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Abortion Before & After *Roe*

Ted Joyce, **Ruoding Tan**, and **Yuxiu Zhang**

Abstract

We use unique data on abortions performed in New York State from 1971–1975 to demonstrate that women travelled hundreds of miles for a legal abortion before *Roe*. A100- mile increase in distance for women who live approximately 183 miles from New York was associated with a decline in abortion rates of 12.2 percent whereas the same change for women who lived 830 miles from New York lowered abortion rates by 3.3 percent. The abortion rates of nonwhites were more sensitive to distance than those of whites. We found a positive and robust association between distance to the nearest abortion provider and teen birth rates but less consistent estimates for other ages. Our results suggest that even if some states lost all abortion providers due to legislative policies, the impact on population measures of birth and abortion rates would be small as most women would travel to states with abortion services.

Keywords

abortion; *Roe v. Wade*; births

I. Introduction

Abortion on demand was legal in a few states in 1970. Not until the 1973 Supreme Court decision in *Roe v. Wade* was legalized abortion available nationally. In the years since, economists have estimated the association between abortion rates and the availability of abortion services. In each analysis abortion rates are regressed on the number or presence of the abortion providers in a county or state (Matthews, Ribar, Wilhelm 1997; Blank, George and London 1996; Haas-Wilson 1996). The maintained assumption is that the availability of abortion services is exogenous to use. In the one exception, researchers instrumented the natural log of abortion providers with the log of hospitals and non-OBGYNs in a state (Blank, George and London 1996). However, the exclusion restrictions were questionable by current standards and use of log physicians and hospitals instead of per capita measures was vulnerable to spurious scale effects.

The best evidence as to the effect of dramatically increasing the supply of abortion services comes from changes in birth rates before and after legalization in the early 1970s (Levine et al. 1999; Levine 2004; Angrist and Evans 1999). Results from these influential studies have proven to be robust and the difference-in-difference research design has been the basis for

Corresponding Author Ted Joyce, NBER-NY&Baruch College, CUNY, 365 Fifth Ave, 5th Floor, NY, NY 10016, 212-817-7960, Theodore.joyce@baruch.cuny.edu, Ruoding Tan, Department of Economics, Graduate Center, CUNY, 365 Fifth Ave, 5th Fl, NY, NY 10016, rtan@gc.cuny.com, Yuxiu Zhang, Health Policy and Admin, Yale School of Public Health, 60 College St, New Haven, CT 06510, yuxiu909@gmail.com.

much subsequent work. And yet, without data on abortions in the pre-*Roe* era, it has not been possible to know the impact of early legalization on abortion rates, the relationship between abortion and birth rates, or even the total effect of legalization on fertility. The latter holds because the effect of legalized abortion on birth rates in the pre-*Roe* years extended to states in which abortion remained illegal. Literally tens of thousands of women from these states traveled to New York for an abortion in the years before *Roe*. This movement is dramatically illustrated by the map in Figure 1. The number in each state is the abortion rate for residents of the state that were *performed in New York* in 1971–1972, two years before the Supreme Court decision in *Roe*. For instance, there were 7.6 abortions to residents of Michigan performed in New York per 1000 women 15–44 residing in Michigan. In absolute numbers, 29,227 women traveled from Michigan to New York for an abortion in 1971–72.[1]

In this study we return to the period just before and after *Roe* to analyze changes in the availability of abortion services on use. The legalization of abortion in New York in July of 1970 provides a plausibly exogenous change in the availability of abortion services to non-residents of the State moderated in part by distance. A second supply shock occurred with *Roe* in January of 1973 as abortion providers became available in every state obviating most travel to New York. We exploit both these changes to identify the effect of access to abortion in New York on use. The analysis is made possible by re-discovered data on abortions performed in New York State by age, race, year and state of residence in the years before *Roe*. Although the analysis is limited geographically, the data are matchless and provide new insights as to the impact of legalized abortion on the abortion and birth rates of women from states where abortion remained illegal. Because similar abortion data are not available nationally, we take a less direct but broader approach to the question of abortion availability and use by examining the association between age- and race-specific birth rates with distance to nearest legal abortion provider in any state from 1968 to 1975. We use the results to provide a more detailed assessment than has been previously possible of the effect of legalized abortion on abortion and birth rates in the U.S. in the years just before and after *Roe*.

We find a robust association between distance to New York and resident abortion rates in the years before *Roe*. Abortion rates as measured by abortions performed in New York among residents of northern and Midwest states fell 12.2 percent in 1971–72 for every hundred miles a woman lived from the state. The decline was greater for nonwhites than for whites. Travel to New York for an abortion fell dramatically in years immediately after *Roe* as abortion services became available locally. The story that emerges from the national birth data is less robust. Distance to the nearest legal abortion provider was associated with an increase in teen birth rates in the years before *Roe*, but changes in distance evaluated at the mean had only modest effects on birth rates in the years right after *Roe*. We conclude that recent efforts by states to limit the supply of abortion providers will have only minor effects on population measures of birth and abortion rates, but will have a greater impact on young women and those without resources to adjust.

II. Background

II.1 Impact of Legalized Abortion

Early studies on the impact of legalized abortion were largely descriptive, limited to one or a few states, or they did not account for ongoing trends in fertility (Melton et al. 1972; Smith et al. 1973; Paktar et al. 1973; Sklar and Berkov 1974; Quick 1978; Joyce and Mocan 1990).

[1]Authors' tabulations of data from the New York State Department of Health. See Table 1.

Levine et al. (1999) and Angrist and Evans (1999) were the first to provide a more comprehensive analysis of legalized abortion on fertility rates across all 50 states and over a longer period. Both studies used a difference-in-difference (DD) framework by comparing variation in fertility rates in the states that legalized abortion or reformed their abortion laws in the years before *Roe* relative to states in which abortion remained illegal. Levine et al. (1999) analyzed changes among all women and then separately by age whereas Angrist and Evans (1999) focused on changes in teen fertility. Both studies found that birth rates declined by approximately 4 percent more in the early legalizing or reform states relative to the states in which abortion did not become legal until *Roe*. Both studies also found that birth rates of nonwhites fell more than those of whites. Neither study analyzed changes in abortion rates directly due to a lack of data. However, Levine et al. (1999) reported that birth rates fell less among women who lived more than 750 miles relative to women who lived within 750 miles of an early legalizing state. The association suggested that large differences in travel distance were inversely related to abortion rates.

The difference-in-difference estimator employed by Levine et al. (1999) and Angrist and Evans (1999) provides unbiased estimates of the *relative* changes in birth rates in states that legalized or reformed abortion laws relative to states in which abortion remained illegal. But the DD cannot estimate the absolute decline in birth rates in the non-legalizing states induced by legislation in New York or California. The limitation of the DD in this context is illustrated in Figure 2. Birth rates for women 15 to 44 years of age are plotted from 1968 to 1975, a period roughly two years before and after the legalization of abortion in the U.S. Birth rates are stratified by states based on the legal status of abortion prior to *Roe* of proximity to New York All four series move in tandem. Birth rates are relatively flat from 1968 to 1970 and then decline rapidly to 1973 at which point the rate of decline flattens or moderates. Estimates from previous studies that used a DD design treated all non-repeal states as the control group for the five repeal states (Alaska, California, Hawaii, New York and Washington) from 1971 to 1973 (see Gruber Levine and Staiger 1999). But as shown in Figure 2, the coincident decline in birth rates among women in the non-repeal states prior to *Roe* raises questions as to the credibility of the comparison group. In other words, the legalization of abortion in the years before *Roe* may have had a larger impact on fertility in the repeal states as well as the non-repeal states than has been previously estimated. Data on abortions to non-residents of New York performed in the State not only support this conjecture, but they provide an alternative means of estimating the broader impact of legalized abortion on fertility in the U.S. in the years before *Roe*.

In fact, access to abortion services in the years before *Roe* was more extensive and at the same time more variable than is captured by a zero-one indicator of legality or reform. For example, none of the aforementioned studies considered the District of Columbia (DC) as an early legalizing or reform state. And yet, in 1972 there were 38,868 reported legal abortions in the District, the most of any state after New York and California. Moreover, there were more abortions to non-residents performed in DC (21,101) than there were to non-residents performed in California (20,201). In addition, 11 states reformed their abortion laws between 1967 and 1970 based on guidelines articulated by the American Law Institute (ALI).[2] According to the ALI, abortions should be allowed if continuance of a pregnancy represented a serious risk to the health of the mother; could result in severe deformities of the child; or was the result of rape or incest. Decisions as to which pregnancies met these conditions were generally decided by a hospital committee of physicians. The interpretation of these guidelines varied widely between committees (Joffe 1995; Garrow 1998). For example, Maryland and Georgia both reformed their abortion statutes and yet the abortion

[2]The 11 states are AR, CO, DL, GA, KS, MD, NM, NC, OR, SC, VA.

ratio in Maryland in 1972 (178 abortions per 1000 live births) was over five times greater than in Georgia (29 abortions per 1000 live births). The abortion ratio in Kansas, another reform state, was double that of Maryland (369 vs. 178), but 63 percent of abortions in Kansas were to non-residents, whereas only 2 percent of abortions in Maryland were to non-residents (Center for Disease Control 1974). In sum, the patchwork of legal abortion services in the years before *Roe* and travel to California and especially New York by non-residents has made it difficult to isolate the effect of legalization on reproductive outcomes.

