Do all roads lead to the same destination? Proximity to abortion providers, abortions and their conditions in Portugal*

António Melo [1]

June 19, 2023

Abstract

Portugal legalized abortion in 2007, making it available through the National Health Service (NHS) free-of-charge. This paper analyzes how variations in proximity to an abortion provider affect the probability of aborting and the conditions under which abortions occur, namely when, where, and how. We find suggestive evidence that there are fewer abortions among women living further away from a provider relative to women living closer. We also find evidence that *(i)* these women abort later, *(ii)* are more likely to be referred by public hospitals to private clinics, and, consequently, *(iii)* have an increased risk of aborting surgically, an invasive procedure which is more costly than the medical method.

JEL Codes: I11, I12, J13

Keywords: Abortion Access; Distance to Abortion Care; Family planning;.

---

* The author is indebted to Direção-Geral de Saúde and to Statistics Portugal for providing the data on abortions and births and is grateful to Eve Caroli and Susana Peralta for all their valuable insights and suggestions. The author is also thankful to Andrea Bassanini, Éric Bonsang, Clémentine Garrouste, Mathilde Godard, Eva Moreno-Galbis, Elsa Perdrix, Miguel Portela, Anne-Laure Samson, Bettina Siflinger, Arthur Thomas and to participants at the LEGOS seminar at Université Paris-Dauphine, the EEA-ESEM 2021 Congress, the 8th EuHEA PhD Conference, the 14th Conference of the Portuguese Economic Journal, the 2021 Bavarian Young Economists' Meeting, and the Journée des Doctorants en économie de Dauphine for their helpful comments. All remaining errors are his own. This work was funded by a PhD scholarship from FCT – Fundação para a Ciência e Tecnologia (SFRH/BD/146123/2019). Declarations of interest: none.

[1] ESOMAS, University of Turin, Corso Unione Sovietica, 218 bis - 10134 Torino.
antonio.ludovice @unito.it,

1. INTRODUCTION

Women undergoing unsafe abortion are at a higher risk of having health problems or even dying (Grimes et al. 2006). The World Health Organization (WHO) has defined the elimination of unsafe abortion as one of its top five priorities of its global reproductive health strategy (WHO 2004). Legalizing abortion was shown to be an effective way to decrease maternal mortality and morbidity (Clarke and Mühlrad 2021), and, indeed, since 2007, when Portugal made abortion legal and fully subsidized, there has been a decrease in the number of abortion-related deaths. Between 2001 and 2007, there were, on average, two deaths per year – out of an estimated number of 20,000 yearly illegal abortions –while, between 2008 and 2014, a total of two deaths were registered in seven years – for this period, the annual number of abortions ranged between 16,762 and 20,480 (Vicente 2020). However, the legal status of abortion is not the only dimension of access at stake. As Grimes et al. (2006) point out: "enabling abortion legislation is necessary but not sufficient: a new law might not translate into widespread access to safe services" (p. 6).

One important dimension is the actual distance to a provider, which can be seen as the physical, and logistical cost faced by women when traveling to an abortion facility (Kimport 2022). Increases in this cost render abortion more difficult to obtain, and thus, likely influence not only whether women abort (Kane and Staiger 1996), but also the conditions under which they abort, namely when (Bitler and Zavodny 2001; Lindo et al. 2020), where, and how. This is, of course, relevant for the well-being of women. In fact, not being able to abort can lead to worse present and future financial and economic conditions (Miller et al. 2023). Furthermore, when a woman is able to abort, "any delay increases the risk of complications" (Cates et al. 1977:268). Given that later abortions are more demanding in terms of logistics and training of healthcare professionals (Harris 2008), delays may also reduce the number of available abortion providers. In addition, as medically induced abortions lose efficiency after the ninth week of pregnancy (Winikoff et al. 2008), delays may lead to the use of surgical abortion,[1] a less time-consuming method,[2] but an invasive and more costly procedure.

The role of proximity to abortion services in affecting whether women abort is a growing topic in applied economics. Quast et al. (2017), Fischer et al. (2018), Lindo et al. (2020), Venator and Fletcher (2021), and Myers (2021) document that the number of abortions in U.S. counties fell in response to increases in the travel distance to the nearest provider. However, there is not much research on how proximity affects when, where, or how women abort. To the best of our knowledge, only Lindo et al. (2020) address how being close to a provider affects when abortions occur.

In this paper, not only do we analyze if proximity to a provider affects whether and when women abort, but we also consider how proximity determines other characteristics of abortions, such as where they take place – with a public hospital or a private clinic – and how they are performed – using the medical or surgical method.

To measure proximity, we use the travel time from the women's municipality of residence to the nearest abortion provider. In Portugal, travel times to the nearest abortion provider have varied over time due to the shutdowns and openings of abortion services. To examine how changes in travel time affect abortion numbers and their conditions, we rely on an individual-level dataset of all abortions occurring in Portugal between 2008 and 2016. It contains information on the number of weeks of gestation at the time of abortion and women's socioeconomic characteristics, including their municipality of residence. Together with the information on the location of abortion providers throughout time, this allows us to compute

[1] The Portuguese General Directorate of Health recommends the use of the surgical method to terminate pregnancies above nine weeks of gestation (DGS 2007a).
[2] For medical abortions, women need to make two to three visits to the doctor: one to take the mifepristone, and another, 48 hours later, to take Misoprostol. If abortion did not take place during the second visit, a third visit is required to check if abortion was successful (DGS 2007b). As for surgical abortions, women only need to make one trip to the doctor. However, as it is a surgical procedure, it demands more hospital resources, namely an operating room and an anesthesiologist (DGS 2007c).

the travel time from the populational center of each municipality to the nearest abortion provider. We find that living far away from a provider is associated with fewer abortions in the area of residence and also with aborting later. Moreover, these late abortions appear to be primarily caused by late arrivals to abortion care. For abortion services, it may prove challenging to accommodate women at later gestational ages, within the legal time limits, and to use the medical method since it is more time-consuming than the surgical procedure but non-invasive and less costly. The challenge is particularly difficult for public hospitals, which are chronically short of healthcare professionals who are not conscientious objectors (Oliveira da Silva 2009). As a consequence, they have the incentive to refer women to private clinics that predominantly use the surgical method. We provide evidence of this mechanism by showing that longer trips to a provider are associated with a higher likelihood of being referred from a public hospital to a private clinic and a greater risk of having a surgical abortion. Although abortion supply might be partially determined by demand, in the Results section, we show that our findings are unlikely to be driven by the endogeneity of the travel time to the nearest abortion provider. Finally, even though women living far away are at a higher risk of having the more costly surgical abortion, a back-of-the-envelope calculation suggests that providing proximity abortion services through the NHS would only save a limited amount of public money. However, this would reduce the individual burden of undergoing a late and invasive abortion.

This paper contributes to the economic literature studying how abortion access, in particular proximity, affects abortion rates. Theoretically, decreased access to abortion should reduce the number of abortions through two channels (Kane and Staiger 1996; Levine and Staiger 2002). On the one hand, pregnant women may decide to carry their pregnancy to term, as abortion becomes too costly. On the other hand, women may exert more effort to avoid pregnancy, leading to fewer unwanted pregnancies and, consequently, fewer abortions (Kane and Staiger

1996; Levine and Staiger 2002). Both theoretical predictions find support in empirical studies, most of which rely on natural experiments conducted in the USA as a source of exogenous variations in abortion access. Cook et al. (1999) take advantage of North Carolina's intermittent reimbursement of abortion procedures throughout the year – that randomly left some women uncovered – to show that unexpected funding restrictions reduce the number of abortions. Quast et al. (2017), Fischer et al. (2018), Lindo et al. (2020), and Venator and Fletcher (2021) exploit restrictive abortion laws that led to drastic reductions in the number of abortion clinics in Texas and Wisconsin and show that increasing the distance to an abortion provider reduces abortion rates. Recently, Myers (2021) used variation in distances to the nearest provider across the entire United States to find similar impacts to the ones found for Texas and Wisconsin. In our paper, we explore a setting where, unlike the United States, a universal health care system provides abortions free-of-charge and where traveling is the only tangible cost faced by women. In Portugal, the time constraint is particularly relevant since the legal gestational age limit for abortion is only ten weeks, the lowest among high-income countries (Popinchalk and Sedgh 2019). To our knowledge, together with Brooks and Zohar (2021),[3] this is also one of the few papers using non-US data to examine how abortion access affects the number of abortions. We also are the first in the literature to correct for the potential bias of two-way fixed effects (TWFE) regressions when measuring the impact of proximity on abortion rates (de Chaisemartin and D'Haultfoeuille 2020, Goodman-Bacon 2021). To that end, we implement a stacked difference-in-differences as in Cengiz et al. (2019).

Our paper also contributes to the literature on how barriers to abortion affect its timing. The intuition is that women with deprived access may need more time to reach abortion services, hence delaying abortions (Lindo et al. 2020). For the United States, a number of state-specific

[3] Brooks and Zohar (2021) examine how expanding access to free abortion in Israel affected abortion rates. They find that abortions increased in response to this policy, while the probability to become pregnant was not affected.

studies find that women abort later when facing mandatory reflection periods (Joyce and Kaestner 2001; Lindo and Pineda-Torres 2021), or the need to obtain parental consent (Joyce and Kaestner 2001), or congested abortion services (Lindo et al. 2020; Kelly 2020). However, it is unclear how proximity affects abortion timing (Lindo et al. 2020). In the present paper, we find suggestive evidence that living far away from a provider leads women to abort later. As far as we know, we are the first to examine how access affects abortion timing in a European country. We also look at the consequences that these delays cause on other aspects of the abortion process, namely where – being referred to a private clinic by a public hospital – and how women abort – medical or surgical method – which has not been tackled so far in the literature.

The structure of the paper is the following: Section 2 provides institutional background on the legal framework and distribution of abortion services in Portugal; Section 3 presents the empirical strategy; Section 4 introduces and describes the data; Section 5 provides the results, Section 6 presents the discussion, and Section 7 the conclusions.

2. INSTITUTIONAL BACKGROUND

Before dwelling on how proximity to a provider affects the number of abortions and the conditions under which they occur, we must point out that in Portugal, abortion on request only became legal in 2007 (Law 16/07). The Portuguese law is quite restrictive compared to its European counterparts: it has the lowest gestational age limit among high-income countries (Popinchalk and Sedgh 2019) – ten weeks of pregnancy – and it requires a mandatory reflection period of three days, as well as parental consent for minors below the age of 16.

Upon legalization, there was a swift effort to generalize access to abortion services, either public or private. A key factor for that rapid expansion was the provision of abortions free-of-charge within the pre-existing public maternity network of the NHS, which is of universal access (Simões et al. 2017). To that end, the law determined that all public hospitals with a gynecology or obstetrics department should provide abortion services (Portaria741-A/2007). According to the standard procedure, to access public abortion, women should first contact primary care services, which should refer these women to the regional specialized public hospital. However, it is admissible that women bypass this system and access hospital services directly (Simões et al. 2017).

However, as 85% of gynecologists in Portugal were conscientious objectors (Oliveira da Silva 2009), some hospitals could not provide abortion services, undermining the local supply of abortion and leading to discrepancies in the geographical distribution of providers, which, as we show in Figure 1, varied across time.

If public hospitals do not have abortion services or cannot promptly provide them within the legal limit of ten weeks of gestational age, hospitals must redirect women living in the area they cover toward another provider – either a public hospital or a certified private clinic. In that case, the cost of the abortion is directly paid by the hospital first contacted by the woman to that which performed the abortion – at a set price, defined by law, depending on the abortion method. Overall, in the NHS, the financing of abortion procedures, outsourced or not, is provided through each hospital's fixed budget. Hospital budgets are set according to the hospital's cost history, use, and complexity indicators (Simões et al. 2017). Women may also directly access private providers, but, in this case, they must pay for the abortion procedure themselves.

3. EMPIRICAL STRATEGY

The first goal of this paper is to understand how proximity affects the probability that women abort. Given that we do not have individual-level data for all fertile females in Portugal to estimate how variations in travel time affects the probability to abort, we conduct an analysis on the number of yearly abortions at the municipality-level – the lowest geographical aggregation level at our disposal. Then, using individual-level data on all abortions, we examine how proximity affects the conditions under which abortion occurs, namely when, where, and how.

3.1. Number of abortions in municipalities

We start by examining how travel time affects the number of abortions among all women at the municipality-level. To estimate this effect, we follow the literature and use a difference-in-differences design where the treatment is continuous. In this setting, we want to assess the causal response to treatment dosage – i.e., travel time to the nearest abortion provider, with longer distances representing higher treatment intensities or doses. One potential issue with previous studies is that they rely on TWFE regressions to retrieve causal responses. Recent literature shows that in some cases, TWFE regressions potentially estimate treatment effects poorly (de Chaisemartin and D'Haultfoeuille 2020, Goodman-Bacon 2021). This is particularly problematic in our setting where treatment is continuous (Callaway et al. 2021) and non-staggered, meaning that municipalities change treatment dose at different timings and, possibly, multiple times. First, TWFE regressions attribute greater weight to treatments occurring in the middle of the panel. Second, TWFE regressions make "forbidden comparisons" (Borusyak and Jaravel 2017), which, in our case, translates to comparing municipalities that change treatment at one point in time with those that had already changed dose. If treatment effects – or causal responses in the continuous treatment case – are heterogenous or dynamic, such comparisons can lead to a negative weighting of some of the estimated treatment effects, possibly yielding estimates bearing the wrong sign (Callaway et al. 2021).

The literature proposes different estimators to overcome the bias of TWFE regressions. The common element behind the new estimators is that they all try to avoid “forbidden comparisons” by taking out from the control group all units that have already been treated or, in the treatment intensity case, those which have already switched dose. We use the stacked difference-in-differences strategy suggested by Cengiz et al. (2019),[4] which is particularly well-suited to the model we estimate – a non-linear regression model with a non-staggered and continuous treatment.[5]

We implement the stacked difference-in-differences as follows: for each municipality *m* changing treatment dose we construct a dataset – hereafter, we will refer to it as a stack – composed by that municipality and those where travel time never varied (never changers) or where it did not vary yet (not-yet-changers). This ensures we compare each municipality to a “clean” control group. We start with an initial number of 176 stacks. As our setting allows treatment dose to change multiple times, in the spirit of the solution proposed by de Chaisemartin and D’Haultfoeuille (2022a), we only keep stacks of municipalities that change dose for the first time so that we avoid contamination by past treatments, thereby keeping 109 stacks. Moreover, since we want outcomes at T+1 to be caused by treatments at T rather than treatments at T+1, we also exclude stacks of municipalities that change dose in two consecutive years – thus doing we drop nine stacks. Then within each stack, we only keep observations

[4] For recent papers in applied microeconomics that use stacked difference-in-differences when encountering similar issues see, for example, Abouk et al. (2023) or Mathur and Rhum (2023).

