EC pharmacy in that zip code that joined either earlier or in the same year and that has been updating its participation status continuously with the EC

Hotline. 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 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. I identify the location of an EC pharmacy by the geographical coordinates of the zip code centroid that pharmacy is located in. Then I estimate the travel distance from each county in Idaho and Oregon to the closest pharmacy location in Washington as the distance between county's i population center and the geographical centroid of the nearest zip code with an EC pharmacy.[5] 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 Staigner (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 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.[6]

I use the variation in the travel distance to identify the Idaho and Oregon counties where the changes in the EC availability in Washington might have changed fertility outcomes. Counties

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[5] If an EC pharmacy entered in the EC Hotline database in the fourth quarter then this location is considered for distance calculation only starting from the next year.

[6] 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 for Oregon but not Idaho. Travel distances for affected Oregon counties are still substantial and exceed 75 miles.

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 dependent variable Y is the abortion rate per 1,000 women age 15-29 and age 15-44 in county-year or the pregnancy rate per 1,000 women age 15-29 and age 15-44 in county-year.[7] 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.[8] The analysis focuses on 15-29 year olds as both abortion and pregnancy rates are substantially lower for older women.[9] The effect on 15-29 age group is expected to be larger in magnitude than that on 15-44 age group.

The dummy variable, *TREATMENT*, indicates whether the closest EC pharmacy location in Washington State for a given county in Idaho or Oregon is within 20 miles or less. Values are set to zero for years prior to 1998, since prior to the start of the EC Project none of the counties in Idaho or Oregon had access to EC without a prescription. The spillover effect (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 are reported in Table 1.

The vector X_{ct} includes county level unemployment rate, per-capita personal income in 2010 dollars, and divorce rate per 1,000 people (data available from the Bureau of Labor Statistics, Bureau of Economic Analysis, and Vital Statistics annual reports respectively). 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. As I mentioned above, the omission of county-specific linear trends might be responsible for differences reported in the

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[7] Following the lead of Levine et al (1996) and Levine (2003), pregnancy rate is calculated as a sum of births and abortions. Abortions and births by place of residence are available from the annual vital statistics reports released by 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.
[8] For example, for a few years in some Oregon counties data are not reported by age due to confidentiality concerns.
[9] Fertility rates by age group and state are reported in Appendix A.

literature regarding the effects of the EC laws on fertility rates. On the other hand, 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 the model, I analyze the residuals from the model (1) 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 parameters in the trend component that are not statistically different from zero and helps to increase the efficiency of other estimates. To evaluate the sensitivity of results to the model specification, I present results with a full set of county-specific linear trends, as well as models without a trend and with a reduced number of parameters in the trend component.

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 Idaho and Oregon, allowing them to capture the potential benefits from the increased availability of EC in Washington. 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.

To allow for the effects to vary across states, both models are estimated separately for Idaho and Oregon. The standard errors are clustered at the county level. All regressions are weighted using county female population in the appropriate age group.

Finally, to test the hypothesis whether the effect decreases with an increase in the travel distance, I re-estimate both models with the following alternative definitions of the treatment group: the

closest EC pharmacy location in Washington is within 25 and 50 miles.[10] If the increasing travel distance hypothesis is true, then the estimated coefficient on the treatment dummy in model (1) should 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 (e.g. rural versus urban areas).

To assess the credibility of the results for the neighboring states and put the magnitude of the effects (if any) in perspective, I start with an estimation of equation (1) for Washington State. This exercise produces a baseline or a "direct effect" of EC availability as a comparable model; 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. 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 96% of all county-year observations).

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

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[10] 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.

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 Appendix B).

In addition, the mean fertility rates for Idaho and Oregon, by age group and the treatment status for before and after the EC Project, are reported in Table 2. For all age groups abortion rates in the treated counties (i.e. counties that had an EC pharmacy within 20 miles) tend to be higher than in control counties both in pre-1998 and post-1998. The same is true for pregnancy rates in Oregon. Substantial and statistically significant differences in abortion rates that exist between treatment and control counties prior to the EC Project persist after 1998. However, for women age 15-29 the gap diminishes slightly and for women age 15-44 it is nearly unchanged. In Idaho, the difference between the overall pregnancy rate and the rate for women age 15-29 in treated and control counties decreases with time, with treatment counties maintaining a lower rate. In Oregon, the difference between treatment and control counties remains stable over time for women age 15-29 and increases for women age 15-44.

Results

Washington State

The baseline effect of increased EC availability on fertility rates in Washington State by age group is reported in Table 3. All regressions include county-level socio-economic characteristics, year fixed effects, 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.

Results indicate that abortion rates among 15-29 and 15-44 year old women in counties with a close EC pharmacy access are generally significantly lower than in control counties. As expected, the magnitude of the effect decreases with an increase in the travel distance to the closest EC pharmacy. Among women age 15-29, there were on average 29.7 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 5.1%. The corresponding changes in abortion rate are 2.6% and 2.0% respectively for treatment groups EC pharmacy within 20 miles and within 25 miles. The estimates for both treatment groups are not statistically significant. A corresponding drop in the abortion rate for women age 15-44 is 5.5%, 3.7%, and 3.3% relative to the pre-EC Project average for treatment groups 10, 20, and 25 miles or less, respectively. These results are at odds with Durrance (2012) who does not find an association between the percent of EC pharmacies in a county and abortion or birth rates. However, this is not surprising given that studies use different measures of the EC availability and the percent of pharmacies in a county-year that participated in the EC Project might be a less adequate measure of EC availability.

The coefficient estimates for treatment indicators in models for pregnancy rates show a statistically significant 1.6% and 2.1% decrease respectively for women age 15-29 and 15-44 in counties with EC pharmacy access within 10 miles. 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. Alternatively, this result might be indicative of changes in the sexual behavior but among a relatively small number of women (i.e., a decrease in the number of unwanted pregnancies associated with a lower cost of EC among women whose sexual behavior has not changed exceeds or roughly equals an increase in the number of unwanted pregnancies among those whose sexual risk taking was stimulated by the availability of EC). The latter explanation is more consistent with results in Durrance (2012) who reports an increase in STD rates among females, which is in line with an increase in sexual risk taking.

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 results are available on request).[11] Qualitatively, the results are mostly not sensitive to the exclusion of county-specific linear trends or to the inclusion of a selected set of trends; quantitatively, the effects vary by about 1-2 percentage points depending on the age group.

Neighboring States

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[11] 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 reported in the vital statistics reports.

The point estimates for Idaho and Oregon are reported separately in Panel A and Panel B of Table 4. The discussion is focused on results from the model that includes a restricted set of parameters in the trend component reported in column (2). After the implementation of EC Project, abortion rates in Idaho counties with EC pharmacy access within 20 miles is statistically significantly lower than in control counties. Specifically, a pre-1998 average abortion rate of 20.0 abortions per 1,000 women age 15-29 decreases by about 8.4% (or 1.7 abortions per 1,000 women) after 1998. A similar effect is observed for the abortion rates for women age 15-44: a decrease of 8.2% (or about 1 abortion per 1,000 women) relative to 12.6 abortions per 1,000 women in the pre-treatment period. The model specification that allows for time variant effects on treatment counties (reported in Appendix C columns 1-2) reveals 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 and 2004-2005).

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. The results from models where the outcome variable is pregnancy rate indicate a statistically significant decrease in pregnancy rates between 1998 and 2005 in counties that had the EC pharmacy access within 20 miles compared to the control group. Relative to the pre-treatment average rate this corresponds to a decrease of 8.7% and 7.6% for 15-29 and 15-44 age groups. The event-study specification (Appendix C columns 5-6) indicates a lag in the response, with a substantial reduction in the rate 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 show a substantial increase in abortion rates between 1999 and 2003 (Appendix C columns 3-4) and pregnancy rates between 2000 and 2002 (Appendix C columns 7-8). It is possible that the quality of estimates for 15-29 age group 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).