II.2 Abortion availability and use

As noted above, the standard analysis of abortion availability and use has included regressions of abortion rates on the number of abortion providers per capita, the logarithm of abortion providers, or the percent of women in counties with an abortion provider (Matthews, Ribar, Whilhelm 1995; Blank, George and London 1996; Haas-Wilson 1996). In each case the coefficient on abortion availability from OLS regressions was positive and highly significant ($p<.001$). But interpretation of these estimates is hampered by the simultaneous determination of supply and demand. It is unclear, for example, whether abortion rates would fall if the number of abortion providers in New York suddenly declined by, say, 25 percent.[3] One recent study used quasi-experimental evidence to analyze changes in abortion rates given a sudden change in availability. In 2004, Texas required that all abortions after 15 weeks be performed in a hospital or ambulatory surgical center. At the time, not one of the 54 free-standing clinics met the standard. Abortions after 15 weeks fell by 64 percent to residents of the State in the first year of the law despite a threefold increase in Texas residents obtaining late abortions in nearby states (Colman and Joyce 2011). However, less than five percent of abortions to resident of Texas were performed at 16 weeks or more gestation. And although increased distance to the nearest late-term abortion provider appears to have been a deterrent, the generalizability of the findings to the much broader population of pregnant women is unclear.

In this study we use the two supply shocks following early legalization of abortion in New York and then national legalization with *Roe* to identify the effect of distance to a legal abortion provider on abortion rates. A strength of the design is that these shocks mitigate issues of policy endogeneity. Many state legislatures, for example, had no intention of legalizing abortion on demand in 1970. And yet, New York's sudden passage meant that women in non-legalizing states had unanticipated access to legal abortion services. With the U.S. Supreme Court decision in *Roe*, travel to New York for an abortion diminished rapidly, as we show below, and it fell more precipitously the further a woman resided from New York. However, after 1972 we can only test whether non-resident abortions were less likely to be performed in New York and not whether the local availability of abortion services caused resident abortion rates to rise. There exist no national data on abortions by age, race and state of residents in the years before or even after *Roe*. Thus, we associate age- and race-specific births rates from 1968 to 1975 with distance to nearest legal abortion provider so as to compare findings from New York, albeit indirectly, with those based on national natality data.

III. Empirical Implementation

III.1 Data

Abortions in New York—Data on abortions performed in New York come from the New York State Department of Health. Analysts form the State provided aggregate data on abortions performed in New York from 1971 to 1975 by state of residence, age (<20, 20–24,

[3]Jacobson and Royer (2011) show that abortions are largely unchanged when an abortion provider is closed due to arson or violence.

25+), race (white, nonwhite) and year. However, the age categories differed slightly stratified by race (<20, 20–29, 30+). To appreciate the exceptionality of these data, it is important to realize that there exists no population-based data on induced abortions by age, race and state of residence in the US today. The Centers for Disease Control and Prevention (CDC) annual surveillance summaries report abortion by state of *occurrence* cross-tabulated by age or race but not by state, age and race. The Guttmacher Institute's survey of abortion providers collects data on the total number of abortions by state of occurrence in selected years. The Guttmacher Institute *estimates* the distribution of abortions by state of residence and age based on data from the CDC. Some states make available individual-level records on induced abortions that can be aggregated into detailed cells (Joyce, Kaestner and Colman 2006). However, there is no reciprocal reporting agreement for induced abortions among states as there are with births. As a result, abortions to residents of one state that occur in another are rarely reported back to the state of residence. In sum, the New York State abortion data are matchless not only because they pre-date *Roe*, but because they are even more detailed than abortion data currently collected.

The Importance of New York—The focus on New York is driven only partly by the availability of data. New York was the overwhelming destination for women wishing to terminate a pregnancy in the pre-*Roe* years. In 1971, for example, abortion on demand was effectively available in Alaska, California, the District of Columbia, Hawaii, New York and Washington. [4] Eighty-seven percent of the 480,259 reported legal abortions in the U.S. were performed in these 6 jurisdictions, but 84 percent of all known abortions obtained outside a woman's state of residence were performed in New York. Table 1 lists the number of abortions by state of residence as reported by the Centers for Disease Control in 1971 and 1972. The second column under each year shows the number and the third column the proportion of abortions to residents of the state obtained in New York. With relatively few exceptions, if the state had not legalized or reformed its abortion laws, then the vast majority of abortions to residents of the state were performed in New York. The exceptions have plausible explanations. For instance, Iowa, Missouri, Nebraska and Oklahoma all border Kansas, a reform state in which 63 percent of abortions were to non-residents. There are also changes between 1971 and 1972. Texas, for instance, reported 2,558 abortions in 1971, 92 percent of which were obtained in New York. In the next year, there were 16,022 reported abortions to residents of Texas but only 7 percent were obtained in New York.[5]

Distance—To proxy the availability of abortion services in New York we compute the straight line distance in miles from the population centroid in each county to the nearer of Buffalo, New York or New York City. We then average the county distances within each state weighted by the population of women 15 to 44 years of age in the county to arrive at the average distance to the nearest abortion provider in the state. For residents of New York, we compute the average distance from the population centroid of the county of residence to nearest county with an abortion provider based on the distribution of abortion providers in 1973 within the state. That was the first year the Guttmacher Institute collected data on the number of abortion providers by county. We average the county-level distances weighted by

[4]The California Supreme Court case in *People v. Belous* (September, 1969) resulted in *de facto* legalization in California. This decision was followed by repeals in Hawaii (effective March 1970), New York (July, 1970), Alaska (July, 1970) and Washington State (December 1970). Abortions became available at outpatient clinics in Washington DC in 1971 following the decision in *US v. Vuitch* (April 1971). For details, see Garrow (1998) and Lader (1973).

[5]Another anomaly occurs when the CDC reports fewer abortions to residents of a state than does New York. We cannot explain this discrepancy since the CDC surveillance is ostensibly collecting data from all reporting states on abortions performed in a state and assigning women to their state of residence (CDC 1972, 1974). For instance, there were no reported legal abortions to residents of Michigan obtained in Michigan in 1972. The CDC reports 14,626 abortions to residents of Michigan obtained in other states in 1972. However, the New York State Department of Health alone reports 15,522 abortions to residents of Michigan obtained in the state.

the county-level population of women 15 to 44 years of age to arrive at the average distance to the nearest abortion provider within New York.

The average distance in hundreds of miles from each state to the nearest of either Buffalo, New York or New York City is displayed in Figure 3. We have organized states into three groupings. We assume that women from the 13 darkest-colored states were the most likely to obtain legal abortions in New York prior to *Roe*. This is based on proximity and the proportion of all known resident abortions obtained in New York (see Table 1). The mean distance to New York was 233 miles among the 12 states excluding New York ranging from a low 35 miles in New Jersey to a high of 506 miles in Illinois. The lightest colored states are those that either repealed or reformed their abortion laws prior to *Roe* (Arkansas, California, Colorado, Delaware, District of Columbia, Georgia, Kansas, Maryland, New Mexico, North Carolina, Oregon, South Carolina, Virginia and Washington). For women in the remaining states, New York was the most likely destination for an abortion but not the only source of legal services (see for example Iowa and Minnesota in Table 1).

We also compute distance to the nearest legal abortion provider in any state from 1970 to 1975. From 1970 to 1972 we compute distance from a woman's county of residence for those in the continental US to the nearest of either Los Angeles or San Francisco in California, and Buffalo or New York City in New York. We assumed residents of Maryland, Virginia and Delaware accessed services in Washington DC.[6] From 1973 to 1975 we used the Guttmacher Institute's abortion provider survey which details the counties in each state and year that had an abortion provider. We then measure distance from the population centroid of each county to the county of the nearest abortion provider regardless of whether the provider was in the state of residence or in a neighboring state. We assume distance is zero if the county had an abortion provider.[7] To obtain a summary measure at the state level, we average the distance for each county in the state weighted by the population of women 15 to 44 years of age in the county.

Birth and other data—Data on births are from the National Center for Health Statistics national natality files.[8] We generate age- and race-specific birth rates by dividing the number of births by the number of women in the relevant state, year, age and racial group. We compute annual births rates based on the number of births from July of year "t" to June of year "t+1" in order to align them by year of conception with abortion rates that are measured by calendar year.[9] Thus, the birth rate for 1970 is births from July 1970 to June 1971 divided by the population in 1970. Population is from the Surveillance Epidemiological and End Results (SEER) from the National Cancer Institute as measured on July 1 of each year. We also include state controls for the per capita income, the percent of nonwhite females 15 to 44 years of age and the unemployment rate as well as indicators of whether states allowed women less than 21 to obtain the contraceptive pill without parental consent.[10]

[6]Washington State had a 90-day residency requirement rendering services essentially inaccessible to non-residents. Alaska and Hawaii were relevant primarily for their own residents. The District of Columbia mainly served residents from the surrounding states (see Lader 1973, p. 115).

[7]Delaware and the District of Columbia had providers in every county and thus zero distance. We substituted the minimum distance (0.62 miles) from the sample so as not to lose these observations when using logarithms.

[8]These data were obtained from the website of the National Bureau of Economic Research. http://www.nber.org/data/vital-statistics-natality-data.html

[9]Ninety percent of all abortions with known gestation in 1971 were performed within the first four months of pregnancy (CDC 1972), approximately six months earlier than birth from the same conception cohort.

[10]We thank Phil Levine for the state-level covariates and Melanie Guldi for sharing her coding on access to the pill (see Guldi 2008).