[5] Other strategies have been proposed but these are well-suited for linear models. See de Chaisemartin and D’Haultfoeuille (2022b) or Roth et al. (2023) for a survey of this recent literature, including a presentation of the alternative estimators to TWFE regressions.

corresponding to the two years before municipality *m*'s change in treatment and the year immediately after. [6] To ensure that stacks are balanced and that all treatment changes occur in their mid-point – thus avoiding the weighting bias arising from different treatment timings – we restrict our analysis to municipalities changing treatment doses between 2010 and 2015. Hence, we drop 32 stacks from the analysis.[7] Finally, we append the remaining 68 stacks together and estimate the general model below:

$$N^{o}Abortions_{m,t,s} = \beta_1 Time_{m,t,s} + X_{m,t,s}\beta_2 + \varphi_{m,s} + \zeta_{t,s} \tag{1}$$

where $N^{o}Abortions_{m,t,s}$ is the number of abortions among women living in municipality *m*, in year *t* in stack *s*. $Time_{m,t,s}$ is the travel time between the nearest abortion provider and the town hall of municipality *m* in year *t* in stack *s*. $X_{m,t,s}$ is a vector of time-varying municipality-level controls, namely the share of each age group – defined in 5-year intervals – in the population of fertile women, the insured unemployment rate of the municipality, the GDP per capita growth rate of the NUTS III region, and the number of marriages and catholic marriages per thousand inhabitants in the municipality. As control municipalities appear multiple times in different stacks, we follow the recommendation of Baker et al. (2022) and include municipality-by-stack ($\varphi_{m,s}$) fixed effects. We cluster standard errors at this level. Finally, we also add year-by-stack fixed effects ($\zeta_{t,s}$). The coefficient of interest is β_1, which we expect to

[6] Since our time windows restricts the post-treatment period to T and T+1, we keep municipalities that change dose two or more times with at least a one year gap between switching dose as these will not pose a threat of contamination by future treatments.

[7] If we keep municipalities that were treated in 2009, we do not have data for the two years preceding the treatment. Similarly, for municipalities treated in 2016, we do not have data for 2017. Thus we drop those treatments from our analysis to ensure that our panel is balanced.

carry a negative sign, as increases in travel time should make abortion more costly, leading women to either carry their pregnancies to term or to avoid becoming pregnant at all.

As some municipalities have zero abortions in a number of years – see Figure A1 (online appendix) – we estimate the general model above by a Poisson pseudo-maximum likelihood estimator, [8] using the number of fertile women in municipality *m* in year *t* as the exposure variable.[9] To be more precise, we estimate:

$$E(N^{o}Abortions_{m,t,s} \mid Time_{m,t,s}\,,\, X_{m,t,s}\,,\, \varphi_{m,s}\,,\, \zeta_{t,s}) = e^{(\beta 1 Time_{m,t,s} + X_{m,t,s}\beta + \varphi_{m,s} + \zeta_{t,s})} \qquad (2)$$

We do not consider alternative non-linear estimation methods such as the negative binomial regression because, unlike the Fixed Effects Poisson, they usually suffer from the incidental parameters problem (Cameron and Trivedi 2005).[10] Furthermore, Wooldridge (1999) shows that the Fixed Effects Poisson estimator with robust standard errors relies on minimal assumptions, namely that it is robust to distributional misspecifications and is consistent as long as the conditional mean is correctly specified.[11]

As a second step, to understand the potential channels in action, we analyze how travel time affects the number of abortions among pregnant women. To do so, we estimate the model described in equation (1), using the number of pregnant women as the exposure variable, which is equivalent to estimating the effect of travel time to the nearest provider on the abortion ratio

[8] As Lindo et al. (2020), we also estimated the above model by OLS, using an Inverse Hyperbolic Sine Transformation of the dependent variable, which has the advantage of being defined at zero. As evidenced in Table B1 (online appendix) the results are robust to this change, both in magnitude and in statistical significance.

[9] Using the number of abortions as the dependent and the number of fertile women as the exposure variable variable is equivalent to analyzing the abortion rate, as the exposure variable has its coefficient restricted to one.

[10] Moreover, the negative binomial regression with fixed effects may not even be able to account for time invariant variables (Guimarães 2008).

[11] Even when the outcome is continuous – or close to continuous, as in our case – the Fixed Effects Poisson regression is still a consistent estimator (Wooldridge 2010).

– i.e., the number of abortions divided by the number of pregnancies.[12] β_1 should be negative, as increases in travel time should make abortion harder to obtain, and thus, some pregnant women may no longer be able to abort. Finally, we examine whether women who become farther away from a provider decreases the number of unwanted pregnancies. As we do not have information on unwanted pregnancies, we restrict our analysis to teenage pregnancies, which, in principle, should be unwanted. In this case, we use the population of adolescent women aged between 15 and 19 years old as the exposure variable. Once again, β_1 should be either negative.

3.2. Abortion conditions

We then analyze how travel time affects the conditions under which abortion takes place. Using individual-level data on women who aborted, we estimate the following general model:

$$Y_{i,m,t,s} = \lambda_0 + \lambda_1 Time_{m,t,s} + X_{m,t,s}\lambda + V_{i,m,t,s}\alpha + \varphi_{m,s} + \zeta_{t,s} \quad (3)$$

where $Y_{i,m,t,s}$ stands for the six different outcomes related to abortion conditions of woman i living in municipality m and conceiving her pregnancy at year t in stack s. $Time_{m,t,s}$ is the travel time between the nearest abortion provider and the town hall of municipality m where woman i lives, at the year of the conception of her pregnancy t. $X_{m,t,s}$ is a vector with the same time-varying municipality-level controls presented in equation 1. $V_{i,m,t,s}$ is a vector of individual controls, namely: year of age, occupation, education, number of children, nationality, and cohabitation status. Again, standard errors are clustered at the municipality-by-stack level.

First, we examine three dependent variables related to the timing of abortion, namely: i) the gestational age at the moment when women make the first contact with abortion care, ii) the

[12] In the abortion ratio analysis, besides examining the robustness of the results to estimating the model by OLS, we also use a fractional probit estimated by pooled Bernoulli quasi-maximum likelihood estimation (Papke and Wooldridge 2008). Again, the results are robust, both in magnitude and in statistical significance – see Table B2 in the online appendix.

number of waiting days between that moment and the abortion intervention, and iii) the gestational age at the time of abortion. We also dichotomize the number of weeks of pregnancy to examine how travel time to the nearest abortion provider affects iv) the probability of having an abortion after nine weeks of pregnancy. This provides insight on a turning point in the quality of care, as, after nine weeks of pregnancy, the risk of complications and of using the surgical method increases. In fact, over nine weeks of pregnancy, the General Directorate of Health (DGS) recommends the use of the surgical method to abort (DGS, 2007a), as the efficiency of medical abortion decreases overtime (Winikoff et al. 2008).

Second, we analyze where abortions occur, namely, v) the probability of being referred by a public hospital to a private clinic. Third and last, we examine how travel time affects the abortion method, namely, vi) having a surgical abortion, which is invasive, unlike the medical method. We expect the main coefficient of interest, λ_1, to be positive for the six different outcomes.

Regarding the estimation method, for variables i) to iii), given the count nature of these outcomes, we estimate a model in line with the one presented in equation 3 using a Poisson regression.[13] As for the binary variables – iv) to vi) –, we use a linear probability model for computational simplicity.[14]

[13] We also estimate our model by OLS using an inverse hyperbolic sine transformation of the dependent variable – see appendix Table B3.

[14] Using a probit or logit with year-by-stack and municipality-by-stack fixed effects requires introducing over 10,000 dummies. As the stacked difference-in-differences approach also increases our sample size by a factor of the number of stacks, this considerably increases computational time. In appendix Table B4 we run a probit on a less demanding specification where we only include year-by-stack and municipality fixed effects. These regressions suggest that our results are robust to the choice of estimation method.

4. DATA

4.1. Data sources

To carry out our investigation on the relationship between proximity and abortion numbers and conditions, we use administrative data on all women who aborted in Portugal between 2008 and 2016.[15] These data were provided by the DGS (2020) and contain detailed information on women, particularly their socioeconomic characteristics and municipality of residence, which is crucial to measure proximity to an abortion provider. This dataset also allows us to track women throughout important stages of the abortion process, namely the timing at which they request and obtain an abortion, the type of provider they go to, and the abortion method they use. Each observation in our data refers to an abortion. Data on births originate from birth records at Civil Registers, subsequently compiled by Statistics Portugal (2020a). The birth dataset has information on women's municipality of residence, age, and the number of weeks of pregnancy. Together with the abortion data, we have information on the date of abortion or birth, and on the number of weeks of gestation, thus allowing us to estimate when each pregnancy was conceived.

To obtain the location of abortion providers for each year of the analysis, we construct a list of the abortion services operating in Portugal and the bordering regions of Spain – that women living in Portugal may potentially use. This information is provided by the DGS and the Spanish Ministry of Health, respectively, in annual reports on abortion registers (DGS 2010-2017; Sanidad 2009-2018).[16] For Portugal, these reports disclose the number of abortions that

---

[15] Miscarriages or involuntary abortions are not included in the abortion data.

[16] To compute travel time to the nearest Spanish provider we only consider Spanish private clinics as most abortions in Spain occur in the private sector – 91.9% in 2014 (Sanidad 2009-2018). Also, women living in Portugal are unlikely to follow the Spanish National Health System referral path since abortions abroad are not covered by the national health insurance neither in Portugal nor in Spain. For the period under study, the closest Spanish municipalities with a private abortion clinic were always Badajoz, Vigo, Huelva, Leon, Valladolid, or

each provider performed. We only consider a provider to have been in operation if it performed at least five abortions in a given year. Our results are robust to considering other thresholds, namely, having had at least one or ten abortions in a given year – see Tables B5 to B8 (online appendix). Using the name of the hospital or clinic provided in the reports, we identify the coordinates where that abortion facility is based. Because of the 2018 General Data Protection Regulation, the DGS stopped publishing the number of abortions per provider in their annual reports. Since the report of 2017 was only published in 2018, we do not have information on the providers operating from 2017 onwards, and we can only conduct our analysis on the 2008-2016 period.

We also gather data to characterize the socioeconomic and demographic characteristics of municipalities. The data on the yearly number of marriages, population by age and gender, and the regional GDP per capita come from Statistics Portugal (2020b, 2020c, 2020d). In addition, data on the number of people receiving unemployment benefits originate from the Portuguese Employment Office (IEFP 2008-2017).

4.2. Variables

Proximity to the nearest provider is at the core of our analysis and is measured by the travel time to the nearest abortion provider. Not knowing the exact coordinates where women live, we assume that they all live in the populational centroid of their municipality of residence, which is proxied by the coordinates of the town hall. We then compute travel times by car to the coordinates of the nearest abortion provider for each of the 278 municipalities in mainland Portugal between 2008 and 2016.[17] We also calculated the travel time by car between each

Salamanca, meaning that the travel time between each Portuguese municipality and its nearest Spanish municipality with an abortion provider remained constant between 2008 and 2016.

[17] In Portugal, the travel time by car is particularly relevant, especially because according to the 2011 Census (Statistics Portugal 2013), in 262 out of 278 municipalities on the mainland more than 50% of the population

municipality and the closest Spanish municipality with a private abortion clinic – see section A.1 in the online appendix for more information on the data on travel time to Spanish providers. To compute these travel times, we use the Stata user-written GEOROUTE command (Weber and Péclat 2017).[18] As the literature provides evidence on the non-linear effects of travel time to the nearest abortion provider on abortion rates, we either conduct our analysis using a second-order polynomial of travel time or introducing travel time as a categorical variable with three bins, namely, living in a municipality *i*) within 30 minutes of an abortion provider; *ii*) between 30 minutes and one hour, and *iii*) more than one hour away from the nearest abortion provider – see Figure A2 in the online appendix for the distribution of municipalities across time bins.

Each specification has its advantages and drawbacks. Using a second-order polynomial of travel time allows us to thoroughly explore the variation in our variable of interest, with the caveat that this functional form imposes some structure on the data. On the contrary, the categorical specification does not assume any particular functional form on the effects of travel time. However, this only allows us to take advantage of variations across bins of travel time, with the underlying assumption that travel time changes in 30-minute steps. As Lindo et al. (2020) note, this is not realistic. Thus, we see both specifications as complementary, and reassuringly, we show in section 5 that both specifications provide similar results.

When examining how travel time to the nearest provider affects the number of abortions at the municipality-level, we control for the age structure of the population, using the share of all age groups in the population of fertile-age women.[19] We also control for the economic conditions in the municipality of residence. These are proxied by the number of persons receiving

commutes to work or school by car. Moreover, in 2014, 96% of all of the passenger transportation in Portugal was done either by car or bus (Eurostat 2016).

[18] GEOROUTE computes the travel time by car between two coordinates under normal traffic conditions.

[19] Each age group is defined on the basis of a five-year interval.

unemployment benefits as a percentage of the active population in the municipality (aged 15 to 65) and by the GDP per capita growth rate of the NUTS III region. Since our analysis covers a nine-year period, we consider potential changes in social norms within municipalities. As a proxy of the level of conservatism, we control for the number of marriages and catholic marriages per thousand inhabitants in the municipality. Additionally, to estimate the effect of travel time on the abortion ratio, we use the number of pregnancies – by conception year – as the exposure variable of the Poisson Fixed Effects model, which we compute as the number of both abortions and births in a municipality. Regarding the analysis of teenage pregnancies, we use the number of pregnancies – again, by conception year – among women aged between 15 and 19 years of age as the dependent variable and the population of teenage women of that age as the exposure variable.

To examine how proximity affects the conditions under which abortion occurs, we exploit a detailed individual-level dataset of all abortions in Portugal. This allows us to control for several woman-specific characteristics. The control variables we use are women's marital status (five categories), cohabitation status (two categories), occupation (ten categories), municipality of residence, age, educational level (seven categories), nationality (two categories), and number of previous children. Finally, we use the number of weeks of pregnancy at the time of abortion or birth to estimate the conception date of each pregnancy.

4.3. Descriptive statistics

In our set-up, it is essential that travel time varies within municipalities across time for its effect to be identified, as our preferred specifications have municipality-by-stack fixed effects that capture all time-invariant features of municipalities. In Portugal, between 2008 and 2016, travel times from municipalities to their nearest abortion provider varied, as illustrated by Figure 1. These variations in travel time are primarily due to the shutdowns and openings of public abortion providers – that represent the vast majority of abortion providers (online appendix

Figure A3).[20] The most staggering variation occurred in the south of Portugal, where the shutdown of a provider in 2011 – later reversed in 2015 – led to increases by more than one hour in travel time for several municipalities (Figure 1).[21]

Tables C1 and C2 (online appendix) present summary statistics of the variables we use in the municipality-level analysis,[22] while Tables C3 and C4 (online appendix) provide the descriptive statistics of women who abort. It should be noted that, in our analysis of abortion conditions, we exclude outliers, namely, women who abort after age 60 (172 observations) – who should not be fertile anymore. We note that the 60-year-old cutoff is a conservative threshold since we only have one woman between 55 and 60 years old in our data. Regarding the number of previous children, we discard women with more than 15 children (four observations) and women who aborted more than 15 times (five observations). In addition, we drop women with a negative number of completed weeks of pregnancy at the time of access to abortion services. We also exclude observations with missing information on any control variable. Our final sample contains 152,124 abortions for the time period ranging from 2008 to 2016.

As we can see in Table C3 (online appendix), between 2008 and 2016, 84% of abortions occurred among women living within 30 minutes of an abortion provider, 13% among those residing between 30 and 60 minutes, and 3% among women living over one hour away from an abortion provider. Upon arrival at an abortion provider, the average gestational age was 6.58 weeks, while it was 7.32 weeks at the time of the abortion. On average, women waited for 8.25

[20] See also online appendix Figure A4 for a description of the yearly number of shutdowns and openings of abortion providers.

[21] During the period under analysis, Almost 80% of fertile women were living within 30 minutes of a provider, while only 3 to 6% were more than one hour away from one – see online appendix Figure A5.

[22] The size of Portuguese municipalities varies a lot. They range between 1721 square kilometers (Odemira) to eight (São Joao da Pesqueira). The average size is 315 square kilometers. For population statistics see Table D1 (online appendix).

days between their first contact with abortion care and abortion, with 5% of them aborting above nine weeks of gestation. Most abortions occurred in an NHS hospital (69%) and were medically induced (68%). The proportion of abortions referred to private clinics increases from 21% – among women living within 30 minutes of a provider – to 37% – among women living over one hour away. Similarly, the proportion of surgical abortions increases from 31% among women living within 30 minutes of an abortion provider to 44% for those facing travel time over one hour. Finally, 97% of all abortions in the NHS were medically induced, whereas, in the private sector, surgical abortions represented 97%.

