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REPRODUCTIVE HEALTH CARE IN CATHOLIC-OWNED HOSPITALS

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ABSTRACT

Mergers that affiliate a hospital with a Catholic owner, network, or system reduce the set of possible reproductive medical procedures since Catholic hospitals have strict prohibitions on contraception. Using changes in ownership of hospitals, we find that Catholic hospitals reduce the per bed rates of tubal ligations by 31%, whereas there is no significant change in related permitted procedures such as Caesarian sections. However, across a variety of measures, we find minimal overall welfare reductions. Still, fewer tubal ligations increase the risk of unintended pregnancies across the United States, imposing a potentially substantial cost for less reliable contraception on women and their partners.

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1. Introduction

The Affordable Care Act (ACA) has resulted in significant changes in hospital ownership, in part from mergers and acquisitions. The figures are notable: 105 merger deals were reported in 2012 alone, an increase from an average of 50 to 60 annually in the pre-ACA and pre-recession years of 2005–2007 (Dafny 2014). Catholic hospital systems have actively participated in this merger frenzy, with 120 mergers between Catholic and non-Catholic systems between 2001 and 2016 (Uttley and Khaikin 2016), a fifteen-year growth rate of 22%. Four out of the top ten largest healthcare systems (and four of the top five non-profit systems) were Catholic affiliated, and Catholic hospitals accounted for 14.5 percent of all acute care hospitals and one in six acute care hospital beds in 2016 (Uttley and Khaikin 2016).

Ownership changes that affiliate a hospital with a Catholic owner, network, or system, are consequential because they reduce the set of possible contraceptive medical procedures. Specifically, the U.S. Conference of Catholic Bishops' (USCCB) Ethical and Religious Directives for Catholic Health Care Services forbid sterilization procedures, contraceptives, in vitro fertilization and abortion at Catholic health care facilities (USCCB 2009). As a result, a rise in mergers between Catholic and secular hospitals and health systems over the past decade has drawn increased attention to the directives' impact on access to reproductive health care services at such facilities. For example, in October of 2015, the American Civil Liberties Union sued Trinity Health (the second largest Catholic Health System that owns 86 hospitals in 21 states) for not performing abortions when medically necessary. The lay press, medical and legal journals have featured discussions about the impact of these ownership changes on patient care, particularly with regard to reproductive health, such as abortions and sterilizations, and have drawn attention to the $45 billion in federal funding these hospital systems receive each year (Catholics for Choice 2005, National Women's Law Center 2011, Abelson 2012, Mencimer 2013, Martin 2013, Lee and Propublica 2016). This is in addition to other new restrictions on reproductive health care services that proliferated over the past decade (Packham 2017, Quast et al. 2017, Fischer, Royer, and

White 2017, Cunningham et al. 2017, Bailey and Lindo 2018, Lu and Slusky 2016). Existing research on the potential effect of Catholic ownership on patient care has relied on qualitative interviews of patients and doctors (Rubin et al. 2006, Stulberg et al. 2014). This paper examines the effect of Catholic affiliation on reproductive health procedures and finds significant reductions in tubal ligations.

To illuminate the potential consequences of Catholic owned hospitals, we examine the effect of changes in ownership from secular to Catholic (and vice versa) on reproductive health procedures such as tubal ligation, abortion, vasectomy, hysterectomy, and dilation and curettage (D&C)[1] that are likely to be affected by Catholic ownership and banned under the USCCB Ethical and Religious Directives.[2] In particular, we investigate the following question: How does Catholic ownership affect the rates of reproductive procedures restricted under the USCCB Directives? We hypothesize that changes to Catholic ownership result in a reduction in the rates of these procedures. We also investigate how Catholic affiliation of a hospital affects the fertility rate, women's hospital choice, and complications after miscarriage.

To test our hypothesis, we use the universe of hospitals in six states and compile publicly available data on Catholic hospital mergers to identify hospitals that do not change location but change ownership. We use within-hospital and across-patient variation to control for potential differences in patient population across different types of hospitals, including a hospital fixed effect. In particular, our study exploits changes in affiliation only (such changes are in name, administration, and affiliation) with the hospital location unchanged. We use longitudinal data on hospital procedures to identify the causal effect of Catholic ownership on reproductive health procedures, with a particular focus on tubal ligations.

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[1] Dilation and curettage, used to remove uterine tissue for a variety of reasons. Since the technique used can be similar to that of an abortion, we only code D&C = 1 if the woman had a D&C but did not have an abortion on that discharge.

[2] Despite abortion and vasectomy being primarily performed in an outpatient setting, we measure impacts on inpatient procedures as those are available in our data and find suggestive evidence that the religious directives are also reducing access to these procedures.

We find evidence that Catholic ownership of hospitals decreases the rate of tubal ligations by 30 percent. We find suggestive evidence that vasectomies and abortions also decrease, but are rarely performed in an inpatient setting, so these estimates are less precise. We do not find evidence that changes in Catholic ownership are related to changes in the number of births, Caesarian sections, or miscarriages.

Anecdotal reports have suggested that Catholic hospitals are putting women in danger due to the restrictions on miscarriage management. Contrary to these reports, we find some evidence that Catholic ownership is in fact associated with a reduction in miscarriages that involve a complication, suggesting that anecdotal accounts may not be indicative of a widespread pattern. Hysterectomies are another form of female sterilization restricted by the USCCB Ethical and Religious Directives. We find a reduction in hysterectomies among women of childbearing age, which is less precisely estimated but consistent with the findings for tubal ligations. Hysterectomies are also performed in response to hemorrhage, so a reduction may also be indicative of improved quality. That said, we do not find any evidence of a decrease in severe maternal morbidity with Catholic ownership that would support an overall conclusion of improved quality.

Current literature suggests that this growth in mergers and affiliation changes are part of a broader trend in hospital consolidation likely driven by multiple factors such as economies of scale, financial distress, desires to expand market power, and risk management strategies in response to health care reform (Dafny 2014, Uttley and Khaikin 2016, Neprash et al. 2017). We test our identifying assumption by estimating how changes in ownership affect the composition of reproductive patients, hospital characteristics, and controlling for changes in unemployment in the county where the hospital is located. We find some suggestive evidence that after a switch to Catholic ownership, hospitals may have a slight increase in the share of reproductive patients that are Black and a slight increase in the number of beds, though neither effect is precisely estimated. When we control for these characteristics in our main specification, the results are consistent. Our results are also robust to the inclusion of the county unemployment rate.

There may be national trends in use of these reproductive procedures that are concurrent with our study period. Data from the National Survey of Family Growth (NSFG) from 1980 to 2014 reflect a fairly steady rate of female sterilization (i.e., tubal ligation) of 27.5 percent for all women and 37.8 percent for married women nationally (Bailey and Lindo 2018). This rate has started to decline somewhat after 2010 with the introduction of Long Acting Reversible Contraceptives (LARC) such as IUDs. These data suggest that in the latter part of our study period, there could be secular trends reducing the use of tubal ligation. According to these national survey data, the most prevalent and persistent use of tubal ligation is among women aged 35-44; thus, we also stratify our estimates by age. Our results are robust to inclusion of state-year fixed effects that should at least partially account for changes in state-level insurance coverage for reproductive procedures that might also influence the population seeking tubal ligation.

Our paper contributes to a well-established literature that investigates the impact of access to contraception on fertility and women's health outcomes. This literature has focused on both increases and decreases in access to family planning programs, abortion clinics, and availability of emergency contraception. The conceptual framework used to understand how access to these programs affects fertility rates in particular is ambiguous. Bailey and Lindo (2018), in their recent review, argue that empirical evidence is critical to understand the direction of the effect. For example, decreases in access to abortion or sterilization may induce women to substitute towards other forms of contraception (e.g., the pill or LARC). Access to emergency contraception may increase risky sex and sexually transmitted infections (STIs) but reduce abortion rates and have little effect on overall fertility (Mulligan 2016, Cintina and Johansen 2015). Our findings suggest that limiting access to sterilization and abortion through Catholic ownership does not affect the general fertility rate (GFR) in the hospital referral region of hospitals that switch to or from Catholic. When controlling for an index of policies that promote access to emergency contraception, we do not find that those policies have a statistically significant effect on our outcomes of interest.

Our paper also contributes to a limited literature regarding patient loyalty and hospital choice. Lay media suggests that women may not know that their hospital is Catholic or that there are restrictions on these reproductive services.[3] They may learn, however, after giving birth and may choose to switch to a different hospital for the following birth. Irace (2018) exploits hospital closures due to Hurricane Sandy and finds that patients are persistent in their hospital choice across multiple conditions. Chartock, Garmon and Schutz (2018) find that surprise out-of-network bills on the first birth increases the odds of switching hospitals for the second birth by 13 percent. Raval and Rosenbaum (forthcoming) analyze patients' choices of hospital for childbirth in Florida and find that 70 percent of women return to the same hospital in a following birth and that without switching costs, their choice model would predict a 40 percent persistence in hospital choice, and that network restrictions like those in the ACA result in unambiguous welfare losses. This is fairly consistent with our finding that 30 percent of women switch hospitals between births. We find, however, that women are 50 percent more likely to switch to a non-Catholic hospital when their first hospital becomes Catholic between deliveries, which is likely to also result in welfare losses of the magnitude measured in their paper. We acknowledge that this switching is a plausible mechanism behind our results, but we do not believe it is the driving one.

We make some effort to estimate the welfare effect of these hospital changes by looking at racial and payer subgroups and high and low competitive hospital referral regions (HRR) to try to understand whether there are any disparities that come from these ownership changes. We find that Hispanic mothers

[3] *https://fivethirtyeight.com/features/how-insurers-can-send-patients-to-religious-hospitals-that-restrict-reproductive-care/*
https://fivethirtyeight.com/features/how-catholic-bishops-are-shaping-health-care-in-rural-america/
https://www.nytimes.com/2018/08/10/health/catholic-hospitals-procedures.html

are disproportionately affected by restrictions to tubal ligation. We also find some suggestive evidence that the reductions in tubal ligations are larger in HRRs that have less competition and fewer alternative hospitals for women to seek care. We perform a back-of-the-envelope calculation and estimate that these results translate to 10,000 fewer tubal ligations per year. This is particularly concerning for populations that use tubal ligations to prevent unwanted pregnancies.

Multiple robustness (such as sample selection, balanced panel, alternative outcome measures) and falsification checks (such as differences in miscarriages, Caesarian sections or births), including count and Poisson fixed effects models, did not show strong evidence that our results are sensitive to these alternative specifications or outcome measures. Due to the small number of switching hospitals that we identify our results off of, we use a number of clustering methods including bootstrapping our standard errors, and these results provide additional confidence in our conclusions. We further address potential concerns about bias in generalized difference-in-differences by implementing a method developed by Goodman-Bacon (2018) and show that our common trends assumption holds using a new balance test and that our results are robust to using the weights proposed.

Our paper interacts with the literature on hospital regulation by showing the consequences of the lack of regulation, where hospitals are permitted to deny procedures based on religious grounds. This is in contrast to the majority of the existing literature (e.g., Salkever 2000, Cook et al. 2010, Dranove 2011, Chung et al. 2016, Clemens and Ippolito 2017) which focuses on overt regulations (e.g., pricing, staffing, payments, investments, and competitiveness), rather than services offered. In our case, a recent accommodation by the Supreme Court that allows religious non-profit and for-profit entities to opt out of providing contraceptives under the Religious Freedom Restoration Act (RFRA) (e.g., Burwell v. Hobby Lobby) suggests that there may be limited policy responses to curb these restrictions, and so it is important to evaluate the impact of these restrictions on fertility and ascertain which women are most likely to be affected. It is equally important to measure the impacts in order to weigh the trade-offs between a woman's autonomy over her health and body versus an organization's view of being complicit in another person's access to religiously forbidden activities. We cannot weigh these without measures of the costs and benefits.

Lack of access to reproductive procedures studied in this paper can have reverberations to women's long-term economic outcomes as well as the outcomes of their children. Bailey et al. (2016) show that children born after family planning programs were expanded from 1965 to 1973 were significantly less likely to grow up in poverty and Bailey et al. (2012) found that thirty percent of the convergence of the gender wage gap in the 1990s was attributed to increased access to contraception. Research has shown that unintended and mistimed pregnancies are associated with substantially higher odds of low birth weight babies (Hall et al. 2017), less prenatal care and lower breastfeeding rates (Kost and Lindberg 2015), maternal behaviors that adversely affect child health (Joyce et al. 2000), and a higher risk of child abuse and neglect (Guterman 2015).

2. Hospital Ownership and Reproductive Outcomes

The Patient Protection and Affordable Care Act (ACA) promotes Accountable Care Organizations (ACOs) and the bundling of payments across providers for an episode of care ("bundled payments"). These features of the ACA encourage consolidation between hospitals and physician practices, and this consolidation has substantially increased since the ACA was passed. The last hospital-merger wave in the 1990s led to substantial price increases without improvements in care quality (Gaynor and Town 2012, Encinosa and Bernard 2005, Dafny 2009). Economic research using data from 1990-2003 has shown that hospital mergers increase both the market concentration and the price of hospital care (Dranove et al. 2008, Wu 2009). Mergers in concentrated markets lead to significant price increases (Dafny 2009, Tenn 2011, Town et al. 2006). Research on how consolidation may affect quality is more nuanced. For some procedures, hospital concentration reduces quality (Gaynor and Town 2012). Other studies suggest that competition improves quality where prices are market determined and under an administered pricing system such as the U.S. Medicare Program (Gaynor and Town 2012, Cutler et al. 2010, Rogowskti et al. 2007). However, the vast majority of studies assessing this relationship find no statistically significant relationship between for-profit or non-profit status and mortality (Eggleston et al. 2008). There is some evidence, though, that government-owned hospitals have a higher rate of adverse events than non-profit hospitals (Eggleston et al. 2008).

The United States has 617 Catholic hospitals, all consolidated into 60 integrated health networks and systems, ten of which are part of the twenty-five largest health care systems in the United States (Uttley and Khaikin 2016). From 2001 to 2016, the number of Catholic sponsored or affiliated hospitals increased by 22 percent, while all other types of non-profit hospitals declined in numbers. By 2016, 14.5 percent of all acute care hospitals were Catholic nationally; some states face higher percentages: in five states (Alaska, Iowa, Washington, Wisconsin and South Dakota) more than 40 percent of acute beds were Catholic owned or affiliated (Uttley and Khaikin 2016). Furthermore, 46 sole community hospitals are Catholic owned or affiliated.[4]

Catholic hospitals are prohibited from providing sterilization, abortion, and contraceptive services under the Ethical and Religious Directives for Catholic Health Care Services, which are issued by the U.S. Conference of Catholic Bishops and enforced by local bishops. In Appendix A, we include language from the directives limiting reproductive health care services. In recent years, concerns about health care at Catholic hospitals have caught the attention of the media and general public. For example, in Michigan, a woman filed suit against the United States Conference of Catholic Bishops because she did not experience appropriate care (i.e., induction or surgical removal of the fetus) when she

[4] A "sole community hospital" is a designation by Centers for Medicare and Medicaid Services (CMS) defined as a facility at least 35 miles away from other like hospitals or requires at least 45 minutes travel time away from the nearest similar hospital (Uttley and Khaikin 2016).

experienced a miscarriage at 18 weeks of pregnancy and was turned away from her local Catholic hospital (Eckholm 2013).

Despite increased public attention to women denied necessary reproductive health care at Catholic hospitals, research on the effects of religious reproductive health care restrictions remains limited.[5] Existing research has typically relied on surveys and interviews of physicians. For example, provider surveys have demonstrated a decreased likelihood of prescribing emergency contraception at religious facilities (Rubin et al. 2006, Harrison 2005). Among obstetricians and gynecologists (OB-GYNs) practicing in the United States, 22% identified their primary place of practice as religious, and 37% of these had experienced a conflict over religiously based policies (Stulberg et al. 2012). A national survey of primary care physicians found that 43% had worked in a religiously affiliated hospital or practice, and 19% of these had experienced a conflict over religious policies for patient care (Stulberg et al. 2010). In qualitative interviews, Catholic hospital OB-GYNs expressed frustrations about not being able to offer what they consider standard care, such as postpartum tubal ligation (Stulberg et al. 2014), ectopic pregnancy management (Foster et al. 2011), and timely miscarriage management (Freedman et al. 2008, Freedman and Stulberg 2013).

Additionally, Freedman et al. (2008) found in interviews with obstetrician–gynecologists that physicians sometimes intentionally disregarded protocol when they believed that patient safety was being compromised. So, despite these seemly absolute directives, we might expect less than 100% reductions in prohibited procedures.

While these qualitative studies are suggestive, research is needed on the scope and prevalence of these patterns of care. This study takes the first step at assessing changes in practice patterns associated with Catholic hospital ownership.

3. Identifying the Causal Effect of Catholic Ownership

[5] Economists have studied the impact of the U.S. Catholic clergy abuse scandals (Hungerman 2013, Bottan and Perez-Truglia 2015), but this research does not explicitly focus on health care outcomes.

We examine the effect of changes in ownership from secular to Catholic (and vice versa) on reproductive health procedures (e.g. abortion, tubal ligation, vasectomy, D&C) that are likely to be affected by Catholic ownership and banned under the USCCB Ethical and Religious Directives (USCCB 2009).