Qualitatively, both sets of results reported here (i.e. for Idaho and Oregon), are robust to a various specifications of county-specific linear trends. Point estimates for models without a trend and a full set of county-specific linear trends, along with the relative magnitudes of the effects to the pre-treatment average rates, are reported respectively in columns (1) and (3) of Table 4. Generally, for Idaho, models with a complete set of county-specific linear trends produce the lowest estimates for 15-29 and about the same estimates for 15-44; for Oregon –inclusion of a complete set of county-specific linear trends produces the largest estimates.

Although the findings are fairly robust to the trend specification, 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 Idaho and Oregon, there might be significant differences in the characteristics of "treated" counties that might affect the behavioral response to the increased availability of EC. "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 very 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.

Pharmacies participating in the EC Project in Washington tend to concentrate in urban areas, while bordering counties in Idaho are largely urban. Washington counties with an EC pharmacy within 20 miles might differ substantially from those in Idaho, and thus the different magnitude of the direct and indirect effects could reflect different sets of costs and benefits to women in the treated counties. 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 in treated counties would decrease.[12] 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 (Appendix D). Simultaneously, the share of abortions obtained in Washington has increased by about 7% points. A change in the trend over time indicates that there are changes in the availability of abortion services to Idaho residents and 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.[13] The estimated coefficients of interest remain negative, but their magnitude decreases. In model without trends, the abortion rate per 1,000 women age 15-29 in treated counties decreases by 6.1% relative to the pre-1998 average. This corresponds to 1.2 abortions per 1,000 women and the estimate is statistically significant at 5% level. An addition of a reduced set of county-specific linear trends reduces the effect to 3.7%. However, the standard errors become larger and the estimate is no longer statistically significant. An addition of a full set of county-specific time trends (column 3) absorbs even more "useful variation", resulting in even larger standard errors. An estimated effect for 15-44 year old corresponds to a decrease of 0.5-1 abortion per 1,000 women depending on the specification but lacks statistical significance in all specifications. Consistent with the literature, an increase in the travel distance to closest abortion provider is associated with a decrease in abortion rate.

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[12] 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 Staigner (1996) find a similar association for birth rates among white teens.
[13] Analysis is not done for Oregon as it does not report abortions to Oregon residents by state of occurrence and two neighboring states – California and Nevada – do not report abortions by place of occurrence within the state. So I cannot establish trends over time or identify counties with abortion providers in California and Nevada.

The effects on pregnancy rates reported earlier are slightly more robust to the inclusion of the additional covariate, although the statistical power of the estimates is reduced. Among 15-29 year old in treated counties, pregnancy rate is reduced by 7.5 pregnancies per 1,000 women, a substantial and statistically significant 7.2% reduction from the pre-treatment average of 104 pregnancies per 1,000 women. Models that include a reduced set and a full set of county-specific linear trends yield about 6% change, although the estimate is not statistically significant for the latter specification. The overall pregnancy rate for women age 15-44 decreases by 7.3-9.2% relative to the pre-treatment average. An addition of the full set of county-specific linear trends yields results that are similar in magnitude to the results from the model without the trends, but with larger standard errors. The distance to the closest abortion provider has an inverse effect on pregnancy rates but the statistical power is reduced with the inclusion of county-specific linear trends.

An event-study specification, reported in Appendix E, provides results that are less sensitive to model specification, but fluctuations across years make it harder to pinpoint the reason for an effect in a specific year. For example, the statistically significant decrease in the abortion rate for both age groups in 2005 does not materially change when the trends are included. A substantial and statistically significant reduction in pregnancy rate for women age 15-29 and 15-44 are observed between 2003 and 2005.

An extension of the treatment group definition to travel distance 50 miles produces statistically insignificant point estimates on the treatment indicator in all specifications for both Idaho and Oregon. These results are reported in Appendix F.

Conclusion

In 1998 Washington was the first state to relax the requirements for the access to EC in pharmacies. A formation of collaborative drug therapy agreements between physicians and pharmacists effectively allowed the pharmacists to make an independent assessment of a woman's need for EC and a decision to dispense it without a doctor's prescription. The elimination of prescription requirement reduces the overall costs associated with obtaining EC for women of any age.

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 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). I use the difference-in-difference methodology, where the treatment status is assigned based on the travel distance to the closest pharmacy in Washington where EC is available without a prescription. Several treatment groups are considered: EC access within 20, 25, and 50 miles. The spillover effects (if any) are expected to occur in counties that are in a close proximity to EC locations in Washington (i.e., within 20 miles) and to become trivial as the distance increases. The magnitude of the direct effect (the effect in Washington) is used as a baseline for evaluation of the quality of the estimated spillover effect.

In Washington counties with EC pharmacy access within 10 miles, abortion rates were significantly lower in a post-1998 period compared to rates in control counties. The magnitude of this direct effect is about 5% decrease among women age 15-29 and ranges from 5.5% to 7.3% decrease among women age 15-44, depending on the model specification. Relative to the pre-1998 average, the effect on pregnancy rates is around 2% for both age groups. For both rates, the estimates are smaller and statistically insignificant 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 availability.

The results for the spillover effects in the neighboring states are mixed and are sensitive to model specifications. Relative to a pre-1998 average, an increase in availability of EC after 1998 is associated with an 8.4% decrease in the average abortion rate among women age 15-29 and 8.2% among women age 15-44 in counties that had an EC pharmacy within a 20 miles radius. The effect on pregnancy rate is also negative: a reduction of 8.7% and 7.6% for women age 15-29 and age 15-44 respectively. All results for Idaho are statistically significant and fairly robust to the inclusion and various specifications of county-specific linear trends. The effects on fertility rates in the similarly defined treatment counties in Oregon are not statistically significant in nearly all specifications. Given the substantial differences across treated counties in Idaho and Oregon, as well the relatively high effect in Idaho, it is possible that the results for Idaho are

driven by additional factors, such as changes in the availability of reproductive health services including abortion services. Controlling for the travel distance to the closest county (within or outside the state) with an abortion provider produces more credible estimates: the estimated effects are still negative but reduced in half for abortion rates and also smaller for pregnancy rates although not by as much. However, this additional control yields noisier estimates. 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 (especially with a full set of county-specific linear trends) might not have enough power to establish them.

References

Althaus, F. A., & Henshaw, S. K. (1994). The effects of mandatory delay laws on abortion patients and providers. *Family Planning Perspectives*, 228-233.

Ananat, E. O., & Hungerman, D. M. (2012). The power of the pill for the next generation: oral contraception's effects on fertility, abortion, and maternal and child characteristics. *Review of Economics and Statistics*, *94*(1), 37-51.

Angrist, J. D., & Evans, W. N. (1996). *Schooling and labor market consequences of the 1970 state abortion reforms* (No. w5406). National Bureau of Economic Research.

Bailey, M. J. (2006). More power to the pill: the impact of contraceptive freedom on women's life cycle labor supply. *The Quarterly Journal of Economics*, *121*(1), 289-320.

Bitler, M., & Zavodny, M. (2001). The effect of abortion restrictions on the timing of abortions. *Journal of Health Economics*, *20*(6), 1011-1032.

Blank, R. M., George, C. C., & London, R. A. (1996). State abortion rates the impact of policies, providers, politics, demographics, and economic environment. *Journal of Health Economics*, *15*(5), 513-553.

Boumil, M. M., & Sussman, D. (2008). Emergency Contraception: Law, Policy and Practice. *Connecticut Public Interest Law Journal*, *7*, 157-289.

Cartoof, V. G., & Klerman, L. V. (1986). Parental consent for abortion: impact of the Massachusetts law. *American Journal of Public Health*, *76*(4), 397-400.

