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MEDICALLY NECESSARY BUT FORBIDDEN: REPRODUCTIVE HEALTH CARE IN CATHOLIC-OWNED HOSPITALS

Elaine L. Hill
David Slusky
Donna Ginther

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ABSTRACT

The United States has recently seen a large increase in hospital mergers and acquisitions, and Catholic hospital systems have actively participated in this. As of 2016, 40% of the largest healthcare systems were faith-based, with 141 mergers between Catholic and non-Catholic systems since 1997. Mergers that affiliate a hospital with a Catholic owner, network, or system, are consequential because they reduce the set of possible medical procedures since Catholic hospitals are generally prohibited from providing procedures like tubal ligation. We examine the effect of changes in ownership from secular to Catholic (and vice versa) on reproductive health procedures that are likely to be affected. Using hospital-level variation in ownership status for 1002 hospitals, we estimate a difference-in-differences model with year and hospital fixed effects. We find that Catholic hospitals reduce the per bed annual rates of inpatient abortions by 30% and tubal ligations by 31%, whereas there is no significant change in related procedures such as D&Cs or C-sections. Our results are primarily driven by hospitals that change from not Catholic to Catholic. Across a variety of measures, we find minimal overall welfare reductions. However, this decrease in tubal ligations rate alone represents nearly 10,000 fewer tubal ligations per year across the United States, which in itself imposes a substantial cost on women and their partners.

Elaine L. Hill
University of Rochester
265 Crittenden Blvd
Box 420644
Rochester, NY 14642
elaine_hill@urmc.rochester.edu

David Slusky
Department of Economics
University of Kansas
335 Snow Hall
1460 Jayhawk Boulevard
Lawrence, KS 66045
david.slusky@ku.edu

Donna Ginther
Department of Economics
University of Kansas
333 Snow Hall
1460 Jayhawk Boulevard
Lawrence, KS 66045
and NBER
dginther@ku.edu

1. Introduction

The Affordable Care Act (ACA) has resulted in a large increase in hospital mergers and acquisitions. The figures are notable: 105 merger deals were reported in 2012 alone, an increase from 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. Four out of the top ten largest healthcare systems (and four of the top five non-profit systems) were Catholic affiliated in 2016, with 120 mergers between Catholic and non-Catholic systems since 2001 (Uttley and Khaikin 2016), a fifteen year growth rate of 22%. Currently, Catholic hospitals account for 14.5 percent of all acute care hospitals and one in six acute care hospital beds (Uttley and Khaikin 2016). This paper examines the effect of Catholic affiliation on reproductive health procedures and finds that hospitals that are acquired by Catholic health systems significantly reduce abortions and tubal ligations.

Mergers that affiliate a hospital with a Catholic owner, network, or system, are consequential because they reduce the set of possible 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 discussion about the impact of these mergers 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).

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 2014). In this paper, we examine the effect of changes in ownership from secular to Catholic (and vice versa) on reproductive health procedures such as abortion, tubal ligation, vasectomy, 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.

We begin by reviewing the literature on hospital ownership and patient outcomes. Next we discuss data, methods and results. Our estimates indicate that hospitals that switched ownership from non-Catholic to Catholic reduced the number of abortions and tubal ligations.

2. Hospital Ownership and Patient 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 price of hospital care (Dranove et al. 2008; Wu 2008). Mergers in

[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.

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).

Economic theory does not provide a clear-cut prediction about the relationship between ownership and health care quality; this is an empirical question. The vast majority of studies assessing this relationship find no statistically significant relationship between profit and not-for-profit status and mortality (Eggleston et al. 2008). However, there is some evidence that government-owned hospitals have a higher rate of adverse events than not-for-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.[2]

Catholic hospitals are prohibited from providing sterilization, abortion, and contraceptive services under the Ethical and Religious Directives for Catholic Health Care Services, which are

[2] A "sole community hospital" is a designation by 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).

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 conflicts 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 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.[3] 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).

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

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

3. Identifying the Causal Effect of Catholic Ownership

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.[4] *Catholic* is a dummy for whether the hospital has Catholic affiliation or not during that particular year. μ are hospital fixed effects and ρ are year fixed effects. 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 on hospital ownership. We find this plausible as consumers are either dealing with an emergency and so go to the nearest hospital, often have no choice in terms of a local major hospital regardless of whether it's an emergency and lack the resources to travel, or are simply unaware of the change in policies and so therefore cannot condition on it.[5]

[4] See Appendix E, Table E1 which shows consistent results for using only general and OB-GYN beds as the denominator instead of all beds.

[5] 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).

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.

4. Data on Hospitals and Procedures

We use data from two primary sources: the American Hospital Association Annual Survey (AHA)[6] and the state-level Healthcare Cost and Utilization Project (HCUP) inpatient databases[7] for six high-population states: Arizona, Florida, New Jersey, California, New York, and Washington. We augment this with newly collected public data on hospital ownership and with procedure categories from the Clinical Classification Software (CCS)[8].

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.

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

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

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

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

below, we consider a hospital Catholic if any of these variables equals one.[9] This new variable has much less churn than the one in the AHA, and so we are confident 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 2016).

We merge this AHA and public data with inpatient discharge data from HCUP the six states in our sample over the years 1998-2013. However, we do not have inpatient data for every state for every year.[10] This should 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.

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). We identify which ICD-9 codes correspond to procedures using the CCS's list of procedure categories and codes (see Appendix B for details).

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.[11] We also include HCUP's Hospital Market Structure information on competitiveness of a hospital service area[12] for one the stratified investigation below.

[9] See Appendix E, Table E2 which shows consistent results for only setting Catholic = 1 if the hospital itself is Catholic and not just the network or system.

[10] See Appendix D for a list of hospital-years

[11] See Appendix E, Table E3, which shows consistent results when only using hospitals that appear in all of the years for which we have data for their state.

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

5. Estimated Impact of Catholic Ownership on Reproductive Procedures

Figure 1 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," i.e. hospitals that begin the sample period not Catholic but then become Catholic (red), "From Catholic," i.e., hospitals that begin the sample period Catholic but then become not 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.

[Insert Figure 1 here]

The maps show that 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. Figure 1 indicates that most hospitals are never Catholic. 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, we include a map that shows just the hospitals that switch Catholic status.

Table 1 shows the average number of beds and the average procedure rates for hospital-years that are Catholic and those that are not.