Our regressions take the following form:

$$ProceduresPerBed_{ht} = \alpha + Catholic_{ht} + \mu_h + \rho_t + \varepsilon_{ht}$$

where hospital *h* in year *t* has *ProceduresPerBed* rate of a particular procedure. This is calculated by taking the total number of discharges that have the code for that procedure and dividing it by the total number of beds in that hospital at time t, as one would expect larger hospitals to perform more procedures.[6] *Catholic* is a dummy for whether the hospital has Catholic affiliation during that particular year. μ are hospital fixed effects and ρ are year fixed effects.[7] Finally, robust standard errors are clustered at the hospital level.

We identify the causal effect of Catholic ownership by assuming that consumers will not change behavior based solely on hospital ownership. This may be plausible because women may be dealing with an emergency and so go to the nearest hospital. As mentioned previously, women may live in an area which is only served by a Catholic hospital and thus have no choice because of an emergency or lack of

[6] See Appendix D, Table D1 which shows consistent results for using only general and OB-GYN beds as the denominator instead of all beds. Table D2 shows a count model that does not control for the number of beds. Table D3 shows a Fixed Effect Poisson, controlling for beds. We might also be concerned that number of beds is changing in response to Catholic ownership (e.g., see Table 2) and so we also have Table D4 that performs a count model with additional controls as well as time-invariant measures of beds from the first or last year of data available for each hospital. Our results are consistent across these different specifications. Appendix F also repeats all of our results using three different denominators, and finds directionally consistent results for each outcome, and similar consistent or inconsistent statistical significance as in the main specifications.

[7] The AHA data contain multiple time-varying hospital characteristics that are also correlated with hospital volume. We include them, therefore, in a count model in Appendix Table D4. The controls from the AHA data that are not missing for all the hospitals in the six states include: total payroll expenses, total expenses, total births, total admissions, FTE Physicians and Dentists, FTE Registered Nurses, FTE Licensed Practical Nurses, FTE Medical and Dental Residents, and Total Beds. We also run a specification with the following controls that are missing for half of our hospitals: Beds in the NICU, obstetrics service level, and obstetric beds. Our results are robust to their inclusion.

resources to travel. Furthermore, women may be unaware of the change in Catholic ownership and related policies and so therefore cannot condition on it.[8] Additionally, almost all of the hospitals that change ownership maintain the previous name, as opposed to changing to a name that is overtly Catholic. Finally, we provide direct evidence below that the demographic mix of patients at each hospital does not change significantly when the hospital changes its Catholic status. That said, this assumption may be overly restrictive and there may be demand-side effects.

Thus, we probe the validity of this assumption by examining whether women switch hospitals after their second birth. We do find some suggestive evidence that in non-emergent (or at least expected) situations such as childbirth, women are more likely to switch to a different non-Catholic hospital for their second delivery if the hospital they delivered at the first time became Catholic affiliated in the interim. We acknowledge that this is a plausible mechanism behind our results, but we do not believe it is the driving one.

Our regression is identified off hospitals that switch Catholic status.[9] Assuming common trends, we should be able to estimate the effect of Catholic affiliation on the procedures a hospital performs. However, this may or may not translate into effects at the individual level because of the possible endogeneity of hospital choice. Therefore, our results are informative about population level effects.

[8] According to a small qualitative study, women surveyed did not identify that a hospital with a Catholic name would be unlikely to provide contraception and abortion services (Guiahi et al. 2014).

[9] Figure C1 shows the approximate locations of hospitals in the six states in our sample, and categorizes them as “Always Catholic” (blue), “Never Catholic” (purple), “To Catholic,” “Catholic” (red), “From Catholic” (green), and “To and From Catholic” for the handful of hospitals that change status more than once in the sample (black). The size of each bubble is proportional to the average number of beds in the hospital. While there are more non-Catholic hospitals than Catholic ones, and while most Catholic ones have that status for the entire sample period, there are also many hospitals that switch status. We see evidence of more hospitals becoming Catholic in the states of New Jersey, California, New York and Washington, with a few in Arizona and Florida. These hospitals appear to be randomly distributed across the states in the sample, allaying concerns of overly correlated switches of Catholic hospitals in a particular market. In Appendix C, Figure C2, we include a map that shows just the hospitals that switch Catholic status.

Those effects, though, translate more to the individual for the areas where market concentration is higher and so the newly Catholic hospital has greater influence.[10]

4. Data on Hospitals and Procedures

We use data from two primary sources for the years 1998-2013: the American Hospital Association Annual Survey (AHA)[11] and the state-level Healthcare Cost and Utilization Project (HCUP) inpatient databases[12] for six high-population states: Arizona, Florida, New Jersey, California, New York, and Washington.[13] These data contain the universe of utilization for all hospitals within these states and in some cases, have patient identifiers such that we can observe patients' utilization over time.[14] We augment this with newly collected public data on hospital ownership[15] and with procedure categories from the Clinical Classification Software (CCS).[16]

The AHA data contains information on the name, address, ownership, system, network, and size of each hospital in the United States. It also contains a variable as to whether the hospital is owned by a Catholic organization, but this variable is of questionable quality, with many hospitals appearing to switch in and out of Catholic ownership multiple times.

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[10] See Table 7 below where we stratify by HHI of the hospital service area and find a stronger effect of Catholic ownership on our outcomes when HHI is higher.

[11] http://www.aha.org/research/rc/stat-studies/data-and-directories.shtml

[12] https://www.hcup-us.ahrq.gov/sidoverview.jsp

[13] Given the high cost of the data, we were not able to include additional states. Our results are robust to any five-state combination, as shown in Appendix D, Table D5.

[14] We have patient ID data for Arizona 2004-2007; Florida 2004-2013; California 2003-2009; New York 2003-2004 & 2007-2013, Washington 2003-2013. See https://www.hcup-us.ahrq.gov/toolssoftware/revisit/UserGuide_SuppRevisitFilesCD.pdf

[15] Per our agreement with AHA, we unfortunately can only share this new data with individuals or organizations that have a site license for the AHA data, as it reveals the names of the individual hospital in the AHA sample.

[16] https://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp#download

Hospital sales and acquisitions as well as network and system reorganizations are generally public events with accompanying press releases and media reports. We therefore supplement the AHA data by searching for press releases and articles about each hospital in each state for which we have HCUP data. This process produced new Catholic-affiliation variables, one for the hospital itself, one for the hospital's ownership, and one for the hospital's system. For the analysis below, we consider a hospital Catholic if any of these variables equals one.[17] This new variable has much less churn than the one in the AHA, and so we believe that it is a better representation of a hospital's affiliation. With this variable, across the states for which we have HCUP data, we observe approximately a third of all hospital mergers both to and from Catholic-affiliation that occurred nationally from 1998 until 2013 (Uttley and Khaikan 2016).

We merge these AHA and public data with inpatient discharge data from HCUP for the six states in our sample over the years 1998-2013. However, we do not have inpatient data for every state for every year.[18] This should not pose an econometric problem, since data availability is not related to Catholic affiliation. Furthermore, this lack of data is at the level of a state-year-file and not at the individual hospital level. We estimated models using a balanced panel and find consistent results.[19]

From the HCUP data, we keep hospital-years that have ICD-9 codes for at least one of the following fertility related procedures: tubal ligation, Caesarian section (C-section), vasectomy, abortion, and dilation and curettage (D&C), as these are the procedures most likely to be affected by Catholic directives.[20] We identify which ICD-9 codes correspond to these procedures using the CCS's list of

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[17] See Appendix D, Table D6 which shows consistent results for only setting Catholic = 1 if the hospital itself is Catholic and not just the network or system.

[18] See Appendix C, Table C1 for a list of hospital-years.

[19] See Appendix D, Table D7, which shows consistent results when only using hospitals that appear in all of the years for which we have data for their state.

[20] Our results are robust to including any hospital-year with at least one discharge in HCUP. See Appendix D, Table D8.

procedure categories and codes.[21] We also use the CCS's lists of both procedure and diagnosis categories to identify complications, including hysterectomy, blood transfusion, maternal infections, and maternal hemorrhage. We define severe maternal morbidity (SMM) using the CDC definition.[22]

We link the AHA and HCUP data using the linkage files provided by HCUP which give the AHA ID to HCUP hospital ID mapping. Similarly, we define a "hospital" for the purposes of this analysis by its AHA ID. We also include HCUP's Hospital Market Structure information on competitiveness of a hospital service area[23] for one of the stratified investigations below.

5. Estimated Impact of Catholic Ownership on Reproductive Procedures

Table 1 contains summary statistics. Panel A shows the average number of beds and the average procedure rates for hospital-years that are Catholic and those that are not. Catholic hospitals tend to be somewhat larger than non-Catholic hospitals. They also have statistically significant differences in almost every procedure and diagnosis.

[21] ICD-9 codes used in the paper are available upon request from the authors.

[22] https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm

[23] https://www.hcup-us.ahrq.gov/toolssoftware/hms/hms.jsp

Table 1: Summary statistics

Panel A: Means of Dependent Variables and Demographic Characteristics

	Not Catholic	Catholic	Difference	p-value
Beds	272.9	287.7	14.86	0.032**
Procedures/Bed				
Tubal Ligation	0.456	0.193	-0.263	<0.001***
C-section and Tubal Ligation	0.300	0.147	-0.153	<0.001***
Vasectomy	0.000547	0.000156	-0.000391	<0.001***
Abortion	0.00548	0.000538	-0.00494	0.069*
C-section	1.704	1.573	-0.0294	0.654
D&C	0.117	0.119	0.00216	0.679
Diagnosis/Bed				
Miscarriage/Stillbirth	0.0732	0.0695	-0.00374	0.191
Miscarriage/Stillbirth & Complication	0.0139	0.0141	0.000241	0.766
Demographics				
Share of reproductive patients				
Black	0.130	0.0987	-0.0315	<0.001***
White	0.472	0.462	-0.00982	0.287
Hispanic	0.201	0.202	0.000955	0.890
Medicaid	0.376	0.341	-0.0347	<0.001***
Private	0.491	0.532	0.0414	<0.001***
Self-Pay	0.0578	0.0472	-0.0106	0.001***
N (hospital-years)	8,608	1,459		
N (hospitals)	1,002			

Panel B: Breakdown of Hospitals

	Number of Hospitals
Never Catholic	835
Always Catholic	130
To Catholic Only	17
From Catholic Only	13
To and From Catholic	7
Total	1,002

Panel C: Hosptilas That Switch Once Before and After Switch

	To Catholic		From Catholic	
	Before	After	Before	After
Beds	218.2	249.1	385.7	263.4
Procedures/Bed				
Tubal Ligation	0.491	0.393	0.237	0.429
C-section and Tubal Ligation	0.299	0.268	0.123	0.290
Vasectomy	0.00133	0.000383	0.00000889	0.0000556
Abortion	0.00202	0.000545	0.00109	0.00175
C-section	1.723	1.965	1.171	1.552
D&C	0.121	0.183	0.181	0.0928
Diagnosis/Bed				
Miscarriage/Stillbirth	0.0752	0.0809	0.0895	0.0688
Miscarriage/Stillbirth & Complication	0.0138	0.0126	0.00937	0.0137
Demographics				
Share of reproductive patients				
Black	0.0663	0.137	0.107	0.0982
White	0.430	0.430	0.325	0.487
Hispanic	0.101	0.237	0.180	0.193
Medicaid	0.330	0.199	0.381	0.436
Private	0.535	0.664	0.485	0.456
Self Pay	0.0510	0.0679	0.0624	0.0248
N (hospital-years)	126	99	71	84
N (hospitals)	17		13	

It is important to note that while tubal ligations and C-sections are generally inpatient procedures, vasectomies and abortions are generally outpatient procedures (Babigumira et al. 2015) and so minimally appear in our inpatient discharge data, explaining the low per-bed means. Despite this, we include them as these procedures are restricted by USCCB directives and are suggestive of the directives being somewhat binding.

We also include above the rate of discharges that have both a procedure code for a tubal ligation and for a C-section. This is because many women who have a C-section for their last child choose to have a tubal ligation at the same time, avoiding an additional abdominal surgery (Committee on Health Care for Underserved Women 2012). Sterilization is performed following 10% of all births and performing the procedure immediately postpartum is considered the most effective method (ACOG 2003, Kaunitz et al. 2008). If a woman delivers a baby in a Catholic hospital and wants to become sterilized following the birth, she must now have an additional operation in a different hospital for a tubal ligation, increasing the risk of complications (Miller 2015).

Table 1, Panel A also includes the mean rates of a miscarriage or stillbirth, as well as a miscarriage or stillbirth with an accompanying complication.[24] There is anecdotal evidence that Catholic hospitals wait for the fetal heartbeat to cease during a miscarriage before performing a D&C (Freedman, Landy, and Steinauer 2008). Our hypothesis is therefore that Catholic affiliation may increase the rates of associated complications, but have no effect on the number of miscarriages and stillbirths.

Finally, Table 1, Panel A also contains means for patient demographic characteristics. These are calculated for patients that have at least one of the reproductive related diagnoses or procedures of interest for our analysis, namely tubal ligation, C-sections, vasectomies, abortions, D&C, miscarriages, and stillbirths. As with the procedure and diagnoses rates, there are statistically significant differences between Catholic and not-Catholic hospitals.[25]

Table 1, Panel B shows the breakdown of hospitals by whether they had an ownership change and the type of change. Our results below are identified based on the 37 hospitals that change status at least once during the time period that we study.[26]

Table 1, Panel C, shows the means for the variables in Panel A for the 30 hospitals that change Catholic affiliation exactly once. One can see the outlines of our main results here – that prohibited reproductive procedures decrease when hospitals become Catholic and increase when hospitals cease being Catholic.

Panel C also suggests changes in the demographic composition of patients. Therefore, before turning to our main regression results, we want to check formally whether patient demographic

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[24] We define a complication for at least one of the following codes: maternal infection (diagnosis), maternal hemorrhage (diagnosis), hysterectomy (procedure), or transfusion (procedure).

[25] Including hospital fixed effects does not, however, change the statistical significance of our results. See Tables 3 and 4 (with hospital fixed effects) and Table D9 (without).

[26] Out of the 37 hospitals that change status, 13 become Catholic, 17 stop being Catholic, and 7 change status more than once.

characteristics change in a statistically significant way when hospital fixed effects are included. Table 2 has the results of estimating our main regression but with the share of patients that have a particular demographic characteristic as the outcome variable as opposed to the rate of procedures per bed. We also include the number of beds itself to see if hospitals are changing size when they change affiliation. Based on the results in Table 2 Panel A, we see minimal evidence of compositional changes in patients attending hospitals that switch to or from Catholic ownership. There may also be changes in hospital characteristics that could influence our outcomes of interest and we evaluate them in Panel B of Table 2 We find no evidence that hospital characteristics, such as total expenditure, births or number of doctors, change with Catholic ownership. This allows us to proceed to the main results with some confidence in our identification strategy.[27]

[27] This also suggests that despite the overall merger-driven Catholic consolidation in the U.S., our results are identified from hospitals becoming or ceasing to be Catholic affiliated without substantially changing in size.

