Maternity Ward Crowding, Birth Outcomes, and Future Fertility and Healthcare Decisions: Evidence from California *

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Abstract

We examine how maternity ward overcrowding impacts both concurrent birth outcomes and mothers' future fertility and hospital choices, leveraging quasi-random day-to-day variation in birth counts within Californian hospitals. Our findings reveal a significant reduction in medical interventions—C-sections, epidurals, inductions, and augmentations—on crowded days, without adverse effects on maternal or infant health. While we find no impact on future fertility, mothers, particularly those with a college degree, are more likely to switch hospitals or opt for a non-hospital setting for their subsequent birth. However, we do not observe systematic patterns in hospital selection, suggesting that the decision is primarily driven by negative first-birth experiences.

Keywords: Maternity Ward, Overcrowding, Fertility, Hospital Choice, Medical Procedure

JEL Codes: I11, J13, M50

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1 Introduction

Childbirth is one of the most critical healthcare events women face. However, maternity wards around the world are increasingly closing due to cost-cutting measures and declining fertility rates (Carroll, 2019; Battaglia, 2023; Avdic et al., 2024; Fischer et al., 2024). In the U.S. alone, approximately 300 birthing units closed between 2018 and 2023, creating "maternity care deserts."[1] Over the past 30 years, more than 400 counties have lost their only hospital-based obstetric unit (Fischer et al., 2024). The remaining maternity wards, already constrained by limited beds, staffing, and medical equipment, now face an increased risk of overcrowding. Without careful management, these closures could strain available resources, potentially compromising healthcare quality and negatively impacting mothers' childbirth experiences.

Existing research has shown that hospitals adjust their provision of medical procedures during periods of overcrowding (Maibom et al., 2021; Facchini, 2022). While hospitals have a strong incentive to provide high-quality treatment and retain patients for future care, overcrowding could stretch maternity wards' capacities, resulting in a poorer overall experience for mothers. To our knowledge, we are the first to investigate whether a mother's childbirth experience during these periods affects her future fertility decisions and choice of healthcare provider.

These questions hold significant policy implications. Declining fertility rates often trigger the closure of maternity wards in developed countries; if these closures lead to overcrowding in remaining facilities, potentially deterring future births, there is a risk that cost-containment measures intended to address declining fertility could inadvertently accelerate the trend. After a bad experience, mothers may also be prompted to consider non-hospital settings for future births, which tend to be less safe and may carry greater risks for infant health (Lazuka, 2023).

In this paper, we investigate the effects of overcrowding on the use of medical procedures, its impact on maternal and infant health, and how these experiences shape mothers' future fertility and hospital choices. To address these research questions, we utilize the complete set of Californian birth records from 1989 to 2017, supplemented with hospital-level data from annual financial

[1] For more details, see this news report.

reports. We first analyze concurrent birth outcomes using the entire sample, and then focus on how first-time mothers make future decisions.

For causal analysis, we leverage the inherent randomness in the timing of natural births and rely on variations in the number of mothers each hospital treats on different days. Conditional on health risk, mothers cannot choose the level of maternity ward crowding, resulting in quasi-random variation in delivery experience. Our approach controls for a range of pre-existing health conditions, and also for hospital-year-month, day-of-week, and hour-of-birth fixed effects to account for other time-related birth patterns. To adjust for hospital size and predictable seasonal birth patterns (Darrow et al., 2009; Buckles and Hungerman, 2013), we standardize overcrowding by creating a z-score for daily mother counts at the hospital-year-month level, ensuring comparability across different times and locations. We also exclude weekends and holidays that may feature varying staffing arrangements. A balance test confirms the validity of this measure. It shows that the standardized mother count is uncorrelated with maternal covariates such as age, ethnicity, education level, and Medi-Cal usage, conditional on health risk and the fixed effects.

Our findings indicate that overcrowding can prompt changes in procedures adopted during childbirth: when the level of overcrowding increases, there is a decrease in induction and augmentation during labor as well as a shift away from using epidural anesthesia. Contrary to earlier studies (Maibom et al., 2021; Facchini, 2022), we also see a drop in usage of cesarean sections (C-sections), likely due to differences between U.S. and European healthcare systems. In particular, we find the decline in C-section usage is primarily driven by the unscheduled portion—C-sections after labor trial. These changes are broadly in line with the notion that healthcare providers are time-constrained and actively adjust their provision of services based on overall workload. We also find racial disparities: non-Hispanic Black mothers experience a smaller reduction in C-sections after labor trial, while Hispanic mothers see a larger decline in epidural use. Despite these provider responses, we detect limited effects on short-run maternal and infant health, ruling out the health channel on mothers' future fertility-related decisions.

How do mothers respond after their first birth? Our analysis shows that overcrowding does not

have a significant effect on subsequent fertility within our sample. This finding remains consistent across different measures, including both extensive and total fertility, over 2- and 5-year periods. Additionally, we do not observe any significant heterogeneity in this effect.

While overcrowding does not affect future fertility, we find that first-time mothers who give birth on more crowded days are more likely to switch hospitals for their next birth. A one-standard-deviation increase in a hospital's daily mother count relative to the monthly average raises the likelihood of choosing a different hospital for the second birth by 0.18 percentage points, resulting in approximately 3,000 hospital switches during our sample period. We also observe interesting heterogeneity in this behavior: higher educated mothers are more likely to switch hospitals in response to overcrowding, possibly reflecting disparities in healthcare access. Moreover, we find no significant impact of first-birth overcrowding on the characteristics of the second-birth hospital or the distance from home to the hospital, suggesting that mothers do not systematically choose a particular type of facility. We attribute this behavior to mothers' negative first-birth experiences, consistent with previous medical literature (Bernhard et al., 2014).

Furthermore, we show that mothers who experienced overcrowding during their first hospital birth were more likely to opt for a non-hospital setting for subsequent births, such as giving birth at home or in a birth center. This statistically significant effect is small in magnitude but meaningful: a one-standard-deviation increase in overcrowding accounts for about 4% of the decision to switch to a non-hospital setting. Such a shift toward out-of-hospital births could increase neonatal mortality rates and lead to more negative long-term outcomes (Lazuka, 2023).

We conduct several robustness checks, all of which confirm the consistency of our main findings. First, we remove covariates on demographics and maternal health from our regression to see if our main results hold. Second, we restrict the sample to low-risk mothers. Third, we modestly change the standardization of daily mother counts in four ways: extend the analysis to include weekends, standardize at the hospital-year level, use the number of babies instead of mothers, and drop dates with no births in standardization calculation. Lastly, we test three alternative overcrowding measures: standardize by the hospital's number of obstetric beds (Freedman, 2016; Singh and

Venkataramani, 2024), use a 2-day average mother count for standardization, and expand the measure to include hospitals within a larger geographical area.

We contribute to three strands of literature. First, we add to research on the management process and healthcare provision within hospitals, particularly in the context of maternity wards. On procedure usage, in Denmark, Maibom et al. (2021) find a reduction in induction and epidural use on crowded days, while in Italy, Facchini (2022) report an increase in C-section rates. Fitzsimons and Vera-Hernández (2022) report lower breastfeeding rates for children born around weekends in the UK. Marks and Choi (2019) analyze Californian data and observe reduced spending on at-risk infants during crowded days. Recent work on maternity ward closures further highlights these impacts on treatment provision and health status (Avdic et al., 2024; Battaglia, 2023; Fischer et al., 2024).[2] Our findings on procedure usage largely align with existing literature, and we provide additional evidence of racial disparities in childbirth, complementing recent studies (Kennedy-Moulton et al., 2022; Corredor-Waldron et al., 2024; Singh and Venkataramani, 2024). Furthermore, to our knowledge, we are the first to investigate the impact of overcrowding on mothers' future fertility and hospital choices.

Our work also contributes to the literature on how salient life events influence healthcare decisions (Fadlon and Nielsen, 2019; Rellstab et al., 2020; Fadlon and Nielsen, 2021), specifically focusing on how past childbirth experiences shape women's fertility decisions. Studies show C-section usage is linked to lower future fertility due to both the physiological impacts and mothers' behavioral responses (O'Neill et al., 2013; Norberg and Pantano, 2016; Halla et al., 2020). Additionally, negative birth experiences are associated with fewer future births and longer intervals (Gottvall and Waldenström, 2002; Preis et al., 2020). We extend this research by examining overcrowding in maternity wards, an objective proxy for birth experience and independent of maternal characteristics.

Third, our work contributes to a larger literature on patients' healthcare choices (Chandra et al., 2019). Previous studies have examined factors such as healthcare quality (Gutacker et al., 2016),

[2]Relatedly, Freedman et al. (2025) document the expansion in neonatal intensive care units raises admission rates of newborns.

financial incentives (Clemens and Gottlieb, 2014; Ho and Pakes, 2014), and shared identities between patients and doctors (Greenwood et al., 2018, 2020; Alsan et al., 2019; Ye and Yi, 2023). Childbirth represents a high-stake healthcare setting, and features repeated interactions between the patient (mothers) and the provider (hospitals). We focus on mothers' decisions about their place of birth among non-hospital settings as well as different options within the hospital system. This represents a broader but less explored decision margin compared to the medical literature on home versus hospital births (Boucher et al., 2009; Murray-Davis et al., 2014; Bernhard et al., 2014). Additionally, we stress that overcrowding experience can be considered as a situational factor discussed by Chandra et al. (2011). While previous research explores heuristic decision-making by physicians (Frank and Zeckhauser, 2007; Jin et al., 2023), we highlight patient heuristics, showing how mothers' past experiences influence their hospital choices.

The remainder of the paper proceeds as follows. We introduce our context in Section 2 and datasets in Section 3. Section 4 specifies our empirical strategy. Section 5 presents the main set of results and robustness checks. We conclude in Section 6.

2 Background

2.1 Childbirth in California

Californian mothers choose hospitals and healthcare providers for childbirth based on their health insurance coverage.[3] However, even though women have such freedom, some providers operate on a rotating schedule, leaving mothers uncertain about which provider they will ultimately interact with. Furthermore, mothers cannot predict how busy their hospital will be on their actual birth date. In our empirical approach, we leverage the unpredictability of birth dates.

Medical procedures during childbirth are jointly decided by mothers and their doctors, consid-

[3]A health insurance plan typically designates a list of providers considered "in network," which ensures more generous reimbursements from the plan. One health insurance program that is particularly relevant is Medi-Cal, the Californian version of Medicaid, a publicly funded health insurance program that supports the low-income population. Due to the more lenient income threshold, it is much easier for a pregnant woman to become eligible for Medi-Cal coverage than for other adults.

ering factors such as the mother's health status, medical history, and any pregnancy-related risks. Common delivery methods include vaginal delivery and C-section, and vaginal delivery is preferred in uncomplicated cases. However, if safety concerns arise for either the mother or baby, a C-section may be recommended.[4] While decisions are typically based on maternal health, earlier research suggests that there may be unrelated considerations. When the occupancy rate is high, healthcare providers may be time-constrained, affecting the provision of certain procedures (Marks and Choi, 2019; Maibom et al., 2021; Facchini, 2022; Singh and Venkataramani, 2024).

2.2 Potential Impacts of Overcrowding

In this subsection, we formalize our hypothesis that maternity ward overcrowding can shape mothers' overall childbirth experience and potentially influence their future fertility decisions and choice of birth location. Maternity wards operate under capacity constraints due to limitations in beds, staffing, and medical equipment. As overcrowding intensifies, resource scarcity may disrupt the allocation of medical care, affecting the quality of maternal and neonatal services.