5. RESULTS

5.1. Validity of the empirical strategy

Our empirical strategy relies on the assumption that changes in proximity to the nearest abortion provider are as good as random. There are three main threats to identification: reverse causality, omitted variable bias, and residential sorting.

The first threat (reverse causality) is that variations in abortion demand may determine variations in abortion supply. If travel time to the nearest abortion provider has a negative effect on the number of abortions in municipalities, this would generate a downward bias in our estimates. We show, in what follows, that we do not find evidence of such mechanism in our data. If providers reacted to demand, past variations in the abortion rate should predict the opening or closure of a provider. To test for this, we construct a provider region-by-year panel by aggregating the number of abortions occurring within each provider's catchment area, which we define as all municipalities that, at some point in time, were closer to that provider than to any other. We then run event studies to assess how the abortion rate – the number of abortions per 10,000 fertile women – of the catchment area varied before an opening or a closure – see section D and Figures D1 and D2 in the online appendix for a detailed discussion of the event studies. We find no evidence that variations in the abortion rate of catchment areas differ prior to the opening or closure of abortion providers. This suggests that the provision of abortion services does not change in reaction to demand.

The real limitation in providing abortion services is the availability of doctors and nurses since most gynecologists in Portugal are conscientious objectors (Oliveira da Silva 2009). This raises our second concern (omitted variable bias), as changes in norms may simultaneously affect abortion demand and supply. If conscientious objectors choose to work in growingly conservative areas where abortion demand is decreasing, then our estimates of the effect of travel time on the number of abortions will again be downward biased. However, we find no evidence of this in our data. In the event studies that we conduct in section D of the online appendix (Figures D3 and D4), we do not observe any changes in social norms – which we proxy by the number of marriages and catholic marriages per thousand inhabitant – before the closures or openings of abortion providers. Furthermore, to test whether these proxies of social norms are correlated with local abortion rates, we regress the number of abortions in municipalities on municipality fixed effects only. We then extract the residuals and regress them on all the control variables we use in the municipality-level analysis. As evidenced in Table B9, the number of abortions appears to be uncorrelated with our proxies of the local level of conservatism.

The third potential source of bias is residential sorting. If women who believe they will never abort choose to live further away from an abortion center, we will not be able to tell apart the effects of travel time to the nearest abortion provider from those of preferences. However, since most abortion centers are located within hospitals that provide a variety of health care services in addition to abortion, this is highly unlikely. As a matter of fact, women may still have to go to a hospital because of other health conditions even if they exclude that they will ever need an abortion. Also, the 2011 Census shows that from 2005 to 2011, only 8.5% of Portuguese families migrated across Portuguese municipalities (Gomes et al. 2019). Hence, between 2008 and 2016, most Portuguese women resided in the same municipality where they lived in 2007 when abortion was legalized by referendum. It is doubtful that women chose their home location based on the expectation of how far their house would become from a legal abortion provider in case the "Yes" vote would win in the referendum.

Finally, as Lindo et al. (2020), we assume that causal responses of municipalities nearby an abortion provider are identical to those of municipalities that are far from one. In their words: “changes in abortion rates for counties with small changes in access provide a good counterfactual for the changes in abortion rates that would have been observed for counties with larger changes in access if their access had changed similarly” (Lindo et al., 2020:1148).[23]

5.2. Distance to an abortion provider and the number of abortions

We start by examining how travel times to the nearest provider affect the number of abortions at the municipality-level in Table 1. All regressions include municipality-level time-varying controls, year-by-stack, and municipality-by-stack fixed effects. Odd columns model travel time to the nearest provider as a second-order polynomial, while even columns use travel time as a categorical variable. In this case, the reference category is municipalities within 30 minutes of an abortion provider.

In the regressions displayed in columns 1 and 2 in Table 1, the dependent variable is the number of abortions in the municipality, while the exposure variable is the number of fertile women in the municipality. Thus, this is equivalent to estimating the effect of travel time on the abortion rate. In both columns 1 and 2 we find evidence of non-linear effects of travel time on abortion rates. In column 1, the joint test of significance of the linear and quadratic terms of travel time

[23] Therefore we are assuming “strong parallel trends” (Callaway et al. 2021), an assumption, which is not testable since it would require knowing the path of potential outcomes of both control and treated units at each dose.

rejects the null hypothesis that the second-order polynomial equals zero (significant at the 1% level). To better grasp how travel time to the nearest provider affects abortion rates, in panel a) of Figure 2, we plot the effect of a 30-minute increase in travel time at different levels of proximity. We find that such increments in travel time are only important for municipalities that are already far from a provider. Our estimates in column 2 further corroborate this. Municipalities that are over one hour away from an abortion provider experience 22% fewer abortions (significant at the 1% level), suggesting that long travel times to the nearest provider are associated with a reduced probability of abortion.[24] To understand if the decrease in the number of abortions we observe is due to women living far away from a Portuguese provider aborting in Spain – a country for which we have no data on abortions –, we exclude municipalities closer to a Spanish abortion clinic than to a Portuguese one – see online appendix Table B10. The results of this analysis are similar to the ones present in Table 1.

As mentioned above, women may not abort either because they carry their pregnancy to term or because they avoid pregnancy. To test the former possibility, we examine the relationship between travel time and the probability of getting an abortion if pregnant. Again, we regress the number of abortions in the municipality on our measures of travel time. However, instead of using the number of fertile women as the exposure variable of the Fixed Effects Poisson model, we use the number of pregnancies, which is equivalent to estimating the impact of travel time on the abortion to pregnancy ratio. As columns 3 and 4 of Table 1 and panel b) of Figure 2 show, we find evidence of a non-linear association between travel time and the abortion ratio, with municipalities over one hour away from an abortion provider having abortion ratios that are, on average, 23% (3.7 percentage points)[25] lower than in municipalities within half an hour of a provider (statistically significant at least at the 1% level). Finally, we turn to the possibility

[24] Percent effects are computed in the following way: $(e^{\beta} - 1) \times 100$.

[25] Percentage points were computed in the following way: percent effect × average abortion ratio of the reference bin = 23% × 14.2 = 3.7 percentage points.

that women living far from a provider exert more effort to avoid unwanted pregnancies. As we do not know whether a pregnancy is wanted, we restrict our analysis to pregnancies among 15 to 19-year-old teenagers. In principle, pregnancies at this age are unwanted. In columns 5 and 6 of Table 1, we use the number of teenage pregnancies as the dependent variable and the population of women in this age group as the exposure variable. We do not find any evidence that increases in travel time to a provider affect the teenage pregnancy rate. Hence, it does not seem these changes in abortion access affected the number of unwanted pregnancies.

Overall, these results suggest that municipalities located further away from an abortion provider experience fewer abortions because some pregnant women living in those municipalities are unable to abort.

5.3. Proximity and the conditions under which abortion takes place

In the section above, we provided evidence that pregnant women living far away from a provider abort less. In this section, we will examine if proximity also affects the conditions under which abortion takes place.

We first analyze the timing of abortion. It arguably depends both on when women request an abortion and on the waiting time to get it. In columns 1 and 2 of Table 2, we estimate equation (2) for the number of weeks pregnant at the time of the first contact with abortion care. In both our specifications in columns 1, 2 and in panel a) of Figure 3, we find that women living over one hour away from the nearest provider arrive later to abortion services than women living within 30 minutes of a provider (statistically significant at the 1% level). Moreover, these women experience longer waiting periods between the first contact with abortion care and abortion (columns 5 and 6). Overall, the combined effect of travel time on both later arrivals to abortion care and waiting days leads women living over one hour away from a provider to abort almost four days later than the reference group (columns 3 and 4).[26]

In columns 7, 8, and panel d) of Figure 2, we analyze how travel time affects the probability of having an abortion beyond nine weeks of pregnancy – which we refer to as late abortions. Again, in both specifications, increases in travel time lead to increases in the probability of aborting later. We estimate that relative to living within 30 minutes away from a provider, women living between 30 minutes and one hour away have a 140%[27] higher probability of aborting after nine weeks of gestation, while women living over one hour away have a 157% higher likelihood of late abortion. Both estimates are significant at the 1% level.

With only ten weeks to abort legally, the delays we observe can explain why regions with low access to abortion have lower abortion ratios – women may be requesting abortions too late to be eligible to abort and, consequently, carry their pregnancies to term. These delays can also have repercussions at other stages of the abortion process, namely, where and how abortions occur. Public hospitals attending women near the legal gestational age limit may encounter difficulties providing abortion in due time. We find evidence of this in columns 9 and 10, where we consider the probability of being referred to a private clinic by the NHS when one wants to abort. This probability increases with the travel time to an abortion provider, whatever the specification we use, as panel e) of Figure 2 illustrates.

As mentioned before, private clinics almost exclusively perform surgical abortions. The increased likelihood of referral by the NHS to private clinics, together with the higher probability of aborting after nine weeks of pregnancy, can arguably lead women who live further away from a provider to be more prone to surgical abortion. Our findings are consistent

---

[26] The number of days is computed as follows: $(e^{\beta} - 1)$ × average number of weeks at the time of abortion among women residing within 30 min of a provider × 7 = 0.0731 × 7.42 × 7 = 3.74 days.
[27] This percentage is computed as follows: (point estimate × 100)/(% Late abortion among women residing within 30 min of a provider) = (0.0699 × 100)/5 = 140%

with this mechanism. The regression in column 11 and its respective graph of the marginal effects of travel time – panel f) of Figure 3 – shows that, for women living 30 minutes away from a provider, adding 30 minutes more of travel time would increase their likelihood of having a surgical abortion by 10 percentage points. For women living over 90 minutes away from an abortion service, that same increment in travel time yields a 38 percentage point increase in the probability of aborting through surgery – i.e., a 119% increase. Both these effects are significant at the 1% level. When modeling travel time as a categorical variable, we find that living over one hour away from a provider is associated with a 179% increase in the probability of having a surgical abortion.

These findings suggest that living far away from a provider makes it more difficult to obtain an abortion and may even prevent pregnant women from aborting. It takes more time for them to reach an abortion provider, making them more likely to have a late abortion. In a setting where abortions are only legal until ten weeks of pregnancy, these delays may impede women from accessing aborting services in due time. Moreover, aborting late leads women to be referred by the NHS to private clinics and eventually have a surgical rather than a less invasive medical abortion.

One potential concern about these results is selection. Specifically, one may worry that women who no longer abort because they became too far from a provider would have different abortion conditions than those who still abort. However, if selection is the mechanism driving our results, we should observe a change in the share of late or surgical abortions but no positive effect on the overall number of late and surgical abortions. To check for this, in line with Kelly (2020), we regress the number of abortions in each municipality according to referral type, gestational age, and method on our measures of travel time to an abortion provider. Our findings are coherent with an increase in late and surgical abortions in municipalities in response to longer travel times– see Table B11 (online appendix). This suggests that the effect of proximity on abortion conditions is not an artifact of selection but that hindered access directly affects when, where, and how women abort.

6. DISCUSSION

6.1. Comparing findings with existing literature

In this paper, we provide evidence that proximity to abortion services is an important dimension of abortion access that affects the ability to abort and the conditions under which abortions occur. Papers exploiting decreases in abortion access in the USA (Quast et al. 2017, Fischer et al. 2018, Lindo et al. 2020, Venator and Fletcher 2021) also find that the abortion rate of counties decreases in response to longer distances to the nearest abortion provider. However, while all the previous papers find that the magnitude of this effect fades away the farther counties are from a provider, we see the opposite – the impact is even greater when municipalities are already far. Of course, our results are not directly comparable. The U.S. literature examines much larger geographical areas than us – Texas (Fischer et al. 2018, Lindo et al. 2020), Wisconsin (Venator and Fletcher 2021), and the USA. as a whole (Myers 2021). For example, in 2014 in Texas, 23% of counties were more than 320 kilometers away from a provider (Quast et al. 2017), almost twice the maximum distance between any municipality in Portugal and its nearest abortion provider (175 kilometers). Thus, we might be only capturing the effects of travel time among municipalities that, in the Texas case, would be relatively close to a provider. Also, before 2022, women in the US could abort later than in Portugal, where abortion is only legal up to ten weeks of gestation. Regarding the magnitude of our effects, we use Lindo et al. (2020) as a reference point since they also measure access based on the travel time by car to the nearest provider. They find that counties over one hour away from a provider experience 17% fewer abortions than counties within one hour of one, which is in line with our findings.

We cannot exclude that the effects of travel time in the USA are even larger than ours. This is due to their use of TWFE regressions to estimate the impact of distance on abortion rates. As they allow for “forbidden comparisons”, this may lead to a negative weighting of some of the estimated causal responses, possibly attenuating the estimated effects of distance on abortion rates. In that regard, only Myers (2021) deals with this problem by estimating a regression with leads and lags of distance to an abortion provider, which is equivalent to running an event study. She argues that she finds no evidence of dynamic effects that can plague TWFE estimators. Yet, Sun and Abraham (2021) show that the coefficients of leads and lags of event studies estimated by TWFE regressions may also be biased when treatment timing varies across units.

Regarding abortion conditions, only Lindo et al. (2020) examine abortion timings. They find that longer distances decrease the number of abortions below seven weeks, between 7 and 12 weeks, and over 12 weeks of gestation, which is coherent with their finding that distance to a provider decreases abortion rates. However, these results do not allow them to conclude whether distance generates delays in getting an abortion since all abortion rates across gestational age categories decrease. It also means that we cannot compare these results with our findings.

Even if the effects in Portugal and the USA do not align perfectly, one should consider the vastly different institutional settings. In particular, Portugal has a universal healthcare system where abortions are available free of charge; thus, the major obstacle to aborting is reaching an abortion provider in due time.

6.2. Medical vs. Surgical abortion costs: back of the envelope calculation

We now discuss how our results may contribute to assess the efficiency of the current organization and financing of abortion care in Portugal.

Our findings suggest that women who live further away from a provider are more likely to abort late, be referred by the NHS to a private clinic, and have a surgical abortion. As mentioned in section 2, the NHS can outsource abortions to private clinics. Surgical abortions are more costly to provide and are reimbursed at a higher rate than medical abortions. As living further away from a provider increases the risk of having a surgical abortion, it is interesting to estimate how much the NHS would spend on abortion procedures in a hypothetical scenario where no woman would be more than 30 minutes away from an abortion service, as compared to what it currently spends.

Bringing women closer to an abortion provider would have increased the number of abortions in Portugal. According to our estimates, in that scenario, municipalities over one hour away from a provider would have had 7.8% more abortions between 2008 and 2016, i.e. 1156 additional abortions. Thus, the total number of abortions would have been 153,280 instead of 152,124. As 92% of women access abortion care through the public services, this would have resulted in 141,017 women accessing abortion through the NHS, instead of 140,207.

In parallel, bringing women closer to abortion providers would reduce the risk of aborting surgically among women who access abortion care through the NHS. As shown in Table D3 (online appendix), 26% of women who accessed public abortion services and lived within 30 minutes of a provider had a surgical abortion. Transporting this proportion to our hypothetical scenario, there would have been a total of 36,664 surgical abortions instead of 38,603 (respectively, 104,353 medical abortions instead of 102,265). Therefore, in our scenario, the NHS would have paid for 1,938 fewer surgical abortions and 2,088 more medical abortions.

Assuming an average cost of 400 euros per surgical procedure and 300 euros per medical abortion,[28] this would have translated into a reduction in abortion spending by 148,962 euros over nine years.