Table 2: Patient Demographics When a Hospital Changes Catholic Status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Share of reproductive patients that are						
	Black	White	Hispanic	Medicaid	Private	Self-Pay	Beds
Catholic	0.0173*	-0.0248	-0.00451	0.000960	0.00287	-0.007	18.83
	(0.0104)	(0.0574)	(0.0269)	(0.0347)	(0.0343)	(0.0152)	(14.70)
Dependent Var. mean	0.130	0.472	0.201	0.376	0.491	0.0578	272.9
R-squared[28]	0.008	0.020	0.048	0.102	0.105	0.005	0.007
	Panel B: Hospital characteristics						
	Total Payroll	Total Expenditure	Total Births	Total Admissions	FTE Doctors	FTE RNs	FTE Medical Residents
Catholic	6.187e+06	1.550e+07	-49.76	454.3	4.227	-4.370	2.735
	(5.144e+06)	(1.228e+07)	(113.4)	(371.3)	(2.915)	(16.46)	(3.934)
Dependent Var. Mean	8.210e+07	1.940e+08	1410	12495	32.78	387.0	43.23
R-squared	0.272	0.295	0.012	0.102	0.024	0.182	0.026
Observations	10,067	10,067	10,067	10,067	10,067	10,067	10,067
# of Hospitals	1,002	1,002	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. These regressions include all hospitals in our sample. "Dependent Var. Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

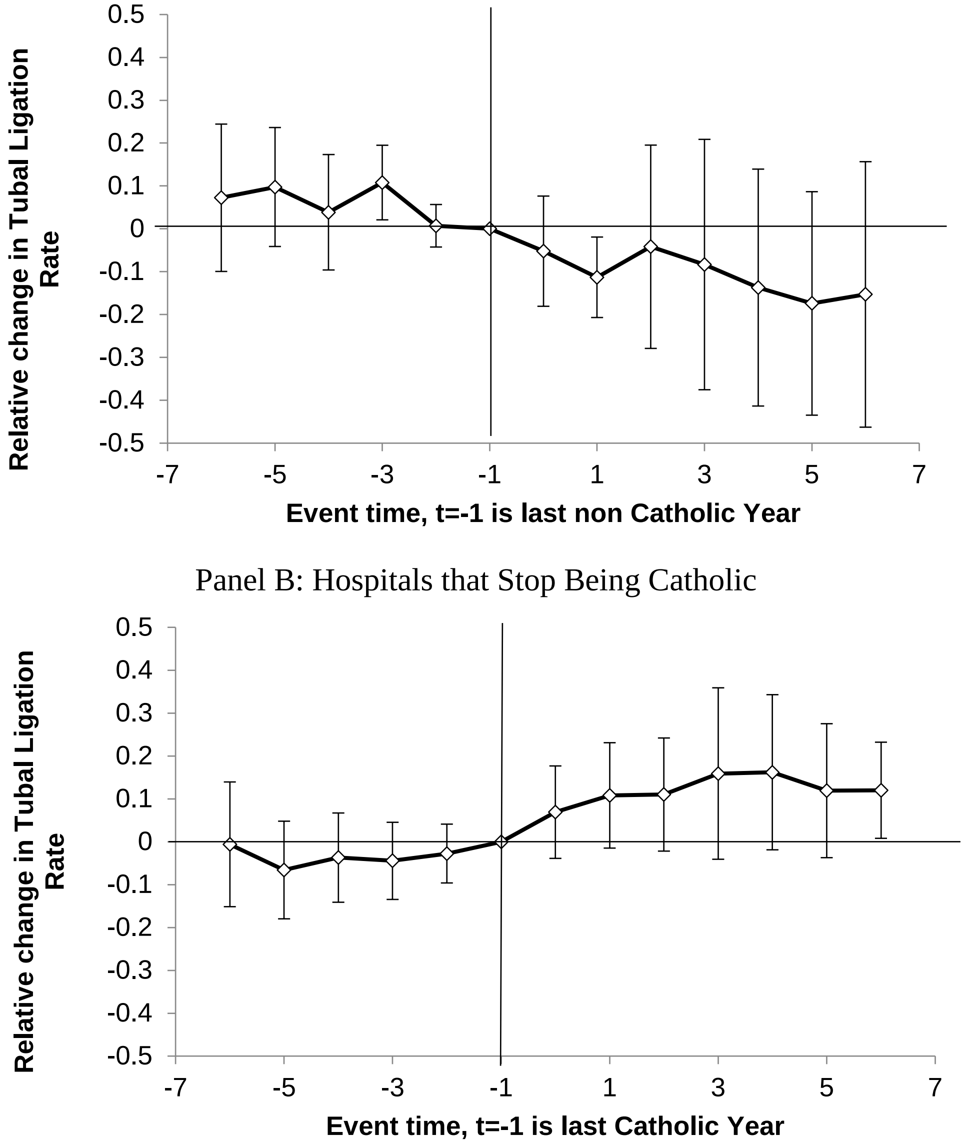
Panels A and B of Figure 1 show an event study for the per bed rate of tubal ligations for the 30 hospitals that change status once. Each point comes from a coefficient on a dummy variable for that value of event time. To be consistent with our regressions below, we also include hospital and year fixed effects and cluster standard errors at the hospital level.

Time zero is defined as the first year of Catholic affiliation (Panel A) or the last year of Catholic affiliation (Panel B). We exclude hospitals that have the same affiliation throughout the sample, as well as the ones that switch more than once, though both are included in the regressions below.

[28] Throughout the paper, we are reporting the "within" R-squared per the xtreg, fe model in Stata, which are "obtained by only fitting a mean deviated model where the effects of the groups (all of the dummy variables) are assumed to be fixed quantities." See https://www.stata.com/support/faqs/statistics/areg-versus-xtreg-fe/.

Figure 1: Event Study For Tubal Ligation Rate

Panel A: Hospitals that Become Catholic



Notes: From regressions which included a dummy for year in event time. The last year non-Catholic (Panel A) or non-Catholic (Panel B) year (-1) was omitted. Whiskers show 95% confidence interval. Both regressions include hospital and year fixed effects. Robust standard errors are clustered at the hospital level.

In Panel A, one can see a persistent level drop in the post period. In Panel B, there is a smaller but clear increase in the early part of the post period. This is in part because sales of religious hospitals to non-religious organizations can include stipulations to maintain religion-based restrictions on procedures.[29]

[29] http://www.mergerwatch.org/sale-of-religious-hospitals/

One may be concerned that there is an overall downward trend that is driving this result. Out of the 17 hospitals that become Catholic, two do have a multi-year downward trend in their per bed tubal ligation rate. Our results, though, are robust to omitting those two hospitals from the analysis.[30]

Table 3: The Impact of Catholic Hospitals on Tubal Ligations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Catholic	-0.139***	-0.141***	-0.151***	-0.152***	-0.117**	-0.121***	-0.1000**
	(0.0406)	(0.0402)	(0.0227)	(0.0508)	(0.0496)	(0.0462)	(0.0502)
1 year lead for Catholic							-0.0294
							(0.0403)
Dependent variable mean	0.456	0.456	0.394	0.457	0.456	0.465	0.465
Year Fixed Effects	N	Y	Y	Y	Y	Y	Y
No Change Hospitals	Y	Y	N	Y	Y	Y	Y
To Catholic Hospitals	Y	Y	Y	Y	N	Y	Y
From Catholic Hospitals	Y	Y	Y	N	Y	Y	Y
R-squared	0.001	0.011	0.141	0.011	0.010	0.015	0.015
Observations	10,067	10,067	491	9,912	9,842	8,902	8,902
Number of Hospitals	1,002	1,002	37	989	985	943	943

*Notes: All regressions include hospital fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 3 contains results from our main regression for the tubal ligation rate for many different specifications. Column (1) is a parsimonious model for the pure within-hospital effect for all hospitals, with hospital fixed effects but without year fixed effects. Column (2) adds year fixed effects in case there are national trends which might affect the results, though here they have minimal impact on the coefficient of interest. We consider this to be our primary specification, as it includes all of the hospitals and a full set of time and hospital fixed effects.

Columns (3)-(5) exclude different groups of hospitals, including those that do not change, those that become Catholic, and those that stop being Catholic.[31] In Columns (6)-(7), we test our identification

[30] See Appendix D, Table D10. We also preform the balance test proposed by Goodman-Bacon (2018) and fail to reject the hypothesis that trends differ.

[31] One might be concerned that with only 37 hospital that change ownership that we would not have enough power to identify a statistically significant result. The results in the third columns of Tables 3-5 show that our results are actually more precise when focusing on only these hospitals, and so demonstrate that we have sufficient power. We have also bootstrapped our

by including a one-year lead for hospitals that switch to Catholic. Not all hospitals in our sample have data for this lead. Column (6) estimates our main result with this subsample and Column (7) includes the lead. Although this lead is not statistically significant, it may explain about 20% of our effect. We also estimate lagged models to better understand how effects vary over time (Appendix Table D11). We find that these effects are more immediate, which is consistent with our other suggestive evidence that patients may learn about the religious restriction over time and sort to other hospitals.

The coefficient is fairly consistent across specifications, with Catholic affiliation reducing the per bed tubal ligation rate by 31%, compared with non-Catholic hospitals.[32] Furthermore, when comparing the results in Columns (4) and (5) to the other coefficients in the table, it appears that the effect is being driven by hospitals that become Catholic, as only using hospitals that are no longer Catholic affiliated gives a smaller coefficient (though it is of the same direction).[33]

Table 4 Panel A repeats this analysis for the per bed rate of both a tubal ligation and C-section. As above, the effect is consistent across specifications and driven primarily by hospitals that become Catholic affiliated. Compared to the mean, becoming Catholic affiliated reduces the per bed rate by 24%. Hospitals that are no longer Catholic have no significant change in C-section and tubal ligation compared to hospitals that do not change ownership.

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standard errors for the main result in Column (2) of Table 3 and the p-value becomes 0.004. For Column (3) that includes just switching hospitals, the bootstrapped p-value is 0.000.

[32] One might be concerned that we are simultaneously testing six different hypotheses in Tables 3-5. A conservative Bonferroni correction would be to set a p-value threshold of 0.17% (1/6) instead of 1%. The p-values for tubal ligation in Column (2) are less than 0.17% and so the result is still statistically significant even with this stringent definition.

[33] Again, this may be due to sales including stipulations to maintain religion-based restrictions on procedures. See http://www.mergerwatch.org/sale-of-religious-hospitals/

Table 4: The Impact of Catholic Hospitals on Additional Outcomes

	(1)	(2)	(3)	(4)	(5)
	Panel A: C-Section & Tubal Ligation				
Catholic	-0.0837***	-0.0724***	-0.0760***	-0.0773**	-0.0505
	(0.0271)	(0.0267)	(0.0152)	(0.0349)	(0.0341)
Dependent variable mean	0.300	0.300	0.250	0.300	0.300
R-squared	0.001	0.025	0.095	0.024	0.024
	Panel B: Vasectomy				
Catholic	-0.00063**	-0.00073***	-0.00077**	-0.0010***	-0.00030
	(0.000265)	(0.000243)	(0.000304)	(0.000387)	(0.000370)
Dependent variable mean	0.00055	0.00055	0.00066	0.00055	0.00054
R-squared	0.001	0.005	0.043	0.006	0.005
	Panel C: Abortion				
Catholic	-0.000952**	-0.00168**	-0.00103***	5.98e-05	-0.00343
	(0.000394)	(0.000659)	(0.000388)	(0.00614)	(0.00601)
Dependent variable mean	0.00548	0.00548	0.00197	0.00551	0.00553
R-squared	0.000	0.003	0.103	0.003	0.003
Year Fixed Effects	N	Y	Y	Y	Y
No Change Hospitals	Y	Y	N	Y	Y
To Catholic Hospitals	Y	Y	Y	Y	N
From Catholic Hospitals	Y	Y	Y	N	Y
Observations	10,067	10,067	491	9,912	9,842
Number of Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 4 Panel B repeats the analysis for vasectomies. Here the results are trickier, as the mean is extremely low due to the fact that most vasectomies are performed as an outpatient procedure. Still, the coefficient is statistically significant and driven by hospitals that become Catholic affiliated. At the mean, this coefficient represents a greater than 100% decrease, which is partly a function of the mean being so low. Still, the result is overall consistent with those above.

Table 4 Panel C repeats the analysis for the per bed abortion rate. As with vasectomies, abortion is usually an outpatient procedure and the average rate is very low. The coefficient in the full specification in Column (2) corresponds to 30% decrease at the mean, which is very close to the percentage drops from the results in Table 3. However, the results in Columns (4) and (5) are not statistically significant, and so it is difficult to say which kind of hospital affiliation change is driving the results.

Table 5 Panel A and Panel B show estimates for the two procedures that we do not expect to be affected by Catholic affiliation: C-section rates by themselves and D&Cs. These tables show few statistically significant results, nor directionally consistent point estimates, which confirms our hypothesis that the number of these procedures performed should not be affected by Catholic ownership.[34]

Table 5: The Impact of Catholic Hospitals on C-Section and D&C

	(1)	(2)	(3)	(4)	(5)
Panel A: C-Section					
Catholic	-0.169	-0.0859	-0.124*	-0.234	0.0885
	(0.112)	(0.111)	(0.0704)	(0.197)	(0.193)
Dependent variable mean	1.704	1.704	1.394	1.706	1.704
R-squared	0.000	0.033	0.070	0.033	0.033
Panel B: D&C					
Catholic	0.0205	0.0106	-0.000491	-0.00232	0.0142
	(0.0177)	(0.0154)	(0.0203)	(0.0227)	(0.0216)
Dependent variable mean	0.117	0.117	0.0899	0.117	0.117
R-squared	0.000	0.033	0.070	0.033	0.033
Year FE	N	Y	Y	Y	Y
No Change Hospitals	Y	Y	N	Y	Y
To Catholic Hospitals	Y	Y	Y	Y	N
From Catholic Hospitals	Y	Y	Y	N	Y
Observations	10,067	10,067	491	9,912	9,842
Number of Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

[34] We also investigate as an outcome variable the total number of reproductive discharges (i.e., ones that that have reproductive procedure or diagnoses, including abortion, tubal ligation, vasectomy, D&C, C-section, hysterectomy, IUD, childbirth, miscarriage, stillbirth, maternal hemorrhage, or maternal infection. This is a larger sample of hospital-years (any with at least one of these procedures or diagnoses) than our primary one (at least one of tubal ligation, C-section, vasectomy, abortion, and D&C). We find that our tubal ligation results are consistent in this larger sample, but that across multiple specifications, including count (with and without adjusting for the number of beds) and per bed rates, we find no statistically significant effect of changing to or from Catholic on this new measure. See Appendix D, Table D12.

6. Welfare Implications of Reductions in Reproductive Procedures

The above results confirm that hospitals that switch to Catholic ownership seem to partially comply with USCCB Ethical and Religious Directives (USCCB 2009) and reduce certain reproductive health procedures. We now consider the broader welfare implications of these changes, parameterized with a handful of metrics that are possible with our data sets. We first start with stratifying our main results by dimensions that may indicate racial disparities or which women are disproportionately affected by these ownership changes.

We examine the racial and ethnic breakdown of the effect on the per bed rate of tubal ligations in Table 6. Column (1) has the per bed rate for discharges in any of the three groups.[35] The result in Column (1) is comparable to the results above. The results of Columns (2)-(5) are all of a comparable direction and magnitude, although the result for whites is no longer statistically significant. Using the mean for all hospitals, the percentage changes are also comparable – 22%, 37%, 31%, and 33%. Overall, this result is most precisely estimated when non-white women are pooled together in Column (5).

However, it is possible that individuals of different races and ethnicities are not being admitted to the same hospitals and therefore these point estimates have different relative meaning. The second row of dependent variable means is for hospitals that switch status when they are not Catholic. Here we see that the mean rate is much lower for Hispanics, which makes the relative drop much larger (68%). This relative effect is almost as large when pooling blacks and Hispanics (57%).[36]

[35] Notice that the mean of 0.372 (for all hospitals) is lower than the mean in Table 3 of 0.456 due to the exclusion of the "other" category from the numerator but the same denominator. Also notice that the means in Columns (2)-(4) sum to the mean in Column (1).

[36] While this is suggestive of a larger impact on Hispanics, we cannot reject the null hypothesis that these coefficients are statistically significantly different from each other.

Table 6: Racial Breakdown of Effect on Tubal Ligation Rate

	(1) White, Black, and Hispanic	(2) White	(3) Black	(4) Hispanic	(5) Black and Hispanic
Catholic	-0.101**	-0.0394	-0.0168**	-0.0450**	-0.0618***
	(0.0429)	(0.0292)	(0.00741)	(0.0207)	(0.0230)
Dependent variable mean:					
All non-Catholic hospitals	0.372	0.182	0.046	0.144	0.190
Switching Hospitals when non-Catholic	0.249	0.140	0.0426	0.0661	0.109
R-squared	0.003	0.002	0.008	0.006	0.004
Observations	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 7 stratifies by competitiveness of the hospital service area, using HCUP's 2006 data on the Herfindahl Hirschman Index (HHI). We do this to determine whether having fewer alternative hospitals in a service area explain our findings. While we cannot reject that the coefficients in Columns (2) and (3) are equal to each other, it is strongly suggestive that hospital service areas with more concentration in a handful of hospitals (i.e., more market power for the Catholic hospital), the greater the reduction on the tubal ligation rate from being Catholic affiliated. We discuss additional heterogeneity of our findings in Appendix G where we stratify by age, insurance type and type of Catholic affiliation.

Table 7: Competitiveness of Hospital Service Area on Tubal Ligation Rate

	(1) All	(2) Low HHI	(3) High HHI
Catholic	-0.173***	-0.143**	-0.193***
	(0.0490)	(0.0689)	(0.0676)
Dependent variable mean:	0.517	0.512	0.522
R-squared	0.023	0.022	0.041
Observations	7,146	3,471	3,675
Number of Hospitals	713	366	347

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Next, one can imagine a scenario where a woman who wants a tubal ligation cannot get one at the hospital where she is planning on delivering her final child. She therefore then has to recover and go to a different hospital for a tubal ligation.

In five out of the six states that we have data for (excluding New Jersey) and for the years 2003 and onward, we can identify patients across discharges and also order those discharges in time. Using these measures, we can identify women who had a C-section and then had a subsequent tubal ligation in another hospital without a subsequent C-section. Table 8 shows our main results from above for the subset of states and years with these patient linking variables, as well as the impact of Catholic affiliation on this new variable. First, we check the consistency in this subsample of our main results (for tubal ligation, C-section and tubal ligation, vasectomy, and abortion) from Table 4. The estimates in the Columns (1)-(2) are comparable to above, whereas those in (3) and (4) are directionally consistent but no longer statistically significant, perhaps due to the loss of power and variation from these exclusions. Column (5), however, shows both an exceptionally low mean rate of our new variable and also a marginally significant coefficient which has the opposite sign of our hypothesis.[37] We also looked at days from birth to tubal ligation in order to measure the intensive margin of a delay in tubal ligation and

[37] These results are consistent using a broader definition, namely a woman who has a child (by any means of delivery) but not tubal ligation, and then later a tubal ligation and no C-section.

show those results in Appendix D Table D13. We find some qualitative evidence that the time to tubal ligation for vaginal births increases, but time to tubal ligation for C-sections does not change.