Effects on Medical Procedures and Concurrent Birth Outcomes Hospitals face a resource allocation problem when patient volumes are high. Providers may exercise discretion in adjusting treatment practices to prioritize procedures that expedite patient turnover, as documented in Facchini (2022). However, many medical interventions require coordination among multiple specialists—not just obstetricians—including anesthesiologists, nurses, midwives, technicians, and neonatologists. For instance, labor induction and augmentation, which accelerate delivery at different stages, rely on collaboration among these professionals. Induction artificially starts labor before it begins naturally, using medication or mechanical methods to trigger contractions. Augmentation strengthens and increases contractions after labor has already begun to ensure steady progression. Both procedures often involve obstetricians, nurses, and midwives, with anesthesiologists playing a role when pain management is required. We hypothesize that if staffing is the

[4]Such as in cases of breech presentation, placenta previa, fetal distress, or if the mother had previously used C-sections.

primary constraint, there can be a decrease in medical procedure utilization rates on crowded days, even for those that could otherwise help manage patient flow.

There can also be disparities in treatment received by different demographic groups. For example, Black mothers are more likely to undergo discretionary C-sections (Corredor-Waldron et al., 2024), and Black patients experience worse health outcomes when hospitals reach capacity (Singh and Venkataramani, 2024). Additionally, Black-white racial gaps in maternal and infant health outcomes persist even after accounting for income (Kennedy-Moulton et al., 2022). We aim to also investigate whether mothers from disadvantaged racial, ethnic, or socioeconomic backgrounds may be disproportionately affected by maternity ward overcrowding.

Changes in produce usage may directly translate into a mother's overall quality of experience. For instance, epidural anesthesia is a common pain management procedure during labor, but when anesthesiologists are busy, mothers may face delays or be unable to receive it if labor progresses too quickly, leading to a more painful childbirth experience. The impact of shifts in C-section usage is more debated. C-sections are often necessary for dealing with complications, and a decrease or delay can be uncomfortable or unsafe. However, there is ongoing debate about whether C-section rates are excessively high and the associated health impacts.[5]

Effects on Future Fertility and Place of Birth Overcrowding can lead to a traumatic childbirth experience for mothers, even if their physical health is not compromised. This may influence their future decisions regarding fertility and place of birth. However, the causal effect of past birth experiences remains uncertain, as they are just one of many factors shaping these decisions.

Fertility choices are shaped by both individual and social factors, including household income and social welfare policies (Doepke et al., 2023). A traumatic childbirth experience may discourage mothers from having another child (Norberg and Pantano, 2016; Halla et al., 2020), though its influence on subsequent fertility decisions may be limited. If the mother remains in good health, the household may still derive utility from having another child, potentially offsetting any negative effects of overcrowding.

[5]We refer to Online Appendix A of Card et al. (2023) for an overview of the health effects of C-section deliveries.

Likewise, a mother's decision to switch birth locations for a subsequent delivery may also be influenced by her overall satisfaction with her previous birth experience. In our dataset, approximately 60% of mothers choose the same hospital for both their first and second births. This may be due to their familiarity with their obstetricians and the reduced time and effort required to establish trust with a new provider. These factors suggest that switching hospitals between births entails an opportunity cost. However, if a mother had a negative experience during her first birth, the perceived benefits of switching may outweigh these costs. We hypothesize that mothers who experienced overcrowding during their first birth are more likely to change hospitals for subsequent deliveries.

3 Data

3.1 Main Data: Californian Birth Records

Birth Records Data The primary data source for this study is the Vital Records Data managed by the California Department of Public Health (CDPH). Specifically, we use the Static Birth Statistical Master File (BSMF) spanning the years 1989 to 2017, a comprehensive dataset that encompasses all births within California and comprises a large set of variables extracted from birth certificates.[6]

The birth records include detailed demographic and health information about mothers and infants, such as socioeconomic indicators, delivery method, some health conditions of the mother during pregnancy, and documentation of various medical complications encountered by mothers (such as blood transfusion and ICU admission) and by babies (such as birth injury and NICU admission) during the delivery process and immediately after birth. Importantly, we observe the time and location of each childbirth, enabling us to infer how busy each hospital is on a daily basis. However, a limitation of the data is that we do not observe the date of initial admission.

[6]We use this time frame to keep our main variables consistent over time. The format of birth certificates has undergone significant changes: new variables are introduced, and details change for some existing ones.

Linking Mothers over Time Of particular significance, the birth records allow us to uniquely identify each mother and link their birth over time.[7] It is important to note that some births may go unobserved if mothers moved out of California. While mothers are also likely to relocate within California, they can still be tracked, as demonstrated in Chyn and Shenhav (2021). In our analysis, we assume that the overcrowding experience does not prompt mothers to move out of California, meaning that any missing births are assumed to be missing at random. In Figure A1, we illustrate the average subsequent fertility of mothers against the time of their first childbirth. Panel (a) showcases the extensive margin of subsequent births (i.e., whether or not the mother has any later births), while panel (b) displays the total subsequent fertility (i.e., the total number of newborns in the future). These figures display fertility rate variables within 2, 3, 4 and 5 years thereafter.

The fertility rates are remarkably stable in the eligible years. In terms of the extensive margin, about 15% of first-time mothers gave subsequent births within 2 years, 30% within 3 years, 40% within 4 years, and 48% within five years. Total fertility rates are a bit higher than these figures, suggesting a small, but positive and stable intensive margin. On average, first-time mothers gave birth to 0.15 subsequent children within 2 years, 0.31 within 3 years, 0.42 within four years, and 0.50 within five years. We cannot directly tell when a mother delivered her last ever child, though.

Sampling and Summary Statistics For the analysis of current birth, we start with mothers aged between 18 and 45, and drop mothers who deliver at home, at a birth center, at hospitals with very low birth counts, or whose place of delivery is unknown.[8] Since staffing patterns and caseloads differ on weekends and public holidays, our main analysis focuses on births occurring on working

[7]The data includes details such as their first name, maiden name, and date of birth. Furthermore, the records furnish information on the month and year of the mother's most recent previous birth, as well as the number of previous births a mother had, facilitating the tracking of mothers over time and the analysis of their subsequent fertility patterns. We segment the birth records by birth order and link each subsequent birth with the first birth using mothers' identifiers.

[8]We classify a birth as a home birth if the place of birth is recorded but no hospital or facility is coded, and a facility as a birth center if its name contains "birth", "midwife", or "babies". The practice of home births and birth centers is likely very different from that of hospitals, and only a small proportion (about 1%) of mothers are dropped this way. We exclude births from hospitals with an average monthly birth count below 15, which account for 0.2% of all births; these facilities are more likely to lack a regular maternity ward and are primarily handling emergency births.

days.[9] As two robustness checks in Section 5.4, we include weekend births in the analysis and separately restrict the sample to low-risk mothers without certain pre-existing health conditions.

In Panel A of Table 1, we provide summary statistics on basic demographic information for three samples, which will be used at different points in our empirical analysis. They are the full sample of mothers, a sample consisting of all first-time mothers, and a sample of all first-time mothers for whom we can link to a future birth. At the aggregate level, we observe high participation rates, about 40-50%, in the public welfare programs of Medi-Cal and WIC. Compared to the full sample of births, mothers of first-time births are younger, better educated, and less likely to be enrolled in the two programs.

The birth records contain several variables that record conditions related to the pregnancy, the delivery process, and infant conditions respectively, allowing us to infer a wide range of pre-existing health risks the mother faces, the major medical procedures used in each birth, and whether the mother or the infant experienced severe medical complications. We present them in Panels B through D in Table 1.[10] In terms of medical procedures, C-section and epidural anesthesia are prevalent: about 30% of the births involve a C-section, and more than half of the births, either vaginal or using C-section, involve epidural anesthesia. Additionally, induction and augmentation during delivery are present within about 12% of all births.

3.2 Supplementary Data: Hospital Annual Financial Disclosure Report

While birth records allow us to identify the location of each birth, they provide limited information on hospital characteristics, such as the scale of operations. For this purpose, we turn to the Hospital Annual Financial Disclosure Report, managed by the California Department of Health Care Access and Information (HCAI). This dataset includes information collected from all acute care hospitals licensed by the State of California and is desk-audited to ensure data quality.

[9] While our analysis of concurrent birth outcomes focuses on births in a hospital setting on working days, we track mothers' future births across all settings and dates to study fertility and delivery location choices.

[10] We note that incidences of the health risk factors in Panel B are similar to those in New Jersey, as studied in Corredor-Waldron et al. (2024). However, smoking during pregnancy, which is not studied in their paper, is likely under-reported in our data.

In this paper, we use reports from fiscal year 2002-2003 onward, the earliest period for which these reports are publicly available. We construct a crosswalk linking hospitals in financial reports to those in birth records for each year by matching on facility name, city, and street address.

Our analysis focuses on two key sets of variables: the number of beds allocated for birthing purposes, and variables related to the hospital's revenues and net incomes.[11] Specifically, we use bed count information to construct an alternative measure of overcrowding, as will be discussed in Section 4.1 and with results presented in Section 5.4. Both sets of variables serve as proxies for hospital size when we examine hospital-level characteristics in our later analysis.

4 Empirical Analysis

4.1 Proxies for Overcrowding

Maternity wards are capacity-constrained due to limitations in beds, staffing, and medical equipment. Given the scarcity of these resources, overcrowding is more likely when an unusually high number of births occur on the same day. While hospitals typically have regular staffing schedules and may anticipate demand,[12] an unexpectedly high number of births can still result in unpredictable crowding.

We exploit the inherent randomness of birth timing within one maternity ward as an exogenous shock. Mothers typically deliver via C-section or vaginal birth. Unlike C-sections, which can be emergencies but can also be scheduled, vaginal births occur naturally and unpredictably. Despite a normal gestation length of 40 weeks, actual lengths vary widely (mean 275.2 days, SD 13.2 days for vaginal births in our data). Mothers are usually advised to call the hospital when contractions start or water breaks, and have limited control over the level of maternity ward crowding in this

[11] For hospitals with multiple reporting periods within a fiscal year, we compute stock variables, such as the number of beds, as weighted averages, with weights proportional to the length of each reporting period. For flow variables, such as revenues, we first derive the daily average within each reporting period, and then calculate a similar weighted average within that year.

[12] For instance, Figure A2 shows a noticeable increase in both births and C-sections around 8 AM each day, consistent with a typical workday schedule.

process.

We use the daily number of mothers at each hospital as a proxy for crowding, following the approach of prior studies (Marks and Choi, 2019; Maibom et al., 2021). Due to data limitations, we define the number of mothers based on their delivery date rather than their admission date. To address potential concerns, we provide a two-day average measure as a robustness check. On average, 5.62 mothers give birth at a hospital per day, as shown in Panel A of Table A1. This figure is slightly lower than the total birth count (5.71), which accounts for multiple births. The median standard deviation of the daily number of mothers giving birth at the hospital-year-month level is 2.05, which corresponds to approximately 36% of the mean daily mother count.