III.2 Statistical models

New York 1971–1975—We regress abortion rates by state of residence in the 48 continental states and the District of Columbia on distance to New York from 1971–1975. We include only abortions performed in New York. As shown in Figure 1, the further women resided from New York, the lower the abortion rate. Exceptions include states in which abortion was legal on demand or states in which reforms of abortion statutes permitted hospital committees to approve induced terminations under selected circumstances (see Table 1). After *Roe* in 1973, travel to New York for an abortion fell off rapidly. Figures 4 and 5 show resident abortion rates for abortions obtained in New York in 1973 and 1975, respectively. However, even in 1973, proximity to New York mattered. The closer a woman lived to New York, the more likely she was to obtain abortion services in the State. For instance, the rate of abortions obtained in New York for residents of Connecticut fell from 9.8 in 1972 to 6.0 in 1973, a decline of 39 percent. In Michigan, by contrast, the rate fell from 8.0 to 1.4, an 83 percent decline (Figure 4). At the same time, the total resident abortion rate in Michigan rose to 18.3 in 1973 (Forrest, Sullivan and Tietze 1979). By 1975, virtually no one that resided in a state that did not border New York obtained an abortion in the state (Figure 4). To capture these changes in access on abortion rates, we estimate the following regression.

$$\begin{aligned}\text{Abrate}_{jt} = {} & \alpha_1 D_j * 7172 + \alpha_2 D_j * \text{Ref} \\ & * 7172 + \alpha_3 D_j * \text{Rep} * 7172 + \alpha_4 D_j * 7374 + \alpha_5 D_j * \text{Ref} \\ & * 7374 + \alpha_6 D_j * \text{Rep} * 7374 + \mathbf{X}_{jt}\boldsymbol{\beta} + \lambda_j + \tau_t + e_{jt}\end{aligned} \quad (1)$$

Let $Abrate_{jt}$ be the abortion rate for a specific age or racial group in state *j* and year *t* that were performed in New York; let D_j be distance to an abortion provider in New York; let *7172* be one if the year is 1971 or 1972 and zero otherwise*; 7374* is the equivalent dummy for 1973 and 1974; the omitted year is 1975. We use the natural log of distance.[11] *Ref is* 1 if the state had reformed its abortion laws and *Rep* is one if the state had repealed its abortion laws. We include three controls for state characteristics (**X**): the insured unemployment rate, per capita income, the percent of the female population that was nonwhite. The **X** matrix also includes the full set of first-order interactions. [12] We also include a dichotomous indicator of whether state policies allowed women less than 21 years of age to obtain the contraception pill without parental consent (Guldi 2008). The last two terms capture the main state (λj) and year (τ_t) fixed effects.

Distance to New York does not vary over time and can only be included as an interaction term in models with state fixed effects. Thus, the coefficient, α_1 captures the difference in abortion rates by distance among non-residents of New York in non-repeal and non-reform states in 1971–72 relative to 1975. We expect α_1 to be negative. The association between distance and abortion rates in reform states in 1971–72 relative to 1975 ($\alpha_1 + \alpha_2$) should also be negative but the sum should be less than α_1 in absolute value since there was some access to legal services in reform states which may attenuate the effect of distance to New York. The association between distance and abortion rates in repeal states in 1971–72 relative to the 1975 ($\alpha_1 + \alpha_3$) is ambiguous and may be statistically insignificant since women in repeal states would have had no need to travel to New York. The coefficient, a_4, captures the association between distance to New York and abortions to non-residents in non-repeal and non-reform states performed in New York after national legalization relative to 1975. There would be no association if non-residents of New York obtained all abortions

[11]We use 1975 as the reference year since by then travel to New York for an abortion would have reached its post-*Roe* steady state, given the growth in local abortion providers.

[12]These include Ref*7172, Rep*7172, NY*7172, Ref*7374, Rep*7374, NY*7172, and NY*7374.

in their own state or a state other than New York. However, this depends on the speed with which abortion providers outside of New York were able to offer services after *Roe*. As noted previously women who resided in states that border New York continued to travel to New York after *Roe* while the market for abortion services developed locally (see Figure 4). However, by 1975 travel to New York for an abortion was rare except for women in Connecticut and New Jersey (Figure 5). The sum of coefficients, $\alpha_4 + \alpha_5$ and $\alpha_4 + \alpha_6$ show the association between distance and abortion rates performed in New York in 1973–74 relative to 1975 among residents of reform and repeal states, respectively.[13]

National Birth Rates 1968–1975—We cannot use distance to New York to explain birth rates nationally since women could obtain legal abortions not only in other repeal states but to a lesser extent in reform states prior to *Roe* and in their own state after *Roe*. Thus, increasing distance from New York should result in fewer abortions *performed in New York*, but it could also result in fewer births as women sought abortions closer to their state of residence. Thus, to estimate the effect of abortion availability on birth rates, we regress age- and race-specific birth rates on distance to the nearest legal abortion provider in any state from 1968 to 1975 as follows:

$$\begin{aligned}\mathrm{Brate}_{jt} = {} & \alpha_1 D_j * 7172 + \alpha_2 D_j * \mathrm{Ref} \\ & * 7172 + \alpha_3 D_j * \mathrm{Rep} * 7172 + \alpha_4 D_{jt} * 7375 + \alpha_5 D_{jt} * \mathrm{Ref} \\ & * 7375 + \alpha_6 D_{jt} * \mathrm{Rep} * 7375 + \mathbf{X}_{jt}\boldsymbol{\beta} + \lambda_j + \tau_t + e_{jt}\end{aligned} \quad (2)$$

The specification is the same as in equation (1) but with two differences. First, birth rates are available electronically since 1968. The extra years yield more power. And second, distance to the nearest abortion provider varies by state and year from 1973 to 1975 *(D_{jt})*. By contrast, distance to New York in equation (1) is time-invariant and thus, we could not explicitly estimate the effect of distance to New York in 1975 as it was absorbed by the fixed effects. Despite these differences, the *pre-Roe* association between distance and abortion rates in equation (1) and between distance and birth rates in equation (2) yield two reduced-form coefficients that we can use to approximate the Wald estimate of the change in birth rates associated with an increase in the abortion rate. Such an approximation is best limited to the 13 states in the New York catchment area since abortions performed in New York more accurately measure the actual resident abortion rate than do abortions to residents of more distant states.[14]

As before, distance to the nearest provider (D_{jt}) is entered in logs and interacted with dummy variables for the years 1970 to 1972 and then 1973 to 1975. The omitted years are 1968 to 1969. We do not weight the regressions by inverse of the female population, but use robust standard error procedures clustered at the state level to correct the standard errors.

IV. Results

IV.1 Graphical analysis

Figures 6 shows the relationship between resident abortion rates in 1971–72 and distance to New York in hundreds of miles in the 48 states and the District of Columbia (left panel) and

[13]We view distance to New York as the correct price for the cost of obtaining abortions in New York. To the extent that New York was the nearest legal abortion provider in 1971 and 1972, then we capture the effect of distance on resident abortion rates. After 1972, New York is no longer the nearest legal abortion provider for almost all nonresidents, but it remains the correct price for abortions obtained in New York. Thus, the coefficient on distance in 1973–74 remains negative as we show below since the further a woman lived from New York the less likely she was to use providers in New York. However, the coefficient on distance after 1972 no longer captures the effect of distance on resident abortion rates.

[14]The 13 states that form the New York "catchment area" are CT, IL, IN, ME, MA, MI, NH, NJ, NY, OH, PA, RI, and VT.

for the 13-state subsample (right panel). The data include only abortions performed in New York. The fitted line in Figure 6 is from a simple regression of abortion rates on the natural logarithm of distance in hundreds of miles.[15]

As is apparent in Figure 6, New York appears as a distinct data point. We estimate the average distance to the nearest abortion provider to be less than a mile in New York in 1971–72, which is an order of magnitude smaller than New Jersey at 35 miles, the state with the next smallest distance to an abortion provider. Consequently, we include separate interaction terms between New York and year in the regressions below. As a sensitivity check we estimate models without New York and results are similar.

IV.2 Regression analysis

Regressions of Abortion Rate and Distance—Table 2 presents results from the estimation of equation (1). Each column is from a separate regression. The dependent variable is the age or race-specific resident abortion rate for abortions performed in New York from 1971 to 1975. The coefficient on *Ln Distance*1971–72* shows the change in abortion rates per unit change in the natural log of miles from the nearest abortion provider in New York and pertains to women who resided in a state other than New York but who did not live in a state that had repealed or reformed its abortion laws prior to *Roe* (see Figure 2). To demonstrate the marginal effect of distance in 100-mile increments, we compute the difference in abortion rates for women that resided 283 versus 183 miles from the nearest abortion provider in New York (Table 2, row2). The midpoint, 233 miles, is the average distance to New York in the 13-state sample excluding New York. The mean distance for the full sample is 828 miles. The overall abortion rate falls by 1.02 abortions per 1000 women 15–44 years of age when distance increases from 183 to 283 miles (column 1, row 2). This represents a decline of 12.2 percent (−1.02/8.37) evaluated at the mean abortion rate of the 12 states for which New York is the most likely site for legal abortions in the years before *Roe*. The change in abortions per 100 miles evaluated at the mean distance for the 49-state sample is −0.28 abortions per thousand women 15–44, a 6.6 percent decline at a mean abortion rate of 4.16.

Another result of note is that the gradient for nonwhites is over double that of whites. For example, the abortion rate among nonwhites fell by 2.1 abortions per 1000 women or 15.1 percent given a mean abortion rate of 13.9. The comparative change among whites was a decline of −0.95 abortions, an 11.6 percent decline evaluated at the mean (Table 2, row 2, columns 5 and 6). To the extent that race captures gross differences in socioeconomic status, then less advantaged women appear more sensitive to the costs associated with travel distance.