Table 8: The Impact of Catholic Hospitals on C-section & Tubal Ligation without C-Section Later Elsewhere

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section & Tubal Ligation Elsewhere
Catholic	-0.132***	-0.0744***	-0.000988	-7.21e-05	-0.000691*
	(0.0326)	(0.0222)	(0.000870)	(0.000804)	(0.000412)
Dependent variable mean	0.429	0.299	0.000456	0.00462	0.000554
R-squared	0.030	0.009	0.004	0.002	0.019
Observations	5,957	5,957	5,957	5,957	5,957
Number of Hospitals	856	856	856	856	856

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

We now turn to another measure, which comes from the concern that miscarriage management may be compromised by religion-based restrictions (Freedman, Landy, and Steinauer 2008). There is anecdotal evidence of health care providers waiting for the fetal heartbeat to stop before performing a D&C, resulting in the mother losing so much blood that she experiences a substantial complication,[38] such as needing a transfusion to survive. Had she received the D&C earlier, the outcome for the fetus would have been the same (i.e., termination), but she could have been spared the complication. In particular, a transfusion also has an opportunity cost for everyone else who may need blood, not to mention the risks to her.[39]

[38] We define a complication as at least one of: maternal infection (diagnosis code), maternal hemorrhage (diagnosis code), hysterectomy (procedure code), or transfusion (procedure code).

[39] Freedman, Lori. "Washington State Case Study: A Difficult Miscarriage Made Worse by Hospital's Religious Restrictions on Care," Huffington Post, March 28, 2014. Available at http://www.huffingtonpost.com/lori-freedman/washington-state-case-stu_b_5037035.html

Table 9 Panel A first checks whether there is an impact of Catholic affiliation on the rate of miscarriages or stillbirths themselves. As expected, we do not see any statistically significant coefficients here. Table 9 Panel B then repeats this for records that have both a diagnosis of miscarriage or stillbirth that also have at least one associated complication. Despite the anecdotal evidence mentioned above, we see no increase in the complication rate for women who are miscarrying or have a stillbirth. If anything, there is some evidence to the contrary – that complication rates decrease. Table 9 Panel C repeats this for records with severe maternal morbidity (SMM), which is a broader definition of complications from birth.[40] We again see weak evidence that SMM may be decreasing (a decrease would support an overall conclusion of improved quality). Lastly, Table 9 Panel D checks whether there is an impact of Catholic affiliation on the rate of hysterectomies for women under age 40. Hysterectomy for this age group may be indicated during a hemorrhage, if women have fibroids or endometriosis and is another form of sterilization. We again find some evidence that there is a reduction in rate of hysterectomies. While consistently negative, unlike the effect on tubal ligations, this effect is not precisely estimated across specifications, ranging from 4% to 33%.

[40] https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm

Table 9: The Impact of Catholic Hospitals on Miscarriage/Stillbirth, SMM and Hysterectomy

	(1)	(2)	(3)	(4)	(5)
Panel A: Miscarriage/Stillbirth					
Catholic	-0.00200	-0.00491	-0.00683	-0.0118	0.000034
	(0.00652)	(0.00614)	(0.00473)	(0.0104)	(0.0102)
Dependent variable mean	0.0732	0.0732	0.0592	0.0732	0.0732
R-squared	0.000	0.028	0.118	0.028	0.027
Panel B: Miscarriage/Stillbirth with Complications					
Catholic	-0.0040*	-0.0034*	-0.0044***	-0.0033	-0.0032
	(0.00207)	(0.00214)	(0.00132)	(0.00373)	(0.00365)
Dependent variable mean	0.0139	0.0139	0.0112	0.0139	0.0139
R-squared	0.000	0.007	0.063	0.006	0.007
Panel C: Severe Maternal Morbidity					
Catholic	-0.0109*	-0.00498	-0.00730*	-0.0119	0.00477
	(0.00632)	(0.00583)	(0.00372)	(0.00855)	(0.00836)
Dependent variable mean	0.0667	0.0667	0.0476	0.0667	0.0669
R-squared	0.000	0.091	0.156	0.091	0.092
Panel D: Hysterectomy Under Age 40					
Catholic	-0.0236	-0.0340	-0.0472***	-0.0529***	-0.00605
	(0.0276)	(0.0216)	(0.0116)	(0.0179)	(0.0173)
Dependent variable mean	0.161	0.161	0.188	0.161	0.158
R-squared	0.000	0.095	0.296	0.094	0.089
No Change Hospitals	Y	Y	N	Y	Y
To Catholic Hospitals	Y	Y	Y	Y	N
From Catholic Hospitals	Y	Y	Y	N	Y
Observations	10,067	10,067	491	9,912	9,842
Number of Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level. *** p<0.01, ** p<0.05, * p<0.1*

Table 10 then shows the results for another outcome measure: the birth rate (births per bed) by hospital.[41] Our hypothesis here is that a decrease in the tubal ligation rate may lead to more births in Catholic hospitals. As described in the introduction and background, unintended pregnancies have many costs to women and their children. These costs may also vary by race/ethnicity and insurance coverage. Despite this hypothesis, we find no evidence that the birth rate changed, overall or for any racial or

[41] We define births by discharges for delivering mothers that include a live childbirth diagnosis. One might be concerned that this undercounts births due to non-singletons or children born outside of hospitals. Comparing the year-state totals from https://wonder.cdc.gov/natality.html yields undercount estimates of less than 10%, suggesting that this is a valid approach.

insurance subgroup.[42] Qualitatively, the magnitudes are small and directionally suggest the opposite of this hypothesis. This is at first surprising, but the conceptual framework used to understand the implications of reduced access to abortion suggest an ambiguous result (Bailey and Lindo 2018). Women who cannot get a tubal ligation due to a change in ownership may seek alternative contraceptive methods, such as LARC, which is growing in popularity over this time period. Furthermore, we see some evidence that women are switching to a non-Catholic hospital for their second birth, which would allow them to get the tubal ligation as planned.

Table 10: Birth Rate with Racial and Insurance Breakdown

	(1) All	(2) White	(3) Black	(4) Hispanic	(5) Medicaid	(6) Private	(7) Self-Pay
Catholic	-0.437	-0.0767	-0.0354	-0.168	0.125	-0.273	-0.138
	(0.365)	(0.355)	(0.0566)	(0.161)	(0.292)	(0.240)	(0.102)
Dependent variable mean	5.597	2.352	0.516	1.490	2.432	2.799	0.199
R-squared	0.006	0.004	0.003	0.013	0.036	0.006	0.016
Observations	10,067	10,067	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

A growing literature has shown that hospital loyalty results in welfare losses due to patients persisting with less quality hospitals. In addition, our Table 3 may be biased by composition effects and so we test for sorting of patients by restricting to women who have at least two births during our time of interest. In Table 11 Panel A, we perform an individual level linear probability model for two outcomes: 1) binary for switching hospital between deliveries (regardless of Catholic status) and 2) binary for switching to a hospital that is not Catholic. We cluster standard errors at the level of the birth hospital

[42] We also repeat our analysis by looking at the general fertility (GFR) rate by hospital service area as a function of the share of beds in Catholic hospitals and find analogous results, overall or for any racial subgroup.

for the second birth. We find some suggestive evidence that women are 50% more likely to switch if the hospital where they first gave birth became Catholic between deliveries. These estimates are not precisely estimated. In Table 11 Panel B, we estimate the second outcome (binary for switching to a non-Catholic hospital) for different subgroups of women. We find larger and more precisely estimated effects for black and Hispanic women and women on Medicaid, though we cannot reject the hypothesis that any pair of coefficients is equal to each other.

Table 11: Catholic Ownership and Women Switching Hospitals between Births

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Overall Switching across First and Second Birth						
	Any Switch			Switch to Non-Catholic		
Hospital to Catholic	0.333*	0.135	0.142	0.269*	0.149	0.157
	(0.183)	(0.142)	(0.138)	(0.155)	(0.127)	(0.125)
Dep. Var. Mean	0.302	0.302	0.302	0.251	0.251	0.251
R-squared	0.002	0.059	0.070	0.001	0.028	0.035
Observations	925,761	925,761	925,761	925,761	925,761	925,761
State FE	N	Y	Y	N	Y	Y
Year FE	N	Y	Y	N	Y	Y
Individual Controls	N	N	Y	N	N	Y
Panel B: Switch Between First and Second Births to Non-Catholic						
	Black	White	Hispanic	Medicaid	Private	Self-Pay
Hospital to Catholic	0.192*	0.0952	0.242**	0.235***	0.145	0.169
	(0.112)	(0.118)	(0.117)	(0.0804)	(0.144)	(0.150)
Dep. Var. Mean	0.300	0.221	0.269	0.285	0.224	0.267
R-squared	0.011	0.048	0.024	0.018	0.046	0.038
Observations	103,186	425,252	233,377	375,981	512,871	17,004
State FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Individual Controls	Y	Y	Y	Y	Y	Y

*Notes: These regressions are performed on individual level data for the population of states where we have individual person id across hospitalizations. We limit to the sample to women who have exactly two births, and to women whose first hospital was never Catholic or always Catholic (Hospital to Catholic =0), or switched to Catholic between the years of the first and second birth (Hospital to Catholic = 1). We drop women whose first birth hospital switch from Catholic to non-Catholic affiliation. Columns (1)-(3) of Panel A is a linear probability model of the likelihood a mother switches hospitals between the two births ("Any Switch") (i.e., the two hospitals have different AHA IDs). Columns (4)-(6) are the likelihood that the mother switches to hospital that is not Catholic. Panel B is a linear probability model for "Switch to Non-Catholic" where each column is a separate subgroup of mothers. In Panel B, all regressions include State and Year FE. Individual controls include dummies for Black, White, Hispanic, and payer categories. "Dep. Var. Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at hospital are in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

8. Robustness checks

Appendix D contains several robustness checks, some of which have been referenced above. Our results are robust to limiting the sample to adult and OB-GYN beds as the denominator, though this reduces our sample because some hospitals' AHA records do not have a breakdown of the general beds (Table D1). They are also robust to only treating a hospital as Catholic affiliated if the hospital itself is Catholic and not just part of a network or system. This reduces the number of switching hospitals from 37 to 32 (Table D6). The results are robust to the inclusion of the county unemployment rate (Table D14).

Our results are also robust to only using hospitals that appear in every year of data we have for their state (Table D7). They are also robust to excluding the years when a hospital changes status, in case we are mis-categorizing those years as we do not have time variables other than year in the HCUP data. This is even the case if we also include an additional year before and after. This is in the spirit of Barreca, et al.'s (2011) "donut" regressions (Tables D15, D16).

Additionally, our results are robust to only considering general hospitals (Table D17) or only considering not-profit hospitals (Table D18), as one might expect them to behave differently than for-profit hospitals (David 2009). Both of these categories can be identified using the AHA data. Our results are also robust to including a state-year fixed effect instead of only a year fixed effect (state fixed effects would be collinear with hospital fixed effects) (Table D19), and to alternate specifications, such as a count, log, and Poisson model, all controlling for the number of beds in the hospital or using a time-invariant measure of beds, or including other controls from the AHA data. (Tables D3, D4, D20 and D21 and Appendix F).[43]

In order to better understand whether hospitals switching to or from Catholic are both experiencing similar levels of consolidation, we estimate models with number of hospitals in the system

[43] Our results are robust to a count model that does not control for the number of beds. See Appendix D, Table D2. We also show that the count model is robust to including hospital characteristics in Appendix Table D4.

as the outcome in Table D22. We find some evidence that switching from Catholic to not-Catholic results in a smaller system and may be indicative of deconsolidation.

We also perform a falsification check using the AHA variable for hospital system. We estimate how tubal ligations change with other system changes in Appendix Table D23. If anything, we find positive effects from system changes, although none are precisely estimated. In Column (4), we add this to our primary specification and the coefficient on Catholic ownership is virtually the same as our main result reported in Table 3. We also estimate two models intended to understand any observable differences between hospitals that switch (either to or from Catholic). Table D24 provides these estimates and we do not find evidence that observables are explaining the likelihood that a hospital switches to or from Catholic.

There may be state-level changes in the availability of emergency contraception which could change the population of women seeking tubal ligation or abortion. We collected policy information and created fixed effects for various policy supports or restrictions of emergency contraception and including these controls does not change our main effect.[44]

Lastly, we address potential concerns about the robustness of generalized difference-in-differences (see Goodman-Bacon 2018). In Appendix E, we describe the proposed method and our implementation of it. In particular, we do not find any violation of the variance weighted common trends (VWCT) assumption using the balance test described in Goodman-Bacon (2018). We also calculate the weights proposed and adjust the estimates and find very similar “variance weighted average treatment on the treated” (VWATT) to our main result.

9. Discussion

[44] The coefficient is -0.140***.

Of the 25 largest hospital systems in the United States, one-third are Catholic, with a combined 67,345 staffed beds (Uttley and Khaikin 2016). Multiplying this by our main primary result above from Column (2) of Table 3 (-0.141) translates into 9,496 fewer tubal ligations per year as a result of Catholic restrictions on reproductive care. This alone represents a substantial cost to women, who must subsequently rely on other, less-reliable forms of contraception.

Despite our results that show these substantial decreases when a hospital is Catholic affiliated, the relative effects are less than 100%. This is puzzling, as one would expect the Catholic-based guidelines on a hospital to be binding. One possible hypothesis is that these guidelines are not in fact binding, and physicians have de facto leeway to ignore the guidelines when they see fit. Freedman, Landy, and Steinauer (2008) found exactly this in interviews with obstetrician-gynecologists. Physicians sometimes intentionally disregarded protocol when they believed that patient safety was being compromised.

Another question is why the magnitude of the effects is generally smaller for hospitals that stop being Catholic versus ones that become Catholic. Here, as mentioned above, the likely explanation is that some of the sales of Catholic hospitals contain stipulations keeping the previous religion-based restrictions.[45]

It is also surprising that we do not find substantial changes in welfare (by these measures). It is possible that women having C-sections and then tubal ligations elsewhere is simply too rare (unlike a tubal ligation) for us to measure in our data or that women reduce their take-up of this procedure when they are faced with the restriction.[46] One possible explanation for why we find tubal ligation rates decreasing but no change in birth rates is that outpatient vasectomies increase to compensate as households switch sterilization strategies. The two are obviously close substitutes, with multiple studies

[45] See again http://www.mergerwatch.org/sale-of-religious-hospitals/

[46] A limitation of our analysis is that we cannot know if patients switched hospitals to undertake procedures after the hospital changed to Catholic.

finding a cross-sectional negative correlation between tubal ligation and vasectomy rates when stratifying by income (Fransoo et al. 2013), education (Anderson et al. 2012), and race (Borrero et al. 2009). Our results suggest that other, specific welfare margins such as the rates of unintended pregnancies would be an appropriate outcome to consider, but this would require substantially different data sets.

That said, our results suggest that more women face the risks of unintended pregnancies when a hospital in their community becomes Catholic and imposes religious-based restrictions on reproductive procedures. Unintended pregnancies result in substantial financial costs and worse outcomes for children. As of 2015, the US Department of Agriculture estimates that it costs $233,610 to raise a child from birth to the age of 17 (Lino et al 2017). These costs can be a substantial share of the total budget for low-income families. Children who experience an unintended birth of a sibling experience negative spillover effects such as declines in the quality of the home environment and increased behavioral problems (Barber and East 2011). Thus, the effects of an unintended pregnancy on child outcomes are negative and in some cases substantial.

Finally, our results are suggestive of racial disparities in the effect of Catholic restrictions on tubal ligations, with the largest relative effect on Hispanics. This is consistent with the general consensus in the literature that finds racial disparities in health care (e.g., Kirby et al. 2006). We also find suggestive evidence that our effect is stronger for hospitals that are Catholic-owned, and also for Catholic-owned institutions for hospital service areas that have greater market concentration that provide consumers with fewer options.

10. Conclusion

In this paper, we investigate the effect of Catholic hospital ownership on the likelihood that a woman receives appropriate reproductive health care. We use within-hospital, across-patient variation to control for potential differences in patient population across different types of hospitals, including a hospital fixed effect. We compile a new data set of hospital ownership status and characterize hospitals as “switchers” (from Catholic to non-Catholic and vice versa) or always Catholic/non-Catholic. We find statistically significant reductions in multiple procedures defined as prohibited by the UCCSB religious guidelines. Most concerning are large reductions in the number of tubal ligations performed in Catholic-owned hospitals.

Our results are stronger in hospital service areas that lack competition, that contribute to greater health disparities for low-income women who lack the time or financial resources to travel to another provider in another service area. Women of color and those who do not have a college education are more likely to rely on contraceptive sterilization for birth control (Daniels et al. 2014). For many women, the lack of sterilization results in an unplanned pregnancy: in one study, nearly half of women with an unfulfilled postpartum sterilization request became pregnant within one year (Thurman and Janecek 2010). As a result, the imposition of a particular religion’s medical restrictions on others, without their consent, could have a substantial negative impact. Previous research has shown that children born from unplanned and mistimed pregnancies have substantially worse health outcomes. While we do not see an effect on the overall birth rate at the hospital service area, it is possible that there is still an effect on subsets of the population. We leave it to further research with additional data sets to measure that outcome.