Using the raw mother counts could lead to three major concerns. First, the daily number of deliveries varies widely across hospitals, and the impact of an additional patient differs between small and large hospitals. Second, staffing levels tend to be lower on weekends and holidays, which affects birth outcomes (Evans and Kim, 2006; Halla et al., 2020; Jacobson et al., 2021; Facchini, 2022). Our data also show fewer births on these days. Third, there are significant seasonal fluctuations in daily births within a year, with a peak in the fall as we observe in Figure A3, possibly leading to pre-determined staffing adjustments.

These concerns motivate us to focus on mothers within a typical working day and normalize the daily number of mothers at the hospital-year-month level to account for differences in hospital size and seasonality.

$$\text{Standardized Mother Count}_{h,d} = \frac{\text{Mother Count}_{h,d} - \overline{\text{Mother Count}_{h,ym}}}{\sigma(\text{Mother Count}_{h,ym})} \tag{1}$$

To be specific, we calculate a z-score for each hospital-day (subscript h,d), as shown in Equation 1, by subtracting the average daily number of mothers served within the hospital-year-month (subscript h,ym) from that number on each day, and then dividing this difference by the standard deviation of the daily number of mothers within that hospital-year-month. Since hospital staffing typically follows a regular schedule, our main specification includes interim days with zero births

in the calculation; in a robustness check, we also perform the calculation excluding these days. This approach enables us to account for daily variation and make interpretations in terms of standard deviations of the daily number of mothers at the hospital-year-month level. We refer to this as the *Standardized Mother Count*. It ranges from -3.5 to 4.5 and has a mean of zero at the hospital-day level. In Figure 1, we plot its distribution both at the hospital-day level and at the mother level for first-time mothers. We note that the distribution has a positive mean of 0.36 at the mother level, because mechanically a greater number of mothers are on the right tail of the distribution.

An alternative measure of hospital capacity and overcrowding is the *Bed Occupancy Rate* (Freedman, 2016; Singh and Venkataramani, 2024). To operationalize this concept in out setting, we use hospital annual financial reports and our constructed crosswalk to hospitals in birth records from Section 3.2 to obtain a panel of the number of obstetric beds[13] at the hospital level for each year between 2002 and 2017. We then define this measure for each hospital-day in Equation 2:

$$\text{Bed Occupancy Rate}_{h,d} = \frac{\text{Mother Count}_{h,d}}{\text{Number of Obstetric Beds}_{h,y}} \tag{2}$$

where h, d, and y indexes hospital, day, and year respectively. This measure focuses on the share of beds occupied by mothers giving birth, and offers a more direct way to document resource usage and scarcity in maternity wards. We defer the discussion of results from this approach to Section 5.4 as a robustness check.

Compared to the *Bed Occupancy Rate*, we consider the *Standardized Mother Count* our preferred specification. One key reason is that bed count data come from annual financial reports, which are unavailable before 2002, and we cannot precisely track the change in available beds within a year. In contrast, the *Standardized Mother Count* is calculated within each hospital-year-month, and can capture potential changes in hospital characteristics on a finer temporal scale.

As additional robustness checks, we construct six alternative measures to validate our main overcrowding metric, *Standardized Mother Count*, as will be discussed in Section 5.4. These in-

[13] We calculate it as the sum of licensed beds from the "Obstetrics Acute" and "Alternate Birthing Center" categories at the end of each reporting period.

clude: (1) incorporating weekends into the calculation, (2) standardizing at the hospital-year level, (3) standardizing based on the number of births rather than the number of mothers to account for non-singleton births (e.g., twins, triplets), (4) excluding dates with no births in the standardization process, (5) using a two-day average of birth counts, and (6) standardizing based on the number of mothers who deliver within 15 miles (24.1 km) of each hospital to capture broader, regional-level demand.

4.2 Regression Specification

$$Y_{ihd} = \alpha + \beta \text{Standardized Mother Count}_{hd} + \gamma \mathbf{X}_{ihd} + \theta_{h,ym} + \zeta_{DoW} + \kappa_{hour} + \varepsilon_{ihd} \tag{3}$$

We outline our regression specification in Equation 3, where i stands for mother,[14] h stands for hospital, d stands for date, ym stands for year-month, DoW stands for day-of-week, and $hour$ stands for hour of birth within each calendar day. In the baseline specification, we standardized the daily mother count at the hospital-year-month level, as specified above. We examine a variety of outcomes Y_{ihd}, including medical procedures such as C-sections and epidural, health outcomes for mothers and babies during delivery and immediately after birth, mothers' future fertility, and choice of hospital at future births. We cluster standard errors at the hospital level.

We incorporate several fixed effects to account for potential confounders in our analysis. First, we control for a hospital-year-month fixed effect to control for differences in hospital size, practice styles, and their evolution over time. For example, some hospitals perform more C-sections than others (Card et al., 2023), which can affect health outcomes and subsequent fertility decisions. Additionally, hospitals may vary in their ability to handle complicated births, influencing mothers' future fertility choices. This fixed effect also captures seasonal variations in child health (Currie and Schwandt, 2013; Isen et al., 2017) and maternal characteristics (Buckles and Hungerman, 2013; Darrow et al., 2009).

We also control for day-of-week fixed effects to account for potential fluctuations in birth

[14] Our main analyses are at the mother level, and for non-singleton births (twins, triplets, etc.), we focus on information recorded for the first child in that birth sequence.

characteristics as well as staffing patterns across different weekdays. Lastly, we include a fixed effect for the hour of birth to control for variations in birth timing within a day, as we observe in Figure A2, which can be influenced by work shifts and has been shown to be a risk factor for mothers (Gijsen et al., 2012).

We incorporate a comprehensive set of control variables to mitigate potential bias in our analysis. These controls include a mother's age, educational attainment, race and ethnicity, and income level (via Medi-Cal participation). We additionally account for the ex-ante health status and medical risk of each mother by controlling for a set of different health conditions prior to delivery, such as plurality birth (e.g., twins or triplets), breech position, diabetes and hypertension.[15] Plurality births also directly affect family planning decisions in the future, an outcome we are interest in.

$$\begin{aligned} Y_{ihd} = &\alpha + \beta \text{Standardized Mother Count}_{hd} + \delta \text{Standardized Mother Count}_{hd} \times \mathbf{X}_{1,ihd} \\ &+ \gamma_1 \mathbf{X}_{1,ihd} + \gamma_2 \mathbf{X}_{2,ihd} + \theta_{h,ym} + \zeta_{DoW} + \kappa_{hour} + \varepsilon_{ihd} \end{aligned} \tag{4}$$

In addition to the baseline effect, we also examine the heterogeneous effects of the outcomes. As outlined in Equation 4, we interact the main explanatory variable, Standardized Mother Count, with a subset of control variables. These include the mother's race and ethnicity (e.g., non-Hispanic Black, Hispanic, and other race, with non-Hispanic white as the baseline group) and socio-economic status (SES) indicators (e.g., age, Medi-Cal usage, and college attainment). When analyzing future hospital choice, we also include interaction effects with local healthcare market characteristics, specifically the Herfindahl-Hirschman Index (HHI) for childbirth.[16] This index captures the degree of concentration in the childbirth market and may influence a mother's decision to switch hospitals for subsequent deliveries.

[15] Specifically, we control for the full set of variables presented in Panel B of Table 1. With the exception of smoking during pregnancy, these factors are all used to predict C-section probabilities in Corredor-Waldron et al. (2024).

[16] For each first-time mother, we calculate the HHI based on the number of mothers served across all hospitals within her county of delivery in her year of childbirth.

4.3 Validity of the Strategy

Despite the randomness of birth timing, concerns remain that overcrowding may not be entirely random for mothers. In particular, if hospitals prioritize high-risk mothers and treat them on less busy days when they are less constrained, then there could be a negative correlation between health risk and overcrowding. To address this issue, we examine whether the demographic characteristics and risk factors of first-time mothers jointly predict the level of overcrowding, controlling for the fixed effects for hospital-year-month, day-of-week, and birth hour. Importantly, we use the same set of variables in the balance test as in our main regression specification, Equation 3.

We find in Table 2 that six pre-existing risk factors (breech position, diabetes, gestational hypertension, chronic hypertension, herpes, and smoking during pregnancy) are indeed negatively correlated with overcrowding, pointing to potential adjustments made by hospitals to accommodate high-risk mothers. However, when we test for whether the other demographic and health factors we examine jointly predict the level of overcrowding, the F-test fails to reject the null. Specifically, for our main specification in column (1), that F-statistic is 1.311, with a p-value of 0.22.

Our identifying assumption requires that any latent health factor observable to physicians but not to the econometrician does not simultaneously influence both overcrowding and health outcomes beyond the major risk indicators we control for. If this assumption holds, hospital overcrowding can be considered conditionally quasi-random in our empirical framework. Although we cannot directly test this assumption, we conduct two exercises in Section 5.4 to support its validity. First, we restrict the sample to low-risk mothers—those without the six major pre-existing health conditions—and find similar results to those in our main specification. Second, we estimate our main outcomes without the demographic and health risk controls, and also obtain similar results, suggesting that selection on observables is unlikely to be driving our findings.

5 Results

5.1 Outcomes at Birth

We first examine how overcrowding affects medical procedures and whether this, in turn, influences health outcomes of the current birth. For this analysis, we present results using both the full sample and a subsample of first births.

Medical Procedures Previous literature has shown that overcrowding in maternity wards could lead to changes in medical procedure usage in European settings (Maibom et al., 2021; Facchini, 2022). We illustrate the impact of crowding in California on medical procedures in Table 3. Panel A consists of the sample of all births, and Panel B consists of the sample of first-time births.

Extending Marks and Choi (2019), who also analyzed Californian data but did not study effects on procedure use, our estimates in columns (1) and (6) show that C-section usage decreases with the level of maternity ward crowding. This contrasts with findings from Europe (Maibom et al., 2021; Facchini, 2022), where C-section usage either does not change or increases on crowded days to expedite delivery. A key factor behind this discrepancy may be structural differences in healthcare systems. In the U.S., approximately 90% of all births are attended by physicians (Martin et al., 2018), and the ratio of physicians to midwives is significantly higher than in European countries (Tikkanen et al., 2020). Given this physician-centered model, procedure use in U.S. hospitals may be more constrained by surgeon and anesthesiologist availability, leading to a decline during busier periods.

Notably, in columns (2) and (7), we find that a significant portion of the decline in C-section usage can be attributed to C-sections following a trial of labor. While these C-sections make up only 13% of all C-sections in the full sample (and 26% in the first-birth sample), their effect size represents 60% of the total reduction in C-section rates. Because C-sections after labor trial are primarily unscheduled,[17] this pattern suggests a significant level of physician discretion in

[17] We note that some unscheduled births may result in a direct C-section and are included in the overall C-section measure but not in the C-section after labor trial category, which can explain the difference in coefficient magnitudes.

determining C-section usage, similar to findings in Corredor-Waldron et al. (2024).

We further observe that overcrowding leads to reduced utilization of labor induction and labor augmentation during the delivery process, as shown in columns (3)-(4) and (8)-(9) of Table 3. This pattern is consistent with findings in Maibom et al. (2021). Induction and augmentation are performed at different points in time during delivery, and both serve to expedite the laboring process. A reduction in their usage could potentially lead to a longer labor process, which may be an unpleasant experience for mothers and could possibly affect mothers' decisions on their subsequent births.

In line with Maibom et al. (2021), we find that overcrowding leads to a decrease in the use of epidural anesthesia, which is administered to alleviate childbirth pain (column (5) and (10) in Table 3).[18] It suggests that anesthesiologists are less available on busier days.