The association between abortion rates performed in New York and distance to the State falls substantially in 1973–74 as abortion services became available locally with national legalization (Table 2, row4). The map in Figure 4 suggests that distance still mattered somewhat in 1973 (relative to 1975 the omitted category) especially for women in states nearest New York. However, by 1975 abortion services in New York were largely irrelevant to non-residents (see Figure 5). We show the association between distance to New York and resident abortion rates performed in New York for women in reform and repeal states in rows (5 & 6) and (7 & 8), respectively. For reform states this is the sum of $\alpha_1 + \alpha_2$ from equation (1) in 1971–72 and ($\alpha_4 + \alpha_5$) in 1973–74. Estimates for the repeal states are ($\alpha_1 + \alpha_3$) and ($\alpha_4 + \alpha_6$), respectively. There is no meaningful association between distance to New

[15]The natural logarithm of distance provides a much better fit to the data than does distance entered linearly (see Joyce, Tan and Zhang 2012); it also allows for marginal effects to vary with distance. A quadratic in distance yielded similar estimates to the logarithmic specification, but was less parsimonious for it substantially increased the number of interaction terms.

York and abortions to residents of the repeals states California, the District of Columbia and Washington either pre- or post-Roe (Table 2, rows 7 & 8). The association between distance to New York and abortions obtained in New York is consistently negative for women who resided in reform states prior to *Roe* (Table 2, row 5) but statistically insignificant. Both sets of results indicate that the more available were abortion services locally, the less likely were women to obtain an abortion in New York.[16]

The estimates in Table 2 make several points: 1) the sudden availability of legal abortion services in New York in 1970 induced many women to travel to the State to terminate their pregnancies; 2) the further a woman lived from New York, the less likely she was to terminate her pregnancy in the State; and 3) the availability of local abortion services starting in 1973 dramatically reduced the likelihood that a woman travelled to New York for an abortion. What is not clear from Table 2 is whether the availability of legal abortion services in New York simply replaced abortions that would have been performed illegally or in some other location. Put differently, would pregnancies or some proportion of pregnancies that were terminated in New York have been carried to term had legal abortion services not been available in New York? We thus turn to the reduced-form regressions of birth rates on distance to the nearest legal abortion provider.

Regressions of Birth Rates on Distance—We have focused on data from New York because of the detailed abortion data and the importance of New York in the pre-*Roe* years. In this section we provide estimates of the association between distance to the nearest legal abortion provider in any state and age- and race-specific birth rates. To appreciate the discrete changes in the availability of abortion services, Figure 7 shows distance to nearest legal abortion provider by four-state groupings. As is apparent the decrease in distance between 1972 and 1973 is huge, from roughly 521 miles on average to 29 miles in the post-*Roe* period. Importantly, this sharp decrease in distance is not commensurate with a sharp drop in birth rates. As shown in Figure 2, the most significant declines in birth rates in all states occurred between 1970 and 1972. There is a clear leveling off in trend from 1973 to 1975.

Estimates of equation (2), the association between age- and race-specific birth rates and distance to nearest abortion provider, is shown in Table 3. The top panel includes all 49 states and the lower panel is limited to the 13 states we have characterized as the New York catchment area (Figure 3). The association between distance and birth rates is mostly positive but only for teens is the association statistically significant in non-repeal and non-reform states (column 2, rows 1 and 2), To compare the magnitudes of the changes associated with distance between the 1970–72 and 1973–75 we compute marginal effects evaluated at the mean distance in each period. Thus, teen birth rates would be expected to decline by 7.5 births per 1000 teens in 1970–1972. This represents a decline of 12 percent relative to the mean teen birth rate of 62.3.[17] The change from 1973–75 is much smaller when evaluated at the mean distance to an abortion provider in that period. Thus we would expect the teen birth rates to fall by 0.36 births per 1000 given a mean distance of 23 miles. The decline in birth rates is consistently positive in the repeal states in 1970–72 but there is no association in the post-*Roe* period.

[16]We also estimated equation (1) by further stratifying the non-repeal, non-reform states between those whose nearest abortion provider was New York versus those whose nearest provider was California. In all models the coefficient on distance to California was never different from coefficient on distance to New York. Results are available upon request.

[17]Distance, in hundreds of miles, is specified in logs. Thus $\delta y/\delta \ln d = (\delta y/\delta d)*d$. We use the mean of distance in each period to evaluate these marginal effects. Thus, the estimated change in teen birth rates is 7.5 per 1000 women 15–19 in 1970–72 given a mean distance of 5.21 in hundreds of miles [1.44*5.21]. The expected change in 1973–75 is 0.36 [1.61*0.23].

The results for the 13 states in the New York catchment area are more robust. Except for non-whites, the birth rates of each group are positively related to distance to New York in the years before *Roe*. There is no association with distance in the years after *Roe*. If we evaluate the association at the mean of distance then, the abortion rates of all women would be expected to fall by 1.6 and those of teens to fall by 1.3 per 1000 women. These are relative declines of 2.2 and 2.7 percent, respectively.

An advantage of the results from the New York catchment area is that we can use the ratio of the reduced-form estimates of distance from the birth and abortion rate regressions to provide a rough estimate of the direct association between birth and abortion rates instrumented by distance. For instance, we obtain a ratio of −0.30 if we divide the coefficient on distance in Table 3, Panel B (0.70) by its counterpart in Table 2 (−2.35). The ratio, −0.30, suggests that every abortion led to a decrease of 0.30 births between 1970 and 1972. If we use the reduced-form coefficients for white women, we estimate that each abortion is also associated 0.29 fewer births (0.62/−2.17). These approximate Wald estimates should be interpreted cautiously but they are consistent with an earlier estimate of legalized abortion based on data from New York City [18]

Implications—The story that emerges from these data is that the availability of legalized abortion services had a significant effect on fertility, but marginal changes in the distance to a legal provider had less of an effect. In other words, *Roe v. Wade* was arguably less important for unintended childbearing than was access to services in California, the District of Columbia and especially New York in the years before *Roe*. This is consistent with the pattern of birth rates in Figure 2. As a further illustration, consider the data in Table 4. Column (1) shows total births to women 15 to 44 years of age from 1969 to 1975; column (2) shows the yearly change in births; and column (3) displays total abortions. We can use counts instead of rates since the denominator is the same for both births and abortions. Recall also that we measure annual births from July through June whereas abortions pertain to the calendar year. Below each column are the sums for the period before and after *Roe*. The sum of yearly changes in births from 1970–72 is −458,053 while the number of abortions over the same span is 1,247,527. However, if we assume that each birth resulted in −0.30 births based on the ratio of the two reduced form estimates, then we obtain a predicted decline of 374,000 births (−0.30*1,247,527), which is broadly consistent with the actual decline. What is also striking is that the sum of yearly changes in births is only −67,001 between 1973–75 despite almost 2.7 million abortions.

The conclusion that *Roe* had a relatively modest impact on birth rates is somewhat at odds with previous work (Gruber, Levine and Staiger 1999; Levine et al. 1999; Levine 2004). These authors argued that national legalization in 1973 led to an equally large decrease in birth rates in the non-repeal states as had occurred in the repeal states in the previous three years. Gruber, Levine and Staiger (1999) refer to this as the “bounce back” effect of *Roe*. However, they lack a comparison group after 1973. Consequently, they cannot distinguish the “bounce back” effect from a relatively larger decrease in birth rates in the repeal states relative to the non-repeal states in the pre-*Roe* years followed by no meaningful effect of *Roe* in the subsequent years.[19] Although the latter seems surprising given the dramatic change in distance to the nearest abortion provider between 1972 and 1973 (Figure 7), trends in birth rates are consistent with this interpretation (see Figure 2 and Table 4). What is less

[18]Tietze (1973) using only New York City (NYC) data estimated that the 65,000 abortion to NYC residents in the first year of the law replaced approximately 18,000 births six months later, a ratio of 0.278, which is very close to the ratio of our two reduced forms. In addition, the approximate Wald estimates reported in the text are roughly 50 percent smaller in absolute value than the direct association obtained by an OLS regression of birth rates on abortion rates (see Joyce, Tan and Zhang 2012).

[19]We thank Michael Grossman for this insight.

ambiguous is that access to legalized abortion in the years before *Roe* induced thousands of women in non-repeal states to travel to repeal states for an abortion which resulted in a substantial decrease in fertility.

IV. Conclusion

The likelihood that *Roe* is overturned in the near future is remote. Nevertheless, states have imposed new requirements of abortion providers that, if enforced, will increase the distance women have to travel to access services. Indeed, the only abortion clinics in Mississippi and North Dakota are likely to close if courts uphold the requirement that physicians performing abortions at the clinics must have admitting privileges at local hospitals. Such policies could have a significant impact on the availability of services in other states in which physicians performing abortions lack admitting privileges at nearby hospitals. Based on data from the pre-*Roe* era, our results suggest that the impact of increased travel distance to a provider on abortion and birth rates will be small at the population level. We expect that the vast majority of women will travel to states in which abortion services remain available. Those most affected by the increase in distance to an abortion provider will likely be the young and poor. We found a robust association between teen birth and abortion rates and distance to the nearest abortion provider. Whether the relationship between access and use of abortion services observed in the early 1970s is relevant today is open to debate. There have been significant changes in contraceptive technology, access to information via the internet, and travel costs since the early 1970s. To the extent that these advances have lowered the costs of fertility control, then estimates as to relationship between the availability and use of abortion services in 1970s likely provide an upper bound estimate as to the effect of changes in policies today.