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Appendix A

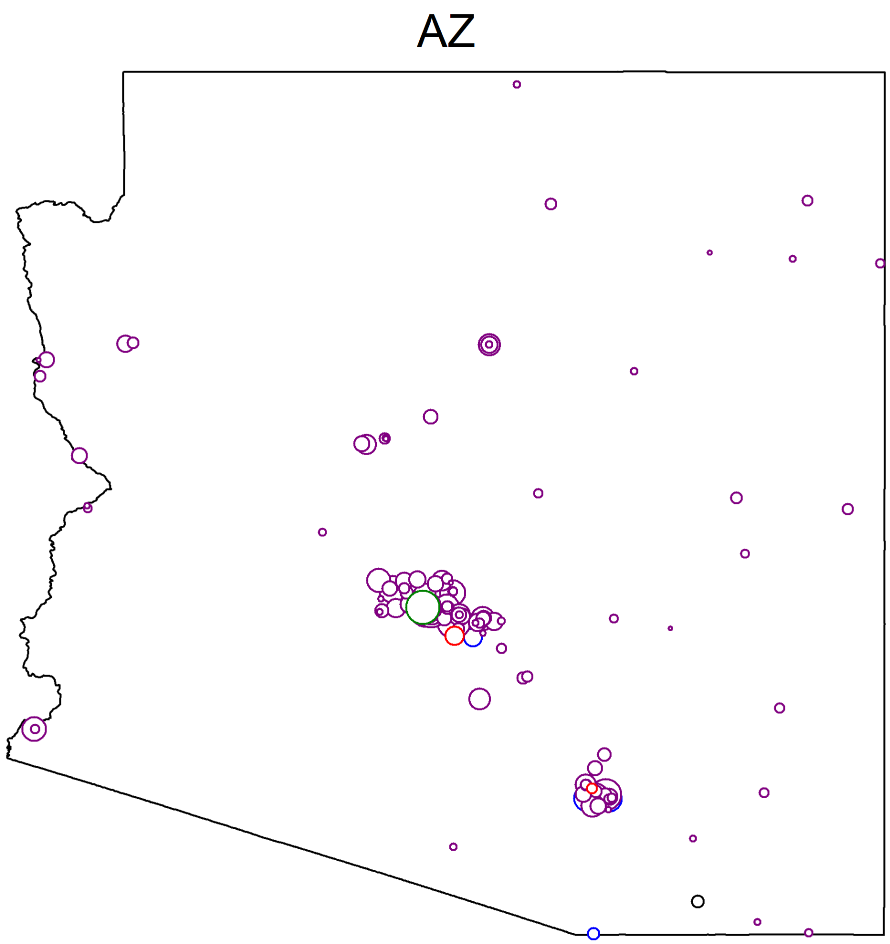
Catholic Hospitals are governed by the Ethical and Religious Directives for Catholic Health Care (Directives), some of which restrict reproductive health care of women:

- "Catholic hospitals may not promote or condone contraceptive practices." (Directive 52)
- "Abortion (that is, the directly intended termination of pregnancy before viability or the directly intended destruction of a viable fetus) is never permitted." (Directive 45)
- "Prenatal diagnosis is not permitted when undertaken with the intention of aborting an unborn child with a serious defect." (Directive 10)
- "In case of extrauterine pregnancy, no intervention is morally licit which constitutes a direct abortion." (Directive 48)
- "Heterologous fertilization (that is, any technique used to achieve conception by the use of gametes coming from at least one donor other than the spouses) is prohibited because it is contrary to the covenant of marriage, the unity of the spouses, and the dignity proper to parents and the child." (Directive 40)
- "Direct sterilization of either men or women, whether permanent or temporary, is not permitted in a Catholic health care institution." (Directive 53)"Catholic health care services must . . . require adherence to [the Directives] within the institution as a condition for medical privileges and employment." (Directive 5)

<u>Appendix B</u>

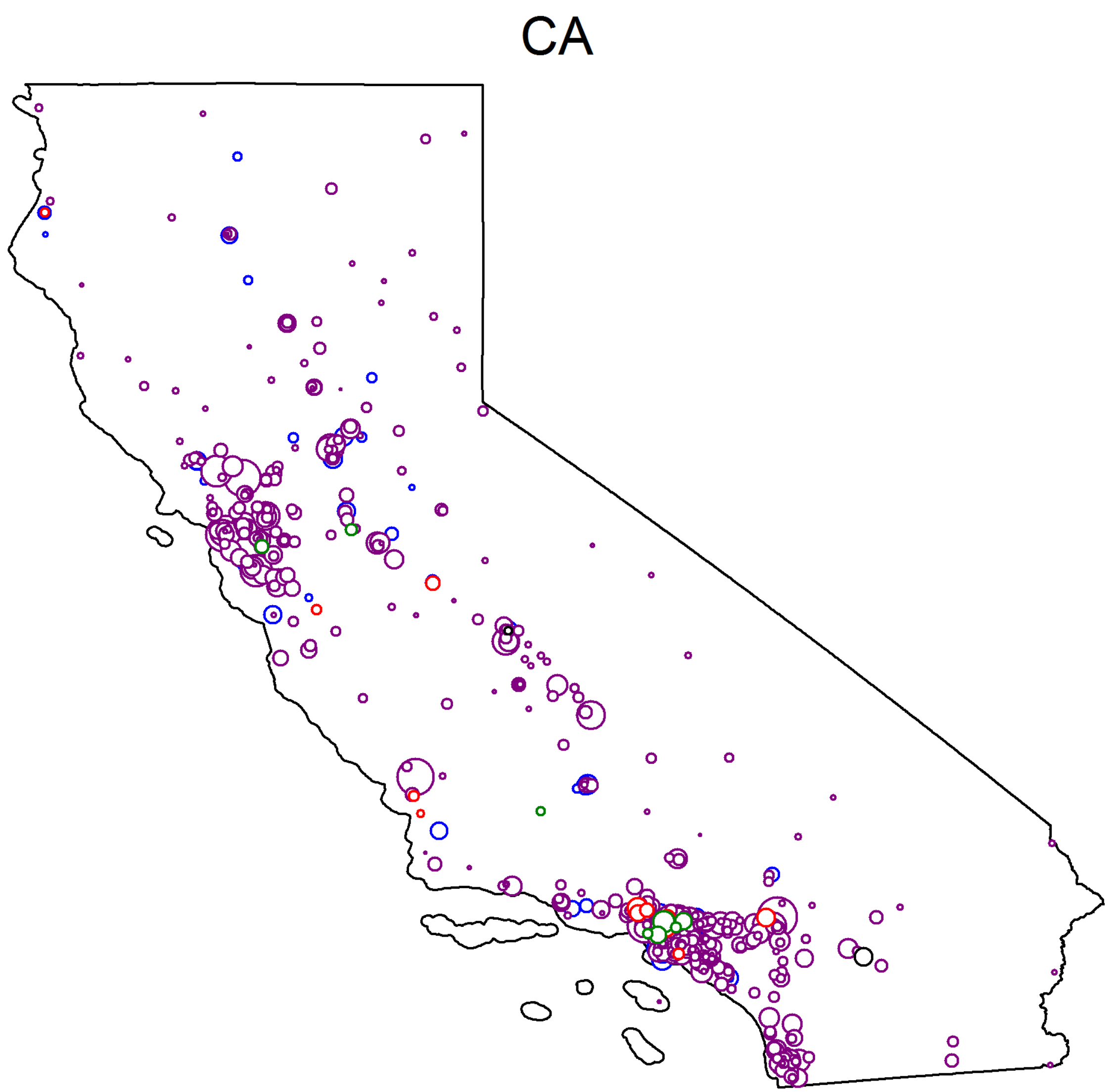
Figure B1: Maps

Panel A:



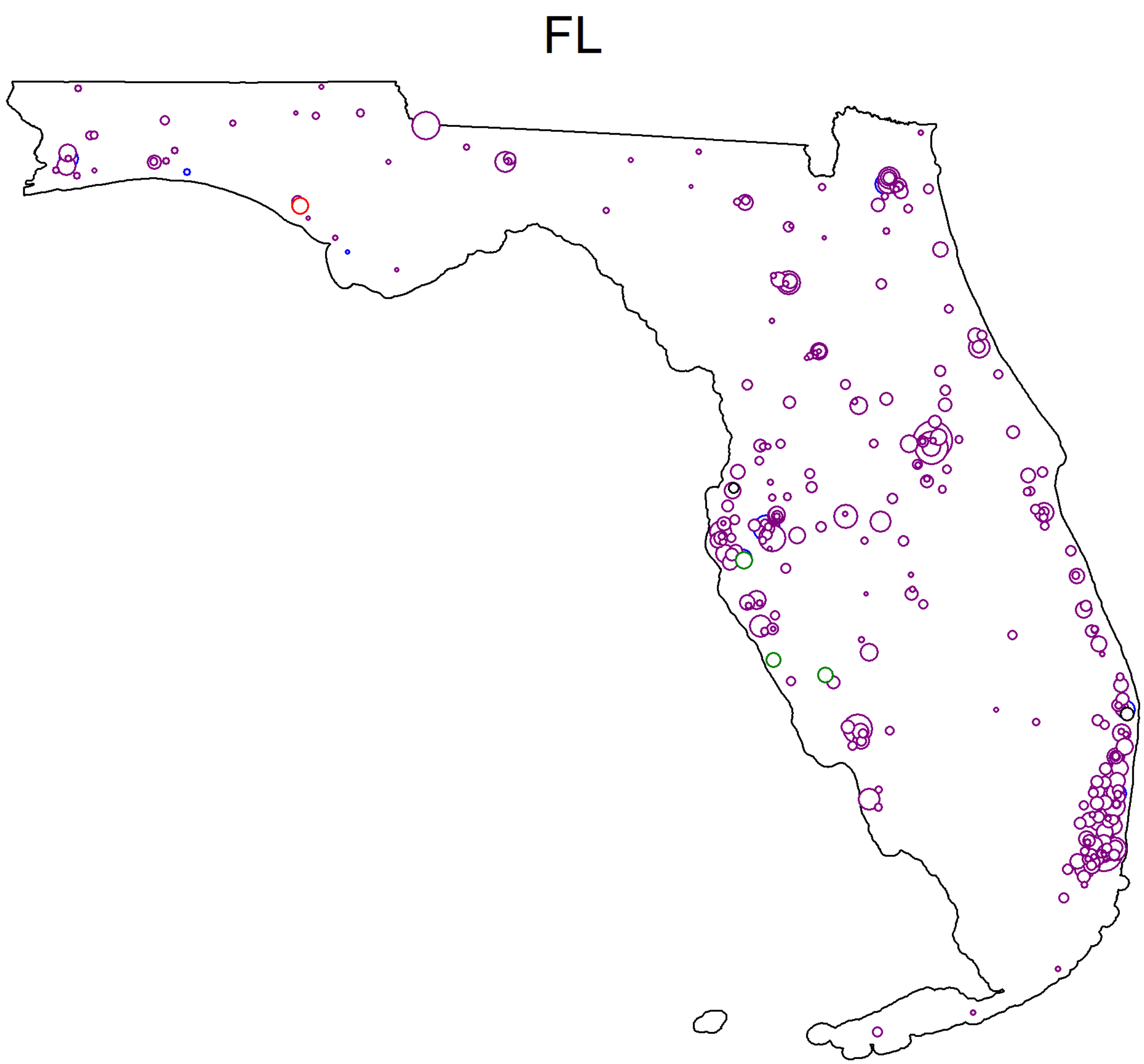
Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

Panel B:



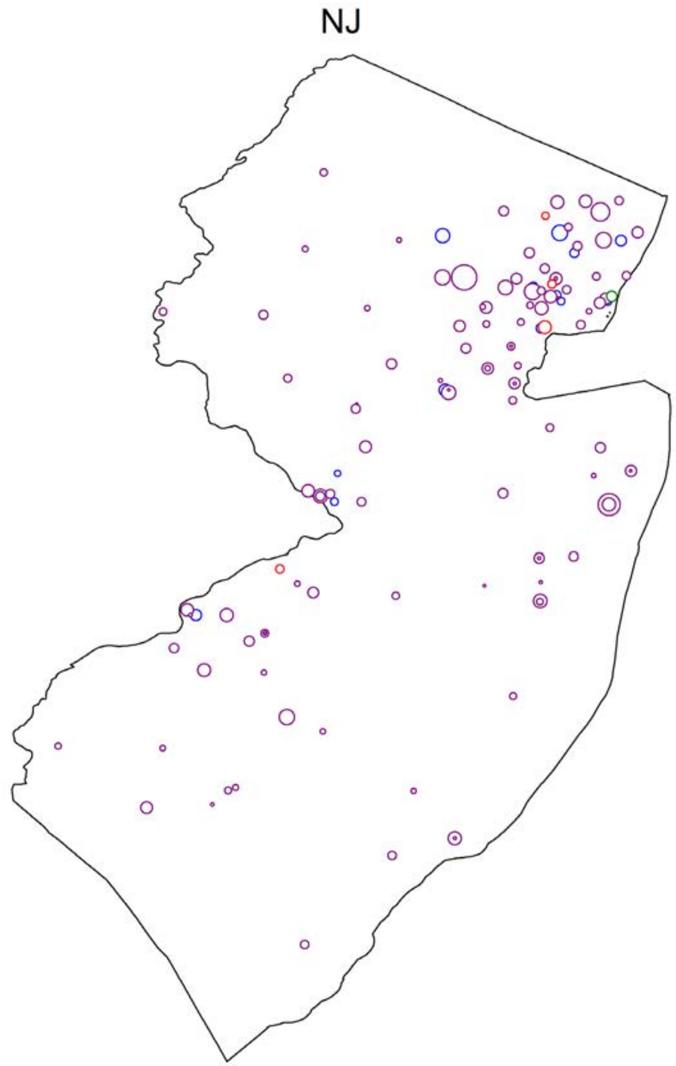
Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

Panel C:



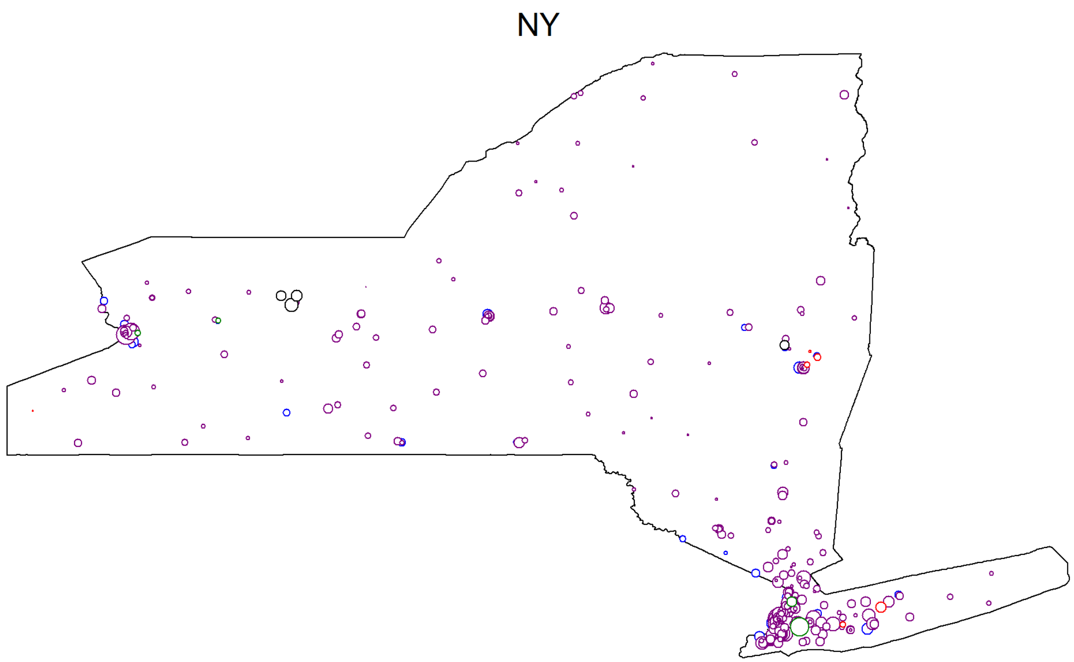
Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

Panel D:



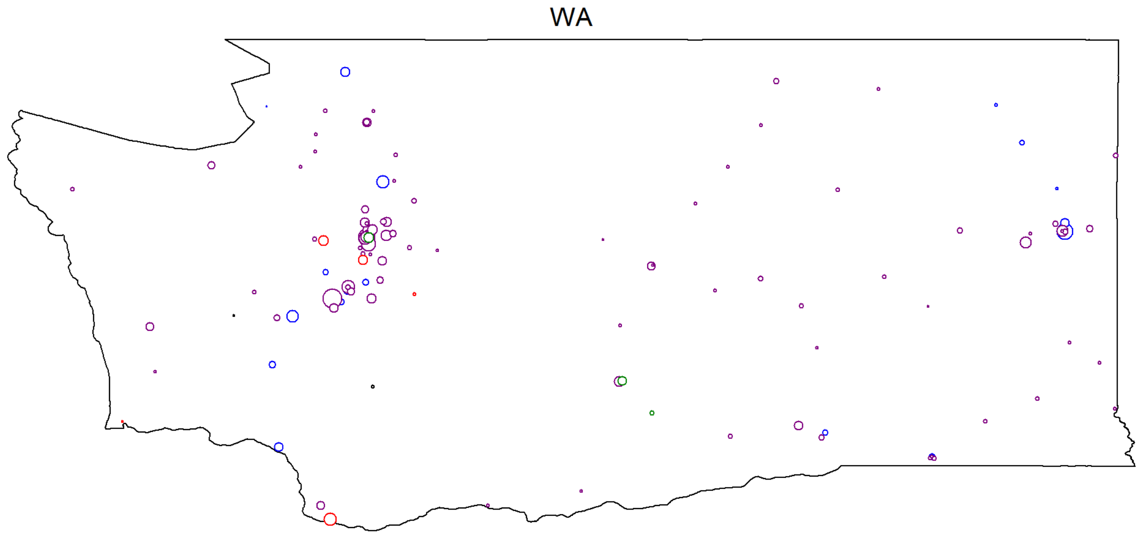
Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