If expanding abortion services required building new facilities or recruiting professionals in the NHS, the costs of making all women within 30 minutes of a provider likely exceeded the potential savings. The 148,962 euros saved on abortion costs indeed do not even allow employing one more entry-level general practitioner (GP) over four years.[29] Nevertheless, to promote equitable access to abortion, the NHS could take advantage of its already existing primary care network since, according to the WHO, medical abortions are not demanding in terms of expertise or equipment and can be provided by nurses and GPs (WHO 2012). In fact, this solution has already been implemented in three health care centers in Portugal.[30]

7. CONCLUSION

This paper shows that proximity to an abortion provider is likely to affect whether or not women are able to get an abortion in due time. We show that Portuguese municipalities that are more than one hour away from the nearest provider have 22% fewer abortions than municipalities located within 30 minutes.

We also document that proximity affects the conditions under which abortions occur. We show that women living further away from a provider abort later in their pregnancies and that this delay is primarily caused by their later arrivals at abortion services, possibly due to ignorance

[28] Between 2008 and 2016 the reimbursement rates of surgical abortions ranged from 368 to 444 euros, while medical abortions were reimbursed at a rate ranging from 283 to 368 euros (Portaria n.8781-A/200; Portaria n.163/2013; Portaria n.20/2014; Portaria n.234/2015).

[29] As of 2012, entry-level specialized doctors in the public sector earn a gross annual income of 38,447.36 euros (Acordo Coletivo de Trabalho n.5/2012).

[30] In the health care centers of Amarante, Penafiel, and Viana do Castelo.

of how to access them. Late abortions make it difficult for public hospitals to provide abortions within the legal gestational age limit of 10 weeks, forcing them to outsource abortions to private clinics, where 97% of abortions are surgical. This likely explains why women living further away from providers are more likely to be referred to private clinics and have a surgical abortion.

Finally, a back-of-the-envelope calculation indicates that the NHS can only expect limited savings on abortion spending from providing proximity abortion care to all women in Portugal. However, this would enable more women to access abortion care within the legal gestational limit while allowing those who abort to escape invasive surgical abortions, thereby improving their health-related welfare.

Recently, the COVID-19 pandemic has disrupted healthcare provision globally, and abortion care was no exception. This led some countries to relax abortion legislation – such as gestational age limits, mandatory reflection periods, or even enabling women to abort from home – while others did not or even made abortion more difficult to access (Moreau et al., 2020). This natural experiment will provide a valuable opportunity to investigate how varying access to abortion impacts abortion decisions and conditions in the context of deprived access to healthcare facilities.

REFERENCES

Abouk, R., Courtemanche, C., Dave, D., Feng, B., Friedman, A. S., Maclean, J. C., Pesko, M, F., Sabia, J, J., & Safford, S. (2023). Intended and unintended effects of e-cigarette taxes on youth tobacco use. *Journal of Health Economics*, 87, 102720. https://doi.org/10.1016/j.jhealeco.2022.102720

Baker, A. C., Larcker, D. F., & Wang, C. C. (2022). How much should we trust staggered difference-in-differences estimates?. *Journal of Financial Economics*, 144, 370-395. https://doi.org/10.1016/j.jfineco.2022.01.004

Bitler, M., & Zavodny, M. (2001). The effect of abortion restrictions on the timing of abortions. *Journal of Health Economics*, *20*, 1011-1032. https://doi.org/10.1016/S0167-6296(01)00106-0

Brooks, N., Zohar, T. (2021). *Out of labor and into the labor force? The Role of abortion access, social stigma, and financial constraints*. (CEMFI Working Paper No. 2111). Madrid, Spain: Centro De Estudios Monetarios Y Financieros.

Borusyak, K. & Jaravel, X. (2017). Revisiting event study designs. Working paper.

Callaway, B., Goodman-Bacon, A., & Sant'Anna, P. H. (2021). Difference-in-differences with a continuous treatment. arXiv preprint arXiv:2107.02637. https://doi.org/10.48550/arXiv.2107.02637

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: methods and applications*. New York, NY: Cambridge University Press

Cates, W., Schulz, K. F., Grimes, D. A., & Tyler, C. W. (1977). 1. The effect of delay and method choice on the risk of abortion morbidity. *Family Planning Perspectives*, *9*(6), 266-273. https://doi.org/10.2307/2134347

Cengiz, D., Dube, A., Lindner, A., & Zipperer, B. (2019). The effect of minimum wages on low-wage jobs. *Quarterly Journal of Economics*, 134, 1405-1454. https://doi.org/10.1093/qje/qjz014

Clarke, D., & Mühlrad, H. (2021). Abortion laws and women's health. *Journal of Health Economics*, *76*, 102413. https://doi.org/10.1016/j.jhealeco.2020.102413

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. https://doi.org/10.1016/S0167-6296(98)00048-4

de Chaisemartin, C., & D'Haultfoeuille, X. (2020). Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review*, *110*(9), 2964-2996. https://doi.org/10.1257/aer.20181169

de Chaisemartin, C., & D'Haultfoeuille, X. (2022a). *Difference-in-differences estimators of intertemporal treatment effects* (NBER Working Paper No. 29873). Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w29873

de Chaisemartin, C., & D'Haultfœuille, X. (2022b). Two-Way Fixed Effects and Differences-in-Differences with Heterogeneous Treatment Effects: A Survey. *Econometrics Journal*. https://doi.org/10.1093/ectj/utac017

de Chaisemartin, C., D'Haultfoeuille, X., Pasquier, F., & Vazquez-Bare, G. (2022). Difference-in-Differences estimators for treatments continuously distributed at every period. arXiv preprint arXiv:2201.06898. https://doi.org/10.48550/arXiv.2201.06898

Direção-Geral da Saúde (DGS). (2007a). *Interrupução da gravidez por opção da mulher: guia informativo* (Clinical practice guideline). Lisbon, Portugal: Ministério da Saude, Direção-Geral da Saúde. Retrieved from https://www.dgs.pt/areas-em-destaque/interrupcao-da-gravidez/formularios-e-documentos-normalizados/interrupcao-da-gravidez-por-opcao-da-mulher-guia-informativo-pdf.aspx

DGS. (2007b). *Circular normativa: Interrupção medicamentosa da gravidez* (Clinical practice guideline). Lisbon, Portugal: Ministério da Saude, Direção-Geral da Saúde. Retrieved from https://www.spdc.pt/files/legix/11268_3.pdf

DGS. (2007c). *Circular normativa: Interrupção cirúrgica da gravidez até às 10 semanas de gestação* (Clinical practice guideline). Lisbon, Portugal: Ministério da Saude, Direção-Geral da Saúde. Retrieved from https://www.spdc.pt/files/legix/11269_3.pdf

DGS. (2010-2017). *Relatório dos registos das interrupções da gravidez* (2008 to 2016 Annual Reports). Lisbon, Portugal: Ministério da Saude, Direção-Geral da Saúde. Retrieved from https://www.spdc.pt/documentacao/publicacoes

DGS. (2020). *Registos das interrupções da gravidez, 2008-2016* [Data set]. Lisbon, Portugal: Ministério da Saude, Direção-Geral da Saúde.

Eurostat. (2016). *Key figures on Europe: 2016 edition*. Luxembourg: Publications Office of the European Union. https://doi.org/10.2785/81608

Fischer, S., Royer, H., & White, C. (2018). The impacts of reduced access to abortion and family planning services on abortions, births, and contraceptive purchases. *Journal of Public Economics*, *167*, 43-68. https://doi.org/10.1016/j.jpubeco.2018.08.009

Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, *225*, 254-277. https://doi.org/10.1016/j.jeconom.2021.03.014

Gomes, M. C. S., Freitas, A., & Pinto, M. L. R. (2019). Famílias e mobilidade interna. *Análise social*, *54*(230 (1)), 82-105. https://doi.org/10.31447/as00032573.2019230.04

Grimes, D. A., Benson, J., Singh, S., Romero, M., Ganatra, B., Okonofua, F. E., & Shah, I. H. (2006). Unsafe abortion: the preventable pandemic. *The lancet*, *368*, 1908-1919. https://doi.org/10.1016/S0140-6736(06)69481-6

Guimaraes, P. (2008). The fixed effects negative binomial model revisited. *Economics Letters*, 99, 63-66. https://doi.org/10.1016/j.econlet.2007.05.030

Harris, L. H. (2008). Second trimester abortion provision: breaking the silence and changing the discourse. *Reproductive health matters*, *16*(31), 74-81. https://doi.org/10.1016/S0968-8080(08)31396-2

Instituto do Emprego e Formação Profissional, IP (IEFP). (2008-2017). *Estatísticas Mensais por Concelhos* (2008 to 2016 Monthly Reports). Lisbon, Portugal: IEFP. Retrieved from https://www.iefp.pt/estatisticas

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*, 263-282. https://doi.org/10.1002/pam.2025

Kane, T. J., & Staiger, D. (1996). Teen motherhood and abortion access. *Quarterly Journal of Economics*, *111*, 467-506. https://doi.org/10.2307/2946685

Kelly, A. M. (2020). *When Capacity Constraints Bind: Evidence from Reproductive Health Clinic Closures.*

Kimport, K. (2022). Reducing the burdens of forced abortion travel: Referrals, financial and emotional support, and opportunities for positive experiences in traveling for third-trimester abortion care. *Social Science & Medicine*, 293, 114667. https://doi.org/10.1016/j.socscimed.2021.114667

Levine, P. B., & Staiger, D. O. (2002). *Abortion as insurance* (NBER Working Paper No. 8813). Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w8813

Lindo, J. M., & Pineda-Torres, M. (2021). New evidence on the effects of mandatory waiting periods for abortion. *Journal of Health Economics*, 80, 102533. https://doi.org/10.1016/j.jhealeco.2021.102533

Lindo, J. M., Myers, C. K., Schlosser, A., & Cunningham, S. (2020). How far is too far? New evidence on abortion clinic closures, access, and abortions. *Journal of Human Resources*, *55*, 1137-1160. https://doi.org/10.3368/jhr.55.4.1217-9254R3

Mathur, N. K., & Ruhm, C. J. (2023). Marijuana legalization and opioid deaths. *Journal of Health Economics*, 102728. https://doi.org/10.1016/j.jhealeco.2023.102728

Miller, S., Wherry, L. R., & Foster, D. G. (2023). The economic consequences of being denied an abortion. *American Economic Journal: Economic Policy*, 15, 394-437. https://doi.org/10.1257/pol.20210159

Ministerio da Administração Interna (MAI). (2020) *Eleições e Referendos* [Data sets]. Retrieved from https://www.sg.mai.gov.pt/AdministracaoEleitoral/EleicoesReferendos

Moreau, C., Shankar, M., Glasier, A., Cameron, S., & Gemzell-Danielsson, K. (2020). Abortion regulation in Europe in the era of COVID-19: a spectrum of policy responses. *BMJ Sexual & Reproductive Health*. https://doi.org/10.1136/bmjsrh-2020-200724

Myers, C. (2021). *Measuring the burden: the effect of travel distance on abortions and births*. (IZA DP No. 14556). Bonn, Germany: IZA - Institute of Labor Economics.

Oliveira da Silva, M. (2009) Reflections on the legalisation of abortion in Portugal. *The European Journal of Contraception & Reproductive Health Care, 14*, 245-248. https://doi.org/10.1080/13625180903053740

Papke, L. E., & Wooldridge, J. M. (2008). Panel data methods for fractional response variables with an application to test pass rates. *Journal of Econometrics*, 145, 121-133. https://doi.org/10.1016/j.jeconom.2008.05.009

Popinchalk, A., & Sedgh, G. (2019). Trends in the method and gestational age of abortion in high-income countries. *BMJ Sexual & Reproductive Health, 45*, 95-103. http://doi.org/10.1136/bmjsrh-2018-200149

Quast, T., Gonzalez, F., & Ziemba, R. (2017). Abortion Facility Closings and Abortion Rates in Texas. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 54*. https://doi.org/10.1177/0046958017700944

Roth, J., Sant'Anna, P. H., Bilinski, A., & Poe, J. (2023). What's trending in difference-in-differences? A synthesis of the recent econometrics literature. *Journal of Econometrics*, 235, 2218-2244. https://doi.org/10.1016/j.jeconom.2023.03.008

Sanidad. (2009-2018). *Interrupción Voluntaria del Embarazo* (2008 to 2016 Annual Reports). Madrid, Spain: Ministerio de Sanidad. Retrieved from https://www.mscbs.gob.es/profesionales/saludPublica/prevPromocion/embarazo/home.htm

Simões J., Augusto G.F., Fronteira I., Hernández-Quevedo C. (2017). Portugal: Health system review. *Health Systems in Transition* 19:1-184.

Statistics Portugal. (2013). *Recenseamento da população e habitação - Censos 2011*. Lisbon, Portugal: Statistics Portugal. Retrieved from https://smi.ine.pt/Indicador/Detalhes/9894

Statistics Portugal. (2020a). *Nados-vivos, 2008-2016* (Série de Microdados 5.4) [Data set]. Lisbon, Portugal: Instituto Nacional de Estatística, IP.

Statistics Portugal. (2020b). *Casamentos, 2008-2016* [Data set]. Lisbon, Portugal: Statistics Portugal. Retrieved from https://smi.ine.pt/DocumentacaoMetodologica/Detalhes/1090

Statistics Portugal. (2020c). *Estimativas anuais da população residente, 2008-2016* [Data set]. Lisbon, Portugal: Statistics Portugal. Retrieved from https://smi.ine.pt/DocumentacaoMetodologica/Detalhes/1074

Statistics Portugal. (2020d). *Contas económicas regionais, 2008-2016* [Data set]. Lisbon, Portugal: Statistics Portugal. Retrieved from https://smi.ine.pt/Indicador/Detalhes/13115

Sun, L., and Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, 225(2), 175-199. https://doi.org/10.1016/j.jeconom.2020.09.006

Venator, J. and Fletcher, J. (2021), Undue Burden Beyond Texas: An Analysis of Abortion Clinic Closures, Births, and Abortions in Wisconsin. *Journal of Policy Analysis and Management*, *40*, 774-813. https://doi.org/10.1002/pam.22263

Vicente, L. F. (2020). Aborto por opção da mulher: a experiência portuguesa da implementação da Rede Nacional. *Cadernos de Saúde Pública*, *36,* e00036219. https://doi.org/10.1590/0102-311X00036219.

Weber, S., & Péclat, M. (2017). A Simple Command to Calculate Travel Distance and Travel Time. *The Stata Journal*, *17,* 962–971. https://doi.org/10.1177/1536867X1801700411

Winikoff, B., Dzuba, I. G., Creinin, M. D., Crowden, W. A., Goldberg, A. B., Gonzales, J., Howe, M., Moskowitz, J., Prine, L. & Shannon, C. S. (2008). Two distinct oral routes of misoprostol in mifepristone medical abortion: a randomized controlled trial. *Obstetrics & Gynecology*, *112*, 1303-1310. https://doi.org/10.1097/AOG.0b013e31818d8eb4

Wooldridge, J. M. (1999). Distribution-free estimation of some nonlinear panel data models. *Journal of Econometrics*, 90, 77-97. https://doi.org/10.1016/S0304-4076(98)00033-5

Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data. MIT press.