We relax the linear functional form assumption in Table A2. In particular, we replace the standardized mother count variable with three indicator variables for whether the measure is within the 2nd, 3rd, or 4th quartile of the overall distribution. We find that the magnitude of the decrease in procedure use increases with quartile, again suggesting that the effects we detect are more concentrated within the busiest days.

Heterogeneous Effects in Procedure Usage We apply the specification in Equation 4 to examine heterogeneity in medical procedure utilization among first-time mothers by race, ethnicity, and socioeconomic status. Given the health disparities across demographic groups discussed in Section 2.2, similar gaps may also arise in the context of maternity ward overcrowding.

We present the coefficient estimates of the interaction terms for C-section after labor trial in Figure 2a, and for epidural anesthesia in Figure 2b. Compared to non-Hispanic white mothers, Black mothers experience a smaller decline in C-sections after labor trial, a pattern consistent with the role of physician discretion in contributing to the higher C-section rates observed among Black mothers (Corredor-Waldron et al., 2024). Additionally, we find that Hispanic mothers experience a sharper decline in epidural usage compared to non-Hispanic white mothers when maternity wards

[18] Epidural anesthesia is recorded in our data for both vaginal births and C-sections.

are overcrowded. Since high C-section rates are generally undesirable, and epidural anesthesia is considered a safe and comforting option for mothers, these patterns suggest that women from certain disadvantaged groups may be more adversely affected by overcrowding compared to their better-off counterparts.

Maternal and Infant Health One concern directly related to overcrowding is that mothers and infants may receive less attention from their healthcare providers, and receive less intensive or less customized treatment for their conditions on crowded days. This could impact important health outcomes, as well as a mother's perception of their childbirth experience. While we are not able to speak to the psychological effect, information on certain maternal medical conditions is available within birth records, allowing us to provide some characterization of the impacts on physical well-being around birth.

In columns (1) and (6) of Table 4, we examine the impact of maternity ward overcrowding on the incidence of prolonged labor among all mothers as well as first-time mothers, where the labor process lasts for more than 20 hours. In columns (2) and (7), we examine whether the mother has been documented to have a fever during delivery, defined as a temperature above 38°C or 100°F. Both conditions are considered unpleasant and may elevate health risks for mothers and their babies. We do not detect any impact of overcrowding on the incidence of prolonged labor, and if anything, we find that a higher level of crowding slightly decreases the probability that mothers have a documented fever during the delivery process.[19] Similarly, in columns (3)-(4) and (8)-(9), we find a small decrease in antibiotics use and blood transfusion, which could be associated with the decrease in C-section usage. However, overcrowding has a limited impact on the likelihood of severe medical conditions, and the incidence of maternal morbidity conditions is not affected.[20]

An additional outcome of interest within our context is infant health—poor infant health at first birth may causally affect a woman's decision regarding subsequent fertility and child investment

[19]This may be related to the decrease we see in other medical procedures. For example, there is some observational evidence that mothers who had an epidural are more likely to develop a fever (Jansen et al., 2020).

[20]Following the classification of maternal health conditions in birth records, we include third or fourth degree perineal laceration, ruptured uterus, unplanned hysterectomy, admission to ICU, and unplanned operating room procedure following delivery into the morbidity category.

choices (Wolpin, 1997). In columns (1)-(2) and (7)-(8) of Table 5, we find overcrowding leads to a small decrease in incidences of MSAF and fetal intolerance treatment, which are related to the laboring process. However, we detect null effects on birth injury in columns (3) and (9), and we do not detect any meaningful impact of overcrowding on post-birth outcomes including a class of several health conditions in columns (4) and (10),[21] and Apgar scores in columns (5)-(6) and (11)-(12).[22] These results are in line with previous literature where effects on infants' health were found to be negligible (Maibom et al., 2021; Facchini, 2022).

5.2 Subsequent Fertility

We further investigate whether overcrowding during a mother's first birth influences her subsequent fertility decisions. The expected outcome is ambiguous ex ante. While we observe a reduction in medical procedures due to overcrowding, there is no evidence of adverse effects on maternal or infant health that may affect a mother's fertility decisions.

By linking mothers across multiple births, we can track fertility patterns following their first birth. We present results on subsequent fertility in Table 6. We focus on first-time mothers who had their first child in or before 2012, allowing us to track a full five-year period post-birth. We then analyze whether these mothers had additional births within two or five years that we can link in our data. The findings are consistent across different fertility measures: the impact of overcrowding on future fertility is null, with none of the coefficient estimates reaching statistical significance.

We further analyze heterogeneous effects on future fertility by employing the regression specified in Equation 4. The coefficients of the interaction terms for the outcome of any fertility within 5 years are presented in Figure 2c. Overall, we observe no significant heterogeneous effects based on mothers' race or socioeconomic status.

[21] Following the classification of infant health conditions in birth records, we include assisted ventilation immediately after birth, NICU admission, seizure or serious neurological dysfunction, and newborn being transferred to another facility within 24 hours of delivery into the severe conditions category.

[22] The Apgar score serves as a rapid assessment tool for evaluating the health and vigor of newborns. Scores range from 0 to 10, with higher values indicating better infant health. A score of 7 or above is considered normal. On average, the Apgar scores in our sample have an average of 8 to 9, as shown in Panel D of Table 1.

The main analysis focuses on the effect of overcrowding on the first-birth sample. We also provide results using the second-birth sample, mothers who are giving birth to their second child, to investigate the subsequent fertility. In column (1)-(4) of Table A4, we show that the results using the second-birth sample align with the main findings. We still find a precisely estimated null effect on subsequent fertility.

5.3 Hospital Choice at Subsequent Birth

Given the null effects observed on subsequent fertility, we now turn to examining how mothers choose their place of birth for their second birth. Although we find no impact on health outcomes or subsequent fertility, the reduction in procedures on busier days could still prompt mothers to switch the place of second birth due to a negative experience (Bernhard et al., 2014).

This analysis focuses on first-time mothers whose second births are also recorded in our dataset. First, we demonstrate that experiencing overcrowding during the first birth leads mothers to select a different place for their second delivery, including switching to a non-hospital setting.[23] Next, we study whether mothers prefer certain types of hospitals by examining hospital characteristics at second birth, such as hospital size and travel distance. Finally, we examine the heterogeneity and racial interactions in mothers' hospital-switching decisions.

Effects on Switching the Place of Birth Choice at Subsequent Birth The main results in switching the place of birth are presented in Table 7. Specifically, we find in column (1) that mothers who experience a higher level of crowding during their first birth are more likely to change to a different place when they give birth to their second child. The coefficient means that a one-standard-deviation increase in daily mother counts, about 2-3 births at an average hospital, increases a mother's likelihood of switching to a different place for second birth by 0.18 percentage points. The effect size is small. Each year in California, there are a total of roughly 122,000 first births, and about 50% of these mothers give birth to a second child within 5 years.

[23] An advantage of using birth records data is that hospital codes remain consistent across different years, eliminating the need for a crosswalk of hospitals over time.

Consequently, a one standard deviation increase in overcrowding translates into an increase of $1.22 \times 10^5 \times 50\% \times 0.0018 = 110$ mothers per year who make the switch at second birth, for a total of about 3,000 mothers across our sample period.

We also observe that the effect is non-linear, as demonstrated in the results presented in columns (2) and (3). In column (2), we decompose the level of crowding into four quartiles according to the standardized mother count. The coefficient of the 4th quartile is the largest among the three indicators, with a value of 0.0037. The coefficients of the 3rd and 2nd quartiles are much smaller and insignificant. This suggests that the overcrowding effect is primarily driven by the upper quartile, indicating a non-linear relationship between the overcrowding measure and the decision to switch the place of birth. In column (3), we introduce a quadratic term for the standardized mother count, in addition to the linear term. The quadratic term has a significantly positive coefficient of 0.0005, further confirming the non-linearity of the relationship. We also visualize this relationship in Figure A4, after controlling for fixed effects and covariates as specified in Equation 3. The figure reveals a non-linear relationship, with steeper slopes at higher levels of overcrowding.

Furthermore, we investigate whether mothers who experienced overcrowding during their first hospital birth were more likely to opt for a non-hospital setting for subsequent births, such as giving birth at home or in a birth center. Previous medical research suggests that negative hospital experiences can prompt mothers to choose home births in the future (Bernhard et al., 2014). In our causal analysis, we find a small but statistically significant effect. As shown in column (4), the coefficient is 0.0002. The faction of mothers switching to a non-hospital birth after a hospital birth in our sample is 0.0045 (or 0.45%), indicating that a one-standard-deviation increase in overcrowding accounts for about 4% of the decision to switch to a non-hospital setting. Such a shift toward out-of-hospital births could increase neonatal mortality rates and lead to more negative long-term outcomes (Lazuka, 2023).

Our main analysis focuses on the effect of overcrowding on the first-birth sample. We also provide results on the second-birth sample to investigate whether the results differ from those of the first-birth sample. As shown in column (5) of Table A4, the effects disappear, suggesting

that the experience of the first birth plays a more significant role in determining the location of subsequent births compared to the second birth.

Characterization of Hospital at Subsequent Birth We further examine how experiencing overcrowding during the first birth affects medical procedures and hospital characteristics of the second birth. As shown in column (1) of Table 8, mothers who gave birth on crowded days are less likely to undergo a C-section for their second delivery. This aligns with the lower likelihood of C-section use during their first birth, given that a prior C-section increases the probability of the procedure being performed again.

Columns (2)–(9) of Table 8 characterize the hospitals where the second birth occurs. In columns (2)–(3), we approximate travel distance using the distance between zipcode centroids and find no significant effects of first-birth overcrowding on hospital travel distance for the second birth, whether measured from the mother's residence at the first or second birth. Additionally, we detect no differences in the socioeconomic composition of the hospital's patient pool (proxied by the share of Medi-Cal mothers), hospital ownership, or hospital size (proxied by the number of licensed obstetric beds and total revenues). These patterns suggest that mothers are inclined to change to a different hospital for future births if they experience a high level of crowding during the first birth, but they do not appear to systematically select hospitals with specific characteristics. Instead, their choice of hospital for the second birth appears as if at random within their local area.

Heterogeneous Effects in Hospital Switching We further analyze heterogeneity in subsequent hospital choice based on mothers' racial and socioeconomic backgrounds, as well as the local hospital HHI index, following the specification in Equation 4. As discussed in Section 2.2, we hypothesize that mothers with broader insurance coverage have greater flexibility in choosing hospitals, making them more likely to switch when experiencing overcrowding during their first birth. Additionally, since higher-SES mothers tend to have a wider range of hospital options, we expect the effect to be more pronounced among this group.

We present the coefficients of the interaction terms for hospital switching in Figure 2d. Notably,

we do not find significant heterogeneous effects based on mothers' race. However, mothers with a college degree are significantly more likely to switch hospitals. Since higher-educated mothers are more likely to have insurance plans covering a broader range of hospitals, their switching costs are lower, increasing their likelihood of changing birth locations.

Additionally, we include the HHI index of hospitals within each county to measure market concentration. However, we do not find significant heterogeneous effects based on this index.

We further examine the heterogeneous effects based on the racial composition of each hospital-day, with the sample split by mothers' race. As shown in Table A3, we find no significant heterogeneous effects.