Acknowledgments

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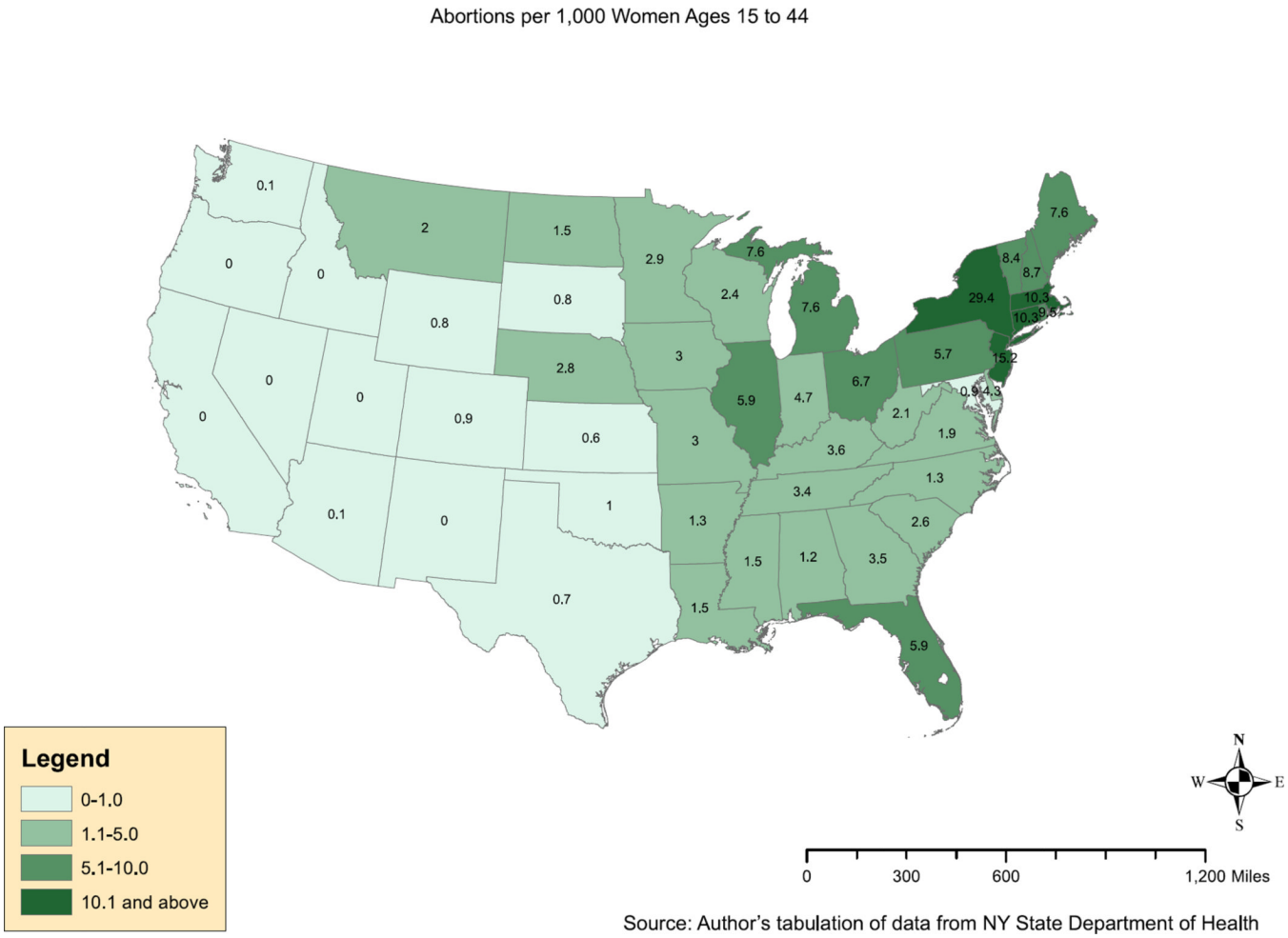

Figure 1.
Average Resident Abortion Rates for Abortions Performed in NY, 1971–1972