World Health Organization (WHO). (2004). *Reproductive health strategy to accelerate progress towards the attainment of international development goals and targets*. Geneva, Switzerland: World Health Organization. Retrieved from https://apps.who.int/iris/handle/10665/68754

World Health Organization (WHO). (2012). *Safe abortion: technical and policy guidance for health systems* (2nd ed.). Geneva, Switzerland: World Health Organization. Retrieved from https://apps.who.int/iris/handle/10665/70914

Figure 1 Provision of abortion across municipalities and travel time to the nearest abortion provider

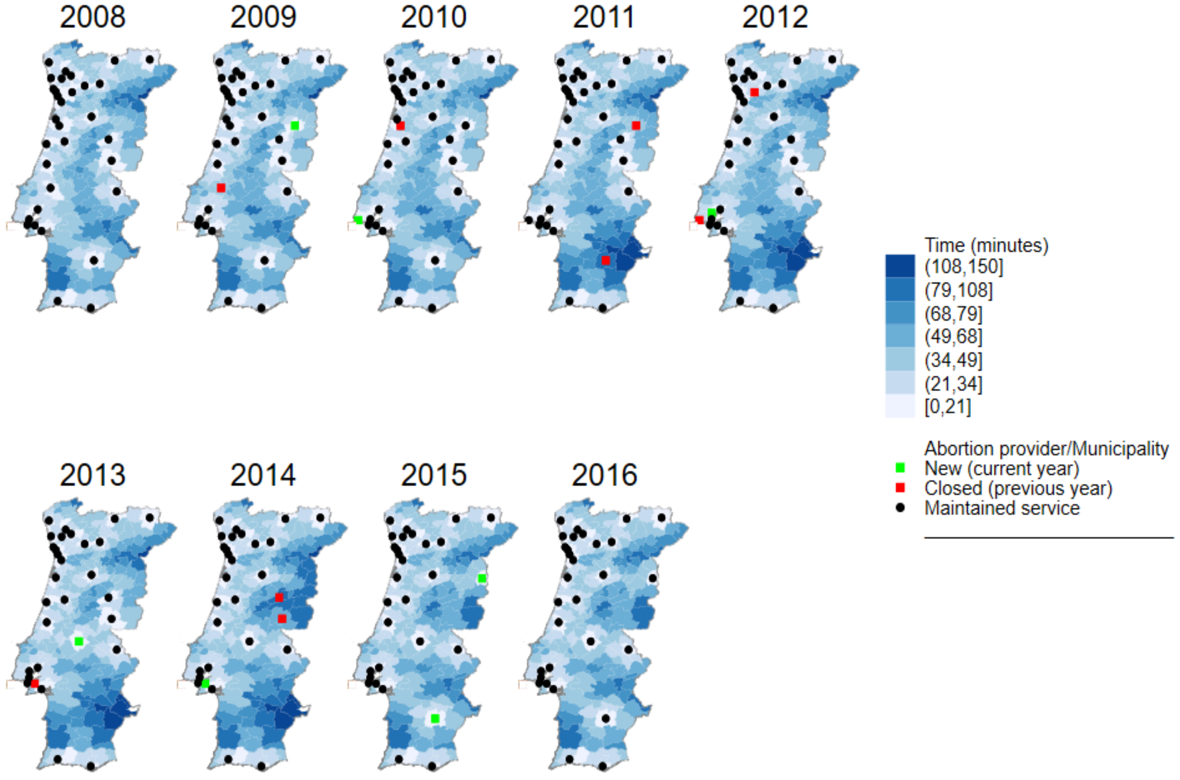
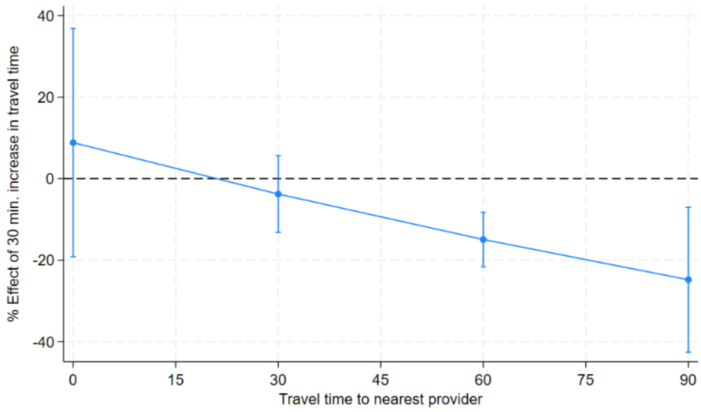
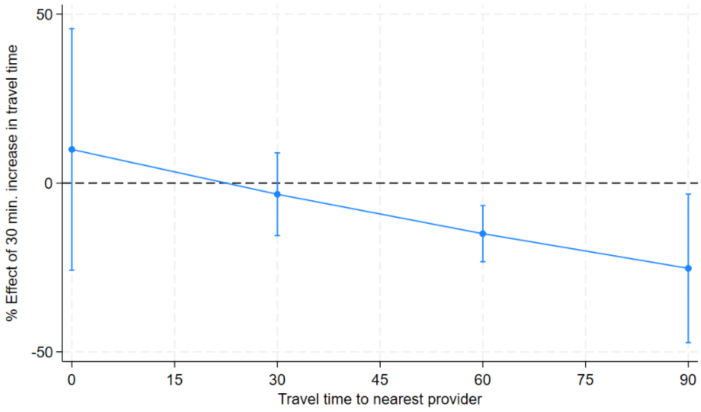


Figure 2 Non-linear effects of travel time to the nearest provider on abortions

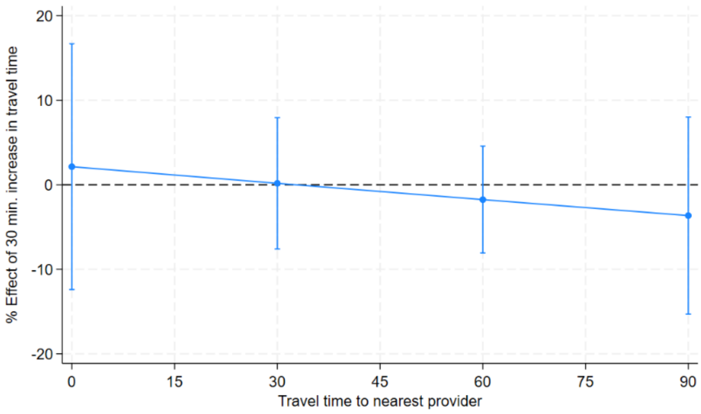
a) Abortion rate among fertile women



b) Abortion to pregnancy ratio



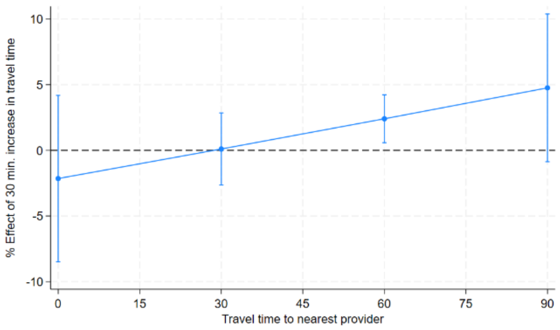
c) Teenage pregnancy rates



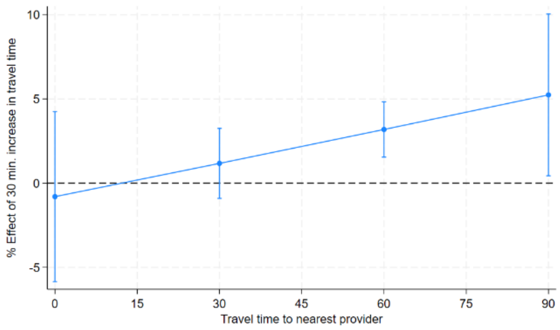
Notes: Each dot represents the effect of an additional 30 minute increase in travel time from different starting points between 0 and 90 minutes of travel time and the respective 95% confidence interval. Graphs in panels a), b), and c) refer to the regressions in columns 1, 3 and 5 of Table 1, respectively.

Figure 3 Non-linear effects of travel time to the nearest provider on abortion conditions

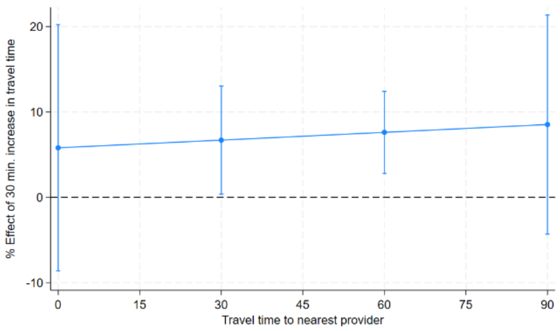
a) Weeks pregnant at first contact



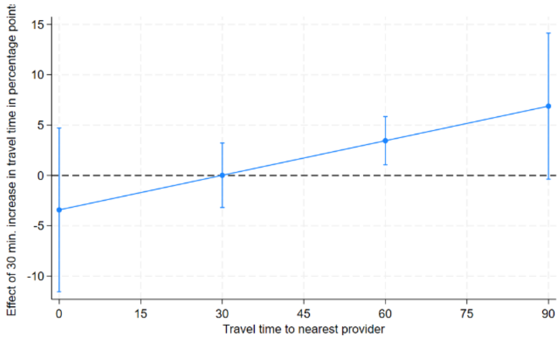
b) Weeks pregnant at intervention



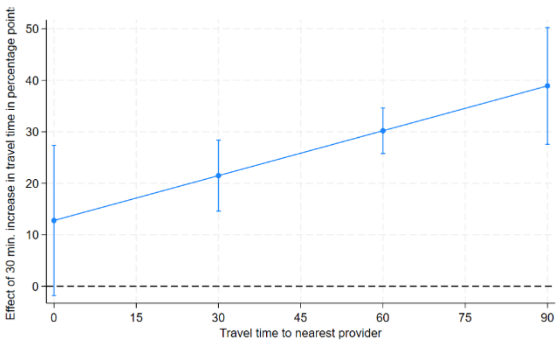
c) Waiting days



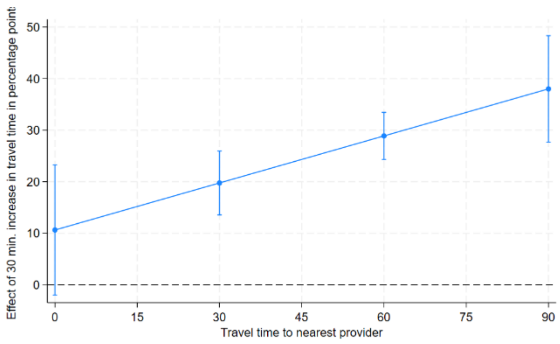
d) Late abortion



e) Referral to NHS



f) Surgical abortion



Notes: Each dot represents the effect of an additional 30 minute increase in travel time from different starting points between 0 and 90 minutes of travel time and the respective 95% confidence interval. Graphs in panels a), b), c), d), e), and f) refer to the regressions in columns 1, 3, 5, 7, 9, and 11 of Table 2, respectively.

Table 1 Abortions and access to abortion

	Abortion rate among fertile women		Abortion to pregnancy ratio		Teen pregnancy rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Travel time (10 min.)						
Linear travel time	0.0531		0.0488		0.0103	
	(0.0726)		(0.0575)		(0.0304)	
Quadratic travel time	-0.0007		-0.0007		-0.0001	
	(0.0006)		(0.0005)		(0.0002)	
P-value of joint test	0.00		0.00		0.83	
Bins of travel time (Ref: within 30min.)						
30 to 60min.		0.0981		0.0306		0.0137
		(0.0980)		(0.0848)		(0.0857)
Over 60min.		-0.2490***		-0.2644***		0.0449
		(0.0865)		(0.0887)		(0.0820)
Dep. Var.	Abortions		Abortions		Teen pregnancies	
Exposure Var.	Fertile women		Pregnancies		Teenage women	
Observations	51,304	51,304	51,304	51,304	51,304	51,304
Municipalities	246	246	246	246	245	245
Stacks	68	68	68	68	68	68

Notes: All regressions were estimated by Poisson quasi-maximum likelihood. All regressions have year-by-stack and municipality-by-stack fixed effects and control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table 2 Conditions under which abortion occurs and abortion access

	Number of weeks pregnant				No. of waiting days		Having abortion over 9 weeks		NHS referral to private clinic		Having surgical abortion	
	First contact with services		Abortion intervention				Yes		Yes		Yes	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Travel time (10 min.)												
Linear travel time	-0.0110		-0.0060		0.0174		-0.0171		0.0280		0.0203	
	(0.0143)		(0.0113)		(0.0301)		(0.0181)		(0.0317)		(0.0273)	
Quadratic travel time	0.0001		0.0001		0.0001		0.0002		0.0004**		0.0005**	
	(0.0001)		(0.0001)		(0.0002)		(0.0001)		(0.0002)		(0.0002)	
P-value of joint test	0.01		0.00		0.00		0.00		0.00		0.00	
Bins of travel time (Ref: within 30min.)												
30 to 60min.		0.0362***		0.0378***		0.0327		0.0699**		0.0943		0.0781
		(0.0117)		(0.0112)		(0.0599)		(0.0303)		(0.1032)		(0.0970)
Over 60min.		0.0616***		0.0705***		0.1267		0.0784***		0.5893***		0.5557***
		(0.0117)		(0.0130)		(0.0949)		(0.0211)		(0.1688)		(0.1626)
Observations	2706035	2706035	2706035	2706035	2706035	2706035	2706035	2706035	2569113	2569113	2706035	2706035
Municipalities	246	246	246	246	246	246	246	246	246	246	246	246
Stacks	68	68	68	68	68	68	68	68	68	68	68	68

Notes: Regressions in columns 1 to 6 were estimated by Poisson quasi-maximum likelihood while regression in columns 7 to 12 were estimated by OLS. All regressions include year of age, occupation, education, number of children, nationality, cohabitation, year-by-stack and municipality-by-stack fixed effects. All regressions also control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages, and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