Clapp, J. D., Voas, R. B., & Lange, J. E. (2001). Cross-border college drinking. *Journal of Safety Research*, *32*(3), 299-307.

Cook, P.J., Parnell, A. M., Moore, M.J., & Pagnini, D. (1999). The effects of short-term variation in abortion funding on pregnancy outcomes**.** *Journal of Health Economics* 18, 241-257

Durrance, C.P., (2012). The Effects of Increased Access to the Morning-After Pill on Abortion and STD Rates. *Economic Inquiry,* doi: 10.1111/j.1465-7295.2012.00498.x

Figlio, D. N. (2007). The effect of drinking age laws and alcohol-related crashes: Time-series evidence from Wisconsin. *Journal of Policy Analysis and Management*, *14*(4), 555-566.

Gardner, J. S., Hutchings, J., Fuller, T. S., & Downing, D. (2001). Increasing access to emergency contraception through community pharmacies: lessons from Washington State. *Family Planning Perspectives*, 172-175.

Girma, S., & Paton, D. (2011). The impact of emergency birth control on teen pregnancy and STIs. *Journal of Health Economics*, *30*(2), 373-380.

Glasier, A., Fairhurst, K., Wyke, S., Ziebland, S., Seaman, P., Walker, J., & Lakha, F. (2004). Advanced provision of emergency contraception does not reduce abortion rates. *Contraception*, *69*(5), 361-366.

Goldin, C., & Katz, L. F. (2002). The power of the pill: oral contraceptives and women's career and marriage decisions. *Journal of Political Economy*, 110(4), 730-770.

Gross, T., Lafortune, J., & Low, C. (2012). What happens the morning after? The costs and benefits of expanding access to emergency contraception. *Unpublished Working Paper available at http://eco3147.facea.puc.cl/economia_puc/docs/dt_425.pdf*

Haas-Wilson, D. (1996). The impact of state abortion restrictions on minors' demand for abortions. *Journal of Human Resources*, 140-158.

Henshaw, S. K. (1995). The impact of requirements for parental consent on minors' abortions in Mississippi. *Family Planning Perspectives*, 120-122.

Henshaw, S. K., & Finer, L. B. (2003). The accessibility of abortion services in the United States, 2001. *Perspectives on Sexual and Reproductive Health*, *35*(1), 16-24.

Joyce, T., Tan, R., & Zhang, Y. (2011). Changes in birth rates of young women following access to the pill and abortion in the early 1970s. *Unpublished Working Paper available at http://paa2012.princeton.edu/abstracts/120255*

Joyce, T., & Kaestner, R. (2001). The impact of mandatory waiting periods and parental consent laws on the timing of abortion and state of occurrence among adolescents in Mississippi and South Carolina. *Journal of Policy Analysis and Management*, 20(2), 263-282.

Joyce, T., & Kaestner, R. (1996). State reproductive policies and adolescent pregnancy resolution: the case of parental involvement laws. *Journal of Health Economics*, *15*(5), 579-607.

Kane, T. J., & Staiger, D. (1996). Teen motherhood and abortion access. *The Quarterly Journal of Economics*, 111(2), 467-506.

Kearney, M. S., & Levine, P. B. (2009). Subsidized contraception, fertility, and sexual behavior. *The review of Economics and Statistics*, *91*(1), 137-151.

Levine, P. B. (2003). Parental involvement laws and fertility behavior. *Journal of Health Economics*, *22*(5), 861-878.

Levine, P. B., Trainor, A. B., & Zimmerman, D. J. (1996). The effect of Medicaid abortion funding restrictions on abortions, pregnancies and births. *Journal of Health Economics*, *15*(5), 555-578.

Medoff, M. H. (2008). Abortion costs, sexual behavior, and pregnancy rates. *The Social Science Journal*, *45*(1), 156-172.

Oza, A. (2009). Plan b as insurance: The effect of over-the-counter emergency contraception on pregnancy terminations and STIs. *Unpublished Working Paper available at http://liberalarts. iupui.edu/economics/uploads/docs/oza.pdf*.

PATH. (1999). Expanding access to emergency contraceptive pills: promoting Pharmacists/ Prescriber Collaborative Agreements. Training manual. *http://www.path.org/publications/files/ECT_pharm_trn_mnl.pdf*

Raine, T. R., Harper, C. C., Rocca, C. H., Fischer, R., Padian, N., Klausner, J. D., & Darney, P. D. (2005). Direct access to emergency contraception through pharmacies and effect on unintended pregnancy and STIs. *JAMA: The Journal of the American Medical Association*, *293*(1), 54-62.

Raymond, E. G., Trussell, J., & Polis, C. B. (2007). Population effect of increased access to emergency contraceptive pills: a systematic review. *Obstetrics & Gynecology*, *109*(1), 181-188.

Saffer, H., & Grossman, M. (1987). Beer Taxes, the Legal Drinking Age, and Youth Motor Vehicle Fatalities. *Journal of Legal Studies*, *16*(2), 351-374.

Tomal, A. (1999). Parental involvement laws and minor and non-minor teen abortion and birth rates. *Journal of Family and Economic Issues*, *20*(2), 149-162.

Zuppann, C. A. (2011). The Impact of Emergency Contraception on Dating and Marriage. *Unpublished Working Paper available at http://www.sole-jole.org/12450.pdf*

Figure 1: Zip code locations of participating pharmacies in Washington in 1998 and 2005
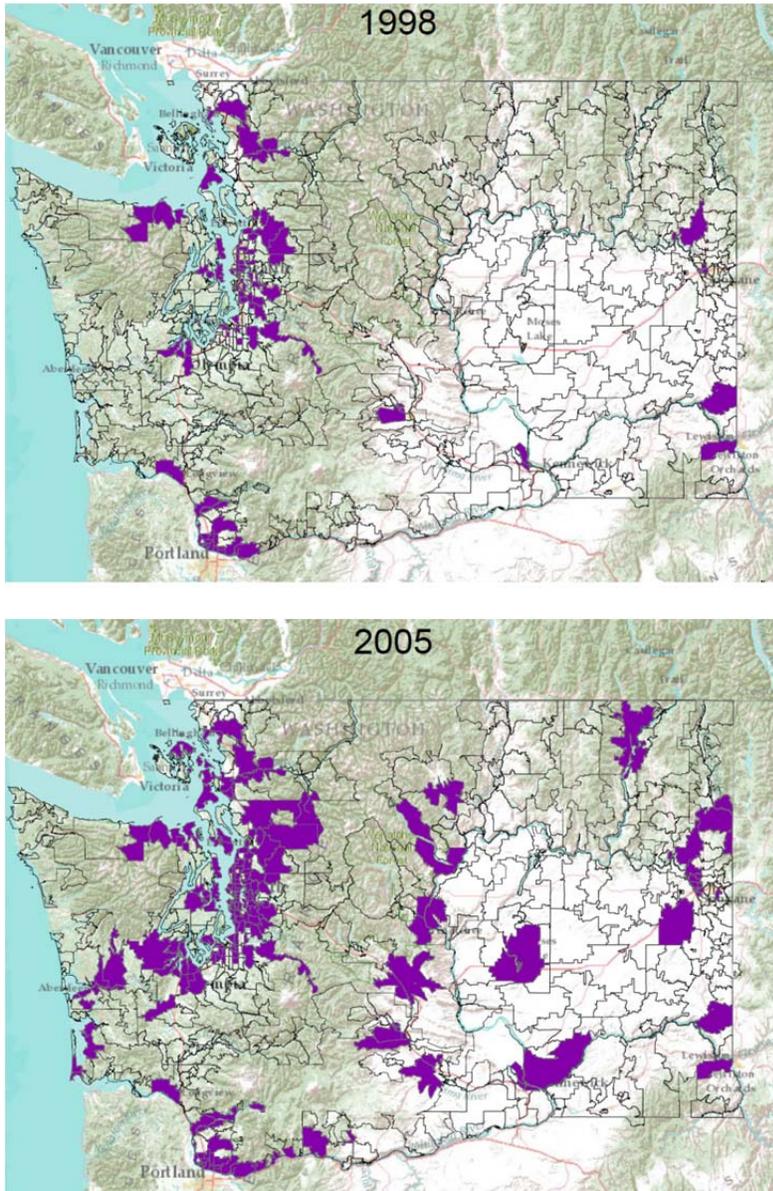
Note: Highlighted areas represent zip codes that had a participating pharmacy based on the year of entry in the EC Hotline database.