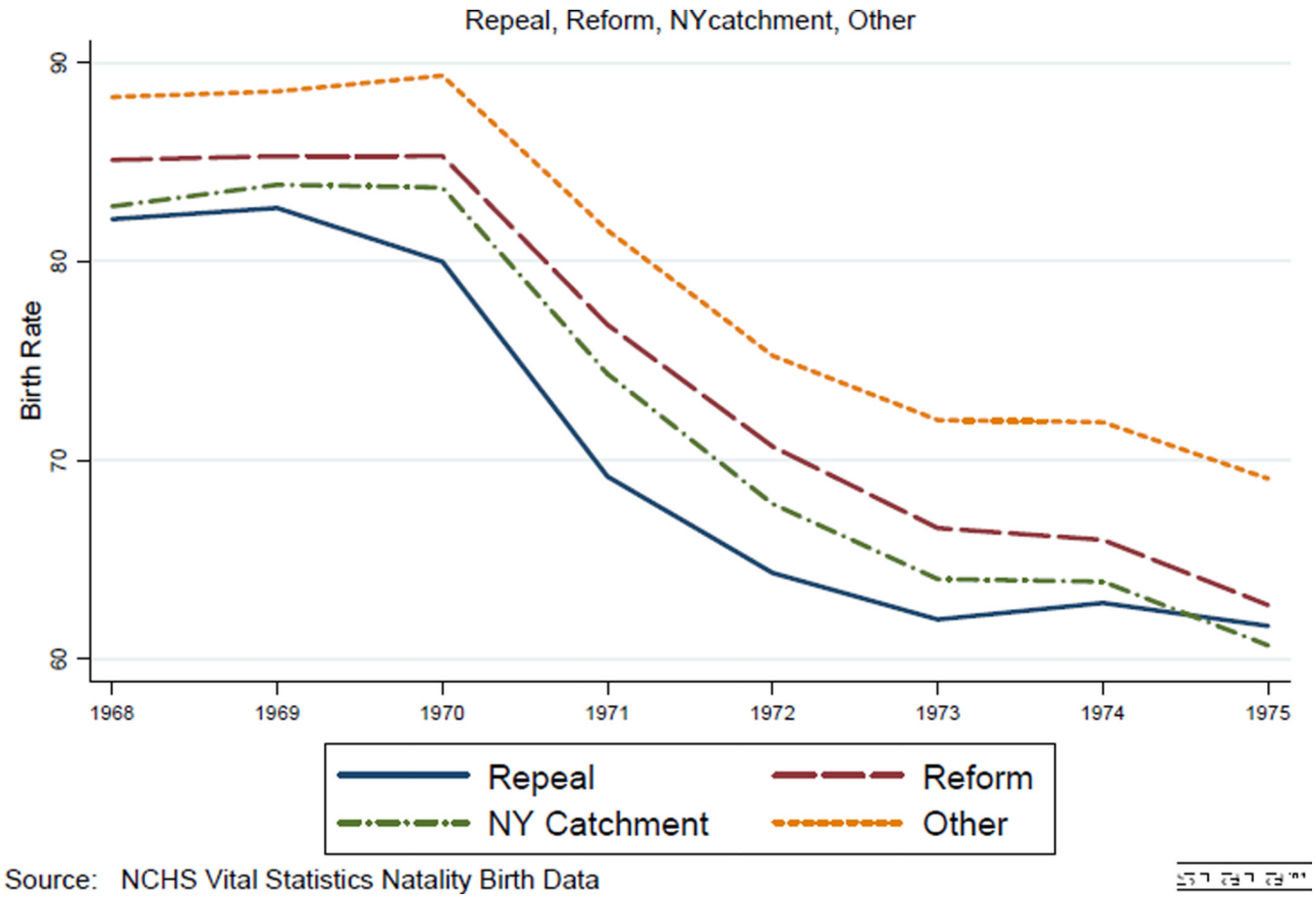

Figure 2.
Birth Rates of Women 15–44 by Timing of Abortion Legalization

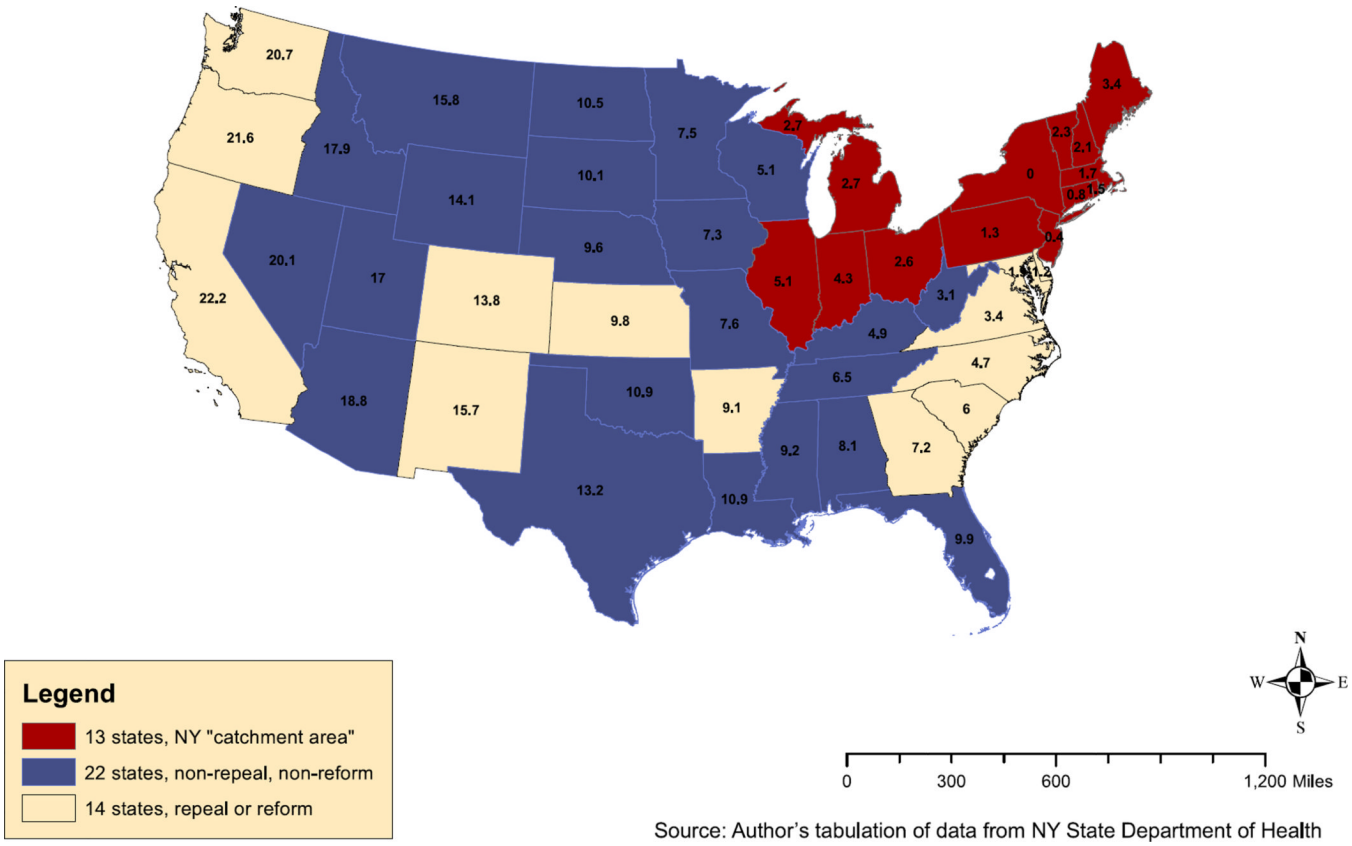

Figure 3.
Average Distance in 100 Miles to New York by State, 1971–1972

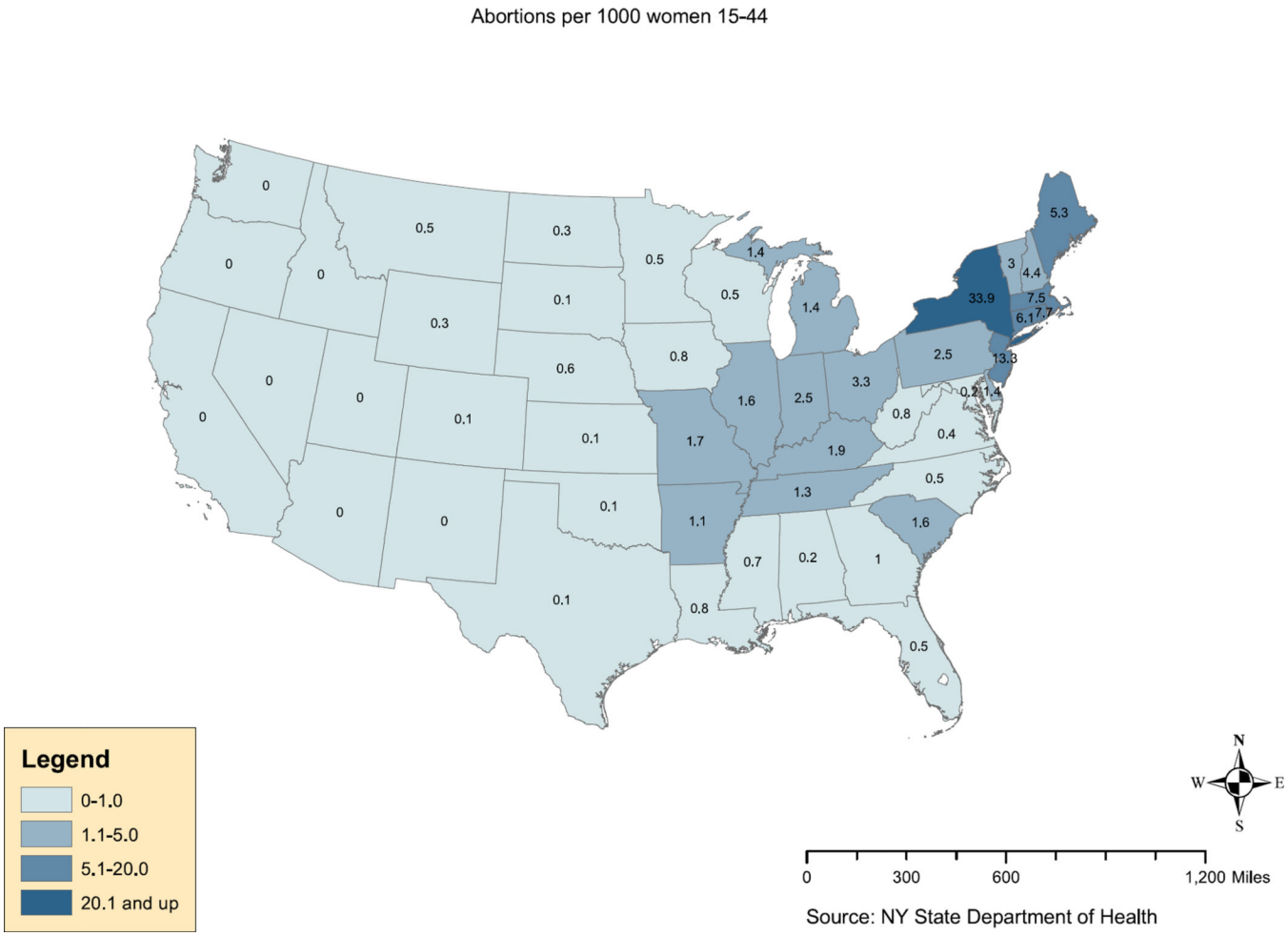

Figure 4.
Resident Abortion Rates for Abortions Performed in NY, 1973

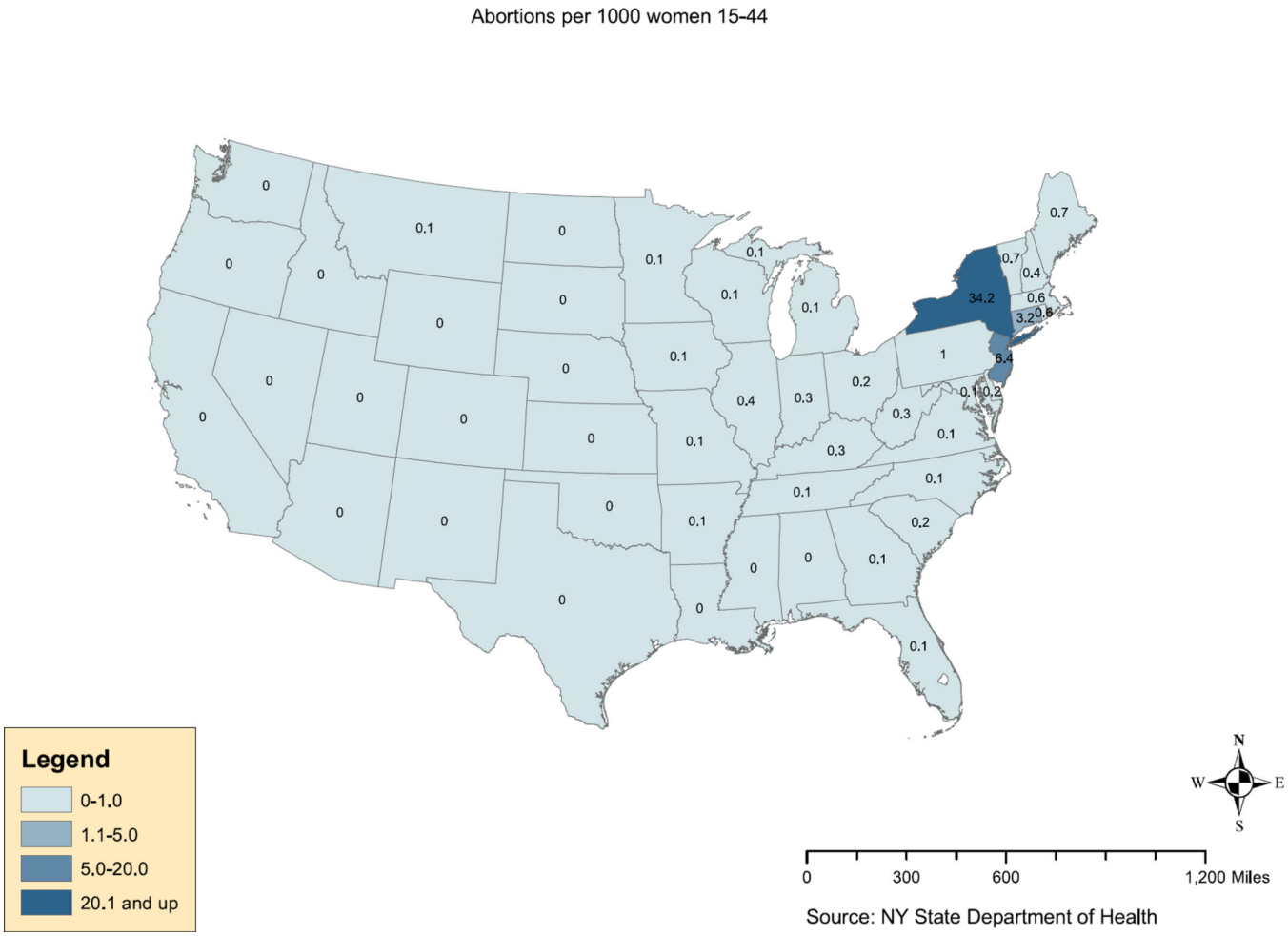

Figure 5.
Resident Abortion Rates for Abortions Performed in NY, 1975

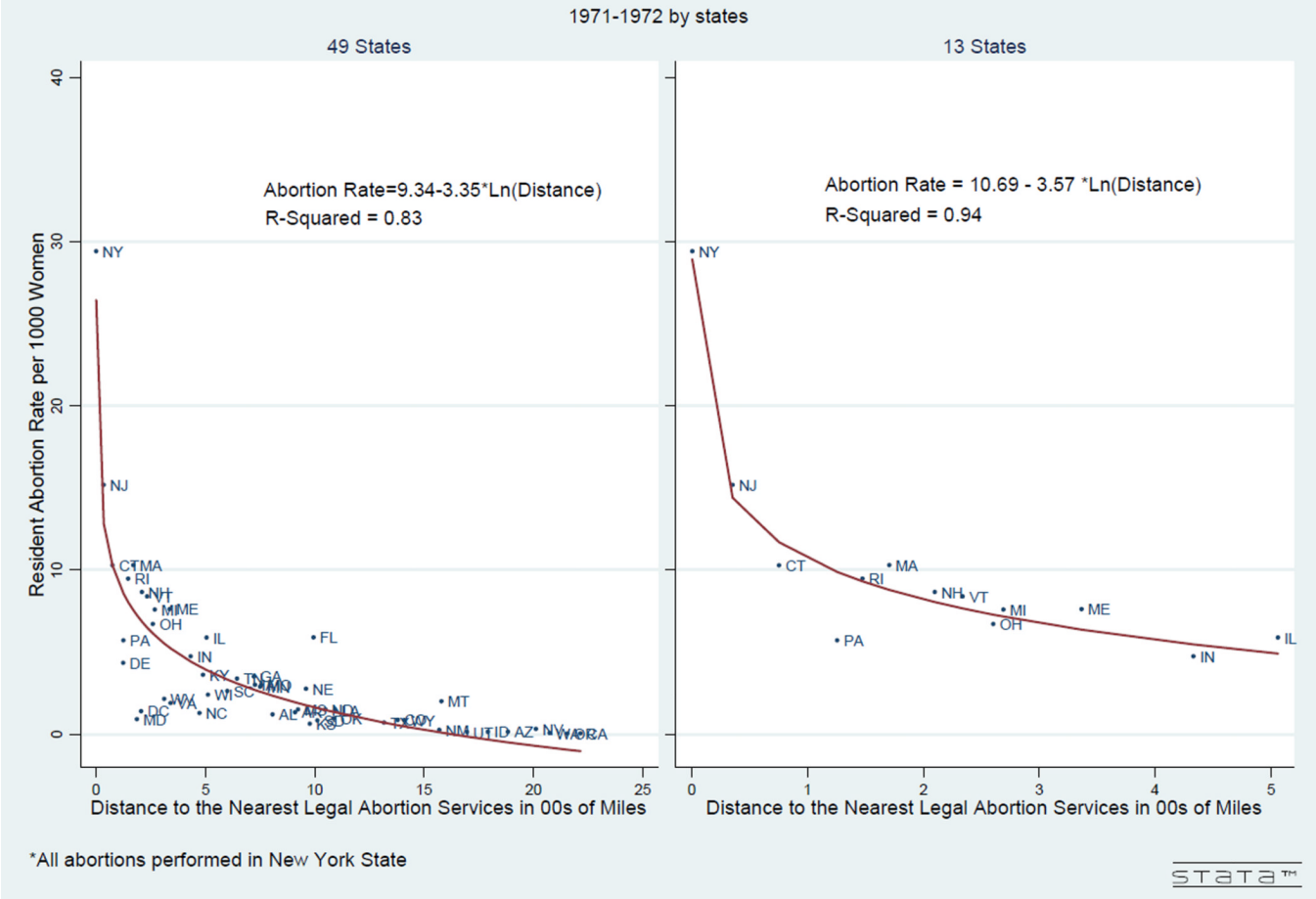

Figure 6.
Resident Abortion Rates by Distance to the Nearest New York Legal Abortion Provider

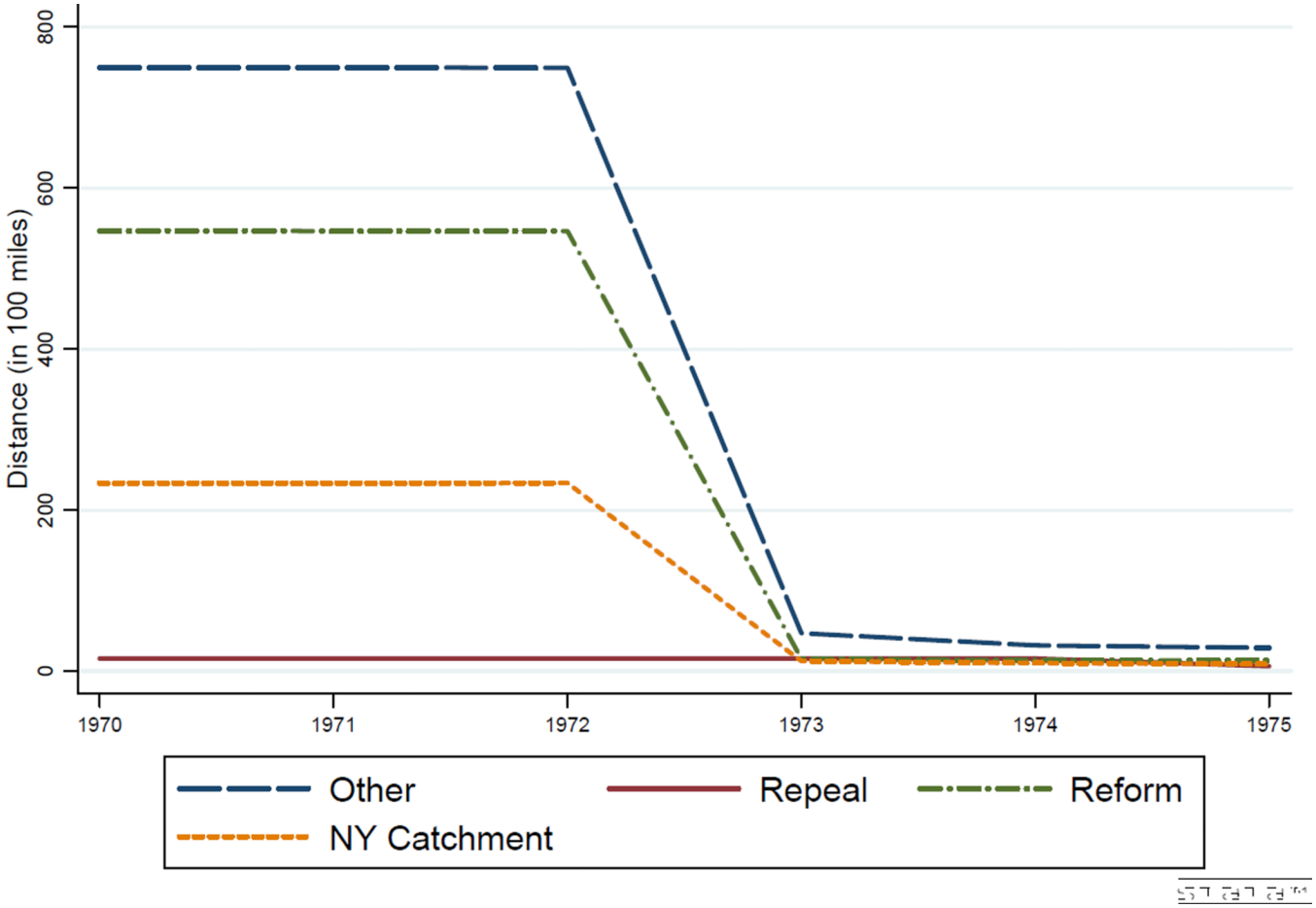

Figure 7.
Distance to the Nearest Abortion Provider (in 100 miles)

Table 1

Total Resident Abortions Reported by the CDC and New York State, 1971–72

	1971			1972		
	CDC	NY	% NY±	CDC	NY	% NY
Alabama	1501	957	0.64	2100	828	0.39
Alaska¥	1191	45	0.04	1166	10	0.01