ONLINE APPENDIX

A Descriptive statistics: figures

Figure A1 Number of municipalities with zero abortions

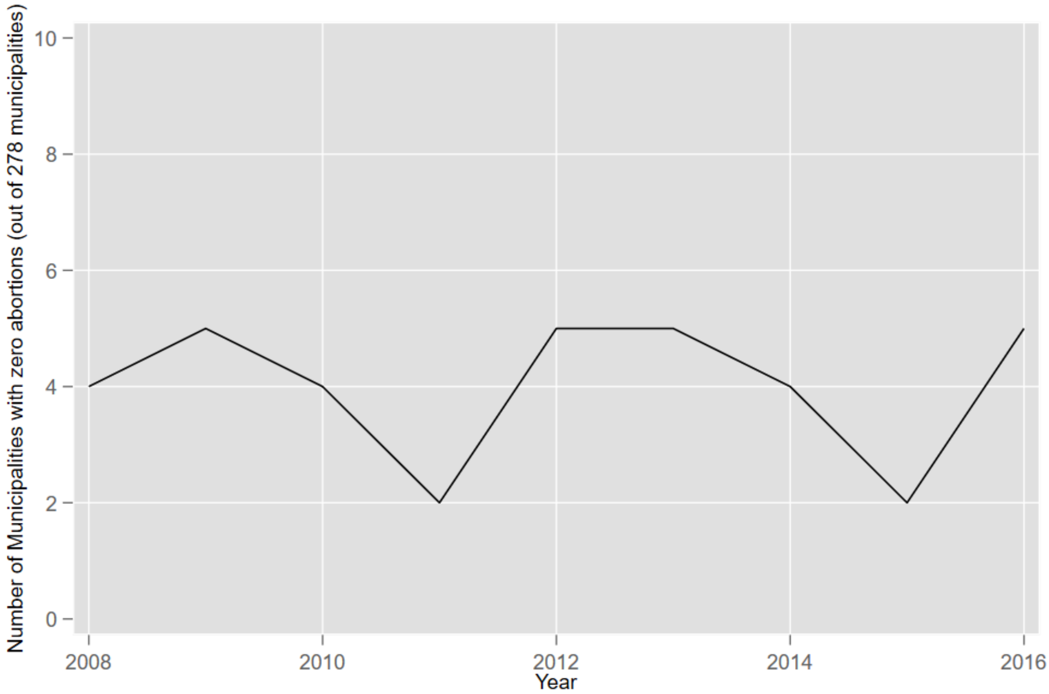


Figure A2 Number of municipalities per travel time bin

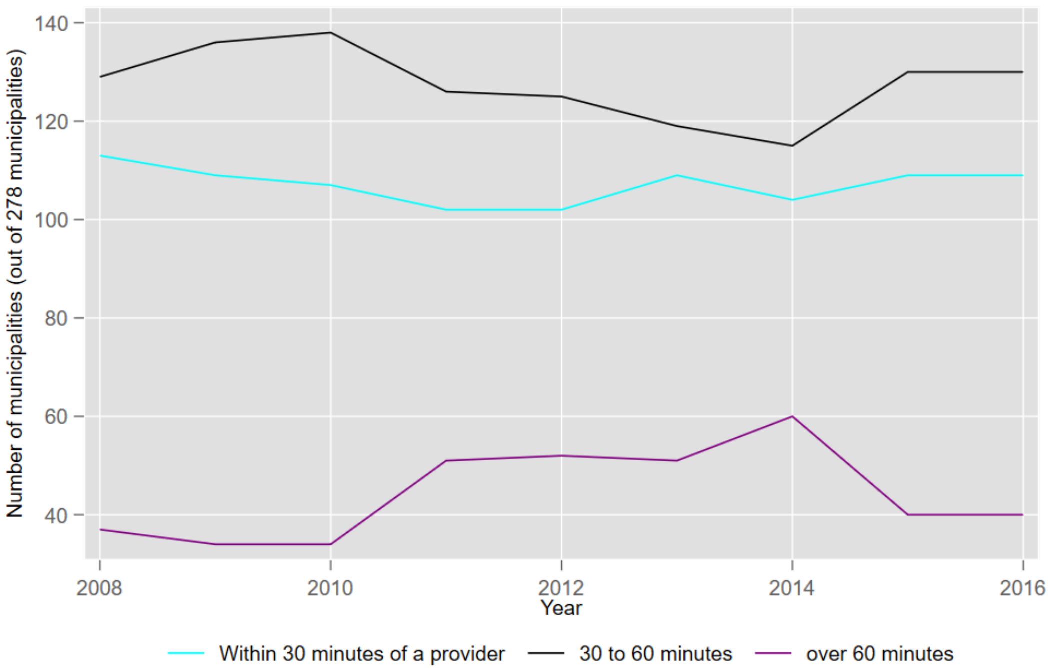


Figure A3 Number of providers by type of abortion provider

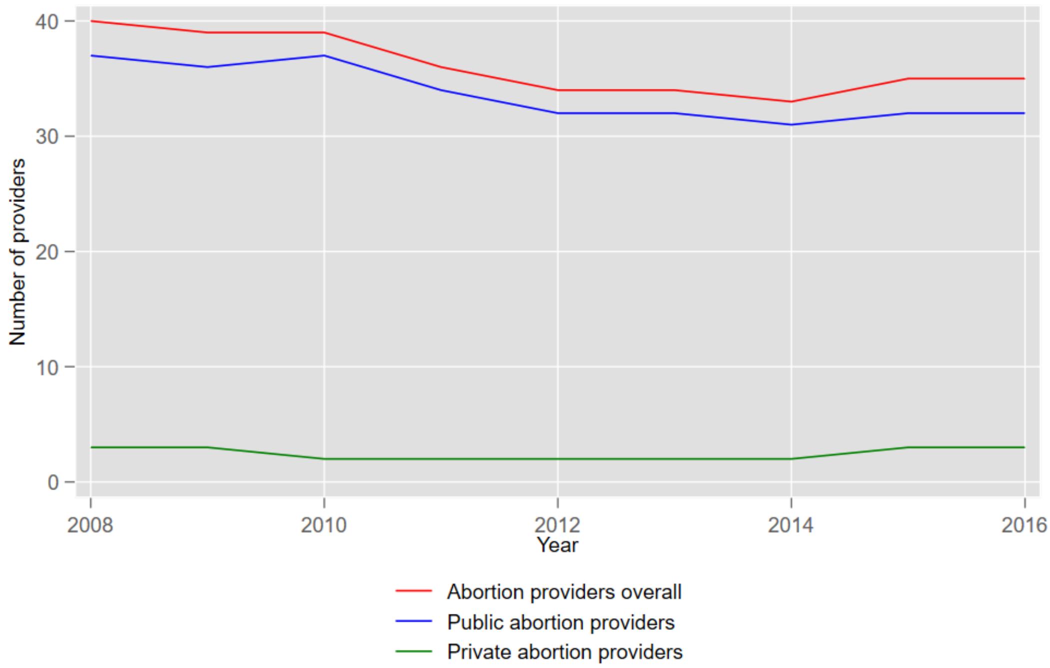


Figure A4 Number of providers' openings and closures

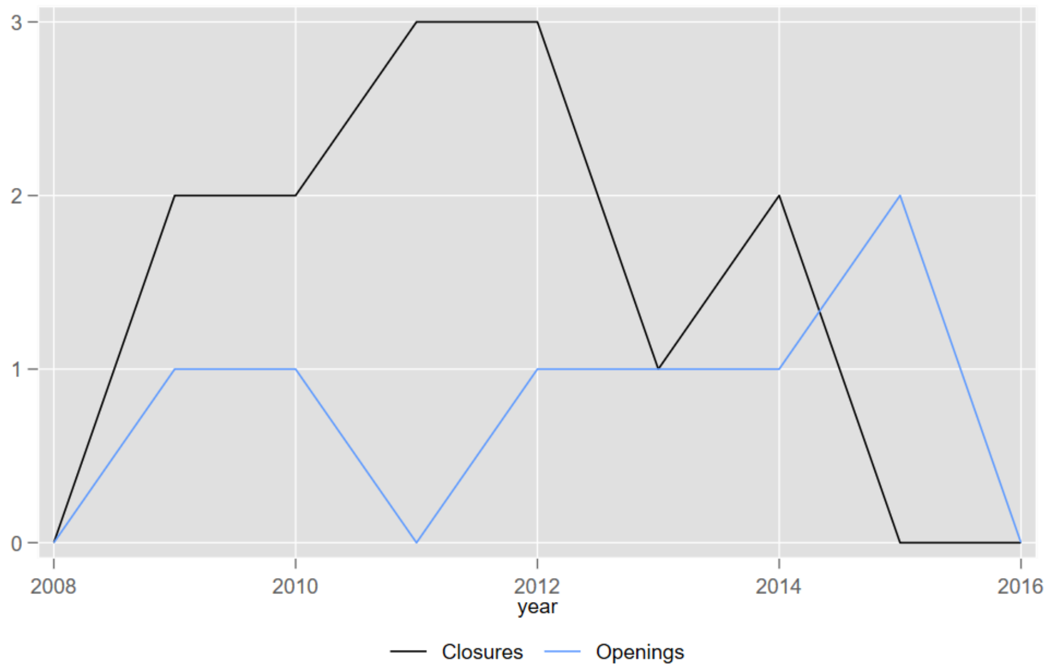
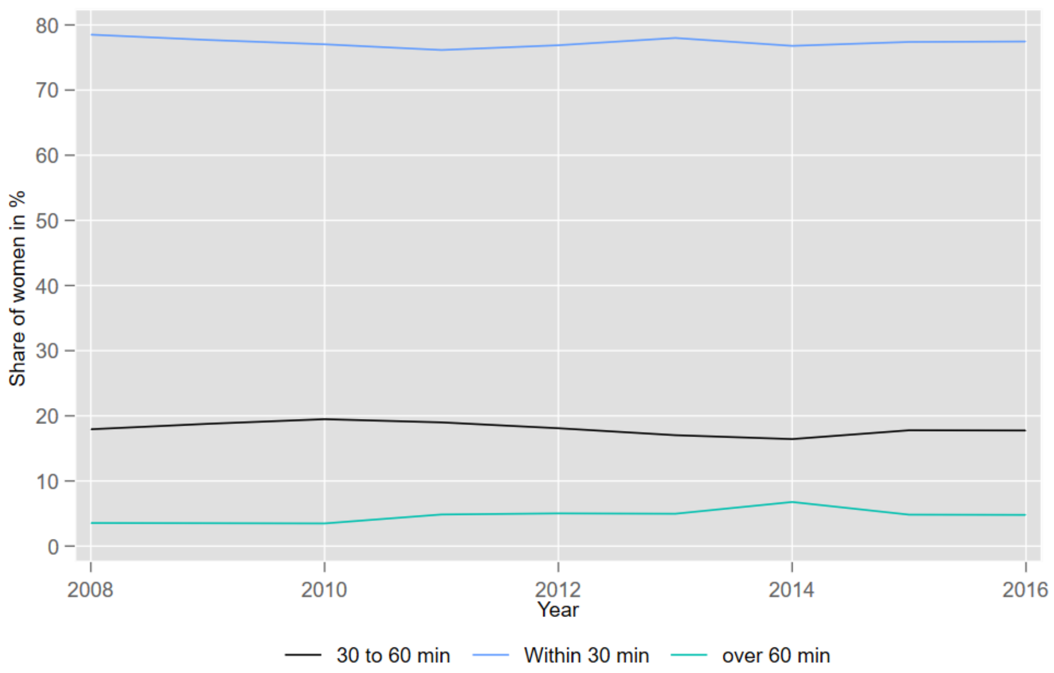


Figure A5 Share of fertile women per travel time bin



B Robustness checks

Table B1 Abortions and access to abortion: Inverse Hyperbolic Sine Transformation

	$\log\left(\frac{Var \times \sqrt{Var+1}}{Denominator}\right)$					
	Abortion rate among fertile women		Abortion to pregnancy ratio		Teen pregnancy rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Travel time (10 min.)						
Linear travel time	0.0344		0.0341		-0.0047	
	(0.0590)		(0.0532)		(0.0340)	
Quadratic travel time	-0.0006		-0.0006		-0.0000	
	(0.0005)		(0.0004)		(0.0002)	
P-value of joint test	0.00		0.00		0.90	
Bins of travel time (Ref: within 30min.)						
30 to 60min.		0.0593		-0.0096		-0.0051
		(0.0878)		(0.0775)		(0.1051)
Over 60min.		-0.2463***		-0.2640***		0.0400
		(0.0941)		(0.1004)		(0.0961)
Var	Abortions		Abortions		Teen pregnancies	
Denominator	Fertile women		Pregnancies		Teenage women	
Weighted by average number of:	Fertile women		Pregnancies		Teenage women	
Observations	51,304	51,304	51,304	51,304	51,304	51,304
Municipalities	246	246	246	246	245	245
Stacks	68	68	68	68	68	68

Notes: All regressions were estimated by OLS. All regressions have year-by-stack and municipality-by-stack fixed effects and control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B2 Abortion to pregnancy ratio and access to abortion: Fractional probit

	Poisson (benchmark from Table1)		Fractional Probit			
	(1)	(2)	(3)		(4)	
	Coefficient	Coefficient	Coefficient		Marginal effects	
Travel time (10 min.)						
Linear travel time	0.0488		0.0025			
	(0.0575)		(0.0278)			
Quadratic travel time	-0.0007		-0.0022			
	(0.0005)		(0.0021)			
P-value of joint test	0.00		0.00			
	in % i.e., $(e^{\beta} - 1) \times 100$		In pp	In %	In pp	In %
Effect of increase in travel time by 30 min at initial distance of:						
0 minutes	8.837		0.180	1.353		
	(14.281)		(1.980)			
30 minutes	-3.774		-0.772	-5.805		
	(4.809)		(1.107)			
60 minutes	-14.924***		-1.631***	-12.263		
	(3.406)		(0.353)			
90 minutes	-24.782***		-2.286***	-17.188		
	(9.067)		(0.732)			
Bins of travel time						
(Ref: within 30min.)						
30 to 60min.		3.107			-1.087	7.655
		(8.488)			(1.593)	
Over 60min.		23.233 ***			-4.180*	29.437
		(8.871)			(2.401)	
Observations	51,304	51,304	51,304		51,304	
Municipalities	246	246	246		246	
Stacks	68	68	68		68	

Notes: Regressions in columns 1 and 2 are the same as those presented in Table 1 (columns 3 and 4). Regressions in columns 3 and 4 of this table were estimated using a fractional probit estimated by pooled Bernoulli quasi-maximum likelihood estimation. All regressions include year-by-stack dummies and control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages and catholic marriages per thousand inhabitants in the municipality. We also control for the average of every time varying variable within stack-by-geocode cell, which is equivalent to introducing municipality-by-stack fixed effects, while avoiding the incidental parameters problem. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Standard errors are clustered at the municipality-by-stack level. Marginal effects in percentage are computed by dividing the estimate in percentage points by the average abortion ratio (13.3%) or by the abortion ratio in the reference bin (14.2%). * p <10% ** p <5% *** p <1%

Table B3 Conditions under which abortion occurs and abortion access: Inverse Hyperbolic Sine Transformation

	$\log\left(Var \times \sqrt{Var+1}\right)$					
	Number of weeks pregnant				No. of waiting days	
	First contact with services		Abortion intervention			
	(1)	(2)	(3)	(4)	(5)	(6)
Travel time (10 min.)						
Linear travel time	-0.0089		-0.0043		-0.0061	
	(0.0143)		(0.0109)		(0.0269)	
Quadratic travel time	0.0001		0.0001		0.0003*	
	(0.0001)		(0.0001)		(0.0001)	
P-value of joint test	0.02		0.00		0.00	
Bins of travel time (Ref: within 30min.)						
30 to 60min.		0.0421***		0.0396***		0.0171
		(0.0138)		(0.0117)		(0.0741)
Over 60min.		0.0663***		0.0714***		0.1889
		(0.0114)		(0.0154)		(0.1293)
Observations	2706035	2706035	2706035	2706035	2706035	2706035
Municipalities	246	246	246	246	246	246
Stacks	68	68	68	68	68	68

Notes: Regressions in columns were estimated by OLS with an inverse hyperbolic sine transformation of the dependent variable. All regressions include year of age, occupation, education, number of children, nationality, cohabitation, year-by-stack and municipality-by-stack fixed effects. All regressions also control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages, and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B4 Conditions under which abortion occurs and abortion access: Linear Probability Model and Probit – no municipality-by-stack FE

	Having abortion over 9 weeks				NHS referral to private clinic				Having surgical abortion			
	LPM		Probit		LPM		Probit		LPM		Probit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Coef.	Coef.	Coef.	Marg.eff.	Coef.	Coef.	Coef.	Marg.eff.	Coef.	Coef.	Coef.	Marg.eff.
Travel time (10 min.)												
Linear travel time	-0.0111		-0.0391		0.0059		0.1476		0.0137		0.0989	
	(0.0170)		(0.0579)		(0.0294)		(0.0955)		(0.0292)		(0.1505)	
Quadratic travel time	0.0015		0.0054		0.0060***		0.0151*		0.0054**		0.0178	
	(0.0014)		(0.0047)		(0.0022)		(0.0083)		(0.0021)		(0.122)	
P-value of joint test	0.00		0.00		0.00		0.00		0.00		0.00	
Average Marginal Effect	-0.0059		-.00053		0.0271		0.0192***		0.0329		0.0216	
	(0.0122)		(0.0111)		(0.0220)		(0.0054)		(0.0220)		(0.0144)	
Bins of travel time (Ref: within 30min.)												
30 to 60min.		0.0476*		0.0426*		0.0456		-0.0125*		0.0974		0.0614
		(0.0268)		(0.0236)		(0.0664)		(0.0065)		(0.0870)		(0.0486)
Over 60min.		0.0712***		0.0807***		0.4480**		0.4282***		0.4645**		0.4199***
		(0.0226)		(0.0246)		(0.1719)		(0.740)		(0.1820)		(0.1381)
Observations	2706035	2706035	2702681	2702681	2569113	2569113	2107948	2107948	2706035	2706035	2669761	2669761

Notes: Regressions in columns 1, 2, 5, 6, 9, and 10 were estimated by OLS while regression in columns 3, 4, 7, 8, 11, and 12 were estimated by Probit. All regressions include year of age, occupation, education, number of children, nationality, cohabitation, year-by-stack and municipality fixed effects. All regressions also control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages, and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B5 Abortions and access to abortion: Criteria of open provider = at least 1 abortion