5.4 Robustness Check

We conduct four sets of robustness checks. First, we remove covariates on demographics and maternal health from our regression to see if our main results hold. Second, we adjust the sample by restricting to the low-risk mothers. Third, we modestly change the standardization of daily mother counts in four ways: extend the analysis to include weekends, standardize at the hospital-year level, use the number of babies instead of mothers, and drop dates with no births in standardization calculation. Lastly, we test three alternative overcrowding measures: standardize by the hospital's physical capacity, use a 2-day average mother count for standardization, and expand the measure to include hospitals within a larger geographical area. Summary statistics for these alternative measures are available in Table A1.

Exclude Covariates on Maternal Demographics and Health Risk In this robustness check, we follow our main regression specification but exclude control variables related to maternal demographics and health risk factors. This serves as an alternative test to determine whether overcrowding is uncorrelated with maternal characteristics, thereby validating our assumption that it can be considered conditionally random. If selection on observables is important, we would expect to see changes in the regression results.

Specifically, we only keep the standardized mother count measure and the hospital-year-month, day-of-week and birth hour fixed effects in the regression, and exclude all other control variables we previously used. Results are presented in Table A5 for usage of medical procedures at birth and in Table A6 for subsequent fertility and hospital switching at second birth. The overall results are very similar to our main regression specification—we see an across-the-board decrease in procedure use, but do not detect any effects on future fertility in most fertility outcomes. This lends some support to our identifying assumption that the effects of overcrowding on the main outcomes of interest we detect are not confounded with effects from other maternal characteristics.

Restrict to the Low-risk Mother Sample In this robustness check, we assess the importance of latent health factors by restricting our sample to low-risk mothers—those without the six major health conditions that influence overcrowding status. These mothers have better underlying health and are less likely to be strategically rescheduled to less crowded days by hospitals.

Results are presented in Table A7 for usage of medical procedures at birth and in Table A8 for subsequent fertility and hospital switching at second birth, and they are similar to those in the main specification. This lends some support to our interpretation that overcrowding can be viewed as conditionally random, and that the role of unobservables in driving our results may be limited.

Include Weekends in the Analysis In our main analysis, we exclude weekends and holidays to avoid potential confounding factors related to staffing pattern changes. Weekends may pose a threat to our analysis if hospitals operate on different schedules.

Here, we conduct a robustness check by including weekends to compare the results with those from the main analysis to account for the fact that natural births could still happen on weekends. Results in Table A9 on medical procedures at birth, and in Table A10 on subsequent fertility and hospital switching at second birth are very similar to the baseline ones.

Standardize at the Hospital-Year Level In our main analysis, we normalize daily mother counts at the hospital-year-month level to account for differences in hospital size and seasonal birth fluc-

tuations (as shown in Figure A3). The latter aspect is important because hospitals may anticipate and adapt to these seasonal variations in advance.

Here, we adopt a regression specification that features mother counts standardized at the hospital-year (instead of the hospital-year-month) level and includes hospital-year (instead of hospital-year-month) fixed effects. This allow for the possibility that hospital staffing patterns are rigid to seasonal fluctuations in births. Results are presented in Table A11 for usage of medical procedures at birth and in Table A12 for subsequent fertility and hospital switching at second birth, which are also very similar to baseline ones.

Measure Overcrowding based on Number of Births In our main analysis, we measure overcrowding based on the number of mothers who deliver at each hospital. When non-singleton births (twins, triplets, etc.) are present, however, the number of births will be greater than the number of mothers, and the birth count better captures total demand for neonatal care.

Here, we use an alternative measure based on the total number of births, and perform the standardization at the same hospital-year-month level. We refer to the measure as *Standardized Birth Count*. Results are presented in Table A13 for usage of medical procedures at birth and in Table A14 for subsequent fertility and hospital switching at second birth. Again, these results are similar to what we obtain from the main specification.

Exclude 0-birth Dates in Standardization In our baseline standardization process, we include interim dates with no births,[24] assuming that the obstetric unit remains open and that the absence of births on these dates is coincidental. However, these dates may instead indicate a temporary closure of the obstetric unit, which should not be considered in the overcrowding calculation.

To account for this possibility, we also perform the same standardization process while excluding these dates. Results are presented in Table A15 for usage of medical procedures at birth and in Table A16 for subsequent fertility and hospital switching at second birth. They are again similar

[24]To be precise, a date is classified as "interim" if there is at least one date before and at least one date after it with nonzero births, distinguishing it from hospital openings or closures.

to the baseline results.

Measure Overcrowding based on Bed Occupancy Rate An alternative measure of hospital capacity and overcrowding is the *Bed Occupancy Rate*, which we discussed in Section 4.1. Instead of calculating a z-score based on the number of mothers, this approach computes the daily share of obstetric beds occupied by mothers, providing an alternative measure on resource utilization.

We find similar results to the baseline specification in Table A17 for usage of medical procedures at birth and in Table A18 for subsequent fertility and hospital switching at second birth. This further supports our hypothesis that capacity constraints impact the provision of healthcare services, and may affect future interactions between the patient and the provider.

Calculate Mother Count based on 2-day Average Mothers may stay at the hospital for childbirth for more than one day, especially when they had a C-section, and this could potentially affect the hospital's capacity to serve new patients. While we do not directly observe admission or discharge dates from birth records, in this robustness check, we calculate the standardized mother count based on a 2-day average, capturing births occurring both on the mother's day of delivery and on the previous day, to account for potential spillovers across consecutive calendar days.[25]

Results are presented in Table A19 for usage of medical procedures at birth and in Table A20 for subsequent fertility and hospital switching at second birth. They are similar to results obtained using the main specification.

Measure Overcrowding within a Larger Geographical Area In our main specification, we analyze overcrowding at the individual hospital level. To address concerns that mothers might be diverted away from at-capacity hospitals, potentially causing spillover effects on nearby facilities, we construct an alternative measure of overcrowding.

This measure uses the total number of mothers from all hospitals within a 15-mile (24.1 km) radius of the delivery hospital, rather than only those at the delivery hospital itself, and then maps

[25] We exclude births from the analysis if either the day of birth or the preceding day falls on a weekend or holiday.

this aggregate number into z-scores within each hospital-year-month. We cluster standard errors at the hospital zipcode level in this specification, and present results in Table A21 for usage of medical procedures at birth and in Table A22 for subsequent fertility and hospital switching at second birth. The effect size is slightly negative for fertility outcomes two years after the reform, and the results for fertility outcomes five years after the reform remain close to zero. We observe similar patterns in the choice of future place of birth, suggesting a strong link between the aggregate demand for childbirth services in a local area and the experiences faced by individual mothers and hospitals.

6 Conclusion

Complementing the extensive literature on how underlying supply and demand factors shape people's healthcare choices, our paper examines a "situational" factor highlighted by Chandra et al. (2011)—how overcrowding in maternity wards during childbirth affects subsequent fertility and hospital choices among first-time mothers.

We standardize daily birth counts at each hospital and find that overcrowding prompts across-the-board reductions in medical procedures—C-section, labor induction, labor augmentation, and epidural anesthesia—likely to alleviate physician workload. Despite these adjustments, there are no significant effects on immediate maternal and infant health outcomes. Regarding post-birth decisions, we find that overcrowding does not affect subsequent fertility within five years after first birth. However, mothers who experience overcrowding are more likely to choose a different place for their second birth, including non-hospital settings, potentially resulting in nearly 3,000 switches within our sample period. Furthermore, mothers with higher education levels are more likely to respond to overcrowding by switching hospitals in the future, reflecting inequalities in healthcare access.

This study has several limitations. Our data is limited to California, so we are unable to track mothers who move out of state. The analysis of maternal and infant health is also restricted to information available on birth certificates, lacking subjective measures of negative experiences.

Additionally, the analysis does not determine the "optimal" level of maternity ward utilization.

Despite these constraints, our findings provide valuable insights into how past experiences influence mothers' subsequent fertility-related healthcare decisions. Additionally, the implications of our study are relevant to the recent trend of maternity ward closures in the U.S., a development that may exacerbate overcrowding in the remaining facilities (Avdic et al., 2024; Battaglia, 2023; Fischer et al., 2024). Our results suggest that this trend could significantly impact mothers' healthcare-seeking behavior. It is especially concerning that mothers may opt for non-hospital settings, which could pose risks for subsequent births. We suggest that policymakers carefully weigh the efficiency gains against potential risks when making decisions about maternity ward closures.

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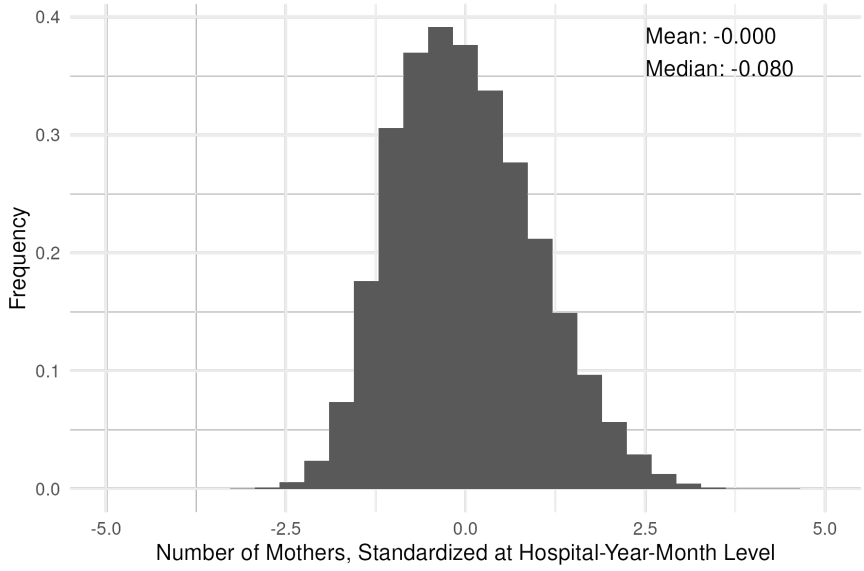
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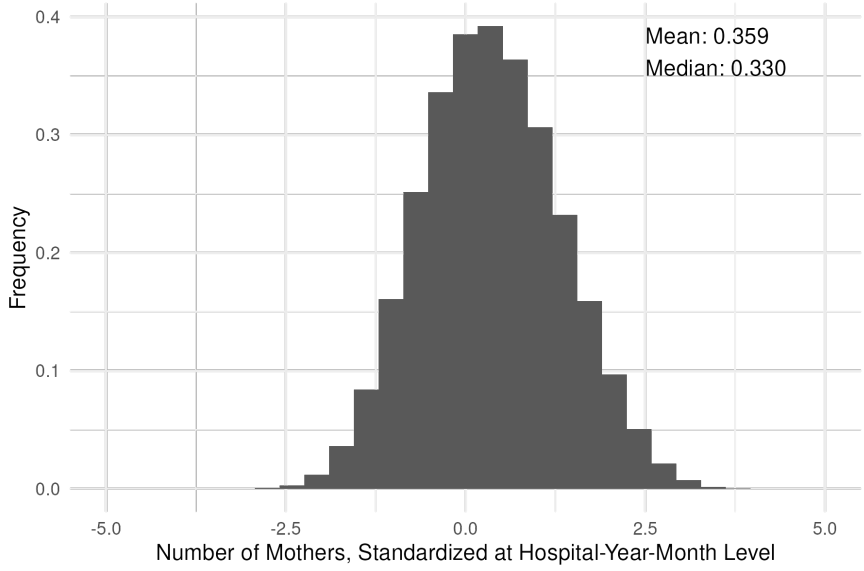
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Figures