Arizona	416	59	0.14	2865	58	0.02
Arkansas	1061	370	0.35	1555	699	0.45
California¥	103929	236	0.00	106307	152	0.00
Colorado*	4589	662	0.14	5428	238	0.04
Connecticut	7808	6779	0.87	8333	6376	0.77
Delaware*	1667	540	0.32	2193	546	0.25
DC¥	11618	364	0.03	7352	143	0.02
Florida	9235	8847	0.96	11624	8085	0.70
Georgia*	4989	3276	0.66	7070	4149	0.59
Hawaii¥	4127	6	0.00	4534	12	0.00
Idaho	29	24	0.83	20	20	1.00
Illinois	15982	13440	0.84	14091	14353	1.02
Indiana	4989	4766	0.96	5481	5842	1.07
Iowa	2834	1821	0.64	2356	1607	0.68
Kansas*	4017	288	0.07	4843	286	0.06
Kentucky	2268	2184	0.96	3132	2839	0.91
Louisiana	1135	1049	0.92	1210	1269	1.05
Maine	1345	1300	0.97	41690	1848	1.09
Maryland*	10001	1136	0.11	14929	483	0.03
Massachusetts	13230	10757	0.81	17581	14035	0.80
Michigan	14361	13705	0.95	14626	15522	1.06
Minnesota	3351	2510	0.75	2227	2106	0.95
Mississippi	344	617	1.79	870	796	0.91