	Abortion rate among fertile women		Abortion to pregnancy ratio		Teen pregnancy rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Travel time (10 min.)						
Linear travel time	0.0431		0.0394		0.0077	
	(0.0556)		(0.0443)		(0.0250)	
Quadratic travel time	-0.0006		-0.0006		-0.0001	
	(0.0005)		(0.0004)		(0.0002)	
P-value of joint test	0.00		0.00		0.75	
Bins of travel time (Ref: within 30min.)						
30 to 60min.		0.0606		0.0170		0.0408
		(0.0603)		(0.0521)		(0.0770)
Over 60min.		-0.2397***		-0.2378***		-0.0150
		(0.0656)		(0.0654)		(0.0814)
Dep. Var.	Abortions		Abortions		Teen pregnancies	
Exposure Var.	Fertile women		Pregnancies		Teenage women	
Observations	55,104	55,104	55,104	55,104	55,104	55,104
Municipalities	246	246	246	246	246	246
Stacks	74	74	74	74	74	74

Notes: All regressions were estimated by Poisson quasi-maximum likelihood. All regressions have year-by-stack and municipality-by-stack fixed effects and control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B6 Abortions and access to abortion: Criteria of open provider = at least 10 abortion

	Abortion rate among fertile women		Abortion to pregnancy ratio		Teen pregnancy rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Travel time (10 min.)						
Linear travel time	0.0531		0.0488		0.0103	
	(0.0726)		(0.0575)		(0.0304)	
Quadratic travel time	-0.0007		-0.0007		-0.0001	
	(0.0006)		(0.0005)		(0.0002)	
P-value of joint test	0.00		0.00		0.83	
Bins of travel time (Ref: within 30min.)						
30 to 60min.		0.0981		0.0306		0.0137
		(0.0980)		(0.0848)		(0.0857)
Over 60min.		-0.2490***		-0.2644***		0.0451
		(0.0865)		(0.0887)		(0.0820)
Dep. Var.	Abortions		Abortions		Teen pregnancies	
Exposure Var.	Fertile women		Pregnancies		Teenage women	
Observations	51,304	51,304	51,304	51,304	51,304	51,304
Municipalities	246	246	246	246	245	245
Stacks	68	68	68	68	68	68

Notes: All regressions were estimated by Poisson quasi-maximum likelihood. All regressions have year-by-stack and municipality-by-stack fixed effects and control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B7 Conditions under which abortion occurs and abortion access: Criteria of open provider = at least 1 abortion

	Number of weeks pregnant				No. of waiting days		Having abortion over 9 weeks		NHS referral to private clinic		Having surgical abortion	
	First contact with services		Abortion intervention				Yes		Yes		Yes	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Travel time (10 min.)												
Linear travel time	-0.0065		-0.0027		0.0159		-0.0071		0.0084		0.0035	
	(0.0105)		(0.0086)		(0.0231)		(0.0154)		(0.0248)		(0.0022)	
Quadratic travel time	0.0001		0.0001		0.0000		0.0001		0.0006**		0.0006**	
	(0.0001)		(0.0001)		(0.0002)		(0.0001)		(0.0002)		(0.0002)	
P-value of joint test	0.00		0.00		0.00		0.00		0.00		0.00	
Bins of travel time (Ref: within 30min.)												
30 to 60min.		0.0272***		0.0326***		0.0515		0.0759***		0.0536		0.0472
		(0.0084)		(0.0087)		(0.0340)		(0.0187)		(0.0716)		(0.0661)
Over 60min.		0.0515***		0.0583***		0.1020		0.0648***		0.4644***		0.4429***
		(0.0096)		(0.0108)		(0.0758)		(0.0142)		(0.1467)		(0.1404)
Observations	2889026	2889026	2889026	2889026	2889026	2889026	2889026	2889026	2746298	2746298	2889026	2889026
Municipalities	246	246	246	246	246	246	246	246	246	246	246	246
Stacks	74	74	74	74	74	74	74	74	74	74	74	74

Notes: Regressions in columns 1 to 6 were estimated by Poisson quasi-maximum likelihood while regression in columns 7 to 12 were estimated by OLS. All regressions include year of age, occupation, education, number of children, nationality, cohabitation, year-by-stack and municipality-by-stack fixed effects. All regressions also control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages, and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B8 Conditions under which abortion occurs and abortion access: Criteria of open provider = at least 10 abortions

	Number of weeks pregnant				No. of waiting days		Having abortion over 9 weeks		NHS referral to private clinic		Having surgical abortion	
	First contact with services		Abortion intervention				Yes		Yes		Yes	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Travel time (10 min.)												
Linear travel time	-0.0110		-0.0060		0.0174		-0.0171		0.0280		0.0203	
	(0.0143)		(0.0113)		(0.0300)		(0.0181)		(0.0317)		(0.0273)	
Quadratic travel time	0.0001		0.0001		0.0001		0.0002		0.0004**		0.0005**	
	(0.0001)		(0.0001)		(0.0002)		(0.0001)		(0.0002)		(0.0002)	
P-value of joint test	0.01		0.00		0.00		0.00		0.00		0.00	
Bins of travel time (Ref: within 30min.)												
30 to 60min.		0.0362***		0.0378***		0.0327		0.0699**		0.0943		0.0781
		(0.0117)		(0.0112)		(0.0599)		(0.0303)		(0.1032)		(0.0970)
Over 60min.		0.0616***		0.0704***		0.1267		0.0784***		0.5894***		0.5557***
		(0.0117)		(0.0130)		(0.0949)		(0.0211)		(0.1688)		(0.1626)
Observations	2705496	2705496	2705496	2705496	2705496	2705496	2705496	2705496	2568593	2568593	2705496	2705496
Municipalities	246	246	246	246	246	246	246	246	246	246	246	246
Stacks	68	68	68	68	68	68	68	68	68	68	68	68

Notes: Regressions in columns 1 to 6 were estimated by Poisson quasi-maximum likelihood while regression in columns 7 to 12 were estimated by OLS. All regressions include year of age, occupation, education, number of children, nationality, cohabitation, year-by-stack and municipality-by-stack fixed effects. All regressions also control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages, and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B9 Correlation between abortions and controls

Outcome:	Residuals of regression: $N^oAbortions_{mt} = Municipality\ FE + u_{mt}$	
	Coefficients	SD
Demographic controls		
Share of age group in population of fertile women		
15 to 19 y.o.	-96.826*	(51.408)
20 to 24 y.o.	(omitted)	(omitted)
25 to 29 y.o.	10.536	(49.620)
30 to 34 y.o.	2.156	(39.737)
35 to 39 y.o.	27.617	(38.158)
40 to 54 y.o.	-153.583***	(41.304)
45 to 49 y.o.	2.186	(40.593)
Economic controls		
Unemplyment rate	29.636**	(14.649)
GDP per capita growth (NUTS III)	-24.851*	(9.997)
Controls for social norms		
Marriages (*per* 1000 inhabitants)	-0. 601	(0.668)
Catholic marriages (*per* 1000 inhabitants)	0.858	(0.877)
Observations	2502	
Municipalities	278	
R^2	0.024	

Notes: The first regression was estimated by Poisson quasi-maximum likelihood, with the number of fertile women in the municipality as the exposure variable. The regression of the residuals on the controls was estimated by OLS. * p <10% ** p <5% *** p <1%

Table B10 Abortions and access to abortion: Excluding municipalities closer to a Spanish provider

	Abortion rate among fertile women		Abortion to pregnancy ratio		Teen pregnancy rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Travel time (10 min.)						
Linear travel time	0.0537		0.0494		0.0103	
	(0.0726)		(0.0575)		(0.0308)	
Quadratic travel time	-0.0072		-0.0069		-0.0012	
	(0.0058)		(0.0046)		(0.0022)	
P-value of joint test	0.00		0.00		0.77	
Bins of travel time						
(Ref: within 30min.)						
30 to 60min.		0.1025		0.0312		0.0247
		(0.1006)		(0.0859)		(0.0885)
Over 60min.		-0.2531***		-0.2649***		0.0369
		(0.0887)		(0.0901)		(0.0849)
Dep. Var.	Abortions		Abortions		Teen pregnancies	
Exposure Var.	Fertile women		Pregnancies		Teenage women	
Observations	49,172	49,172	49,172	49,172	49,172	49,172
Municipalities	245	245	245	245	245	244
Stacks	65	65	65	65	65	65

Notes: All regressions were estimated by Poisson quasi-maximum likelihood. All regressions have year-by-stack and municipality-by-stack fixed effects and control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

Table B11 Conditions under which abortion occurs and abortion access – municipality-level analysis

	Number of abortions below 7 weeks		Number of abortions between 7 and 9 weeks		Number of abortions over 9 weeks		Number of NHS referrals to private clinic		Number of surgical abortions		Number of medical abortions	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Travel time (10 min.)												
Linear travel time	0.0864		0.0619		-0.0318		0.1436		0.0227		-0.0239	
	(0.0934)		(0.0942)		(0.1330)		(0.1405)		(0.1456)		(0.1755)	
Quadratic travel time	-0.0126		-0.0046		0.0047		0.0070		0.0145		-0.0210	
	(0.0077)		(0.0077)		(0.0100)		(0.0109)		(0.0119)		(0.0143)	
P-value of joint test	0.00		0.77		0.26		0.00		0.00		0.00	
Bins of travel time (Ref: within 30min.)												
30 to 60min.		0.0653		0.0410		0.2793***		-0.0109		0.0380		0.0278
		(0.1395)		(0.2012)		(0.0508)		(0.1586)		(0.1181)		(0.3432)
Over 60min.		-0.5126***		0.0693		0.3692***		1.9132***		1.6488***		-1.2874**
		(0.1373)		(0.1445)		(0.0809)		(0.2270)		(0.2261)		(0.6389)
Municipalities	246	246	244	244	243	243	136	136	216	216	244	244
Stacks	68	68	68	68	68	68	68	68	68	68	68	68
Observations	51304	51304	51304	51304	51304	51304	51304	51304	51304	51304	51304	51304

Notes: All regressions were estimated by Poisson quasi-maximum likelihood with the number of fertile women as the exposure variable. All regressions have year-by-stack and municipality-by-stack fixed effects and control for the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP, the number of marriages and catholic marriages per thousand inhabitants in the municipality. Odd columns present travel time as a second order polynomial, while even columns present it categorically. Robust standard errors in parenthesis. * p <10% ** p <5% *** p <1%

C Descriptive statistics: Tables

Table C1 Descriptive statistics of municipalities

Variable	Panel	Mean	SD	Min	P1	P25	P50	P75	P99	Max
Abortion access										
Travel time (minutes)	Overall	39.25	23.61	1.38	1.75	24.12	36.07	51.17	110.90	159.68
	Between Municipalities		21.51							
	Within Municipalities		9.81							
Demographics										
Number of abortions	Overall	63.08	183.39	0	0	6	14	45	661	2,700
	Between Municipalities		182.16							
	Within Municipalities		23.58							
Number of women in fertile-age	Overall	8,353.50	13,548.56	317	528	1433	3239	9145	73559	117,277
	Between Municipalities		13,552.08							
	Within Municipalities		701.57							
Number of teenager (15 to 19 y.o.)	Overall	929.21	1,435.71	31	58	169	383	1020	8061	11,641
	Between Municipalities		1,436.03							
	Within Municipalities		75.40							
Number of pregnancies	Overall	372.83	759.57	6	13	49	122	361	2986	8,859
	Between Municipalities		758.33							
	Within Municipalities		68.62							

Notes: There are 2,502 observations in total, corresponding to a balanced panel of 278 municipalities over a nine year period.

Table C1 (continued)

Variable	Panel	Mean	SD	Min	P1	P25	P50	P75	P99	Max
Number of teenage pregnancies	Overall	16.96	40.60	0	0	2	5	15	188	552
	Between Municipalities		39.62							
	Within Municipalities		9.13							
Economy										
Insured unemployment rate	Overall	7.93	2.57	2.01	3.27	6.03	7.68	9.50	15.38	18.81
	Between Municipalities		2.09							
	Within Municipalities		1.49							
NUTSIII GDP per capita (thousand euros)	Overall	18.24	3.97	11.75	12.11	15.46	17.67	19.73	30.02	32.89
	Between Municipalities		3.83							
	Within Municipalities		1.06							
Proxies for social norms										
Marriages (*per* 1000 inhabitants)	Overall	2.70	0.91	0	0.58	2.9	2.70	3.28	4.90	7.12
	Between Municipalities		0.64							
	Within Municipalities		0.65							
Catholic marriages (*per* 1000 inhabitants)	Overall	1.19	0.66	0	0	0.70	1.11	1.60	3.12	3.93
	Between Municipalities		0.50							
	Within Municipalities		0.43							

Notes: There are 2,502 observations in total, corresponding to a balanced panel of 278 municipalities over a nine year period.

Table C2 Abortion rates per travel time bin

	Travel time to nearest provider							
	Within 30 minutes		*30 to 60 minutes*		*Over 60 minutes*		*Total*	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Abortion rates (per 10000 fertile women)								
Overall	6.228	3.992	4.659	2.642	4.785	2.611	5.283	3.310
Below 7 weeks of gestation	3.735	2.446	2.922	1.880	2.953	1.811	3.240	2.142
Between 7 and 9 weeks	2.256	1.919	1.584	1.308	1.667	1.392	1.856	1.614
Between 9 and 10 weeks	0.237	0.389	0.153	0.318	0.166	0.382	0.187	0.359
Referred from NHS to Private	0.611	2.500	0.913	1.917	1.368	2.603	0.861	2.152
Surgical abortions	0.968	2.504	1.159	2.097	1.600	2.702	1.154	2.368
Medical abortions	5.241	3.347	3.472	2.716	3.158	2.515	4.105	3.082
Abortions to pregnancies ratio								
Overall	0.142	0.061	0.126	0.057	0.129	0.061	0.133	0.060
Teenage Pregnancy rate								
Overall	0.016	0.011	0.014	0.010	0.017	0.014	0.015	0.011

Table C3 Descriptive statistics of women who aborted – outcome variables

	Travel time to nearest provider											
	Within 30 minutes			*30 to 60 minutes*			*Over 60 minutes*			*Total*		
	No.	Col (%)	Row (%)	No.	Col (%)	Row (%)	No.	Col (%)	Row (%)	No.	Col (%)	Row (%)
Abortions	127,783	100	84	19,088	100	13	5,253	100	3	152,124	100	100
Weeks pregnant												
Less than seven	71,014	56	84	10,915	57	13	3,078	59	4	85,007	56	100
From seven to nine	50,319	39	84	7,317	38	12	1,930	37	3	59,566	39	100
From nine to ten	6,450	5	85	856	4	11	245	5	3	7,551	5	100
Total	127,783	100	84	19,088	100	13	5,253	100	3	152,124	100	100
Type of provider												
Private clinic - own initiative	10,334	8	87	1,252	7	11	331	6	3	11,917	8	100
Private clinic - NHS referral	27,318	21	77	6,172	32	17	1,950	37	6	35,440	23	100
NHS Hospital	90,131	71	86	11,664	61	11	2,972	57	3	104,767	69	100
Total	127,783	100	84	19,088	100	13	5,253	100	3	152,124	100	100
Method												
Medical abortion	88,346	69	86	11,612	61	11	2,965	56	3	102,923	68	100
Surgical abortion	39,437	31	80	7,476	39	15	2,288	44	5	49,201	32	100
Total	127,783	100	84	19,088	100	13	5,253	100	3	152,124	100	100
Method (Among women accessing to services through the NHS)												
Medical abortion	87,749	74	86	11,560	65	11	2,956	60	3	102,265	73	100
Surgical abortion	30,294	26	78	6,332	35	16	1,977	40	5	38,603	27	100
Total	118,043	100	84	17,892	100	13	4,933	100	4	140,868	100	100
Method (Abortions performed in the NHS)												
Medical abortion	87,163	97	86	11,496	99	11	2,934	99	3	101,593	97	100
Surgical abortion	2,968	3	94	168	1	5	38	1	1	3,174	3	100
Total	90,131	100	86	11,664	100	11	2,972	100	3	104,767	100	100
Method (Abortions performed in private clinics)												
Medical abortion	1,183	3	89	116	2	9	31	1	2	1,330	3	100
Surgical abortion	36,469	97	79	7,308	98	16	2,250	99	5	46,027	97	100
Total	37,652	100	80	7,424	100	16	2,281	100	5	47,357	100	100
		Mean	SD		Mean	SD		Mean	SD		Mean	SD
Weeks pregnant at:												
Time of access		6.57	1.53		6.59	1.50		6.67	1.46		6.58	1.52
Time of abortion		7.32	1.37		7.30	1.32		7.29	1.29		7.32	1.36
Waiting days		8.31	4.69		8.07	4.62		7.53	4.32		8.25	4.67
Travel time (minutes)		13.57	8.77		40.5	7.72		75.35	16.25		20.31	17.53