Panel E:



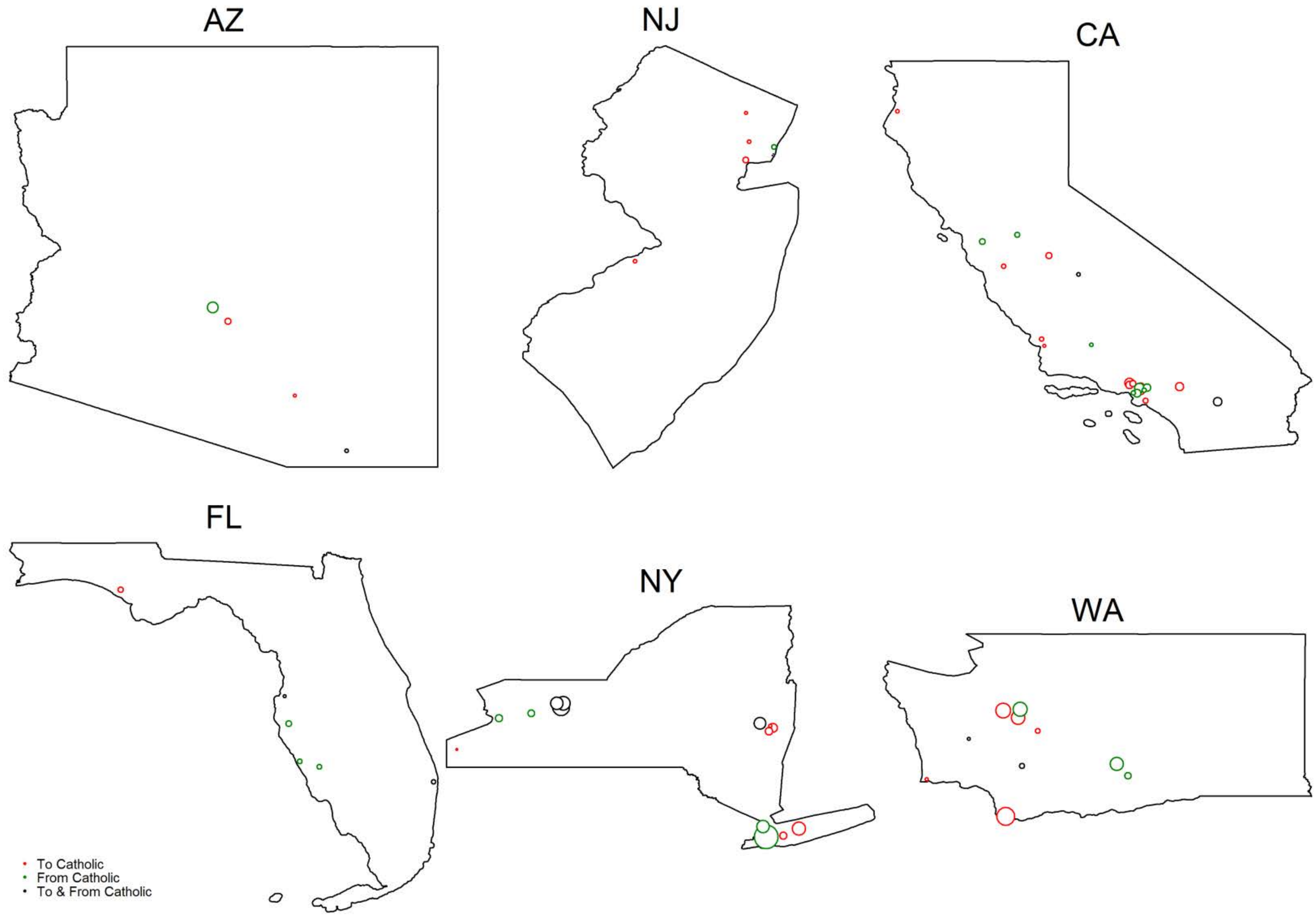
Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

Panel F:



Notes: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

Figure B2: Map of Switcher Hospitals



Appendix C

Table C1:Hospital-Years by States and Year

Year	Arizona	California	Florida	New Jersey	New York	Washington	Total
1998	52	0	174	75	202	76	579
1999	48	0	167	75	194	74	558
2000	49	0	166	75	193	74	557
2001	48	0	166	69	189	74	546
2002	47	0	166	73	184	72	542
2003	46	230	168	72	186	69	771
2004	48	272	167	74	179	70	810
2005	47	283	160	73	175	69	807
2006	45	312	170	71	174	72	844
2007	46	304	158	68	171	73	820
2008	48	300	161	64	142	69	784
2009	46	301	160	66	143	73	789
2010	51	0	164	62	138	71	486
2011	0	0	159	61	153	71	444
2012	0	0	154	0	147	70	371
2013	0	0	155	0	138	66	359
Total	621	2,002	2,615	978	2,708	1,143	10,067

Appendix D Robustness checks

Table D1:Adult & Ob-Gyn Beds Instead of All Beds

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.239**	-0.134**	-0.00110***	-0.00268*	-0.224
	(0.113)	(0.0568)	(0.000393)	(0.00157)	(0.256)
Dependent variable mean	0.753	0.491	0.000881	0.00961	2.811
R-squared	0.012	0.032	0.007	0.006	0.041
Observations	7,874	7,874	7,874	7,874	7,874
Number of Hospitals	933	933	933	933	933

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D2:Count Model, Without Controlling for Beds

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-28.22***	-15.85**	-0.0965***	-0.228	-2.093
	(8.460)	(7.041)	(0.0325)	(0.306)	(33.08)
Dep. Var. Mean	107.4	73.09	0.128	1.679	435.9
R-squared	0.030	0.109	0.007	0.012	0.185
Observations	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: Estimates are from a linear model. Dependent variable is the number of procedures performed in each hospital in each year. All regressions include hospital and year fixed effects. "Dep. Var. Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. ** p<0.01, ** p<0.05, * p<0.1*

Table D3:Fixed Effect Poisson, Controlling for Beds

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.433***	-0.440***	-0.964***	-0.237	-0.0630
	(0.148)	(0.159)	(0.346)	(0.293)	(0.0785)
Number of Beds	0.000263***	0.000337***	0.000899	0.00121**	0.000422***
	(9.14e-05)	(9.17e-05)	(0.000554)	(0.000536)	(6.85e-05)
Observations	9,372	8,203	5,300	7,423	8,826
Number of Hospitals	863	744	429	647	803

*Notes: Estimates are from a Poisson model. Dependent variable is the number of procedures performed in each hospital in each year. All regressions include hospital and year fixed effects. Robust standard errors in parentheses. ** p<0.01, ** p<0.05, * p<0.1*

TableD4: Additional AHA Controls and Time-Invariant Base-Measures for Count, Rate and Fixed-Effects Poisson Models

	(1) Count	(2) Count	(3) Count	(4) Rate	(5) Rate	(6) Poisson	(7) Poisson
Catholic	-29.02***	-25.52***	-26.35***	-0.131***	-0.141***	-.431***	-.431***
	(8.450)	(6.881)	(6.179)	(0.0445)	(0.0362)	(0.0149)	(.0147)
Observations	10,067	10,067	5,601	10,067	10,067	9,372	9,372
R-squared	0.006	0.172	0.199	0.026	0.023	N/A	N/A
Number of Hospitals	1,002	1,002	713	1,002	1,002	1,002	863
Dep. Var. Mean	107.4	107.4	107.4	0.457	0.459		
Controls		No missing	Most				
Denominator				Start Beds	End Beds	Start Beds	End Beds

*Notes: Estimates in Columns 1-3 are from a linear model and the dependent variable is the number of tubal ligations performed in each hospital year. We add AHA controls described as “no missing”: total payroll expenses, total expenses, total births, total admissions, FTE Physicians and Dentists, FTE Registered Nurses, FTE Medical and Dental Residents, and Total Beds and “most”: includes no missing plus Beds in the NICU, obstetrics service level, and obstetric beds. For Columns 4 and 5, the dependent variable is the per bed tubal ligation rate. Columns 6 and 7 are from a Poisson model and the dependent variable is the number of tubal ligation procedures performed in each hospital in each year. All regressions include hospital and year fixed effects. “Dep Var. Mean” row refers to the mean for hospitals that are not Catholic in that year. We use two time-invariant beds measures from the first year of data (“Start Beds”) and from the last year of data (“End Beds”). Robust standard errors in parentheses are clustered at the hospital. ** p<0.01, ** p<0.05, * p<0.1*

Table D5:Dropping One State at a Time

	(1) Drop AZ	(2) Drop CA	(3) Drop FL	(4) Drop NJ	(5) Drop NY	(6) Drop WA
Catholic	-0.149***	-0.132***	-0.138***	-0.117***	-0.179***	-0.138***
	(0.0397)	(0.0434)	(0.0444)	(0.0448)	(0.0491)	(0.0437)
Dependent variable mean	0.453	0.398	0.472	0.463	0.518	0.441
R-squared	0.011	0.012	0.008	0.019	0.013	0.011
Observations	9,446	8,065	7,452	9,089	7,359	8,924
Number of Hospitals	935	658	800	916	786	915

*Notes: Dependent variable is the per bed tubal ligation rate. All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D6:Only Catholic Hospital are Catholic - System or Ownership Are Not Enough

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.146***	-0.0779***	-0.000713***	-0.00225***	-0.117
	(0.0431)	(0.0274)	(0.000193)	(0.000681)	(0.113)
Dependent variable mean	0.457	0.301	0.000546	0.00546	1.710
R-squared	0.011	0.025	0.005	0.003	0.033
Observations	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D7:Only Hospitals That Appear in All Years of Their State's Data

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.188***	-0.0999***	-0.000651**	-0.000804	-0.129
	(0.0459)	(0.0303)	(0.000331)	(0.000922)	(0.117)
Dependent variable mean	0.498	0.328	0.000526	0.00441	1.852
R-squared	0.023	0.031	0.008	0.019	0.064
Observations	7,138	7,138	7,138	7,138	7,138
Number of Hospitals	564	564	564	564	564

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D8:All Hospitals with Any Discharges in HCUP in a Given Year

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.114***	-0.0594**	-0.000609***	-0.00131**	-0.0561
	(0.0361)	(0.0234)	(0.000210)	(0.000514)	(0.101)
Mean	0.352	0.232	0.000422	0.00423	1.315
R-squared	0.012	0.021	0.005	0.003	0.026
Observations	12,766	12,766	12,766	12,766	12,766
Number of Hospitals	1,241	1,241	1,241	1,241	1,241

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D9:Without Hospital Fixed Effects

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.267***	-0.155***	-0.000394***	-0.00511***	-0.0349
	(0.0290)	(0.0216)	(5.12e-05)	(0.00160)	(0.123)
Dependent variable mean	0.456	0.300	0.000547	0.00548	1.704
R-squared	0.035	0.043	0.006	0.002	0.030
Observations	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D10:Dropping Two To-Catholic Hospitals with Strong Pre Trends

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.124***	-0.0636**	-0.000798***	-0.00184***	-0.0347
	(0.0405)	(0.0275)	(0.000248)	(0.000686)	(0.110)
Dependent variable mean	0.455	0.300	0.000547	0.00548	1.702
R-squared	0.010	0.025	0.006	0.003	0.033
Observations	10,044	10,044	10,044	10,044	10,044
Number of Hospitals	1,000	1,000	1,000	1,000	1,000

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D11:Impact of Catholic Hospitals on Tubal Ligations Over Time

	(1)	(2)	(3)	(4)	(5)	(6)
Catholic	-0.155***	-0.134***	-0.161***	-0.146***	-0.165***	-0.148***
	(0.0403)	(0.0432)	(0.0374)	(0.0374)	(0.0405)	(0.0394)
Lag 1-2yrs		-0.0492		-0.0285		-0.0601**
		(0.0375)		(0.0235)		(0.0296)
Lag 3-4 yrs				-0.0242		0.0277
				(0.0478)		(0.0426)
Lag 5-6 yrs						-0.0272
						(0.0350)
Observations	7,996	7,996	6,157	6,157	4,529	4,529
R-squared	0.026	0.026	0.032	0.032	0.050	0.051
Number of Hospitals	921	921	843	843	730	730
No Change	Y	Y	Y	Y	Y	Y
To Catholic	Y	Y	Y	Y	Y	Y
From Catholic	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

*Notes: All regressions include hospital and year fixed effects. Robust standard errors are clustered at hospital in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D12:All Reproductive Discharges

	(1) Tubal Ligation Count	(2) Tubal Ligation Count	(3) Tubal Ligation Rate	(4) Reproductive Discharge Count	(5) Reproductive Discharge Count	(6) Reproductive Discharge Rate
Catholic	-23.92***	-24.70***	-0.129***	37.43	17.58	-0.445
	(8.599)	(8.614)	(0.0382)	(113.1)	(106.3)	(0.400)
Number of beds		0.0438***			1.113***	
		(0.0155)			(0.181)	
Mean	97.26	97.26	0.413	1452	1452	5.917
R-squared	0.027	0.032	0.011	0.022	0.049	0.006
Observations	11,035	11,035	11,035	11,035	11,035	11,035
Number of Hospitals	1,122	1,122	1,122	1,122	1,122	1,122

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. ** p<0.01, ** p<0.05, * p<0.1*

Table D13:Catholic Ownership on Time from Birth to Tubal Ligation

	(1)	(2)	(3)	(4)
	Tubal Ligation	Days Between Birth & Tubal Ligation	C-section & Tubal Ligation	Days Between C-section & Tubal Ligation
Catholic	-0.151***	169.0	-0.161***	-1.241
	(0.0385)	(134.8)	(0.0421)	(1.061)
Observations	4,606	4,606	4,535	4,535
R-squared	0.035	0.035	0.036	0.005
Number of Hospital	688	688	657	657
To Catholic	Y	Y	Y	Y
From Catholic	Y	Y	Y	Y
Dependent Var Mean	0.617	14.31	0.626	5.610

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D14: Impact of Catholic Ownership on Tubal Ligations Controlling for County-Level Unemployment

	(1)	(2)	(3)	(4)
Catholic	-0.141***	-0.140***	-0.150***	-0.150***
	(0.0402)	(0.0406)	(0.0441)	(0.0441)
County unemployment rate		-0.0128***		-0.0116
		(0.00482)		(0.0164)
No Change	Y	Y	N	N
To Catholic	Y	Y	Y	Y
From Catholic	Y	Y	Y	Y
R-squared	0.011	0.012	0.143	0.143
Observations	10,067	10,067	491	491
Number of Hospital	1,002	1,002	37	37

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D15:Donut Regression, Excluding Years When a Hospital Switched

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.166***	-0.0895***	-0.00075***	-0.00201**	-0.111
	(0.0479)	(0.0328)	(0.000284)	(0.000788)	(0.133)
Dependent variable mean	0.457	0.300	0.000548	0.00549	1.706
R-squared	0.011	0.025	0.005	0.003	0.033
Observations	10,023	10,023	10,023	10,023	10,023
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D16:Donut Regression, Excluding Years When a Hospital Switched and +/- 1 Year

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.161***	-0.0895**	-0.00119**	-0.00288***	-0.0350
	(0.0600)	(0.0427)	(0.000462)	(0.00105)	(0.168)
Dependent variable mean	0.457	0.301	0.000550	0.00550	1.707
R-squared	0.010	0.025	0.006	0.003	0.033
Observations	9,949	9,949	9,949	9,949	9,949
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D17:General Hospitals Only

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.141***	-0.0726***	-0.000721***	-0.00154**	-0.0866
	(0.0402)	(0.0267)	(0.000243)	(0.000627)	(0.111)
Dependent variable mean	0.455	0.299	0.000526	0.00400	1.697
R-squared	0.012	0.025	0.005	0.017	0.033
Observations	9,882	9,882	9,882	9,882	9,882
Number of Hospitals	972	972	972	972	972

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D18:Not-for-Profit Hospitals Only

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.120**	-0.0573*	-0.000913***	-0.000709	-0.119
	(0.0474)	(0.0296)	(0.000319)	(0.000531)	(0.143)
Dependent variable mean	0.433	0.285	0.000617	0.00389	1.675
R-squared	0.008	0.030	0.008	0.025	0.034
Observations	6,537	6,537	6,537	6,537	6,537
Number of Hospitals	692	692	692	692	692

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D19: State-Year Fixed Effects

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.148***	-0.0754***	-0.000751***	-0.00146**	-0.121
	(0.0432)	(0.0275)	(0.000248)	(0.000695)	(0.123)
Dependent variable mean	0.456	0.300	0.000547	0.00548	1.704
R-squared	0.024	0.043	0.017	0.008	0.047
Observations	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and state-year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D20:Count Model, Controlling for Beds

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-29.08***	-17.44**	-0.0989***	-0.330	-13.04
	(8.497)	(7.013)	(0.0326)	(0.324)	(30.45)
Number of beds	0.0453***	0.0845***	0.000123	0.00538	0.581***
	(0.0161)	(0.0221)	(0.000128)	(0.00348)	(0.127)
Mean	107.4	73.09	0.128	1.679	435.9
R-squared	0.035	0.133	0.008	0.014	0.223
Observations	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: Estimates are from a linear model. Dependent variable is the number of procedures performed in each hospital in each year. All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital level in parentheses. ** p<0.01, ** p<0.05, * p<0.1*