Figure 1: Distribution of Standardized Mother Count



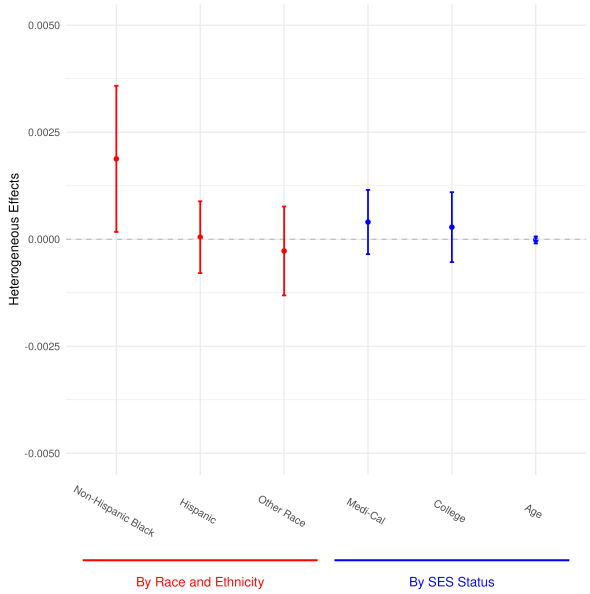
(a) At the Hospital-Day Level



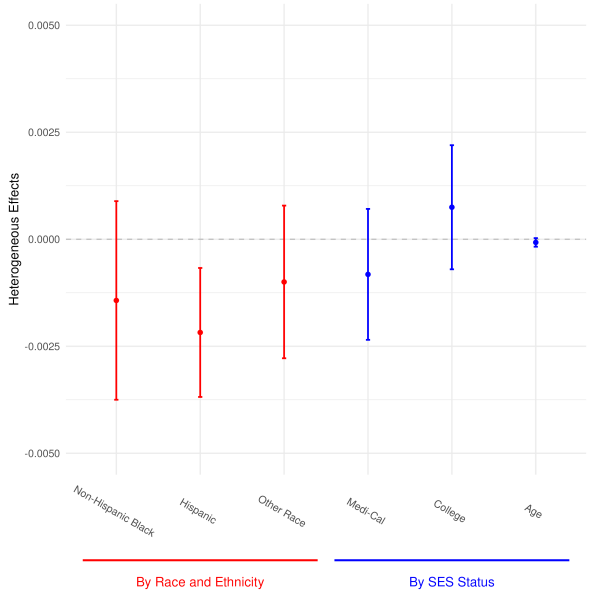
(b) At the Mother Level for First-time Mothers

Notes: In this figure, we plot the distribution of the baseline standardized mother count for each hopital-day in panel A, and for each first-time mother in panel B.

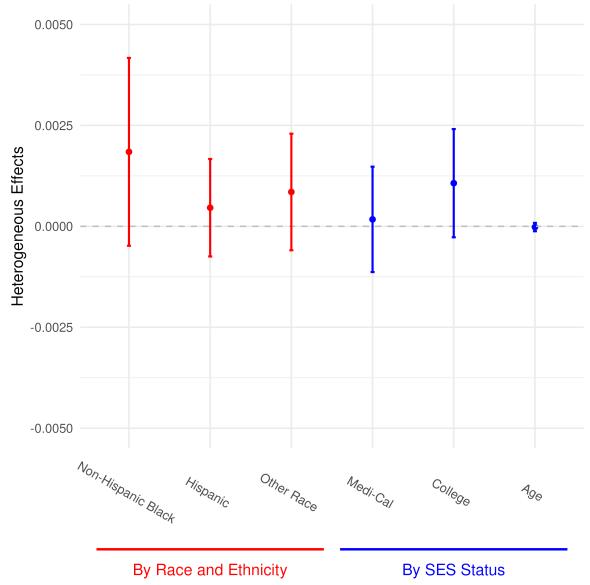
Figure 2: Heterogeneous Effects



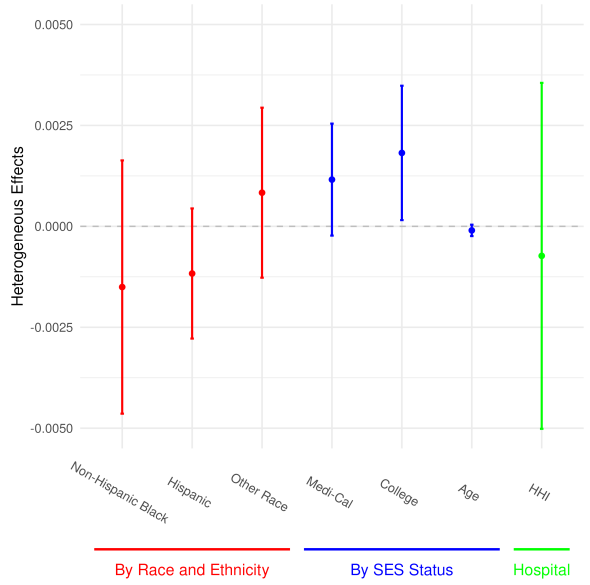
(a) C-section after Labor Trial



(b) Epidural Anesthesia



(c) Any Fertility after 5 Years



(d) Switching the Place of Birth

Notes: We present the coefficients of standardized mother count interacted with multiple indicators derived from Equation 4, where we also control for the standardized mother count and the factors themselves. For the outcome of switching the place of birth, we also add the Herfindahl–Hirschman Index (HHI) of hospital within each county to measure the how concentrated a market is. The error bars represent the 90% confidence interval.

Tables

Table 1: Summary Statistics

	Full Sample		First Birth Sample		Linked Sample		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Years Available
Panel A: Mother's Characteristics							
Mother's Age	28.34	5.91	26.39	5.87	25.55	5.34	1989-2017
Mother is Hispanic	0.48	0.50	0.41	0.49	0.42	0.49	1989-2017
Mother is Black	0.06	0.24	0.06	0.23	0.05	0.22	1989-2017
$\geq$ High school education	0.74	0.44	0.83	0.38	0.81	0.39	1989-2017
$\geq$ College education	0.23	0.42	0.30	0.46	0.29	0.46	1989-2017
Medi-Cal is principal source of payment	0.43	0.49	0.37	0.48	0.37	0.48	1989-2017
Mother uses WIC program	0.51	0.50	0.45	0.50	0.44	0.50	2007-2017
Panel B: Mother's Health Risk Factor							
Plurality Birth	0.0147	0.1203	0.0161	0.1258	0.0002	0.0130	1989-2017
Eclampsia	0.0005	0.0233	0.0007	0.0264	0.0006	0.0240	1989-2017
Abruptio Placenta	0.0032	0.0564	0.0030	0.0550	0.0028	0.0525	1989-2017
Cord Prolapse	0.0014	0.0368	0.0013	0.0364	0.0013	0.0356	1989-2017
Breech or Non-vertex Position	0.0147	0.1205	0.0194	0.1379	0.0169	0.1289	1989-2017
Diabetes	0.0153	0.1228	0.0129	0.1126	0.0122	0.1099	1989-2017
Gestational Hypertension	0.0201	0.1403	0.0287	0.1669	0.0239	0.1527	1989-2017
Chronic Hypertension	0.0047	0.0683	0.0048	0.0689	0.0036	0.0597	1989-2017
Herpes	0.0068	0.0822	0.0081	0.0897	0.0072	0.0845	1989-2017
Smoking during Pregnancy	0.0185	0.1347	0.0151	0.1221	0.0133	0.1147	1989-2017
Panel C: Birth Condition and Medical Procedure							
Gestation Length (days)	274.53	13.80	275.55	14.20	276.31	13.47	1989-2017
All C-sections	0.29	0.45	0.29	0.45	0.30	0.46	1989-2017
C-section after labor trial	0.04	0.19	0.07	0.26	0.07	0.26	2005-2017
Epidural anesthesia	0.55	0.50	0.62	0.49	0.59	0.49	2006-2017
Labor Induction	0.12	0.32	0.14	0.35	0.14	0.35	1989-2017
Labor Augmentation	0.12	0.33	0.16	0.37	0.16	0.36	1989-2017
Prolonged Labor	0.01	0.09	0.02	0.13	0.01	0.12	1989-2017
Panel D: Maternal and Infant Health Outcomes around Birth							
Presence of maternal fever	0.012	0.110	0.025	0.155	0.024	0.152	1989-2017
Antibiotics used during labor and delivery	0.158	0.365	0.177	0.382	0.152	0.359	2006-2017
Maternal blood transfusion	0.002	0.046	0.002	0.046	0.002	0.046	1989-2017
Maternal morbidity conditions	0.009	0.097	0.015	0.124	0.015	0.123	2006-2017
MSAF	0.043	0.203	0.054	0.226	0.053	0.223	1989-2017
Fetal intolerance treatment	0.027	0.162	0.048	0.214	0.045	0.208	2006-2017
Birth injury	0.001	0.034	0.002	0.040	0.002	0.043	1989-2017
Several infant conditions	0.048	0.213	0.057	0.233	0.046	0.209	1989-2017
Apgar score (1 min)	8.17	1.15	8.03	1.30	8.07	1.25	2007-2017
Apgar score (5 min)	8.90	0.59	8.86	0.66	8.88	0.61	2007-2017
Observations	10,638,777		3,923,044		2,095,498		

Notes: In this table, we present summary statistics for the samples of mothers constructed in Section 3.1. The "first birth" sample consists of mothers who have no reported previous births, and the "linked" sample consists of first-time mothers we are able to link to a future birth. Maternal morbidity conditions consist of third or fourth degree perineal laceration, ruptured uterus, unplanned hysterectomy, admission to ICU, and unplanned operating room procedure following delivery. MSAF stands for moderate or heavy meconium staining of the amniotic fluid. Severe infant conditions consist of assisted ventilation immediately after birth, NICU admission, seizure or serious neurological dysfunction, and newborn being transferred to another facility within 24 hours of delivery.

Table 2: Effect of Demographic and Health Risk Factors on Overcrowding for First-time Mothers

Variable Name	Mean	(1) By Month	(2) By Quarter	(3) By Year
Mother's Age	26.39	-0.0001	-0.0001	-0.0001
		(0.0001)	(0.0001)	(0.0001)
Mother is Hispanic	0.41	-0.0007	-0.0004	0.0025*
		(0.0014)	(0.0014)	(0.0015)
Mother is Black	0.06	-0.0012	-0.0007	-0.0014
		(0.0025)	(0.0025)	(0.0025)
$\geq$ High School	0.83	0.0030**	0.0029*	0.0046***
		(0.0015)	(0.0016)	(0.0017)
$\geq$ College	0.30	-0.0016	-0.0013	-0.0009
		(0.0015)	(0.0014)	(0.0014)
Medi-Cal	0.37	0.0026*	0.0024	0.0057***
		(0.0014)	(0.0015)	(0.0015)
Plurality Birth	0.016	-0.0019	-0.0028	-0.0043
		(0.0040)	(0.0039)	(0.0039)
Eclampsia	0.001	-0.0104	-0.0178	-0.0222
		(0.0191)	(0.0198)	(0.0205)
Abruptio Placenta	0.003	-0.0020	0.0008	0.0025
		(0.0100)	(0.0102)	(0.0107)
Cord Prolapse	0.001	-0.0126	-0.0162	-0.0174
		(0.0157)	(0.0170)	(0.0155)
Breech Position	0.019	-0.0081*	-0.0078*	-0.0092**
		(0.0044)	(0.0044)	(0.0046)
Diabetes	0.013	-0.0122***	-0.0122***	-0.0124***
		(0.0042)	(0.0044)	(0.0045)
Gestational Hypertension	0.029	-0.0031	-0.0049	-0.0090***
		(0.0029)	(0.0030)	(0.0030)
Chronic Hypertension	0.005	-0.0248***	-0.0252***	-0.0299***
		(0.0075)	(0.0077)	(0.0077)
Herpes	0.008	-0.0234***	-0.0252***	-0.0261***
		(0.0057)	(0.0057)	(0.0060)
Smoking during Pregnancy	0.015	-0.0163***	-0.0176***	-0.0183***
		(0.0036)	(0.0037)	(0.0038)

Notes: We restrict to mothers with no reported previous births. In column (1), we regress the standardized mother count constructed at the hospital-year-month level on all the control variables presented in this table and hospital-year-month, day-of-week, and hour-of-birth fixed effects. The standardized mother count and the fixed effect are at the hospital-year-quarter level in column (2), and at the hospital-year level in column (3), respectively.