[Insert Table 1 here]

Catholic hospitals tend to be somewhat larger than non-Catholic hospitals. They also have statistically significant differences in almost every procedure and diagnosis. However, unlike the regressions results shown below, these differences are not adjusted for hospital fixed effects, nor

are the standard errors clustered. These differences are therefore merely meant to be illustrative, unlike those in the tables below.

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 do not appear in our inpatient discharge data. This is why the per-bed means are so low.

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 also includes the mean rates of a miscarriage or stillbirth, as well as a miscarriage or stillbirth with an accompanying complication.[13] 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.

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

Finally, Table 1 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, but these rates do not include hospital fixed effects to adjust for time invariant differences across hospitals.

Therefore, before turning to our main regression results, we want to check whether patient demographic 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.

[Insert Table 2 here]

None of the coefficients are statistically significant at even the 5% level, and only one out of 7 is at the 10% level, which is roughly what we would expect from random noise. Based on the results in Table 2, we are confident that changing a hospital's Catholic status does not systematically change the demographics of its patient mix. This allows us to proceed to the main results.

Figure 2 shows an event study for the per bed rate of a tubal ligation for the 17 hospitals that became Catholic. [14] Time zero is defined as the first year of Catholic affiliation. We exclude hospitals that have the same affiliation throughout the sample, ones that stopped being Catholic, as

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

well as the ones which switch more than once.[15] The red line is the average rate, whereas the blue dashed lines form a 95% confidence interval.

[Insert Figure 2 here]

One can clearly see in the graph above a marked drop in the tubal ligation rate between event time = -1 and event time = 0 (the first at least partially Catholic year), and even more between that and event time = 1 (the first fully Catholic year). The rate then stabilizes below the pre-Catholic hospital average.

Table 3 contains results from our main regression for the tubal ligation rate for many different specifications. Column (1) is for all hospitals, with hospital fixed effects but without year fixed effects. Column (2) adds year fixed effects, which has minimal impact on the coefficient. Columns (3)-(5) exclude different groups of hospitals, including those that do not change, those that become Catholic, and those that stop being Catholic.

[Insert Table 3 here]

The coefficient is overwhelmingly consistent across specifications, with Catholic affiliation reducing the per bed tubal ligation rate by 31% compared with non-Catholic hospitals. Furthermore, when comparing the results in (4) and (5) to the other coefficients in the table, it appears that the effect is more 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).

Table 4 repeats this analysis for the per bed rate of both a tubal ligation and C-section. As above, the effect is remarkably consistent across specifications and driven primarily by hospitals that become Catholic affiliated. Compared to the mean, becoming Catholic affiliated reduces the

[15] This is in part because sales of religious hospitals to non-religious organizations can include stipulations to maintain religion-based restrictions on procedures. See http://www.mergerwatch.org/sale-of-religious-hospitals/

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.

[Insert Table 4 here]

Table 5 repeats the analysis for vasectomies.

[Insert Table 5 here]

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 6 repeats the analysis for the per bed abortion rate.

[Insert Table 6 here]

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 Tables 2 and 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 7 and 8 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.

[Insert Table 7 here]

[Insert Table 8 here]

These tables do not show any statistically significant results, nor even directionally consistent point estimates, which confirms our hypotheses that the number of these procedures performed should not be affected by Catholic ownership.

6. Welfare Implications of Reductions in Reproductive Procedures

The above results confirm that hospitals that switch to Catholic ownership 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. First, 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 by C-section. She therefore then has to recover and then 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 9 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.

[Insert Table 9 here]

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 statistically insignificant coefficient which has the opposite sign of our hypothesis.

We now turn to another welfare 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[16], 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 opportunity cost for everyone else who may need blood, not to mention the risks to her.[17]

Table 10 first checks whether there is an impact of Catholic affiliation on the rate of miscarriages or stillbirths themselves.

[Insert Table 10 here]

As expected, we do not see any statistically significant coefficients here.

Table 11 then repeats this for records that have both a diagnoses of miscarriage or stillbirth that also have at least one associated complication.

[Insert Table 11 here]

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 12 then shows the results for another outcome measure: the fertility rate (births per women of child bearing age) by hospital.[18] Our hypothesis here is that a decrease in the tubal ligation rate may lead to more births in Catholic hospitals.

[Insert Table 12 here]

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

[17] 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

[18] 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.

Despite this hypothesis, we find no indication that the birth rate changed, overall or for any racial or insurance subgroup.[19]

Finally, we stratify our primary result for tubal ligations across several different dimensions. First, we examine the racial and ethnic breakdown of the effect on tubal ligations. The discharge records have uniform race variable with values for white, black, Hispanic, and other. Table 13 shows the result of the per bed rate of tubal ligations for those groups.

[Insert Table 13 here]

Column (1) has the per bed rate for discharges in any of the three groups. 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). 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 white result 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, i.e., in column (5).

However, it is possible that individuals of different 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%).[20]

[19] We also repeat our analysis by looking at the fertility 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.

[20] 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 14 then stratifies the regression by insurance type. Analogous to Table 13, we have excluded other insurance types from the table.

[Insert Table 14 here]

The result in column (1) is comparable to our main result. 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%. This suggests that those who are paying themselves may be more sensitive to the restrictions at a hospital. It is also consistent with the results in Table 13, as black and Hispanic women receiving tubal ligations are more likely to be on Medicaid or self-paying than white women.

Table 15 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.

[Insert Table 15 here]

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.

Finally, Table 16 stratifies by competitiveness of the hospital service area, using HCUP's 2006 data on the Herfindahl Hirschman Index (HHI).

[Insert Table 16 here]

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.

7. Robustness checks

Appendix E 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 hospital's AHA records do not have a breakdown of the general beds (Table E1). They are also robust to only treating a hospital as Catholic affiliated if it itself is Catholic and not just part of a network or system. This reduces the number of switching hospitals from 43 to 37 (Table E2).

Our results are also robust to only using hospitals that appear in every year of data we have for their state (Table E3). 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. (2011)'s "donut" regressions (Tables E4, E5).

Additionally, our results are robust to only considering general hospitals (Table E6) or only considering not-for-profit hospitals (Table E7), 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 E8).