Figure 2: Travel distance to the closest EC pharmacy location in Washington or California, 2005
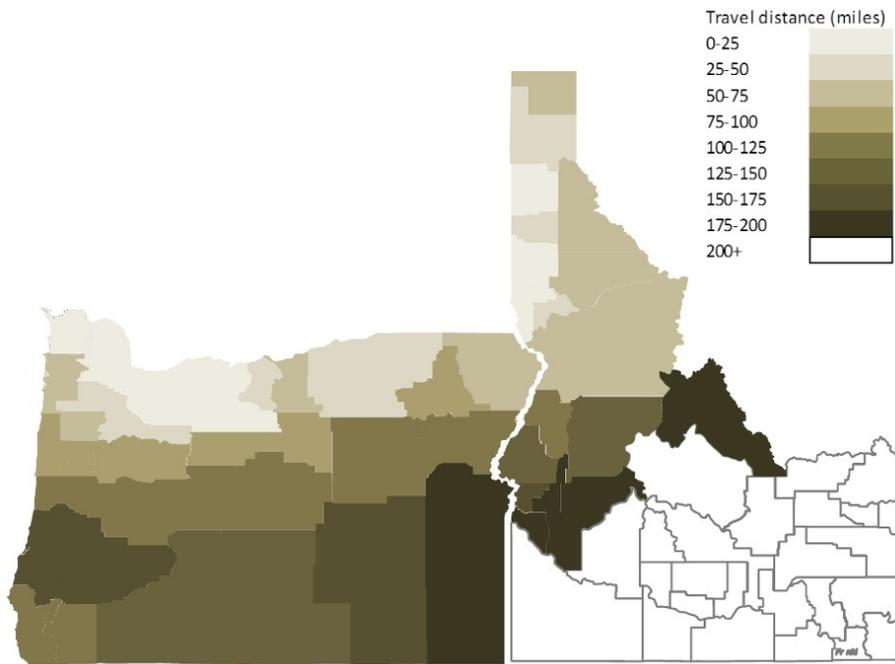
Figure 3: Trends in fertility rates in Washington, by age group and treatment status

Abortion rate

Treatment "10 miles or less"　　　　　　　Treatment "20 miles or less"

Pregnancy rate

Treatment "10 miles or less"　　　　　　　Treatment "20 miles or less"
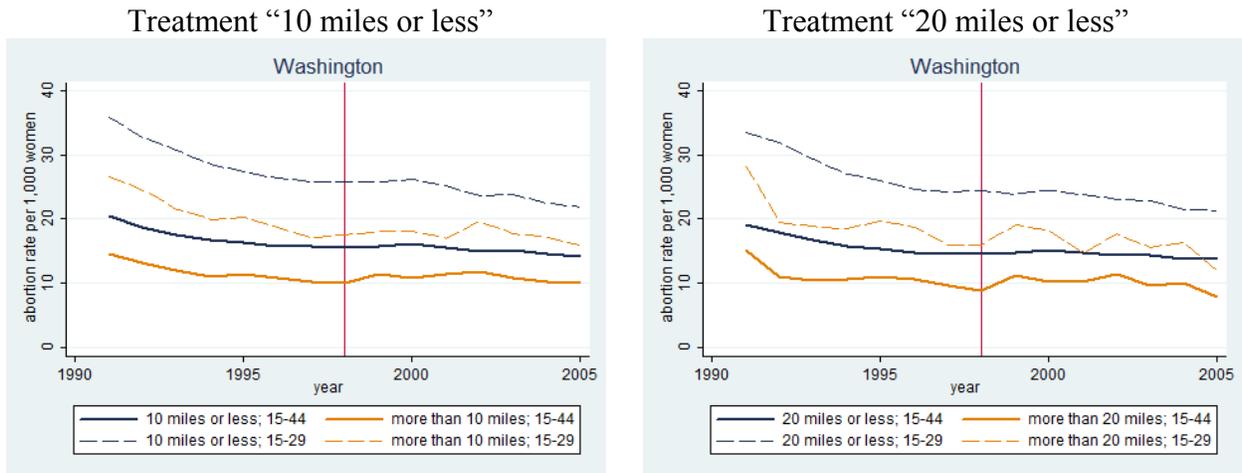
Note: Trends for treatment group "25 miles or less" are not shown as they are very similar to the treatment group "20 miles or less".

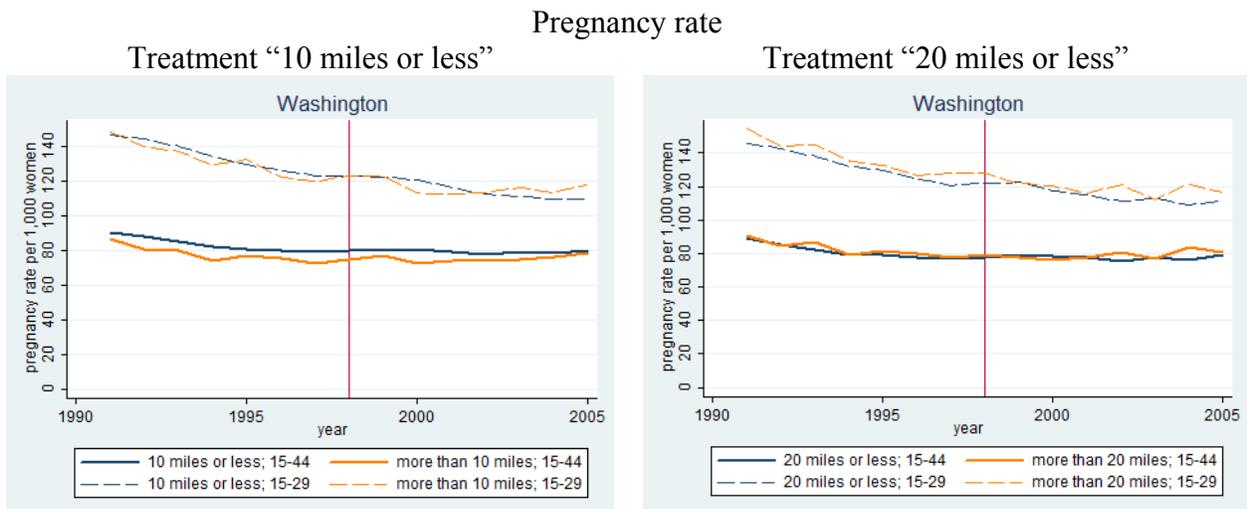**Figure 4**: Trends in fertility rates in Idaho and Oregon, by age group and treatment status (treatment "EC pharmacy is within 20 miles")