Table D21:Log Model, Controlling for Log Beds

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic	-0.577***	-0.415***	-0.165	-0.00865	-0.0772
	(0.169)	(0.124)	(0.125)	(0.127)	(0.0714)
Ln(Number of Beds)	0.209***	0.172***	-0.104*	0.240***	0.218***
	(0.0604)	(0.0466)	(0.0632)	(0.0828)	(0.0464)
R-squared	0.032	0.139	0.056	0.039	0.147
Observations	8,193	7,569	920	2,898	8,182
Number of Hospitals	883	758	434	654	820

*Notes: Estimates are from a linear model. Dependent variable is the natural log of the number of procedures performed in each hospital in each year. All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. ** p<0.01, ** p<0.05, * p<0.1*

Table D22:The Impact of Catholic Hospitals on Number of Hospitals in Healthcare System

	(1)	(2)	(3)	(4)
Catholic	-0.392	-1.506	0.494	-3.545*
	(0.407)	(1.407)	(1.521)	(1.874)
Observations	10,067	491	9,912	9,842
R-squared	0.0238	0.082	0.021	0.024
Number of Hospital	1,002	37	989	985
No Change	Y	N	Y	Y
To Catholic	Y	Y	Y	N
From Catholic	Y	Y	N	Y
Year FE	X	Y	Y	Y
Dependent variable mean	7.518	5.493	7.492	7.591

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table D23: Falsification: Effect of Hospital System Changes on Tubal Ligation Rates

	(1)	(2)	(3)	(4)
Catholic				-0.141***
				(0.0402)
Change System	0.0168	0.0210	0.0158	0.0166
	(0.0360)	(0.0396)	(0.0488)	(0.0359)
Observations	10,067	9,576	8,302	10,067
R-squared	0.010	0.010	0.010	0.011
Number of Hospitals	1,002	965	835	1,002
No Change of Catholic Status		X	X	
Non-Catholic Only			X	

*Notes: All regressions include hospital and year fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*
‘

Table D24: Testing for Determinants of Ownership Changes

	(1) To	(2) From
Tubal ligation rate	0.0101	0.0596
	(0.0119)	(0.0910)
Black	-0.0549	-0.0850
	(0.0376)	(0.187)
White	-0.0270	-0.0779
	(0.0213)	(0.0888)
Hispanic	-0.0261	-0.141
	(0.0287)	(0.137)
Medicaid	0.000521	0.198
	(0.0401)	(0.177)
Private Insurance	0.0130	0.00294
	(0.0381)	(0.166)
Self-Pay	0.0637	0.141
	(0.0620)	(0.302)
Number of beds	3.97e-05	0.000402
	(6.60e-05)	(0.000373)
Unemployment rate	-0.00291	0.0170
	(0.00246)	(0.0124)
EC index	-0.0124*	-0.0350
	(0.00676)	(0.0390)
Total Payroll	-5.30e-10	-4.38e-09
	(5.01e-10)	(4.06e-09)
Total Expenses	8.48e-11	1.84e-09
	(2.05e-10)	(1.91e-09)
Total Births	7.90e-06	-9.43e-06
	(6.94e-06)	(3.49e-05)
Total Admissions	-2.03e-06	-1.18e-05
	(2.03e-06)	(1.47e-05)
FTE MDs	8.11e-05	0.00177
	(9.39e-05)	(0.00127)
FTE RNs	8.06e-05	-5.76e-07
	(5.28e-05)	(0.000345)
FTE Residents	3.15e-05	-0.000295
	(8.86e-05)	(0.000929)
Constant	0.0604	-0.0256
	(0.0416)	(0.170)
Observations	859	143
R-squared	0.022	0.154

Notes: This table is made up of a subsample defined as follows: for each hospital, use the earliest year of data in the sample. Column (1) is made up of the non-Catholic hospitals in the first year of data we have. The dependent variable is whether it ever becomes Catholic. Column (2) is made up of the Catholic hospitals in the first year of data we have. The dependent variable is whether it ever becomes non-Catholic. Standard errors in parentheses.

Appendix E: Goodman-Bacon (2018) Robustness Checks

As an additional layer of robustness checks we follow Goodman-Bacon (2018). This paper shows how the treatment effects resulting from a specification as the one in equation (1) are simply a weighted average of all the possible 2x2 difference-in-differences combinations that can be formed with the data. The author shows how these fixed effects estimator is a consistent estimator of a weighted version of the ATT if the treatment effects do not change over time and a generalized version of the common trends assumption holds. To compute the weights, the sample is divided in groups, where a group is defined as hospitals switching status in the same year (and an additional group is created with those that never change status). These weights will depend not only in the relative sizes of each of the groups, but also on the number of periods within the sample before and after treatment for each group.

To implement this battery of tests we require a balanced panel which leads us to generate four different subsamples within our main sample. In addition, we disregard any hospital that switched status more than once in the period as well as those that switched from Catholic to non-Catholic.

Table E1: Details of Subsamples. Balanced Panels

	Subsample 1	*Subsample 2*	*Subsample 3*	*Subsample 4*
States	*All*	*All w/o CA*	*All w/o CA AZ*	*All w/o CA AZ NJ*
Period	*2003-2009*	*1998-2010*	*1998-2011*	*1998-2013*
# of Hospitals	*609*	*387*	*351*	*286*
# No Change in Status	*606*	*381*	*346*	*279*
# Change to Catholic	*3*	*6*	*5*	*7*
# Groups	*3*	*3*	*3*	*5*
Year of Change for First Group	*2006*	*2000*	*2000*	*2000*

Table E2: Hospital Fixed Effects Estimates for Balanced Panels

	(1) To Catholic & No-Changers	(2) '03-'09	(3) No CA & <='10	(4) No CA AZ & <='11	(5) No CA AZ NJ
Catholic	-0.175***	-0.199**	-0.120	-0.223***	-0.235***
	(0.0629)	(0.0896)	(0.0890)	(0.0395)	(0.0541)
Observations	9,801	4,263	5,031	4,914	4,576
R-squared	0.011	0.012	0.014	0.016	0.024
Number of Hospitals	982	609	387	351	286
Dependent variable mean	0.459	0.540	0.457	0.442	0.450
No. of changers	17	3	6	5	7

Notes: Column (1) is our main result from Table 3 *in the paper (*Table 3 *Column 3). Columns 2-4 are four potential balanced panels contained in our main sample. All regressions include hospital FE. Robust standard errors in parentheses are clustered at the hospital level. *** p<0.01, ** p<0.05, * p<0.1*

Part 1: Testing for VWCT (Variance Weighted Common Trends)

We start by testing the variance weighted common trends assumption. To do so, we generate, for each group a weight as a treatment group and weight as a control group[47]. The fact that groups of switchers act as control groups arises naturally in this setting, in which different units are treated at different points in time, thus can both be used as treatment groups when they switch status and control groups when they don't. The relative importance of each group acting as a control or a treatment will define its net treatment weight, or in words, whether a group is a net treatment group or a control group. Finally, we test whether the pre-trends for the net treatment weighted version of the treatment group is different than those in the never treated group.

To implement this in our data, we generate a dummy variable *B* that takes value 1 if a group acts as a net treatment group (i.e. if its weight as a treatment group is greater than its weight as a control group). Then we regress the outcome variable pre-treatment on B, year dummies and its interaction with B, weighting each group by it net weight as a treatment group. The inclusion of the net weights allows us to control for the importance of each group in determining the fixed effect estimator and apply this same weighting to the pre-trend test. Our second specification, replace the year dummies with a time trend.

The results of this specifications can be seen in Table E3 and Table E4. We do not find any evidence of differential pre-trends for the treated units in comparison with the controls. All specifications show insignificant coefficients for the interaction of the year dummies with B, as well as for the interaction of the time trend with B.

[47] See Goodman-Bacon (2018) for a detailed description on how to compute this weights for each of the groups.

Table E3: Testing for Pre-trend. Year Dummies

	Subsample 1	*Subsample 2*	*Subsample 3*	*Subsample 4*
B	*-0.062*	*0.146*	*0.139*	*0.175*
	(0.621)	*(0.222)*	*(0.262)*	*(0.343)*
1998		-	-	-
1999		*-0.019*	*-0.020*	*-0.014*
		(0.027)	*(0.029)*	*(0.034)*
2003	-			
2004	*0.173*			
	(0.357)			
2005	*0.001*			
	(0.357)			
Bx1998		*-0.012*	*-0.053*	*-0.001*
		(0.314)	*(0.370)*	*(0.485)*
Bx1999		-	-	-
Bx2003	*0.085*			
	(0.879)			
Bx2004	*0.042*			
	(0.879)			
Bx2005	-			
Constant	*0.502****	*0.413****	*0.406****	*0.422****
	(0.025)	*(0.019)*	*(0.020)*	*(0.024)*
Observations	*1827*	*774*	*702*	*572*

Table E4:Testing for Pre-trend. Linear Trends

	Subsample 1	*Subsample 2*	*Subsample 3*	*Subsample 4*
B	*0.023*	*0.158*	*0.139*	*0.175*
	(0.567)	*(0.222)*	*(0.262)*	*(0.343)*
t	*0.000*	*-0.019*	*-0.020*	*-0.014*
	(0.017)	*(0.027)*	*(0.029)*	*(0.034)*
Bxt	*-0.042*	*-0.012*	*-0.053*	*-0.001*
	(0.439)	*(0.314)*	*(0.370)*	*(0.485)*
Constant	*0.508****	*0.413****	*0.406****	*0.422****
	(0.023)	*(0.019)*	*(0.020)*	*(0.024)*
Observations	*1827*	*774*	*702*	

Standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

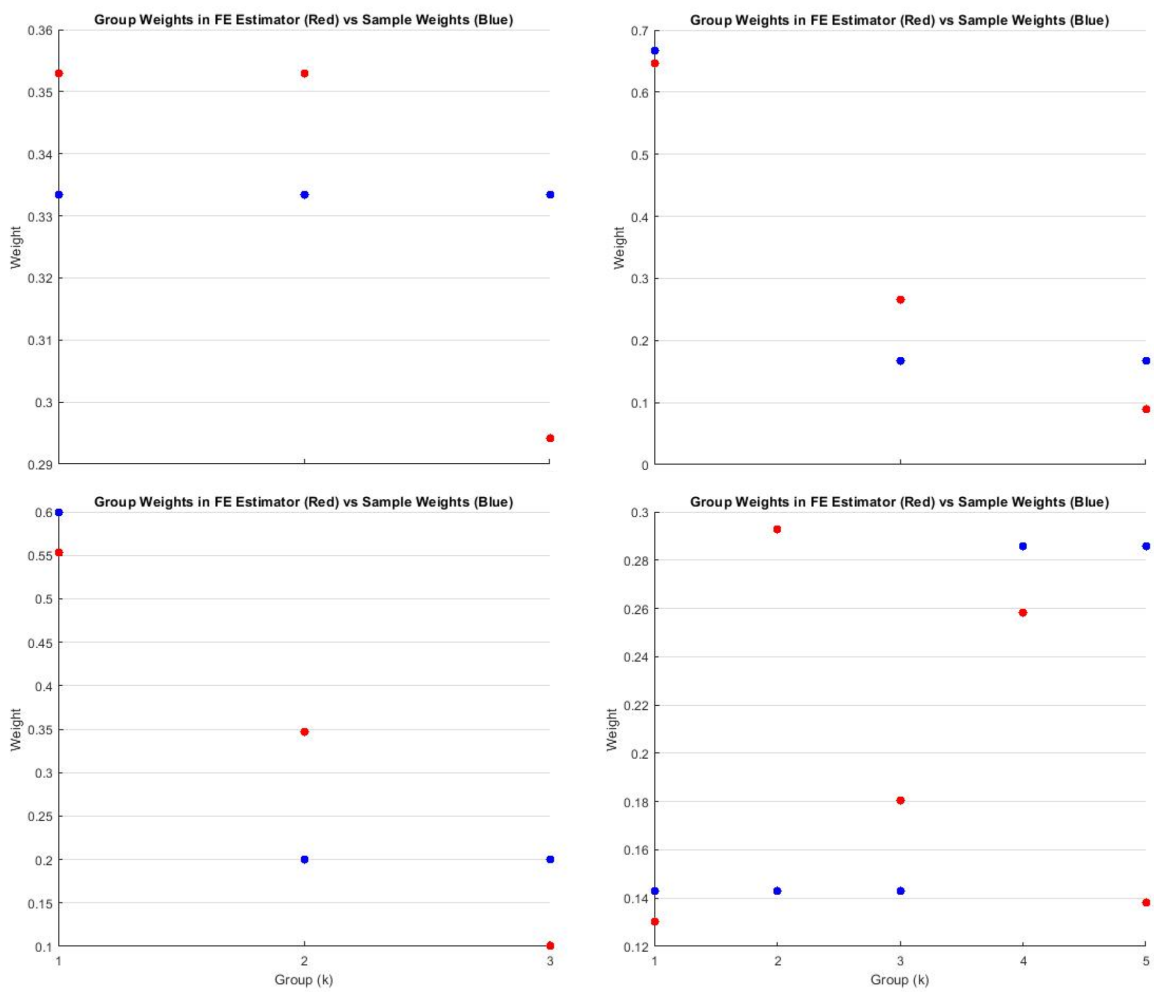
Part 2: Explaining why TVTE would be an insignificant issue in our setting

In this setting an additional challenge to the validity of our results could arise if treatment effects vary over time (i.e. if the effect arises a few periods after treatment, or if it increases or decreases over the time). This is a consequence of the use of already treated units as controls for groups treated later in time. We don't see this as concern in our setting, since the magnitude of the bias introduced by the already treated units acting as controls is function of the relative group sizes. Since our group of never treated contains always more than 100 times the number of hospitals in any treated group the bias will be negligible. As an example, for our first subsample, 0.11% of the fixed effect is a result of comparing early vs late treatment units. This proportion never exceeds 1.1% (fourth subsample) and should be of a similar magnitude in our main specification of the paper.

Part 3: How does the fixed effect estimator (VWATT) compares to other estimators (SWATT)

While our previous test show that the fixed effects estimator in our main specification is consistent for the ATT, it is still interesting to understand how it aggregates all the 2x2 difference-in-differences. Figure E1 shows the implicit weights used by the FE estimator for each group and compares them with the sample weights, for each of our subsamples. The graph below shows that there are some clear differences between both pairs of weights.

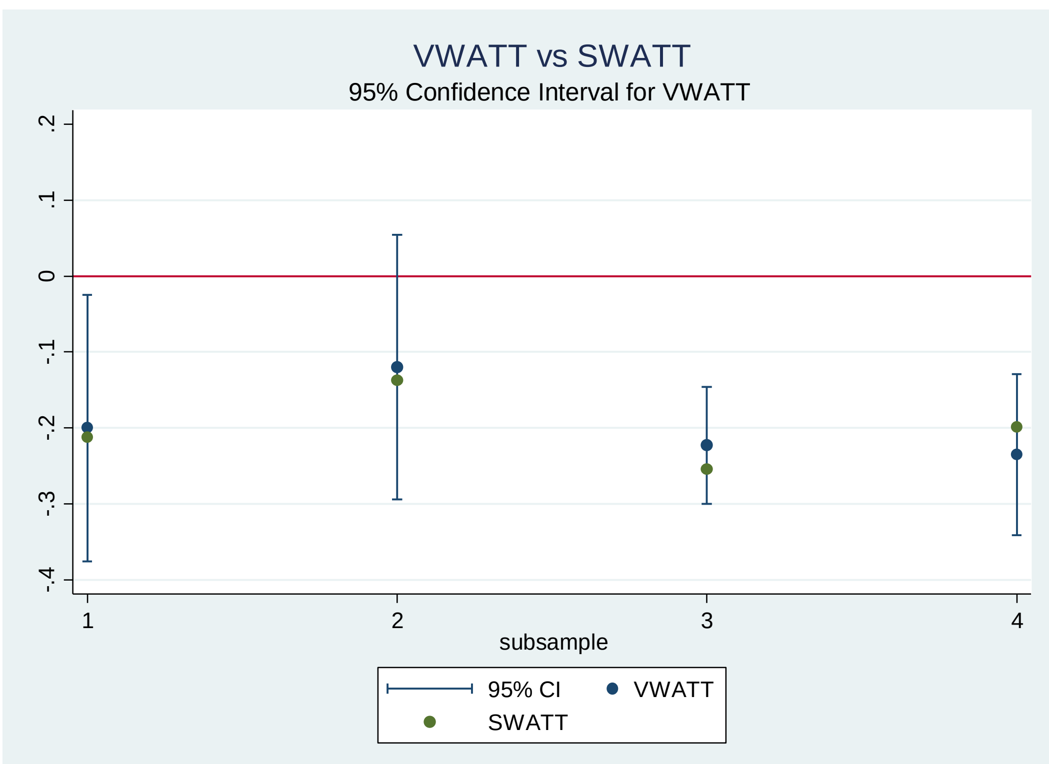
Figure E1: VWATT Weights vs Sample Weights



The graphs show the weights associated to each group's ATT under the fixed effect regression as in equation (1) and how the compared to the sample weights for each group in each of our 4 subsamples. See Goodman-Bacon (2018) for more details
Top left corner: Subsample 1. Top right corner: Subsample 2. Bottom left corner: Subsample 3. Bottom right corner: Subsample 4.