8. Discussion

Of the 25 largest hospital systems in the United States, eight 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) results in 9508 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, more inconvenient suboptimal 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 factor 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.[21]

It is also surprising that we do not find substantial changes in welfare, whether measured by women having C-sections and then tubal ligations elsewhere, having miscarriage complications, or the birth rate. It is possible that in the first case is simply too rare (unlike a tubal ligation) for us to measure in our data. It is also possible that other, specific welfare margins (such as the rates of unintended pregnancies) would be better to look at, but would require substantially different data sets.

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

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, Taliafero, Zuveskas 2006). We also find suggestive evidence that our effect is stronger for hospitals that are Catholic owned, and also for hospital service areas that have greater market concentration and so provide consumers with fewer options.

9. 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 forever 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. This is all the more the case for low-income individuals who lack the time or resources to travel to another provider in another service area. Women of color and those who don't have a college education are more likely to rely on contraceptive sterilization for birth control (Daniels et al. 2014). For many women, the result is an unplanned pregnancy: in one study, nearly half of women with an unfulfilled postpartum sterilization request became pregnant within 1 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. 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 effect.

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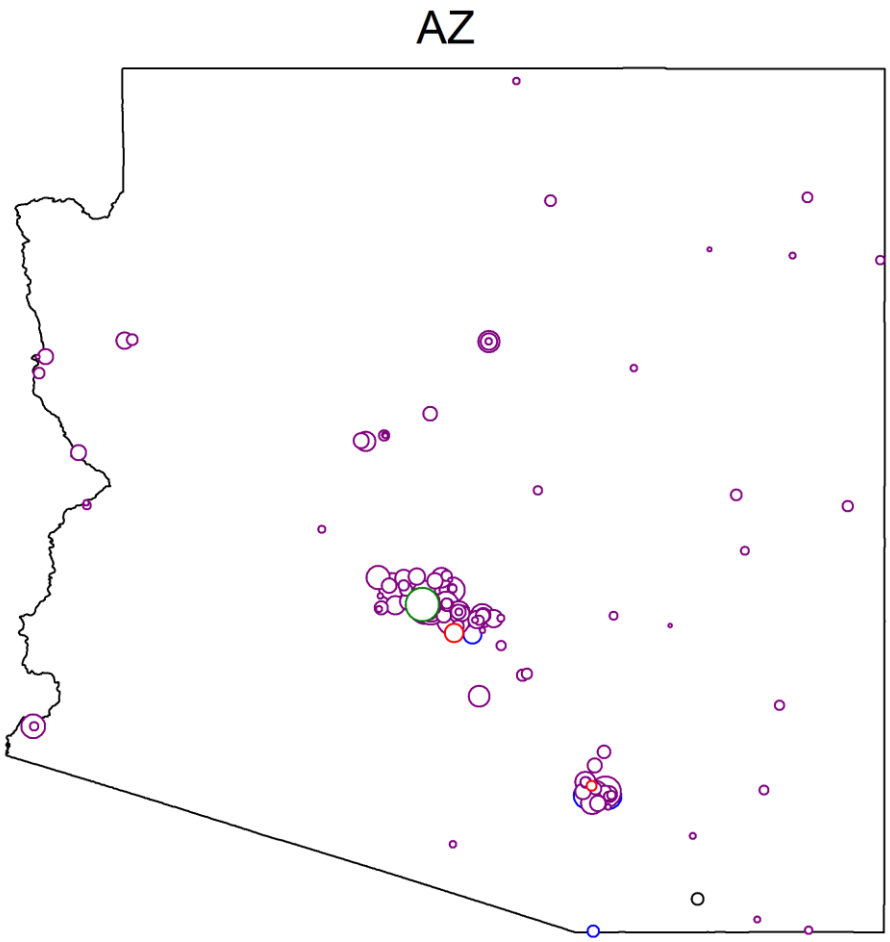
Figure 1: Maps

Panel A:



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

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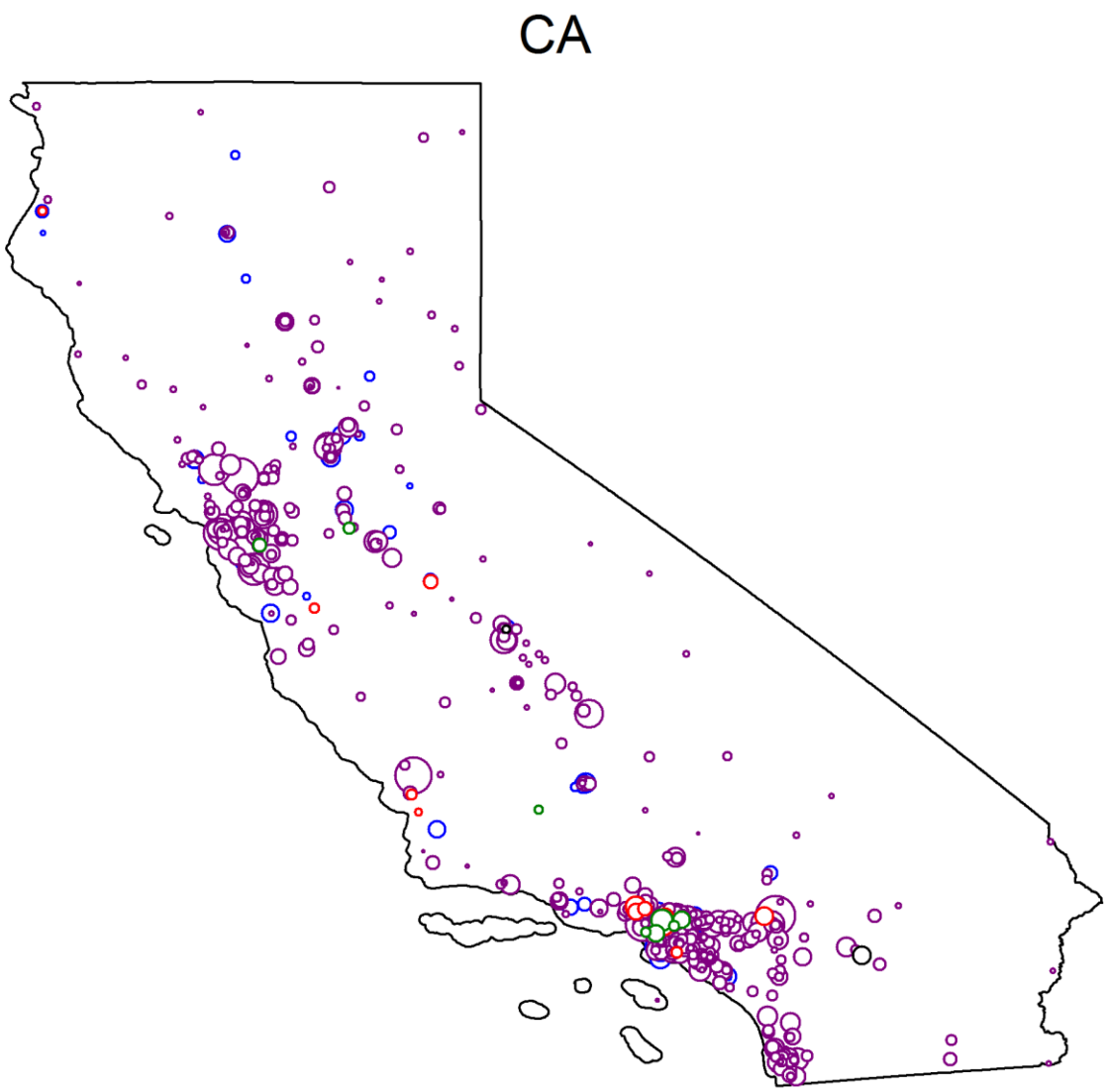

Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

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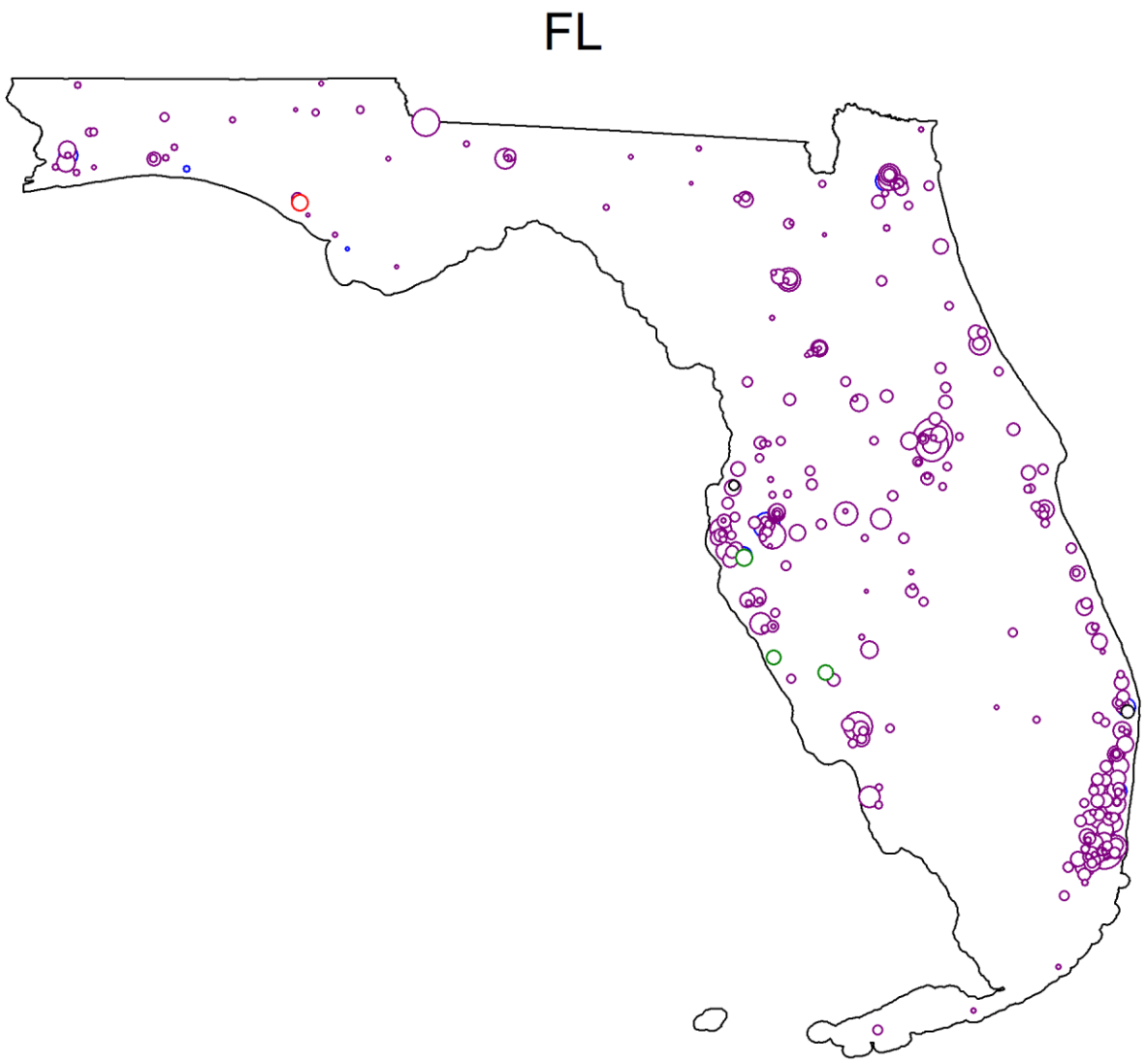

Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

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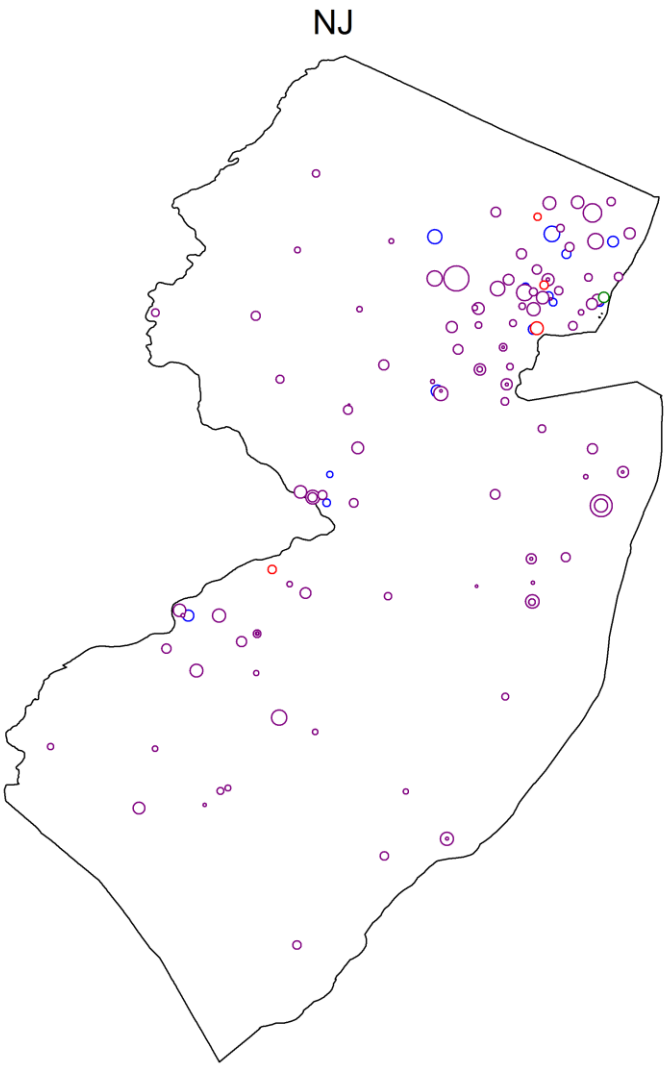

Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

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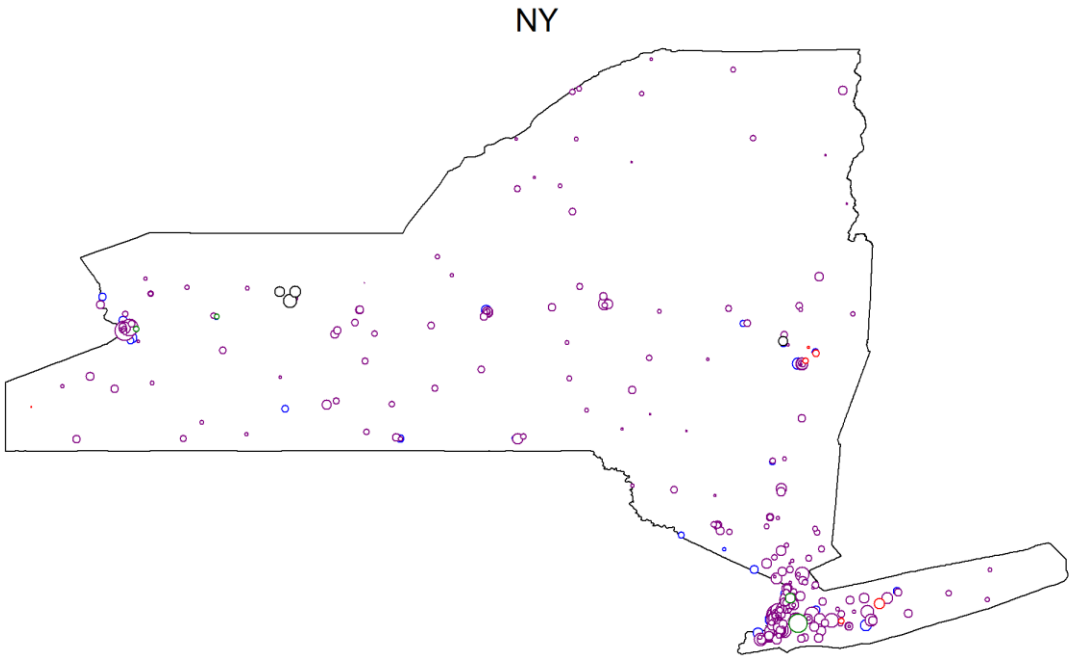
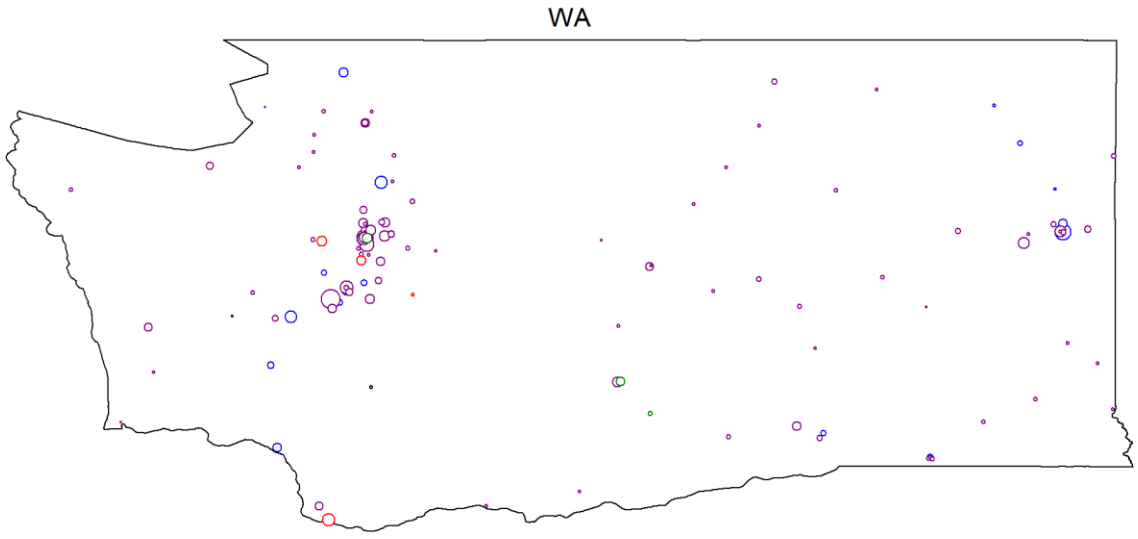


Note: Blue: Always Catholic; Purple: Never Catholic; Red: To Catholic; Green: From Catholic; Black: To & From Catholic

Panel F:



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

Table 1: Summary statistics

	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			

Table 2: Patient Demographics When a Hospital Changes Catholic Status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	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 variable mean	0.456	0.130	0.472	0.201	0.376	0.491	272.9
R-squared	0.008	0.020	0.048	0.102	0.105	0.005	0.007
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*

Figure 2: Event study for tubal ligation for the 17 hospitals that become Catholic