Abortion rate
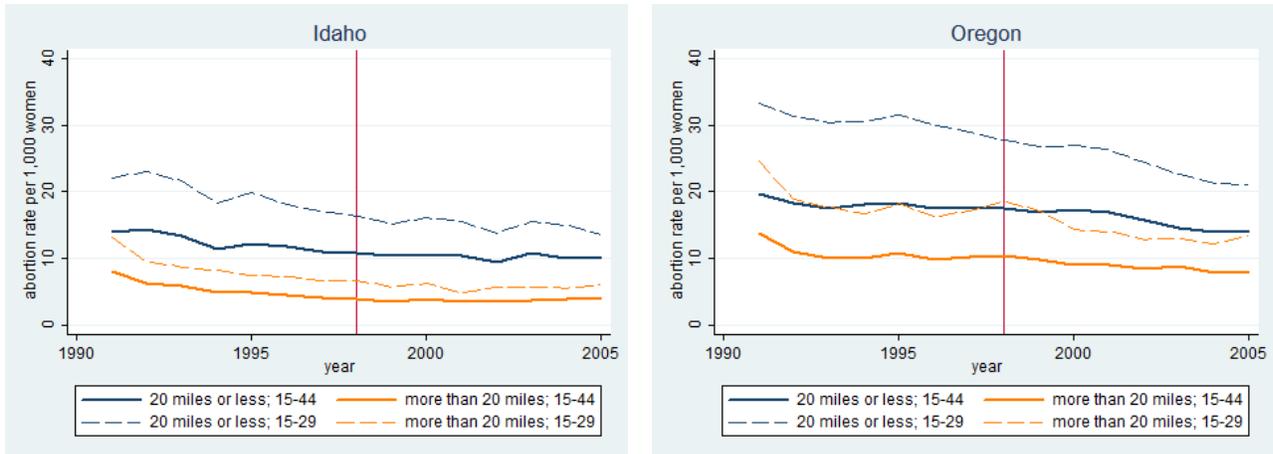
Pregnancy rate
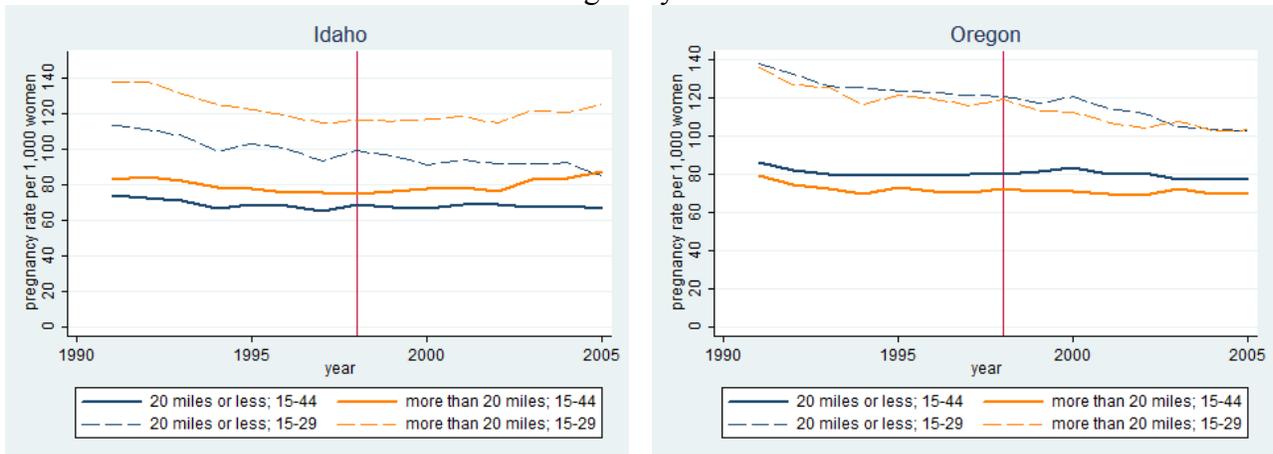
Note: Trends are not reported for a treatment definition "25 miles or less" as trends for Oregon are very similar and for Idaho are identical to the ones reported for "20 miles or less".

Table 1: Summary statistics

	IDAHO		OREGON	
	Mean	Standard Deviation	Mean	Standard Deviation
Abortion rate, age 15-29 [a]	7.83	(6.75)	18.36	(9.39)
Abortion rate, age 15-44	5.01	(3.95)	10.96	(5.55)
Pregnancy rate, age 15-29 [a]	120.70	(26.27)	116.41	(22.84)
Pregnancy rate, age 15-44	78.78	(15.51)	73.20	(12.30)
County unemployment rate	6.17	(2.71)	7.51	(1.97)
Per capita personal income (2010$)	26672.64	(5881.30)	29315.89	(4577.52)
Divorce rate per 1,000 people	4.82	(1.89)	6.25	(9.69)
Distance to the closest EC pharmacy [b]	219.45	(118.26)	91.46	(62.91)
Number of observations	660		540	

Note: [a] Due to missing data, the number of observations for Oregon is 502. [b] Distance to the closest EC pharmacy is observed only for the 1998-2005 time period yielding 352 observations for Idaho and 288 observations for Oregon.

Table 2: Differences in means statistics

		IDAHO							
		Abortion rate				Pregnancy rate			
		15-29		15-44		15-29		15-44	
1991-1997	Treatment	20.0	(3.15)	12.6	(1.74)	103.8	(11.69)	69.4	(6.92)
	Control	8.7	(0.85)	5.5	(0.47)	126.7	(3.16)	79.4	(1.87)
	Difference	**11.4****	(3.26)	**7.1****	(1.80)	**-22.9**+	(12.11)	**-10.0**	(7.17)
1998-2005	Treatment	15.1	(2.77)	10.3	(1.71)	92.5	(11.28)	67.7	(7.82)
	Control	5.8	(0.75)	3.7	(0.46)	118.6	(3.05)	79.6	(2.11)
	Difference	**9.4****	(2.87)	**6.5****	(1.77)	**-26.1***	(11.69)	**-11.9**	(8.10)

		OREGON							
		Abortion rate				Pregnancy rate			
		15-29		15-44		15-29		15-44	
1991-1997	Treatment	30.9	(3.05)	18.1	(1.84)	127.3	(7.95)	81.0	(4.30)
	Control	18.6	(1.38)	10.8	(0.82)	123.5	(3.59)	73.0	(1.92)
	Difference	**12.4****	(3.35)	**7.4****	(2.02)	**3.8**	(8.73)	**8.0**+	(4.71)
1998-2005	Treatment	24.7	(2.83)	15.8	(1.74)	112.2	(7.87)	79.8	(4.47)
	Control	14.2	(1.29)	8.9	(0.78)	108.5	(3.60)	70.7	(2.00)
	Difference	**10.4****	(3.11)	**7.0****	(1.91)	**3.7**	(8.65)	**9.1**+	(4.90)

Note: ** significant at 1%; * significant at 5%. Standard errors are in parentheses; t-values are cluster adjusted. County is considered "treated" if the distance to the closest EC pharmacy in Washington is 20 miles away or less. The difference represents treatment minus control.

Table 3: Effect of increased availability of EC in pharmacies on fertility rates in Washington

	15-29		15-44	
	Abortion rate	Pregnancy rate	Abortion rate	Pregnancy rate
Panel A				
EC pharmacy within	-1.518*	-2.186+	-0.948**	-1.752*
10 miles	(0.73)	(1.27)	(0.33)	(0.65)
R-squared	0.963	0.981	0.968	0.969
Average rate 1991-1997	29.7	134.9	17.3	83.5
Panel B				
EC pharmacy within	-0.737	-0.716	-0.609	-1.442
20 miles	(0.82)	(1.53)	(0.38)	(0.88)
R-squared	0.963	0.981	0.968	0.969
Average rate 1991-1997	28.1	133.4	16.3	81.4
Panel C				
EC pharmacy within	-0.557	-0.398	-0.573	-1.399
25 miles	(0.84)	(1.60)	(0.38)	(0.92)
R-squared	0.963	0.981	0.968	0.969
Average rate 1991-1997	27.8	134.3	16.1	82.2

Note: ** significant at 1%; * significant at 5%; + significant at 10%. 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. All regressions include county level unemployment rate, per-capita personal income in 2010 dollars, and county level divorce rate per 1,000 people as well as year fixed effects and county fixed effects and county-specific linear trends.