Table 3: Effect of Standardized Mother Count on Medical Procedure Usage

	Panel A: All Mothers				
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0014***	-0.0008***	-0.0037***	-0.0020***	-0.0049***
	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0003)
Observations	10,638,777	4,584,561	10,638,777	10,638,777	4,204,034
Dependent Mean	0.2904	0.0384	0.117	0.1225	0.5461
Adjusted R^2	0.1297	0.0571	0.1377	0.2010	0.4274
	Panel B: First-time Mothers				
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0024***	-0.0015***	-0.0029***	-0.0024***	-0.0040***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Observations	3,923,044	1,704,185	3,923,044	3,923,044	1,565,839
Dependent Mean	0.2913	0.0753	0.1436	0.1604	0.6173
Adjusted R^2	0.1217	0.1087	0.1575	0.2307	0.4736

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 4: Effect of Standardized Mother Count on Maternal Health

	Panel A: All Mothers				
	(1)	(2)	(3)	(4)	(5)
	Prolonged Labor	Maternal Fever	Antibiotics Use	Blood Transfusion	Any Morbidity
Std. Mother Count	-0.00004	-0.0002***	-0.0018***	-0.00004***	-0.0001
	(0.00003)	(0.00004)	(0.0003)	(0.00001)	(0.00005)
Observations	10,638,777	10,638,777	4,204,034	10,638,777	4,204,034
Dependent Mean	0.0083	0.0122	0.1578	0.0021	0.0094
Adjusted R^2	0.0354	0.0400	0.2228	0.4213	0.0522
	Panel B: First-time Mothers				
	(6)	(7)	(8)	(9)	(10)
	Prolonged Labor	Maternal Fever	Antibiotics Use	Blood Transfusion	Any Morbidity
Std. Mother Count	-0.0001	-0.0005***	-0.0013***	-0.00004**	0.00002
	(0.0001)	(0.0001)	(0.0004)	(0.00002)	(0.0001)
Observations	3,923,044	3,923,044	1,565,839	3,923,044	1,565,839
Dependent Mean	0.0164	0.0247	0.1773	0.0021	0.0155
Adjusted R^2	0.0598	0.0587	0.2224	0.4392	0.0667

Notes: We present the results on maternal health using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. In panel B, we restrict to mothers with no reported previous births. Information on antibiotics use and morbidity conditions was first available in 2006. Morbidity conditions consist of third or fourth degree perineal laceration, ruptured uterus, unplanned hysterectomy, admission to ICU, and unplanned operating room procedure following delivery. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 5: Effect of Standardized Mother Count on Infant Health

	Panel A: All Mothers					
	(1)	(2)	(3)	(4)	(5)	(6)
	MSAF	Fetal Intolerance	Birth Injury	Severe Con.	Apgar (1 min)	Apgar (5 min)
Std. Mother Count	-0.0006***	-0.0004***	-0.000001	0.00001	0.0009	-0.0002
	(0.0001)	(0.0001)	(0.00001)	(0.0001)	(0.0006)	(0.0003)
Observations	10,638,777	4,204,034	10,638,777	10,638,777	3,787,642	3,783,533
Dependent Mean	0.0432	0.0269	0.0012	0.0478	8.17	8.90
Adjusted R^2	0.0651	0.0495	0.0716	0.0991	0.0804	0.0328
	Panel B: First-time Mothers					
	(7)	(8)	(9)	(10)	(11)	(12)
	MSAF	Fetal Intolerance	Birth Injury	Severe Con.	Apgar (1 min)	Apgar (5 min)
Std. Mother Count	-0.0009***	-0.0005***	-0.00001	-0.0001	0.0011	-0.0001
	(0.0001)	(0.0002)	(0.00002)	(0.0001)	(0.0011)	(0.0006)
Observations	3,923,044	1,565,839	3,923,044	3,923,044	1,412,663	1,411,217
Dependent Mean	0.054	0.0482	0.0016	0.0574	8.03	8.86
Adjusted R^2	0.0755	0.0820	0.0924	0.1064	0.0699	0.0309

Notes: We present the results on infant health using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. In panel B, we restrict to mothers with no reported previous births. MSAF stands for moderate or heavy meconium staining of the amniotic fluid. Fetal Intolerance means one or more of the following actions were taken to treat the condition: in-utero resuscitative measures, further fetal assessment, or operative delivery. Severe Con. refer to severe conditions that consist of assisted ventilation immediately after birth, NICU admission, seizure or serious neurological dysfunction, and newborn being transferred to another facility within 24 hours of delivery. Information on Fetal Intolerance was first available in 2006, and information on Apgar scores was first available in 2007. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 6: Effect of Standardized Mother Count on Future Fertility

	Dep Var: Subsequent Fertility			
	(1)	(2)	(3)	(4)
	Any, 2 Years	Total, 2 Years	Any, 5 Years	Total, 5 Years
Std. Mother Count	-0.00002	-0.00001	-0.0003	-0.0004
	(0.0002)	(0.0002)	(0.0003)	(0.0004)
Observations	3,245,186	3,245,186	3,245,186	3,245,186
Dependent Mean	0.1615	0.1622	0.483	0.5544
Adjusted R^2	0.0062	0.0063	0.0323	0.0298

Notes: We restrict the sample to first births from 1989 to 2012, excluding first births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 7: Effect of Standardized Mother Count on Future Place of Birth Choice

	Dep Var: Switched the Place of Birth			Switched to non-Hospital
	(1)	(2)	(3)	(4)
Std. Mother Count	0.0018***		0.0014***	0.0002***
	(0.0004)		(0.0004)	(0.0001)
4th Quartile		0.0037***		
		(0.0010)		
3rd Quartile		0.0008		
		(0.0010)		
2nd Quartile		-0.0013		
		(0.0010)		
Std. Mother Count^2			0.0005*	
			(0.0003)	
Observations	2,095,498	2,095,498	2,095,498	2,095,498
Dependent Mean	0.4146	0.4146	0.4146	0.04529
Adjusted R^2	0.1145	0.1145	0.1145	0.0137

Notes: We restrict the sample to mothers whose first and second births are both observed in our dataset, excluding first births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. We include the 4th, 3rd, and 2nd quartile indicators of the standardized birth count to capture the non-linear effect. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

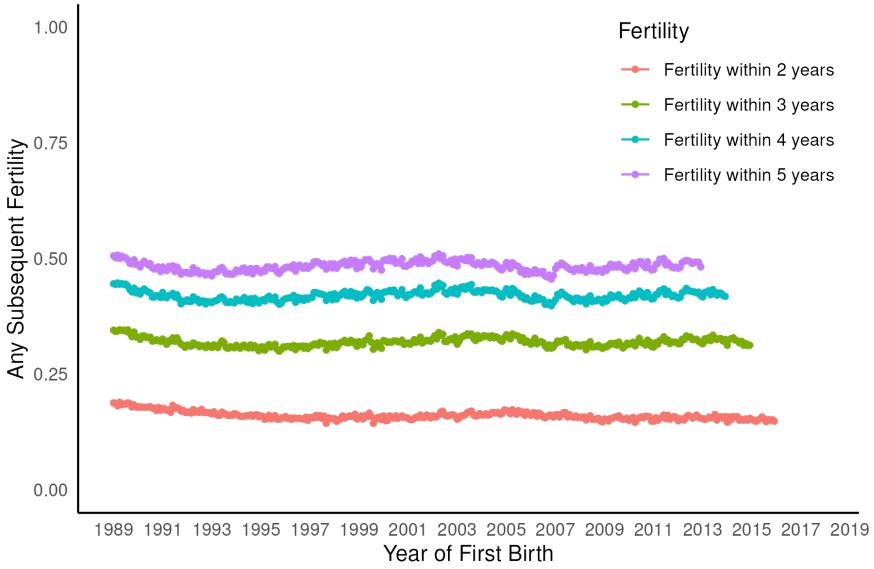
Table 8: Effect of Standardized Mother Count on the Second Birth Characteristics

Panel A: Characterization of Second Birth - Birth Records Data					
	(1)	(2)	(3)	(4)	(5)
	C-section	Home 2 to Hospital 2	Home 1 to Hospital 2	Daily # of Births	% Medicaid Moms
Std. Mother Count	-0.0016***	0.0040	0.0124	-0.0017	-0.0014
	(0.0003)	(0.0280)	(0.0536)	(0.0028)	(0.0168)
Observations	2,096,685	1,916,886	1,906,072	2,083,626	2,083,626
Dependent Mean	0.28	10.31	22.81	8.42	39.58
Adjusted R^2	0.0656	0.0274	0.0304	0.4163	0.5162
Panel B: Characterization of Second Birth - Financial Reports Data					
	(6)	(7)	(8)	(9)	
	# of Licensed Beds	Investor Control	ln(*Gross Revenues*)	ln(*Birth Revenues*)	
Std. Mother Count	0.0118	0.0001	-0.0004	-0.0011	
	(0.0174)	(0.0003)	(0.0007)	(0.0009)	
Observations	1,085,593	1,118,626	969,405	802,391	
Dependent Mean	38.45	0.16	14.62	10.67	
Adjusted R^2	0.4744	0.4410	0.5375	0.5414	

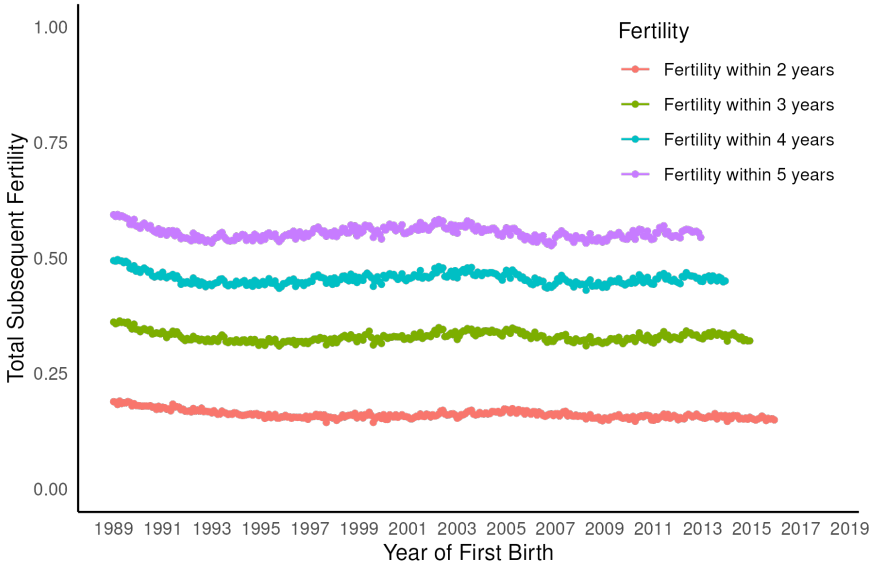
Notes: We present the results on second-birth characteristics using the regression specification in Equation 3. We limit to first-time mothers with a second birth, excluding first-time births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. Outcomes in columns (1)-(3) are at the mother level, and outcomes in columns (4)-(9) are at the hospital level. Outcomes in columns (2)-(3) stand for the distance between the mother's residence at second birth (or at first birth) and the second-birth hospital, as measured by the distance between zipcode centroids in miles. Outcomes in columns (6)-(9) stand for the number of licensed obstetric beds, a binary indicator for whether the hospital is controlled by investors, the log of average daily gross patient revenues, and the log of average daily gross revenues from labor and delivery services respectively. * significant at 10%, ** significant at 5%, *** significant at 1%.