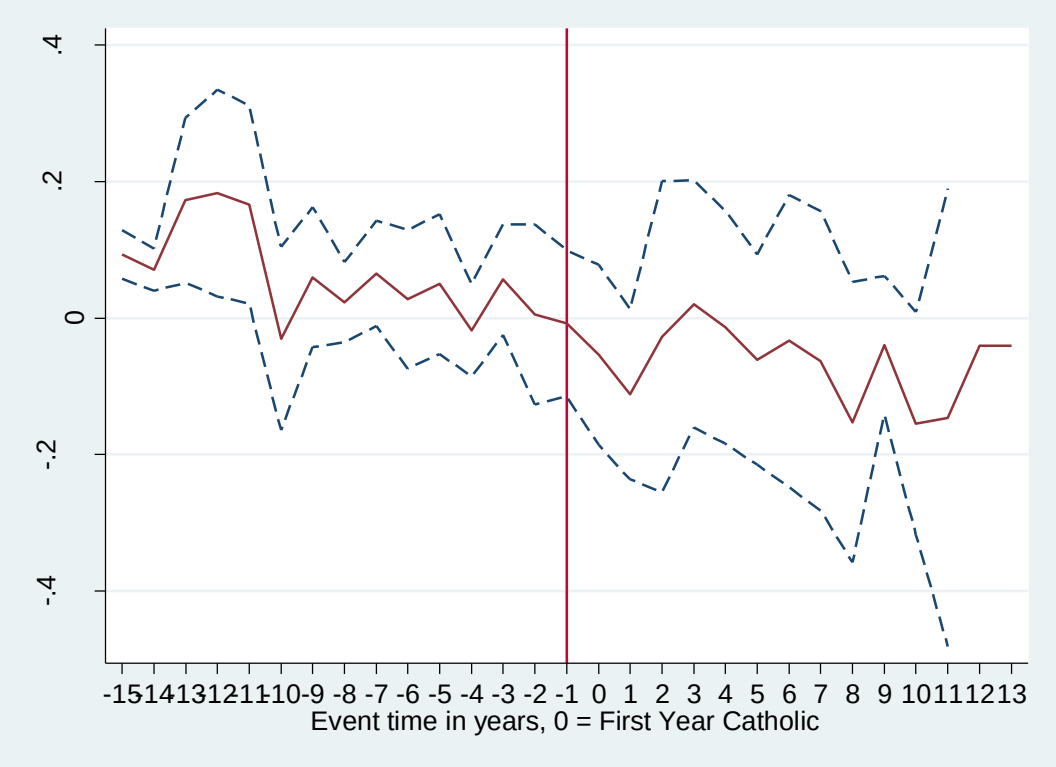


Table 3: The Impact of Catholic Hospitals on Tubal Ligations

	(1)	(2)	(3)	(4)	(5)
Catholic	-0.139***	-0.141***	-0.151***	-0.152***	-0.117**
	(0.0406)	(0.0402)	(0.0227)	(0.0508)	(0.0496)
Dependent variable mean	0.456	0.456	0.394	0.457	0.456
Year Fixed Effects		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.001	0.011	0.141	0.011	0.010
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: The Impact of Catholic Hospitals on C-Section & Tubal Ligation

	(1)	(2)	(3)	(4)	(5)
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
Year Fixed Effects		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.001	0.025	0.095	0.024	0.024
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 5: The Impact of Catholic Hospitals on Vasectomy

	(1)	(2)	(3)	(4)	(5)
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
Year Fixed Effects		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.001	0.005	0.043	0.006	0.005
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 6: The Impact of Catholic Hospitals on Abortion

	(1)	(2)	(3)	(4)	(5)
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
Year Fixed Effects		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.000	0.003	0.103	0.003	0.003
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 7: The Impact of Catholic Hospitals on C-Section

	(1)	(2)	(3)	(4)	(5)
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
Year FE		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.000	0.033	0.070	0.033	0.033
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 8: The Impact of Catholic Hospitals on D&C

	(1)	(2)	(3)	(4)	(5)
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
Year FE		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.000	0.033	0.072	0.032	0.033
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 9: 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*

Table 10: The Impact of Catholic Hospitals on Miscarriage/Stillbirth

	(1)	(2)	(3)	(4)	(5)
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
Year FE		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.000	0.028	0.118	0.028	0.027
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 11: The Impact of Catholic Hospitals on Miscarriage/Stillbirth with Complications

	(1)	(2)	(3)	(4)	(5)
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
Year FE		Y	Y	Y	Y
No Change Hospitals	Y	Y		Y	Y
To Catholic Hospitals	Y	Y	Y	Y	
From Catholic Hospitals	Y	Y	Y		Y
R-squared	0.000	0.007	0.063	0.006	0.007
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 12: Fertility 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*

Table 13: 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
Hospitals that switch when they aren't 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 14: 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*

Table 15: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 16: Competitiveness of Hospital Service Area on Tubal Ligation Rate

	(1) All	(2) Low HHI	(3) High HHI
Catholic	-0.173*** (0.0490)	-0.143** (0.0689)	-0.193*** (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*

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)