Table 4: The effect of EC pharmacy access in Idaho and Oregon

Panel A: **Idaho**

	15-29			15-44		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
	Abortion rates					
EC pharmacy is within 20 miles	-2.038**	-1.678**	-1.564**	-1.065**	-1.030**	-1.292**
	(0.34)	(0.32)	(0.49)	(0.14)	(0.17)	(0.45)
R-squared	0.929	0.937	0.940	0.938	0.942	0.944
Linear trend (a reduced set)	No	Yes	-	No	Yes	-
Linear trend (a full set)	No	-	Yes	No	-	Yes
% Δ relative to a pre-1998 av.	-10.2	-8.4	-7.8	-8.5	-8.2	-10.3

	Pregnancy rates					
EC pharmacy is within 20 miles	-11.695**	-8.997**	-7.107+	-7.427**	-5.248**	-5.258*
	(1.82)	(1.94)	(3.66)	(1.23)	(1.60)	(2.20)
R-squared	0.897	0.925	0.928	0.853	0.889	0.893
Linear trend (a reduced set)	No	Yes	-	No	Yes	-
Linear trend (a full set)	No	-	Yes	No	-	Yes
% Δ relative to a pre-1998 av.	-11.3	-8.7	-6.8	-10.7	-7.6	-7.6

Panel B: **Oregon**

	15-29			15-44		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
	Abortion rates					
EC pharmacy is within 20 miles	-0.108	1.613	1.619	0.646	0.586	1.116
	(1.63)	(1.13)	(1.36)	(0.74)	(0.40)	(0.70)
R-squared	0.952	0.966	0.967	0.957	0.968	0.969
Linear trend (a reduced set)	No	Yes	-	No	Yes	-
Linear trend (a full set)	No	-	Yes	No	-	Yes
% Δ relative to a pre-1998 av.	-0.3	5.2	5.2	3.5	3.2	6.2

	Pregnancy rates					
EC pharmacy is within 20 miles	-1.408	0.627	3.094	1.825	1.681	2.682+
	(4.41)	(1.91)	(2.64)	(2.27)	(1.14)	(1.52)
R-squared	0.945	0.964	0.965	0.929	0.950	0.952
Linear trend (a reduced set)	No	Yes	-	No	Yes	-
Linear trend (a full set)	No	-	Yes	No	-	Yes
% Δ relative to a pre-1998 av.	-1.1	0.5	2.4	2.3	2.1	3.3

Note: ** significant at 1%; * at 5%; + at 10%. Standard errors clustered on county are in parentheses; number of observations is 660 for Idaho and 502 for 15-29 and 540 for 15-44 for Oregon. Observations are weighted by county's female population. All specifications include county level unemployment rate, per-capita personal income (2010$), divorce rate per 1,000 people, county and year fixed effects.

Table 5: Robustness test for **Idaho**

	15-29			15-44		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
	Abortion rates					
EC pharmacy is 20	-1.226*	-0.745	-1.032	-0.541	-0.579	-1.014
miles away or less	(0.57)	(0.67)	(0.88)	(0.37)	(0.43)	(0.67)
Distance to closest	-0.022	-0.026**	-0.031*	-0.015*	-0.017**	-0.019*
abortion provider	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	24.982**	22.566**	24.117**	11.365**	13.287**	12.598**
	(5.58)	(5.05)	(7.98)	(2.45)	(2.37)	(4.01)
R-squared	0.930	0.938	0.941	0.939	0.943	0.945
County-specific linear trends	no	reduced	full	no	reduced	Full
% Δ relative to a pre-1998 av.	-6.1	-3.7	-5.2	-4.3	-4.6	-8.1
	Pregnancy rates					
EC pharmacy is 20	-7.487*	-5.983*	-6.508	-5.072**	-6.384**	-4.922$^+$
miles away or less	(2.99)	(2.38)	(4.06)	(1.45)	(1.17)	(2.46)
Distance to closest	-0.112**	-0.052	-0.035	-0.067**	-0.046*	-0.023
abortion provider	(0.04)	(0.03)	(0.05)	(0.02)	(0.02)	(0.03)
Constant	128.305**	102.537**	81.262**	78.131**	62.990**	58.181**
	(19.80)	(13.39)	(20.10)	(10.57)	(6.11)	(12.57)
R-squared	0.899	0.925	0.928	0.857	0.889	0.893
County-specific linear trends	no	reduced	full	no	reduced	full
% Δ relative to a pre-1998 av.	-7.2	-5.8	-6.3	-7.3	-9.2	-7.1

Note: ** significant at 1%; * at 5%; $^+$ at 10%. Standard errors are clustered at county level are in parentheses; number of observations is 660. Observations are weighted by county's female population in the appropriate age group. All regressions include county level unemployment rate, real personal income, and divorce rate; year and county fixed effects.

Appendix A: Fertility rates by age group and state
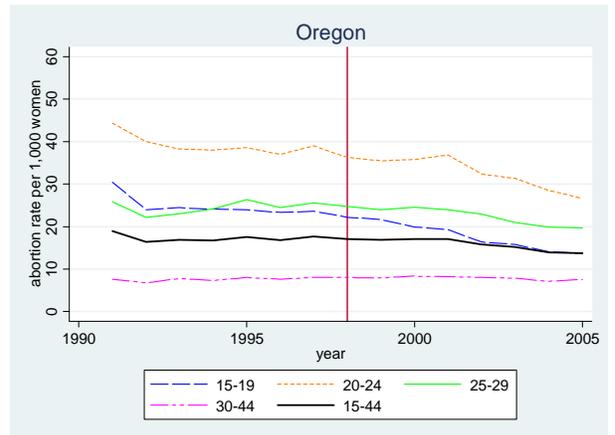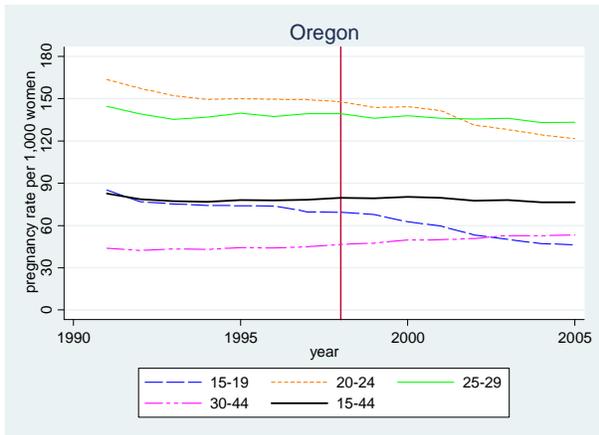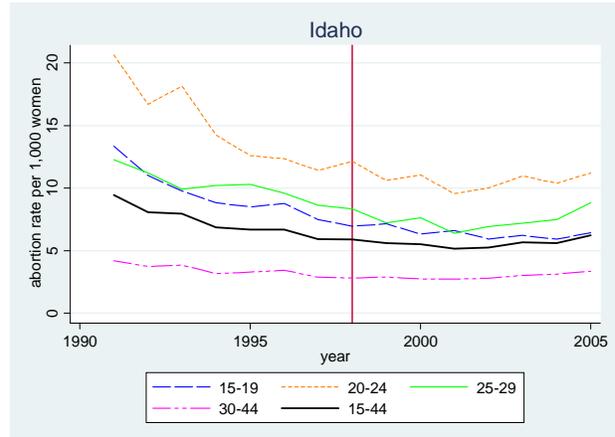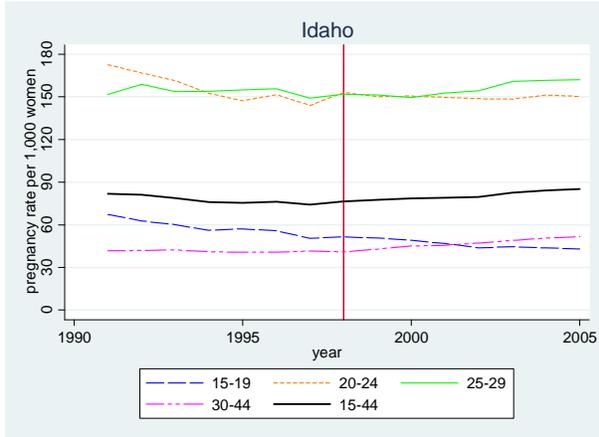
Appendix B: Trends in fertility rates for an alternative definition of treatment group