	1971			1972		
	CDC	NY	% NY±	CDC	NY	% NY
Missouri	4582	2113	0.46	6953	3699	0.53
Montana	420	402	0.96	172	178	1.03
Nebraska	1093	907	0.83	1797	791	0.44
Nevada	40	37	0.93	1630	36	0.02
New Hampshire	1243	1179	0.95	1483	01595	1.08
New Jersey	21207	20465	0.97	22832	25733	1.13
New Mexico*	4936	41	0.01	1962	75	0.04
New York¥	105642	112778	1.07	100615	116555	1.16
North Carolina*	6147	1703	0.28	11810	1257	0.11
North Dakota	252	229	0.91	148	145	0.98
Ohio	14209	13636	0.96	16666	17067	1.02
Oklahoma	1506	601	0.40	2843	453	0.16
Oregon*	6998	14	0.00	7178	18	0.00
Pennsylvania	20430	13466	0.66	22772	14255	0.63
Rhode Island	1697	1612	0.95	1869	2085	1.12
South Carolina*	2045	1283	0.63	3056	1820	0.60
South Dakota	170	128	0.75	116	91	0.78
Tennessee	2782	2681	0.96	4288	3247	0.76
Texas	2558	2358	0.92	16022	1131	0.07
Utah	51	31	0.61	730	33	0.05
Vermont	766	728	0.95	1052	889	0.85
Viriginia*	6995	2729	0.39	11187	1255	0.11
Washington¥	14425	72	0.00	17809	27	0.00
West Virginia	896	844	0.94	1491	719	0.48
Wisconsin	5310	2010	0.38	3090	2400	0.78
Wyoming	190	72	0.38	269	49	0.18
Total	452607	257857	0.57	503423	277905	0.55

Source: Centers for Diseases Control (1972,1974); authors tablulations of abortions by state of residence performed in New York as collected by the New York State Department of Health.

[±] Proportion of all CDC abortions obtained in New York.

[¥] State repealed its abortion law.

[*] State reformed its abortion law. Shaded states included in the 13-state sample.

Table 2

Regressions of Age- and Race-specific Resident Abortion Rates Performed in New York on the Natural Log of Distance to New York, 1971–75*

	(1) All	(2) 15–19	(3) 20–24	(4) 25+	(5) White	(6) NonWhite
row						
1. Ln Distance*1971–72	−2.35*** (0.32)	−2.91*** (0.53)	−3.94*** (0.50)	−1.46*** (0.17)	−2.17*** (0.37)	−4.83*** (1.01)
2. Δ mile 283 – 183	−1.02	−1.27	−1.72	−0.64	−0.95	−2.11
3. Δ mile 878 – 778	−0.28	−0.35	−0.48	−0.18	−0.26	−0.58
4. Ln Distance*1973–74	−0.75* (0.31)	−1.08* (0.45)	−1.19* (0.52)	−0.46* (0.18)	−0.69* (0.30)	−2.25*** (0.58)
row 1- row4	−1.60***	−1.84**	−2.75***	−1.00***	−1.48***	−2.58**
5. Ln Distance*1971–72*Reform€	−1.02* (0.43)	−1.99** (0.71)	−1.90** (0.70)	−0.28 (0.22)	−1.11 (0.58)	−2.40 (1.56)
6. Ln Distance*1973–74*Reformƒ	−0.15 (0.19)	−0.35 (0.31)	−0.23 (0.30)	−0.02 (0.10)	−0.25 (0.26)	−0.88 (0.64)
row 5 – row 6	−0.87**	−1.64***	−1.67***	−0.26*	−0.85*	−1.52
7. Ln Distance*1971–72*Repeal¥	0.50 (0.65)	1.28 (1.05)	1.00 (1.05)	−0.03 0.37)	0.09 0.76)	2.57 1.82)
8. Ln Distance*1973–74*Repeal¶	0.27 (0.28)	0.63 (0.45)	0.56 (0.45)	0.01 (0.16)	0.34 (0.33)	0.99 (0.69)
row 7- row 8	0.23	0.65	0.44	−0.04	−0.24	1.58
Mean abortion rate 12 states±	8.37	11.88	13.96	4.60	8.16	13.94
Mean abortion rate 34 states≠	4.16	6.05	7.05	2.16	4.53	6.67
R2	0.98	0.95	0.98	0.99	0.96	0.97
N	245	245	245	245	220	220

* The figures in each column are from a separate estimate of equation (1) in the the text. The dependent variable is the resident abortion rate for abortions performed in New York from 1971–1975 in 48 states and the District of Columbia. Alaska and Hawaii are not included. Distance is in hundreds of miles. The marginal effect of distance in rows 2 and 3 shows the change in abortion rates associated with an increase of 100 miles between the designated distances. Standard errors adjusted for clustering at the state level are in parentheses.

±Mean abortion rate in 1971–72 in 12 states of the New York "catchment area" (see Figure 2)

≠Mean abortion rate in 1971–72 in all states less New York, reform and repeal

¥(α1 + α2);

$^{\epsilon}$(α1 + α3);

^{f}(α4 + α5);

¶(α4 + α6) from equation (1) in text.

*p<.05,

**p<.01,

***p<.001

Table 3

Regressions of Age and Race-specific Birth Rates on the Natural Log of Distance to the Nearest Legal Abortion Provider, 1968–75*

	(1) All	(2) 15–19	(3) 20–24	(4) 25+	(5) White	(6) NonWhite
Panel A: 49 States in Continental US						
Ln Distance*1970–72	0.22	1.44**	−1.72	−0.18	0.14	−0.67
	(0.46)	(0.46)	(1.33)	(0.39)	(0.50)	(2.20)
Ln Distance*1973–75	1.43**	1.61*	0.46	1.00*	1.39**	−1.06
	(0.43)	(0.75)	(1.02)	(0.38)	(0.43)	(2.59)
Ln Distance*1970-72*Reform€	0.50	0.73	0.78	0.18	0.48	0.33
	(0.55)	(0.68)	(1.22)	(0.35)	(0.49)	(1.47)
Ln Distance*1973-75*Reform£	0.63	1.49	0.83	0.17	0.48	2.31
	(0.80)	(0.96)	(1.86)	(0.50)	(0.73)	(2.30)
Ln Distance*1970–72*Repeal¥	1.76***	2.41**	2.12	1.24**	1.80*	4.28
	(0.48)	(0.84)	(1.23)	(0.41)	(0.80)	(4.15)
Ln Distance*1973–75*Repeal¶	1.08	2.68	0.62	0.73	0.87	−0.41
	(0.90)	(1.92)	(0.50)	(0.69)	(0.83)	(2.90)
Mean Birth Rate	76.90	62.28	142.36	59.61	73.00	105.75
R2	0.97	0.97	0.98	0.97	0.97	0.75
N	392	392	392	392	392	392
Panel B: NY "Catchment Area"- 13 states						
Ln Distance*1970–72	0.70***	0.57**	0.76*	0.59**	0.62*	−2.36
	(0.14)	(0.16)	(0.27)	(0.12)	(0.15)	(2.82)
Ln Distance*1973–75	0.55	−0.35	0.27	0.78*	0.54	−6.19
	(0.37)	(0.47)	(0.98)	(0.34)	(0.33)	(5.26)
Mean Birth Rate	72.15	49.64	131.12	60.33	70.10	104.44
R2	0.99	0.98	0.99	0.98	0.99	0.70
N	104	104	104	104	104	104

Notes: Panel A includes all 49 continental states (Hawaii and Alaska excluded). The average distance to the nearest abortion provider is 521 miles from 1970 to 1972, and 23 miles between 1973 to 1975. Panel B include 13 states that are considered as New York "catchment area". See notes to Table 3 for the list of states . The average distance to the nearest abortion provider in the 13 states is 215 miles from 1970–72, and 9.7 miles from 1973–1975. *Standard error clustered at state level. For panel B, t-statistics based on 11 degrees of freedom.

¥ (α1 + α2);

[€] $(\alpha 1 + \alpha 3)$;

[f] $(\alpha 4 + \alpha 5)$;

[¶] $(\alpha 4 + \alpha 6)$ from equation (3) in text.

[*] $p<.05$,

[**] $p<.01$,

[***] $p<.001$

Table 4

Births and Abortions: 1969–1975

Year	Births	Δ births	Abortions
	(1)	(2)	(3)
1969	3,638,374	--	--
1970	3,697,884	59,510	175,508
1971	3,378,524	−319,360	485,259
1972	3,180,321	−198,203	586,760
1973	3,096,769	−83,552	744,610
1974	3,166,785	70,016	898,570
1975	3,113,320	−53,465	1,034,170
Total 70–72	10,256,729	−458,053	1,247,527
Total 73–75	9,376,874	−67,001	2,677,350

Sources: Births based on authors compilations from national natality files. Annual births measured from July to June; Aborrtions 1970–72 (Centers for Disease Control Abortion Surveillance 1971, 1972, 1974); Abortons 1973–73 (Henshaw and Van Vort, 1992)