Appendix B

Primary IC9 Codes used in this paper

Procedure	CCS CATEGORY	CCS CATEGORY DESCRIPTION	ICD-9-CM CODE	ICD-9-CM CODE DESCRIPTION
Tubal	121	Ligat fallop	6621	Bilat Endosc Crush Tube
Ligation	121	Ligat fallop	6622	Bilat Endosc Divis Tube
(procedure)	121	Ligat fallop	6629	Bilat Endos Occ Tube Nec
	121	Ligat fallop	6631	Bilat Tubal Crushing Nec
	121	Ligat fallop	6632	Bilat Tubal Division Nec
	121	Ligat fallop	6639	Bilat Tubal Destruct Nec
C-section	134	C-section	740	Classical C-Section
(procedure)	134	C-section	741	Low Cervical C-Section
	134	C-section	742	Extraperitoneal C-Sect
	134	C-section	744	Cesarean Section Nec
	134	C-section	7499	Cesarean Section Nos
Vasectomy	117	nOR male gen	6370	Male Sterilization Nos
(procedure)	117	nOR male gen	6371	Ligation Of Vas Deferens
	117	nOR male gen	6372	Spermatic Cord Ligation
	117	nOR male gen	6373	Vasectomy
Abortion	126	Abortion	6901	D & C For Preg Terminat
(procedure)	126	Abortion	6951	Aspirat Curet-Preg Termi
	126	Abortion	7491	Hysterotomy To Termin Pg
	126	Abortion	750	Intra-Amnion Inj For Ab
D&C	127	Rx D&C	6902	D & C Post Delivery
(procedure)	127	Rx D&C	6952	Aspirat Curet-Post Deliv
	128	Dx D&C	6909	D & C Nec
Transfusion	222	Blood transfusion	9900	Periop Autolog Bld Trans (Begin 1995)
(procedure)	222	Blood transfusion	9901	Exchange Transfusion
	222	Blood transfusion	9902	Whole Blood Autotransfus
	222	Blood transfusion	9903	Whole Blood Transfus Nec
	222	Blood transfusion	9904	Packed Cell Transfusion
	222	Blood transfusion	9905	Platelet Transfusion
	222	Blood transfusion	9906	Coag Factor Transfusion
	222	Blood transfusion	9907	Serum Transfusion Nec
	222	Blood transfusion	9908	Blood Expander Transfus
	222	Blood transfusion	9909	Transfusion Nec
	222	Blood transfusion	9900	Periop Autolog Bld Trans (Begin 1995)
	222	Blood transfusion	9901	Exchange Transfusion
'Hysterectomy'	124	Hysterectomy	683	Subtot Abd Hysterectomy (End 2003)
(procedure)	124	Hysterectomy	6831	Laparoscopic Supracervical Hysterectomy (Lsh)
	124	Hysterectomy	6839	Other Subtotal Abdominal Hysterectomy; Nos
	124	Hysterectomy	684	Total Abd Hysterectomy
	124	Hysterectomy	6841	Lap Total Abdominal Hyst (Begin 2006)
	124	Hysterectomy	6849	Total Abd Hyst Nec/Nos (Begin 2006)
	124	Hysterectomy	685	Vaginal Hysterectomy (End 1996)
	124	Hysterectomy	6851	Lapar Assist Vag Hys (Begin 1996)
	124	Hysterectomy	6859	Oth Vag Hys (Begin 1996)
	124	Hysterectomy	686	Radical Abd Hysterectomy
	124	Hysterectomy	6861	Lap Radical Abdomnl Hyst (Begin 2006)
	124	Hysterectomy	6869	Radical Abd Hyst Nec/Nos (Begin 2006)
	124	Hysterectomy	687	Radical Vag Hysterectomy

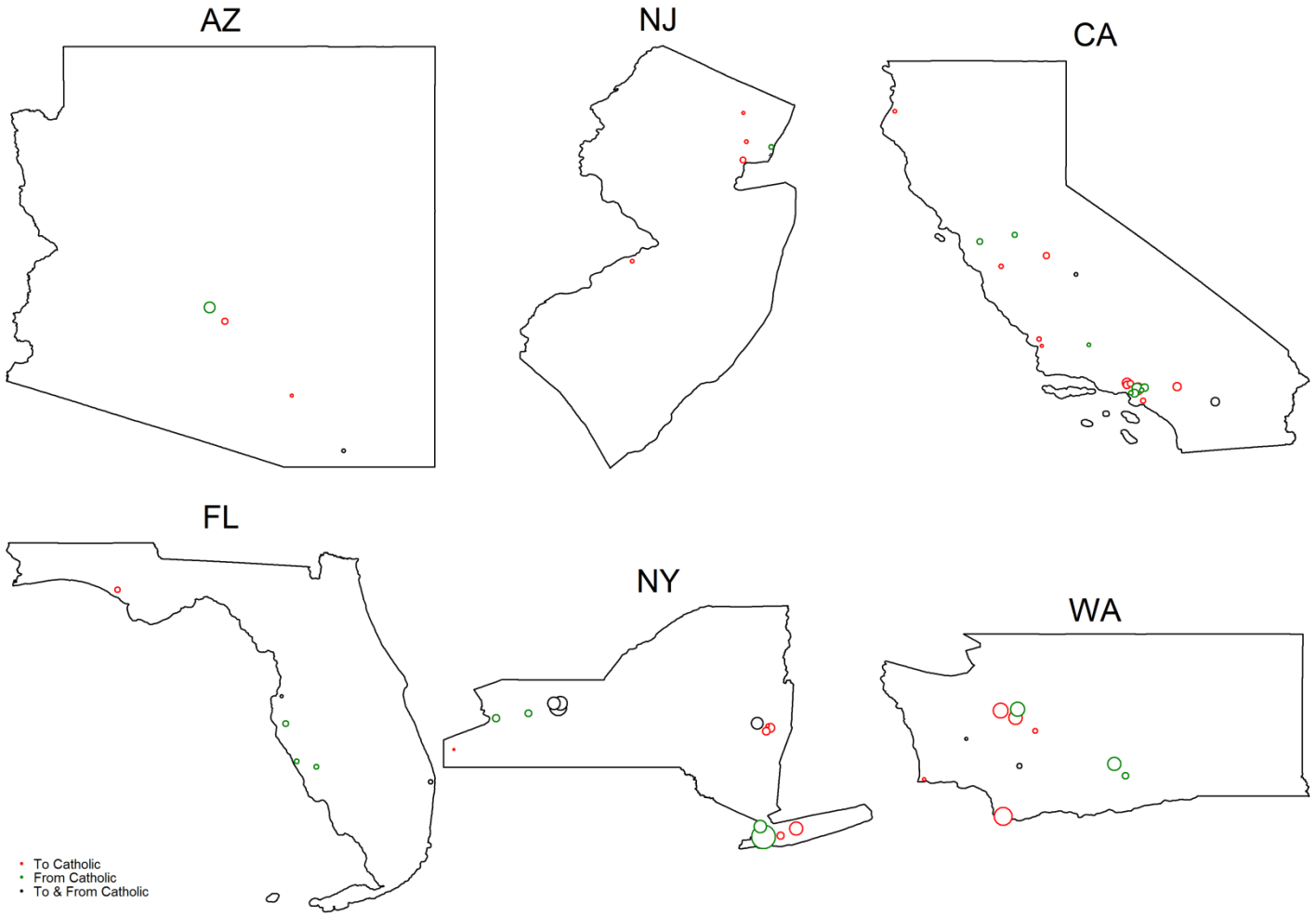
	124	Hysterectomy	6871	Lap Radical Vaginal Hyst (Begin 2006)
	124	Hysterectomy	6879	Radical Vag Hyst Nec/Nos (Begin 2006)
	124	Hysterectomy	689	Other Unspec Hysterectomy (Begin 1992)
Maternal	195	Ot compl bir	65920	Pyrexia In Labor-Unspec
Infection	195	Ot compl bir	65921	Pyrexia In Labor-Deliver
(Diagnosis)	195	Ot compl bir	65923	Pyrexia In Labor-Antepar
	195	Ot compl bir	65930	Septicemia In Labor-Unsp
	195	Ot compl bir	65931	Septicem In Labor-Deliv
	195	Ot compl bir	65933	Septicem In Labor-Antepa
Maternal	177	Spont abortn	63410	Spon Abort W Hemorr-Unsp
Hemmorhage	177	Spont abortn	63411	Spon Abort W Hemorr-Inc
(Diagnosis)	177	Spont abortn	63412	Spon Abort W Hemorr-Comp
	182	Hemorr preg	64000	Threatened Abort-Unspec
	182	Hemorr preg	64001	Threatened Abort-Deliver
	182	Hemorr preg	64003	Threaten Abort-Antepart
	182	Hemorr preg	64080	Hem Early Preg Nec-Unsp
	182	Hemorr preg	64081	Hem Early Preg Nec-Deliv
	182	Hemorr preg	64083	Hem Early Pg Nec-Antepar
	182	Hemorr preg	64090	Hemorr Early Preg-Unspec
	182	Hemorr preg	64091	Hem Early Preg-Delivered
	182	Hemorr preg	64093	Hem Early Preg-Antepart
	182	Hemorr preg	64100	Placenta Previa-Unspec
	182	Hemorr preg	64101	Placenta Previa-Deliver
	182	Hemorr preg	64103	Placenta Previa-Antepart
	182	Hemorr preg	64110	Placenta Prev Hem-Unspec
	182	Hemorr preg	64111	Placenta Prev Hem-Deliv
	182	Hemorr preg	64113	Placen Prev Hem-Antepart
	182	Hemorr preg	64120	Prem Separ Placen-Unspec
	182	Hemorr preg	64121	Prem Separ Placen-Deliv
	182	Hemorr preg	64123	Prem Separ Plac-Antepart
	182	Hemorr preg	64130	Coag Def Hemorr-Unspec
	182	Hemorr preg	64131	Coag Def Hemorr-Deliver
	182	Hemorr preg	64133	Coag Def Hemorr-Antepart
	182	Hemorr preg	64180	Antepart Hem Nec-Unspec
	182	Hemorr preg	64181	Antepartum Hem Nec-Deliv
	182	Hemorr preg	64183	Antepart Hem Nec-Antepar
	182	Hemorr preg	64190	Antepart Hem Nos-Unspec
	182	Hemorr preg	64191	Antepartum Hem Nos-Deliv
	182	Hemorr preg	64193	Antepart Hem Nos-Antepar
	182	Hemorr preg	64000	Threatened Abort-Unspec
	182	Hemorr preg	64001	Threatened Abort-Deliver
	182	Hemorr preg	64003	Threaten Abort-Antepart
	182	Hemorr preg	64080	Hem Early Preg Nec-Unsp
	182	Hemorr preg	64181	Antepartum Hem Nec-Deliv
	182	Hemorr preg	64183	Antepart Hem Nec-Antepar
	182	Hemorr preg	64190	Antepart Hem Nos-Unspec
	182	Hemorr preg	64191	Antepartum Hem Nos-Deliv
	182	Hemorr preg	64193	Antepart Hem Nos-Antepar
Stillbirth /	195	Ot compl bir	65640	Intrauterine Death-Unsp
Miscarriage	195	Ot compl bir	65641	Intrauter Death-Deliver
(diagnosis)	195	Ot compl bir	65643	Intrauter Death-Antepart
	196	Nml preg/del	V271	Deliver-Single Stillborn
	177	Spont abortn	63400	Spon Abor W Pel Inf-Unsp
	177	Spont abortn	63401	Spon Abor W Pelv Inf-Inc
	177	Spont abortn	63402	Spon Abor W Pel Inf-Comp
	177	Spont abortn	63410	Spon Abort W Hemorr-Unsp