Abortion rate
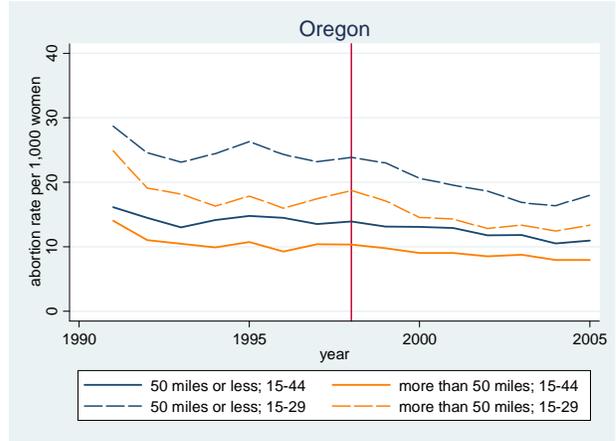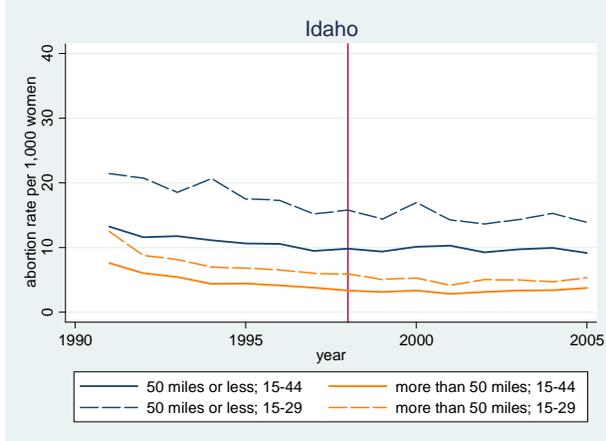
Pregnancy rate

Appendix C: The effect of EC pharmacy access in the event-study specification, treatment "travel distance 20 miles or less"

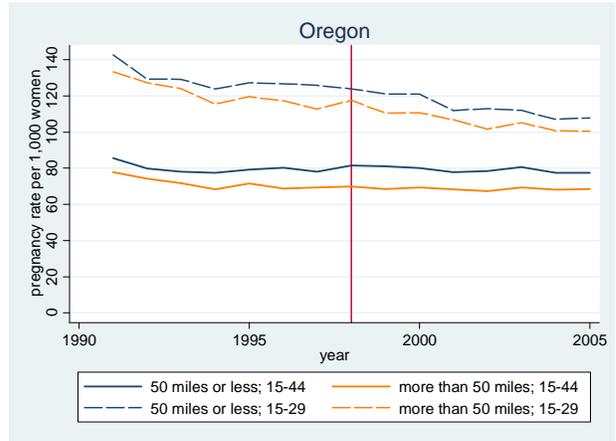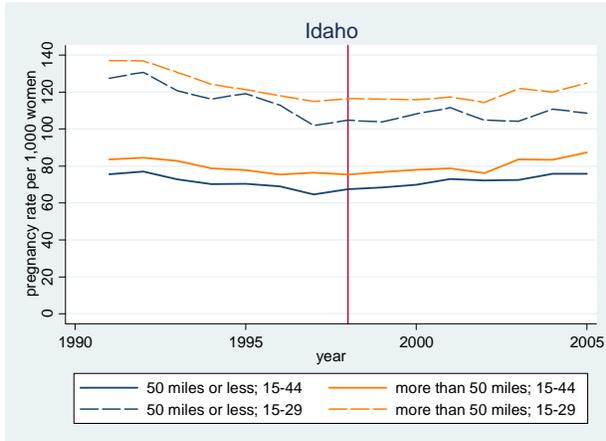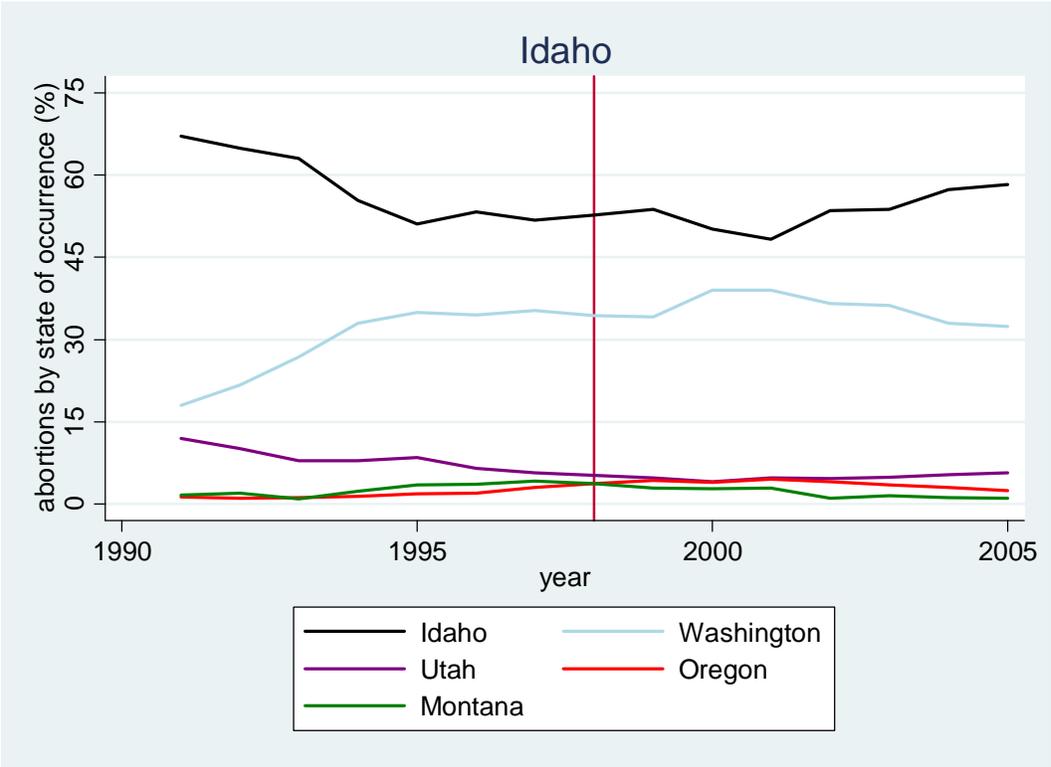|	Abortion rates				Pregnancy rates			
	Idaho		Oregon		Idaho		Oregon	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	15-29	**15-44**	**15-29**	**15-44**	**15-29**	**15-44**	**15-29**	**15-44**
≤ 20 x 1998	-1.635**	-1.023**	-0.205	0.205	-0.809	-0.286	-0.847	0.171
	(0.34)	(0.15)	(1.46)	(0.67)	(1.65)	(1.03)	(2.32)	(1.12)
≤ 20 x 1999	-0.619	-0.332+	1.112	1.303*	-2.017	-2.342*	0.432	1.635
	(0.45)	(0.18)	(1.22)	(0.64)	(1.67)	(1.05)	(1.87)	(1.26)
≤ 20 x 2000	-2.002**	-1.158**	3.930**	3.040**	-8.063+	-5.328*	5.624*	5.618**
	(0.58)	(0.34)	(1.24)	(0.73)	(4.43)	(2.52)	(2.16)	(1.09)
≤ 20 x 2001	-0.403	-0.563	2.840+	2.771**	-4.337+	-2.755+	3.131+	3.785**
	(0.85)	(0.76)	(1.55)	(0.49)	(2.25)	(1.38)	(1.76)	(1.11)
≤ 20 x 2002	-1.947	-1.389	2.962+	3.014**	-2.131	-1.280	3.938*	5.129**
	(1.39)	(0.97)	(1.70)	(0.50)	(1.56)	(2.40)	(1.85)	(1.52)
≤ 20 x 2003	-0.360	-0.076	0.144	1.368*	-8.525**	-6.924**	-2.606	1.667
	(1.61)	(1.06)	(2.23)	(0.63)	(1.68)	(1.64)	(1.69)	(1.42)
≤ 20 x 2004	-1.767*	-1.463*	-0.163	0.746	-9.088*	-5.959*	-0.184	1.767
	(0.78)	(0.62)	(3.25)	(0.96)	(4.03)	(2.26)	(2.74)	(1.83)
≤ 20 x 2005	-2.677*	-1.130*	0.944	1.955	-17.709**	-10.486**	-0.045	1.547
	(1.04)	(0.49)	(3.81)	(1.24)	(2.37)	(1.78)	(4.49)	(3.23)
Constant	21.367**	9.896**	21.131**	12.337**	95.806**	59.235**	118.649**	71.120**
	(4.62)	(2.30)	(3.97)	(2.75)	(12.06)	(6.05)	(8.08)	(4.63)
R-squared	0.938	0.942	0.969	0.971	0.927	0.892	0.966	0.954
Number of obs.	660	660	502	540	660	660	502	540