Table C4 Descriptive statistics of women who aborted – control variables

				Travel time to nearest provider								
				Within 30 minutes			*30 to 60 minutes*			*Over 60 minutes*		
	Mean	SD	No.	No.	Col (%)	Row (%)	No.	Col (%)	Row (%)	No.	Col (%)	Row (%)
Age	28.5	7.3										
Less than 15			640	536	0	84	79	0	12	25	0	4
15 to 19			16,499	13,957	11	85	1,998	10	12	544	10	3
20 to 24			34,559	29,502	23	85	3,926	21	11	1,131	22	3
25 to 29			32,908	27,930	22	85	3,881	20	12	1,097	21	3
30 to 34			30,956	25,851	20	84	4,042	21	13	1,063	20	3
35 to 39			25,134	20,767	16	83	3,415	18	14	952	18	3
Over 40			11,422	9,234	7	81	1,747	9	15	441	8	4
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3
Education												
Illiterate			418	344	0	82	52	0	12	22	0	5
Reads/writes			307	248	0	81	44	0	14	15	0	5
Primary school			6,147	5,123	4	83	807	4	13	217	4	4
Lower middle school			18,751	15,404	12	82	2,645	14	14	702	13	4
Higher middle school			41,032	34,205	27	83	5,372	28	13	1,455	28	4
High school			54,342	45,691	36	84	6,750	35	12	1,901	36	3
College			31,127	26,768	21	86	3,418	18	11	941	18	3
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3
Occupation												
Agriculture (ISCO08:6-8)			23,926	19,679	15	82	3,454	18	14	793	17	3
Armed Forces (ISCO08:0)			827	705	1	85	110	1	13	12	0	2
Services (ISCO-08:4-5)			16,621	14,154	11	85	2,013	10	12	454	10	3
Unskilled (ISCO-08:9)			27,892	23,558	18	84	3,605	19	13	729	16	3
Managers (ISCO-08:1)			1,520	1,357	1	89	134	1	9	29	1	2
Professionals (ISCO-08:2)			10,628	9,183	7	86	1,152	6	11	293	6	3
Technicians (ISCO-08:3)			11,664	10,036	8	86	1,312	7	11	316	7	3
Domestic worker			3,445	2,662	2	77	634	3	18	149	3	4
Student			25,554	21,768	17	85	2,996	15	12	790	17	3
Unemployed			30,047	24,921	20	83	4,039	21	13	1,087	23	4
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3

Table C4 (continued)

	Mean	SD	No.	Travel time to nearest provider								
				Within 30 minutes			*30 to 60 minutes*			*Over 60 minutes*		
				No.	Col (%)	Row (%)	No.	Col (%)	Row (%)	No.	Col (%)	Row (%)
Nationality												
Portuguese			125,483	104,010	81	83	16,802	88	13	4,671	89	4
Other			26,641	23,773	19	89	2,286	12	9	582	11	2
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3
Civil Status												
Married			37,375	30,118	24	81	5,727	30	15	1,530	29	4
Divorced			11,317	9,168	7	81	1,743	9	15	406	8	4
Separated			2,263	1,890	1	84	295	2	13	78	1	3
Single			100,518	86,098	67	86	11,208	59	11	3,212	61	3
Widow			651	509	0	78	115	1	18	27	1	4
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3
Cohabitation												
Lives with partner			74,954	61,528	48	82	10,513	55	14	2,913	55	4
Lives without partner			77,170	66,255	52	86	8,575	45	11	2,340	45	3
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3
Previous children	1.0	1.0										
0			61,676	52,725	41	85	7,006	37	11	1,945	37	3
1			44,694	37,767	30	85	5,386	28	12	1,541	29	3
2			33,630	27,365	21	81	4,962	26	15	1,303	25	4
3			8,959	7,271	6	81	1,330	7	15	358	7	4
4			2,247	1,892	1	84	281	1	13	74	1	3
More than 4			918	763	0	83	123	0	13	32	0	4
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3
Previous abortions	0.4	0.7										
0			112,079	93,180	73	83	14,845	78	13	4,054	77	4
1			30,607	26,306	21	86	3,354	18	11	947	18	3
2			6,887	6,050	5	88	651	3	9	186	4	3
3			1,676	1,482	1	88	153	1	9	41	1	2
4			503	454	0	90	39	0	8	10	0	2
More than 4			176	142	0	81	23	0	13	11	0	6
Total			152,124	127,783	100	84	19,088	100	13	5,253	100	3

D Event studies

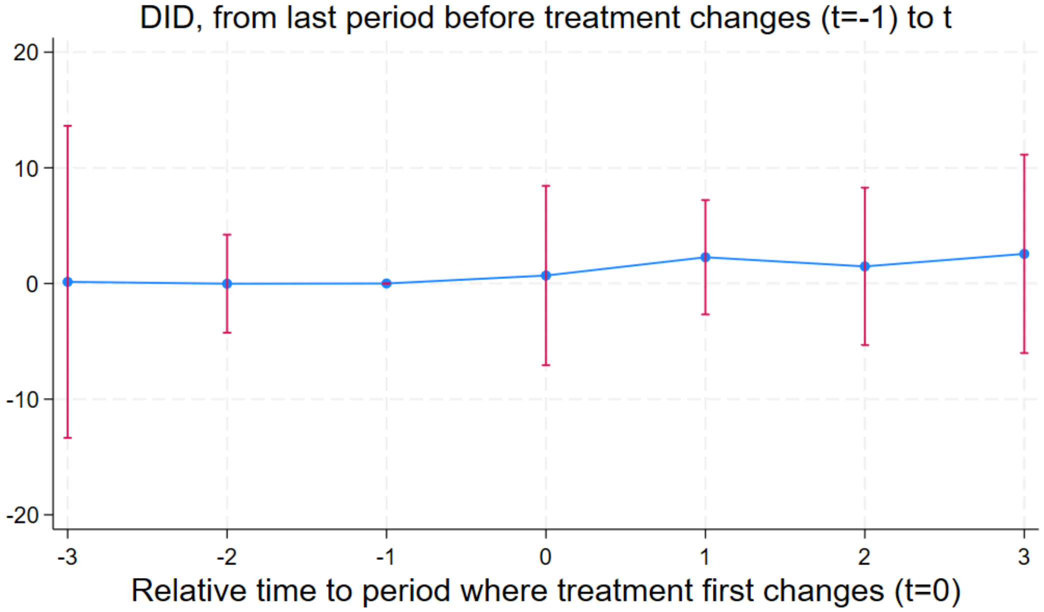
To better understand if openings and closures of abortion providers are driven by abortion demand or broader social forces, we conduct event studies which are displayed in Figures D1 to D4 below. In this analysis, we use the abortion rate and the number of marriages and catholic marriages of the catchment area of a provider – which is defined as the set of municipalities to which that provider was, at some point in time, the closest abortion provider – as an outcome and estimate the model described below:

$$Log(Y_{rt}) = \sum_{i=-Pre}^{-2} \alpha_i T_{rti} + \sum_{i=0}^{Post} \alpha_i T_{rti} + X_{rt}\beta + \varphi_r + \zeta_t + u_{rt}$$

Where Y_{rt} is either the abortion rate or one of our two proxies for social norms (number of marriages and catholic marriages per thousand inhabitants) and T_{rti} is a dummy equal to one for the catchment area of provider r, in year t, which is i years away from the event (opening or closure of provider). X_{rt} is a vector of time-varying characteristics of the provider's catchment area, namely: the share of all age groups in the population of fertile-age women, the insured unemployment rate, the growth rate of the NUTS III region's GDP. If the outcome variable is the abortion rate, we also include as controls the number of marriages and catholic marriages per thousand inhabitants. φ_r and ζ_t are provider's catchment area and year fixed effects, respectively. u_{rt} is the error term.

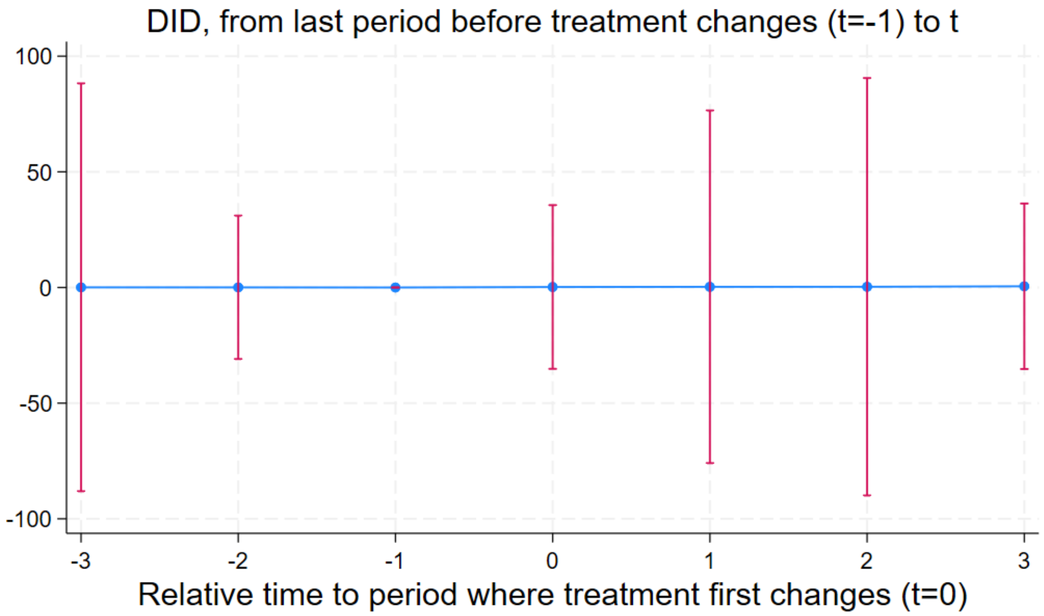
However, estimating this model by a standard TWFE regression is problematic, as regions where an abortion provider closed in year T-1 will be used as controls for regions experiencing a shutdown in year T (Sun and Abraham 2021). To correctly estimate the value of the coefficient of both leads and lags, we implement the DIDM estimator (de Chaisemartin and D'Haultfoeuille 2020), where only never treated or not-yet-treated observations are used in the control group. The advantage of this procedure is that unlike other solutions – e.g. Callaway and Sant'Anna (2021) – it allows us to control for time varying variables. This was done using the Stata did_multiplegt command (de Chaisemartin et al. 2019). As shown in Figures D1 to D4, we find no evidence that there were systematic differences in abortion rates or changes in social norms prior to the closures or openings of abortion providers.

Figure D1 Abortion rate before and after clinic closure



Notes: Each dot presents the coefficient of lags/leads and is represented along with the respective 95% confidence interval.

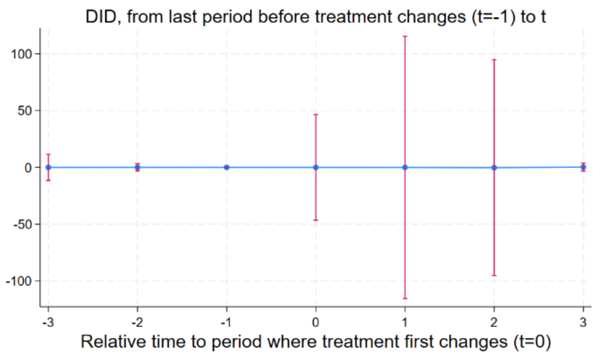
Figure D2 Abortion rate before and after clinic opening



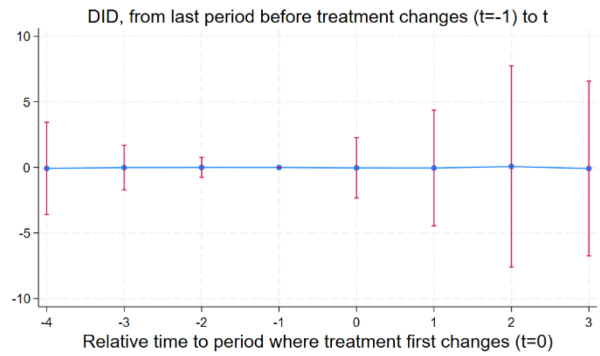
Notes: Each dot presents the coefficient of lags/leads and is represented along with the respective 95% confidence interval.

Figure D3 Marriages before and after clinic closure

a) Marriages in the population



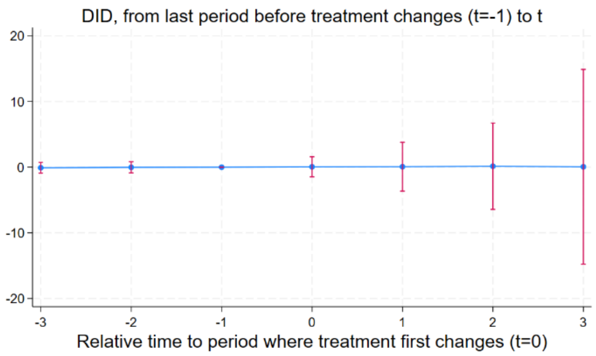
b) Catholic marriages in the population



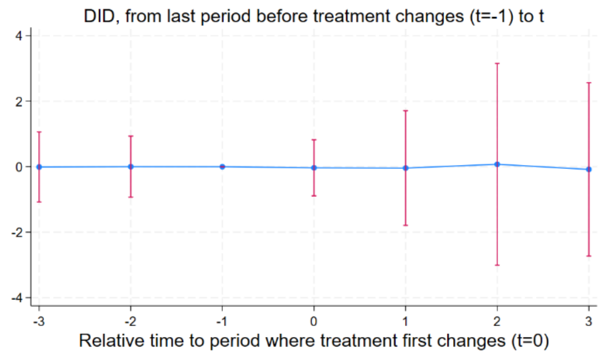
Notes: Each dot presents the coefficient of lags/leads and is represented along with the respective 95% confidence interval.

Figure D4 Marriages before and after clinic opening

a) Marriages in the population



b) Catholic marriages in the population



Notes: Each dot presents the coefficient of lags/leads and is represented along with the respective 95% confidence interval.

APPENDIX REFERENCES

Callaway, B. & Sant'Anna, P. (2021). Difference-in-Differences with multiple time periods. *Journal of Econometrics, 225*, 200-230.

de Chaisemartin, C., & D'Haultfoeuille, X. (2020). Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review, 110*(9), 2964-2996.

de Chaisemartin, C., D'Haultfœuille, X. and Guyonvarch, Y. (2019). did multiplegt: DID Estimation with Multiple Groups and Periods in Stata.

Sun, L. & Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, *225*, 175-199.