177	Spont abortn	63411	Spon Abort W Hemorr-Inc
177	Spont abortn	63412	Spon Abort W Hemorr-Comp
177	Spont abortn	63420	Spon Ab W Pel Damag-Unsp
177	Spont abortn	63421	Spon Ab W Pelv Damag-Inc
177	Spont abortn	63422	Spon Ab W Pel Damag-Comp
177	Spont abortn	63430	Spon Ab W Ren Fail-Unsp
177	Spont abortn	63431	Spon Ab W Ren Fail-Inc
177	Spont abortn	63432	Spon Ab W Ren Fail-Comp
177	Spont abortn	63440	Spon Ab W Metab Dis-Unsp
177	Spont abortn	63441	Spon Ab W Metab Dis-Inc
177	Spont abortn	63442	Spon Ab W Metab Dis-Comp
177	Spont abortn	63450	Spon Abort W Shock-Unsp
177	Spont abortn	63451	Spon Abort W Shock-Inc
177	Spont abortn	63452	Spon Abort W Shock-Comp
177	Spont abortn	63460	Spon Abort W Embol-Unsp
177	Spont abortn	63461	Spon Abort W Embol-Inc
177	Spont abortn	63462	Spon Abort W Embol-Comp
177	Spont abortn	63470	Spon Ab W Compl Nec-Unsp
177	Spont abortn	63471	Spon Ab W Compl Nec-Inc
177	Spont abortn	63472	Spon Ab W Compl Nec-Comp
177	Spont abortn	63480	Spon Ab W Compl Nos-Unsp
177	Spont abortn	63481	Spon Ab W Compl Nos-Inc
177	Spont abortn	63482	Spon Ab W Compl Nos-Comp
177	Spont abortn	63490	Spon Abort Uncompl-Unsp
177	Spont abortn	63491	Spon Abort Uncompl-Inc
177	Spont abortn	63492	Spon Abort Uncompl-Comp
177	Spont abortn	63481	Spon Ab W Compl Nos-Inc
177	Spont abortn	63482	Spon Ab W Compl Nos-Comp
177	Spont abortn	63490	Spon Abort Uncompl-Unsp
177	Spont abortn	63491	Spon Abort Uncompl-Inc
177	Spont abortn	63492	Spon Abort Uncompl-Comp

Source: HCUP Clinical Classification Software, 2013

Appendix C

Figure C1: Map of Switcher Hospitals



Appendix D

Table D1: States and years with data

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 E: Robustness checks

Table E1: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table E2: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table E3: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table E4: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table E5: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table E6: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table E7: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table E8: 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 in parentheses. *** p<0.01, ** p<0.05, * p<0.1*