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$), divorce rate per 1,000 people, county and year fixed effects as well as a reduced set of county-specific linear trends. Specifications without trends and with a full set of trends are available on request.

Appendix D: Abortions to Idaho residents by state of occurrence

Appendix E: Robustness test for the event-study specification, **Idaho** (treatment "travel distance 20 miles or less")

	Abortion rate						Pregnancy rate					
	15-29			15-44			15-29			15-44		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
≤ 20 x 1998	-0.582	-0.155	-0.172	-0.225	-0.152	-0.284	4.637*	2.386	2.106	2.845*	2.029	1.314
	(0.81)	(0.63)	(0.61)	(0.39)	(0.38)	(0.40)	(2.11)	(2.12)	(2.18)	(1.31)	(1.46)	(1.38)
≤ 20 x 1999	0.443	0.881	0.678	0.485	0.548$^+$	0.281	3.565	1.241	0.315	0.733	-0.277	-1.086
	(0.70)	(0.57)	(0.56)	(0.31)	(0.30)	(0.30)	(2.18)	(2.36)	(2.73)	(1.40)	(1.38)	(1.30)
≤ 20 x 2000	-1.244	-0.601	-0.986	-0.453	-0.397	-0.762$^+$	-5.644	-5.196	-6.117	-3.802$^+$	-3.742	-4.176
	(0.92)	(0.78)	(0.66)	(0.44)	(0.44)	(0.42)	(5.19)	(5.18)	(5.81)	(2.10)	(2.79)	(2.85)
≤ 20 x 2001	0.430	1.041	0.504	0.188	0.260	-0.244	-1.078	-1.286	-3.163$^+$	-0.941	-1.325	-1.954
	(1.03)	(0.88)	(0.88)	(0.72)	(0.72)	(0.51)	(2.43)	(2.09)	(1.75)	(2.14)	(1.35)	(1.47)
≤ 20 x 2002	-1.110	-0.479	-1.153	-0.610	-0.553	-1.154	1.440	1.050	-1.470	0.582	-0.036	-0.745
	(1.61)	(1.52)	(1.44)	(1.14)	(1.19)	(1.44)	(3.47)	(2.50)	(3.02)	(1.80)	(2.74)	(2.58)
≤ 20 x 2003	0.402	1.078	0.213	0.684	0.710	-0.015	-5.651$^+$	-5.445**	-8.358**	-5.537**	-6.034**	-6.726**
	(1.72)	(1.71)	(1.63)	(1.21)	(1.24)	(1.60)	(3.16)	(1.99)	(2.43)	(1.36)	(1.87)	(1.81)
≤ 20 x 2004	-1.434	-1.014	-1.806	-1.088	-1.204	-1.866*	-7.723*	-7.416*	-8.782*	-5.278*	-5.610*	-6.314*
	(0.97)	(1.15)	(1.12)	(0.73)	(0.79)	(0.72)	(3.53)	(3.33)	(4.08)	(2.57)	(2.10)	(2.36)
≤ 20 x 2005	-2.330*	-1.926*	-2.839**	-0.739*	-0.854**	-1.637**	-16.210**	-16.007**	-17.818**	-9.686**	-10.206**	-11.078**
	(0.92)	(0.78)	(0.90)	(0.35)	(0.32)	(0.48)	(3.26)	(3.19)	(2.75)	(1.67)	(1.79)	(1.92)
Distance to	-0.025$^+$	-0.031**	-0.040**	-0.017**	-0.020**	-0.024**	-0.137**	-0.068*	-0.083*	-0.080**	-0.062*	-0.048$^+$
abort. provider	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Constant	25.46**	23.36**	24.48**	11.65**	13.94**	12.89**	131.34**	103.01**	82.35**	79.91**	65.31**	59.13**
	(5.76)	(5.12)	(8.03)	(2.59)	(2.52)	(4.09)	(19.14)	(13.04)	(19.77)	(10.58)	(6.73)	(12.48)
R-squared	0.931	0.940	0.942	0.940	0.944	0.947	0.902	0.927	0.931	0.861	0.893	0.897
Linear trends	no	reduced	full	no	reduced	full	no	reduced	full	no	reduced	full
Pre-1998 av.	20.0			12.6			103.8			69.5		

Note: ** significant at 1%; * at 5%; $^+$ at 10%. Standard errors clustered on county are in parentheses; number of observations is 660. Observations are weighted by county's female population in the appropriate age group. All specifications include a set of county-level socio-economic characteristics, county and year fixed effects. The pre-1998 average is reported per 1,000 women.

Appendix F: The effect of EC pharmacy access for an alternative definition of the treatment group (50 miles or less)

	Idaho				Oregon			
	Abortion rates		Pregnancy rates		Abortion rates		Pregnancy rates	
	15-29	15-44	15-29	15-44	15-29	15-44	15-29	15-44
EC pharmacy is within	0.313	0.546	4.818	3.187	-0.083	0.224	-0.477	1.057
50 miles	(0.59)	(0.35)	(3.05)	(2.01)	(1.61)	(0.88)	(2.64)	(1.56)
Constant	23.429**	12.097**	81.283**	57.991**	5.689	2.691	98.825	53.044**
	(7.59)	(3.76)	(20.05)	(12.60)	(8.05)	(4.74)	(12.09)	(6.46)
R-squared	0.939	0.943	0.928	0.891	0.967	0.969	0.965	0.951
Number of observations	660	660	660	660	502	540	502	540

Note: ** significant at 1%; * at 5%; + at 10%. Standard errors clustered on county are in parentheses. Observations are weighted by county's female population in a given age group. All specifications include a set of county level variables (unemployment rate, divorce rate and per capita personal income), county and year fixed effects as well as a full set of county-specific linear trends. Results are not reported for the treatment "25 miles or less" as they are very similar to "20 miles or less" (available on request).