While not a problem per se, it could be that the weights used by the FE estimator is what is driving our main result, and a different weighting procedure would give us a completely different estimator. To analyze this idea we compare, for each subsample, the FE estimator to a different version in which sample weights are used to calculate the ATT. To do this, we calculate all the potential DiD for each of the groups vs the never treated group and aggregate them using the sample weights. Figure E2 presents the result of this exercise, where the red dots represent the estimator from a FE regression as in our main specification, and the blue dots are the sample weighted version of the estimator. We can see that both are very similar for all subsamples, providing further robustness to our main result of the paper.

Figure E2: VWATT vs SWATT



CI intervals calculated using robust standard errors.
ATT for each group calculated using only the never treated units as a control group.

Appendix F: Repeat of All Results Using Three Denominator Options

Table F1:Tubal Ligations

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.139***	-0.141***	-0.151***	-0.152***	-0.117**
	(0.0406)	(0.0402)	(0.0227)	(0.0508)	(0.0496)
Mean	0.456	0.456	0.394	0.457	0.456
R-squared	0.001	0.011	0.141	0.011	0.010
Panel B: Earliest Bed Data (Constant)					
Catholic	-0.135***	-0.131***	-0.136***	-0.119***	-0.115***
	(0.0443)	(0.0445)	(0.0238)	(0.0257)	(0.0248)
Mean	0.457	0.457	0.404	0.457	0.457
R-squared	0.005	0.026	0.096	0.025	0.023
Panel C: Latest Bed Data (Constant)					
Catholic	-0.142***	-0.141***	-0.155***	-0.142***	-0.112***
	(0.0359)	(0.0362)	(0.0471)	(0.0277)	(0.0242)
Mean	0.459	0.459	0.401	0.459	0.458
R-squared	0.005	0.023	0.055	0.022	0.023
No Change	Y	Y	N	Y	Y
To Catholic	Y	Y	Y	Y	N
From Catholic	Y	Y	Y	N	Y
Year FE		Y	Y	Y	Y
Observations	10,067	10,067	491	9,912	9,842
Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table F2: Vasectomy

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.000628**	-0.000729***	-0.000774**	-0.00104***	-0.000304
	(0.000265)	(0.000243)	(0.000304)	(0.000387)	(0.000370)
Mean	0.000547	0.000547	0.000655	0.000552	0.000535
R-squared	0.001	0.005	0.043	0.006	0.005
Panel B: Earliest Bed Data (Constant)					
Catholic	-0.000591**	-0.000678***	-0.000706***	-0.000957***	-0.000286
	(0.000240)	(0.000221)	(0.000270)	(0.000361)	(0.000346)
Mean	0.000543	0.000543	0.000618	0.000548	0.000533
R-squared	0.001	0.006	0.044	0.006	0.005
Panel C: Latest Bed Data (Constant)					
Catholic	-0.000566**	-0.000660***	-0.000702***	-0.000936**	-0.000279
	(0.000229)	(0.000210)	(0.000244)	(0.000396)	(0.000383)
Mean	0.000558	0.000558	0.000595	0.000563	0.000549
R-squared	0.000	0.005	0.052	0.006	0.005
No Change	Y	Y	N	Y	Y
To Catholic	Y	Y	Y	Y	N
From Catholic	Y	Y	Y	N	Y
Year FE		Y	Y	Y	Y
Observations	10,067	10,067	491	9,912	9,842
Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table F3:Abortion

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.000952**	-0.00168**	-0.00103***	5.98e-05	-0.00343
	(0.000394)	(0.000659)	(0.000388)	(0.00614)	(0.00601)
Mean	0.00548	0.00548	0.00197	0.00551	0.00553
R-squared	0.000	0.003	0.103	0.003	0.003
Panel B: Earliest Bed Data (Constant)					
Catholic	-0.000850**	-0.00144**	-0.000856**	0.000377	-0.00324
	(0.000388)	(0.000653)	(0.000380)	(0.00603)	(0.00591)
Mean	0.00534	0.00534	0.00190	0.00538	0.00539
R-squared	0.000	0.003	0.094	0.003	0.003
Panel C: Latest Bed Data (Constant)					
Catholic	-0.000489	-0.00123	-0.000498	0.000388	-0.00296
	(0.000586)	(0.000797)	(0.000503)	(0.00618)	(0.00606)
Mean	0.00566	0.00566	0.00187	0.00570	0.00572
R-squared	0.000	0.004	0.075	0.004	0.004
No Change	Y	Y	N	Y	Y
To Catholic	Y	Y	Y	Y	N
From Catholic	Y	Y	Y	N	Y
Year FE		Y	Y	Y	Y
Observations	10,067	10,067	491	9,912	9,842
Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table F4:C-section & Tubal Ligation Elsewhere

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.000765*	-0.000691*	-0.000454	-0.000568	-0.000781
	(0.000413)	(0.000412)	(0.000576)	(0.000717)	(0.000795)
Mean	0.000554	0.000554	0.000985	0.000552	0.000544
R-squared	0.000	0.019	0.170	0.019	0.017
Panel B: Earliest Bed Data (Constant)					
Catholic	-0.000780*	-0.000686	-0.000456	-0.000561	-0.000784
	(0.000432)	(0.000429)	(0.000612)	(0.000842)	(0.000934)
Mean	0.000598	0.000598	0.00102	0.000596	0.000588
R-squared	0.000	0.016	0.161	0.016	0.015
Panel C: Latest Bed Data (Constant)					
Catholic	-0.000668**	-0.000618*	-0.000368	-0.000436	-0.000787
	(0.000328)	(0.000333)	(0.000492)	(0.000751)	(0.000833)
Mean	0.000550	0.000550	0.000878	0.000549	0.000542
R-squared	0.000	0.016	0.170	0.016	0.015
No Change	Y	Y	N	Y	Y
To Catholic	Y	Y	Y	Y	N
From Catholic	Y	Y	Y	N	Y
Year FE		Y	Y	Y	Y
Observations	5,957	5,957	170	5,880	5,873
Hospitals	856	856	21	845	847

*Notes: All regressions include hospital fixed effects. Subsample is state-years with patient linking variables. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table F5:Miscarriage/Stillbirth

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.00200	-0.00491	-0.00683	-0.0118	0.0000346
	(0.00652)	(0.00614)	(0.00473)	(0.0104)	(0.0102)
Mean	0.0732	0.0732	0.0592	0.0732	0.0732
R-squared	0.000	0.028	0.118	0.028	0.027
Panel B: Earliest Bed Data (Constant)					
Catholic	0.000542	-0.00152	-0.00330	-0.00688	0.00259
	(0.00645)	(0.00619)	(0.00467)	(0.00629)	(0.00611)
Mean	0.0727	0.0727	0.0598	0.0727	0.0727
R-squared	0.000	0.049	0.084	0.049	0.049
Panel C: Latest Bed Data (Constant)					
Catholic	0.0110	0.00851	0.00615	-0.0152**	0.0271***
	(0.0188)	(0.0184)	(0.00943)	(0.00697)	(0.00697)
Mean	0.0744	0.0744	0.0604	0.0744	0.0744
R-squared	0.000	0.053	0.079	0.056	0.056
No Change	Y	Y	N	Y	Y
To Catholic	Y	Y	Y	Y	N
From Catholic	Y	Y	Y	N	Y
Year FE		Y	Y	Y	Y
Observations	10,067	10,067	491	9,912	9,842
Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table F6:Miscarriage/Stillbirth with Complications

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.00401*	-0.00377*	-0.00438***	-0.00325	-0.00321
	(0.00207)	(0.00214)	(0.00132)	(0.00373)	(0.00365)
Mean	0.0139	0.0139	0.0112	0.0139	0.0139
R-squared	0.000	0.007	0.063	0.006	0.007
Panel B: Earliest Bed Data (Constant)					
Catholic	-0.00346	-0.00298	-0.00360***	-0.00239	-0.00261
	(0.00229)	(0.00230)	(0.00135)	(0.00199)	(0.00194)
Mean	0.0137	0.0137	0.0114	0.0137	0.0137
R-squared	0.001	0.012	0.046	0.012	0.013
Panel C: Latest Bed Data (Constant)					
Catholic	-0.00407	-0.00369	-0.00420*	-0.00503**	-0.000927
	(0.00281)	(0.00287)	(0.00217)	(0.00238)	(0.00228)
Mean	0.0139	0.0139	0.0114	0.0139	0.0139
R-squared	0.001	0.008	0.038	0.009	0.009
No Change	Y	Y	N	Y	Y
To Catholic	Y	Y	Y	Y	N
From Catholic	Y	Y	Y	N	Y
Year FE		Y	Y	Y	Y
Observations	10,067	10,067	491	9,912	9,842
Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table F7:Severe Maternal Morbidity

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.0109*	-0.00498	-0.00730*	-0.0119	0.00477
	(0.00632)	(0.00583)	(0.00372)	(0.00855)	(0.00836)
Mean	0.0667	0.0667	0.0476	0.0667	0.0669
R-squared	0.000	0.091	0.156	0.091	0.092
Panel B: Earliest Bed Data (Constant)					
Catholic	-0.00849	-0.00166	-0.00229	-0.00529	0.00482
	(0.00872)	(0.00797)	(0.00519)	(0.00654)	(0.00635)
Mean	0.0673	0.0673	0.0494	0.0673	0.0675
R-squared	0.000	0.176	0.158	0.176	0.178
Panel C: Latest Bed Data (Constant)					
Catholic	-0.0119	-0.00554	-0.00901	-0.0162**	0.00860
	(0.00810)	(0.00807)	(0.00642)	(0.00642)	(0.00610)
Mean	0.0670	0.0670	0.0481	0.0670	0.0672
R-squared	0.001	0.153	0.080	0.153	0.163
No Change	Y	Y	N	Y	Y
To Catholic	Y	Y	Y	Y	N
From Catholic	Y	Y	Y	N	Y
Year FE		Y	Y	Y	Y
Observations	10,067	10,067	491	9,912	9,842
Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table F8:Hysterectomy Under Age 40

	(1)	(2)	(3)	(4)	(5)
Panel A: Actual Bed Data (Changes Annually)					
Catholic	-0.0236	-0.0340	-0.0472***	-0.0529***	-0.00605
	(0.0276)	(0.0216)	(0.0116)	(0.0179)	(0.0173)
Mean	0.161	0.161	0.188	0.161	0.158
R-squared	0.000	0.095	0.296	0.094	0.089
Panel B: Earliest Bed Data (Constant)					
Catholic	-0.0167	-0.0251	-0.0352***	-0.0308**	-0.00464
	(0.0263)	(0.0209)	(0.0110)	(0.0145)	(0.0140)
Mean	0.164	0.164	0.193	0.164	0.162
R-squared	0.000	0.122	0.259	0.121	0.117
Panel C: Latest Bed Data (Constant)					
Catholic	-0.00736	-0.0159	-0.0265**	-0.0209	-0.000125
	(0.0215)	(0.0159)	(0.0119)	(0.0139)	(0.0133)
Mean	0.159	0.159	0.176	0.159	0.157
R-squared	0.000	0.125	0.224	0.124	0.122
No Change	Y	Y		Y	Y
To Catholic	Y	Y	Y	Y	
From Catholic	Y	Y	Y		Y
Year FE		Y	Y	Y	Y
Observations	10,067	10,067	491	9,912	9,842
Hospitals	1,002	1,002	37	989	985

*Notes: All regressions include hospital fixed effects. "Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at the hospital level in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Appendix G: Heterogeneity

We stratify our primary result for tubal ligations across several different dimensions. Stratification by racial/ethnic groups and HHI are in the main body of the paper.

Data from the National Survey of Family Growth (NSFG), as presented in Bailey and Lindo (2018), suggest that the majority of tubal ligations are performed on older women. In Appendix Table G1, we find evidence of a larger impact of Catholic ownership on tubal ligations for women over the age of 40 (rate is reduced by 35%). We also stratify births and miscarriages/stillbirths with complications by age. We find a marginally significant decrease in the birth rate for women ages 30-39 (Appendix Table G2). The potential protective effect of Catholic ownership on miscarriage or stillbirths with complications appears to be driven by improvements for younger women (Appendix Table G3).

Table G1: Impact of Catholic Ownership on Tubal Ligations by Age

	(1)	(2)	(3)	(4)	(5)
	Overall	Ages 10-19	Ages 20-29	Ages 30-39	Ages 40+
Catholic	-0.141***	-0.000227	-0.0557***	-0.0729***	-0.0120***
	(0.0402)	(0.000261)	(0.0182)	(0.0207)	(0.00346)
Observations	10,067	10,067	10,067F	10,067	10,067
R-squared	0.011	0.006	0.028	0.006	0.011
Number of Hospitals	1,002	1,002	1,002	1,002	1,002
To Catholic	Y	Y	Y	Y	Y
From Catholic	Y	Y	Y	Y	Y
Dependent Var Mean	0.456	0.000463	0.167	0.254	0.0346

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table G2:Impact of Catholic Ownership on Births by Age

	(1)	(2)	(3)	(4)	(5)
	Overall	Ages 10-19	Ages 20-29	Ages 30-39	Ages 40+
Catholic	-0.437	-0.0210	-0.181	-0.220*	-0.0153
	(0.365)	(0.0482)	(0.202)	(0.130)	(0.00950)
Observations	10,067	10,067	10,067	10,067	10,067
R-squared	0.006	0.029	0.008	0.004	0.015
Number of Hospitals	1,002	1,002	1,002	1,002	1,002
To Catholic	Y	Y	Y	Y	Y
From Catholic	Y	Y	Y	Y	Y
Dependent Var. Mean	5.597	0.559	2.867	1.994	0.163

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at hospital in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table G3:Impact of Catholic Ownership on Miscarriage/Stillbirth + Complications by Age

	(1)	(2)	(3)	(4)	(5)
	Overall	Ages 10-19	Ages 20-29	Ages 30-39	Ages 40+
Catholic	-0.00377*	0.000214	-0.00211*	-0.00165*	-0.000249
	(0.00214)	(0.000351)	(0.00121)	(0.000860)	(0.000246)
Observations	10,067	10,067	10,067	10,067	10,067
R-squared	0.007	0.007	0.005	0.004	0.004
Number of Hospitals	1,002	1,002	1,002	1,002	1,002
To Catholic	Y	Y	Y	Y	Y
From Catholic	Y	Y	Y	Y	Y
Dependent Var Mean	0.0139	0.00135	0.00618	0.00516	0.00103

*Notes: All regressions include hospital and year fixed effects. "Dependent Var Mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors clustered at hospital in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Appendix Table G4 then stratifies the regression by insurance type. We also see comparable results for Medicaid and private insurance. The main difference is in Column (4) where we see a much larger decrease for those who do not have insurance, approaching 100%. It is also consistent with the results in Table 6 as black and Hispanic women receiving tubal ligations are more likely to be on Medicaid or self-paying than white women.

Table G4:Insurance Type Breakdown of Effect on Tubal Ligation Rate

	(1) Medicaid, Private, and Self Pay	(2) Medicaid	(3) Private	(4) Self-Pay
Catholic	-0.125***	-0.0456**	-0.0660**	-0.0134**
	(0.0372)	(0.0177)	(0.0290)	(0.00629)
Dependent variable mean:				
All non-Catholic hospitals	0.444	0.215	0.217	0.0115
Hospitals that switch when they aren't Catholic	0.370	0.168	0.191	0.0112
R-squared	0.011	0.016	0.016	0.012
Observations	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Appendix Table G5 looks at which type of Catholic affiliation has the most impact on our main results. Given that the three variables are highly correlated, we have also included a p-value for the joint significance of the three coefficients. The joint significance tests perfectly match our results above, with statistically significant effects for tubal ligations, vasectomies, and abortions, but not for C-sections. However, when looking at the different types of Catholic affiliation, Catholic ownership has a stronger and more statistically significant effect, especially for the tubal ligation rate.

Table G5:Type of Catholic Affiliation Breakdown of Effect on Tubal Ligation Rate

	(1) Tubal Ligation	(2) C-section & Tubal Ligation	(3) Vasectomy	(4) Abortion	(5) C-section
Catholic Hospital	0.105	0.00893	-0.000610	-0.000432	0.123
	(0.0770)	(0.0515)	(0.000477)	(0.00118)	(0.155)
Catholic Ownership	-0.291***	-0.122*	0.000726	-0.00281*	-0.447**
	(0.0953)	(0.0720)	(0.000588)	(0.00148)	(0.195)
Catholic System	-0.00680	0.0212	-0.000911*	0.000710	0.175
	(0.0723)	(0.0606)	(0.000489)	(0.000981)	(0.204)
Joint p-value	0.000043***	0.0164**	0.0034***	0.0034***	0.146
Dependent variable mean	0.456	0.300	0.000547	0.00548	1.704
R-squared	0.012	0.025	0.006	0.003	0.033
Observations	10,067	10,067	10,067	10,067	10,067
Number of Hospitals	1,002	1,002	1,002	1,002	1,002

*Notes: All regressions include hospital and year fixed effects. "Dependent variable mean" row refers to the mean for hospitals that are not Catholic in that year. Robust standard errors are clustered at hospital in parentheses. *** p<0.01, ** p<0.05, * p<0.1*