Appendix

Figure A1: Average Subsequent Fertility of First-time Mothers



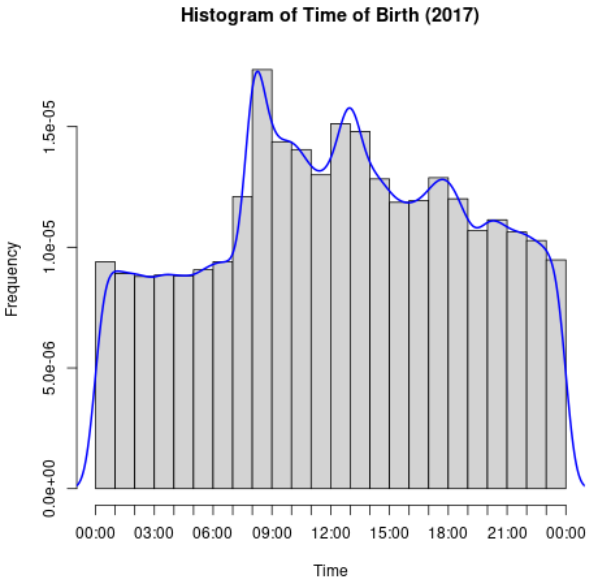
(a) Any Subsequent Fertility



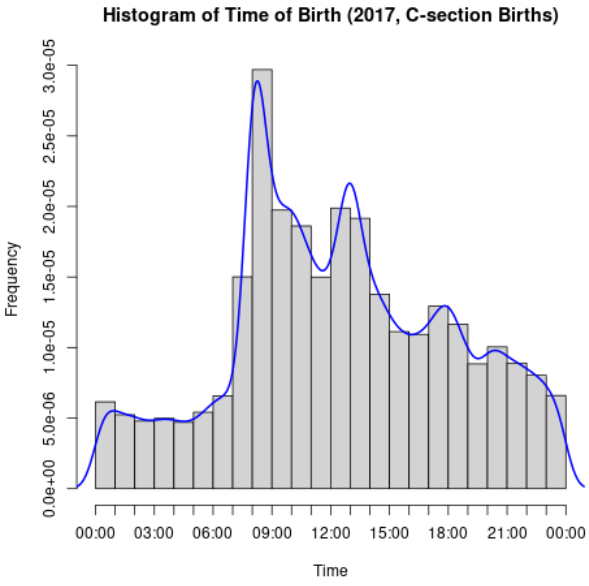
(b) Total Subsequent Fertility

Notes: In this figure, we track the average subsequent fertility of first-time mothers from California birth records between 1989 to 2017.

Figure A2: Timing of Birth and Procedure



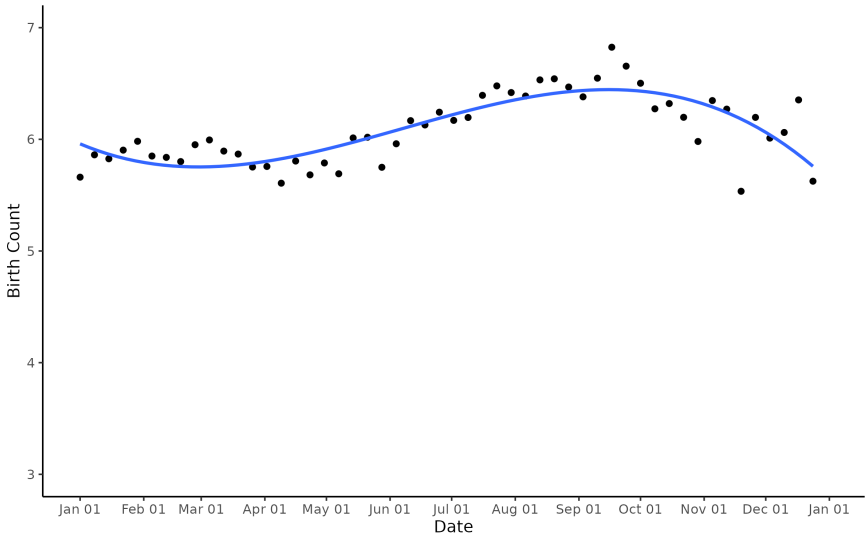
(a) Birth



(b) C-section

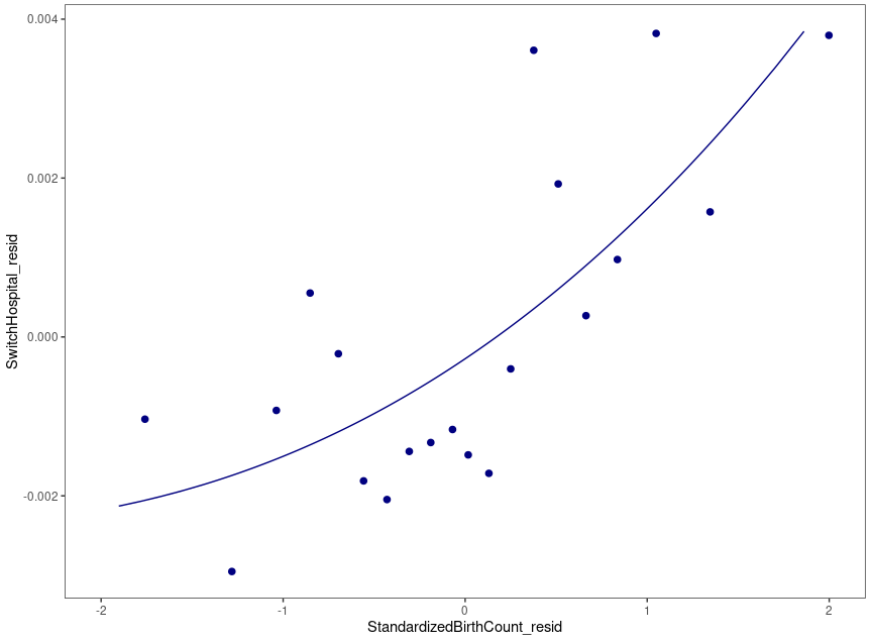
Notes: In this figure, we use California birth records from 2017 and plot the birth or procedure frequency against timing within a calendar day.

Figure A3: Distribution of Births within the year of 2007



Notes: In this figure, a dot represents the weekly average of daily births per hospital within the year of 2007. The blue curve is fitted with a third-order polynomial.

Figure A4: Effect of Standardized Mother Count on Switching Hospital



Notes: We restrict to mothers whose first and second birth are both observed in the birth records. We plot the relationship between the standardized mother count and the outcome of switching hospital, after absorbing the fixed effects and controlling for the variables as specified in Equation 3. We also add a fitted line for their relationship.

Table A1: Summary Statistics of Mother Count Measures

Variables	Min.	Median	Mean	Max.
Panel A: Main Specification (Exclude Weekends and Holidays)				
Total Mother Count	0	4	5.62	71
Non-Hispanic White Mother Count	0	1	1.82	33
Non-Hispanic Black Mother Count	0	0	0.34	15
Hispanic Mother Count	0	2	2.69	68
Other Mother Count	0	0	0.71	21
Standard Deviation of Mother Count	0.00	2.05	2.13	9.30
Std. Mother Count (within hospital-year-month)	-3.589	-0.080	0	4.587
Std. Mother Count (within hospital-year)	-3.594	-0.084	0	15.843
Panel B: Standardize based on Birth Count				
Total Birth Count	0	5	5.71	74
Std. Birth Count	-3.529	-0.083	0	4.587
Panel C: Include Weekend Births				
Total Mother Count	0	4	5.21	80
Std. Mother Count	-3.649	-0.090	0	5.388
Panel D: Exclude 0-Birth Dates				
Total Mother Count	1	5	6.15	71
Std. Mother Count	-3.589	-0.098	0	4.008
Panel E: Standardize based on Number of Licensed Obstetric Beds				
Number of Licensed Obstetric Beds	1	24	27.46	129
Bed Occupancy Rate	0.000	0.186	0.209	2.667
Panel F: Two-day Average Mother Count				
Total Mother Count	0.00	4.50	5.66	63.00
Std. Mother Count	-3.398	-0.049	0	4.129
Panel G: Within 15 Miles of Delivery Hospital				
Total Mother Count	0	43	72.84	465
Std. Mother Count	-3.649	-0.030	0	4.587

Notes: This table shows the summary statistics of mother count-related variables at the hospital-day level, except for the standard deviation of mother count (at the hospital-year-month level), the number of licensed obstetric beds (at the hospital-year level), and the standardized mother count based on all births within 15 miles of the delivery hospital (at the hospital zipcode-day level).

Table A2: Effect of Standardized Mother Count on Medical Procedure Usage, by Quartile

	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
4th Quartile	-0.0058***	-0.0034***	-0.0060***	-0.0061***	-0.0087***
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0011)
3rd Quartile	-0.0038***	-0.0018**	-0.0021***	-0.0031***	-0.0043***
	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0010)
2nd Quartile	-0.0015**	-0.0010	-0.0008	-0.0027***	-0.0015
	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0010)
Observations	3,922,287	1,703,989	3,922,287	3,922,287	1,565,669
Dependent Mean	0.2913	0.0753	0.1436	0.1604	0.6174
Adjusted R^2	0.1217	0.1086	0.1575	0.2307	0.4736

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, replacing the standardized mother count with three quartile indicators. We restrict to mothers with no reported previous births, and exclude births that occurred on weekends or holidays. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A3: Racial Interaction Effects on Switching the Place of Birth

	Dep Var: Switched the Place of Birth			
	(1)	(2)	(3)	(4)
	Non-Hispanic White	Non-Hispanic Black	Hispanic	Others
Std. Mother Count	0.0002	−0.0020	−0.0006	0.0021
	(0.0012)	(0.0084)	(0.0023)	(0.0031)
Std. Mother Count × Black Share	0.0125*	0.0110	0.0043	−0.0187
	(0.0070)	(0.0112)	(0.0063)	(0.0119)
Std. Mother Count × Hispanic Share	0.0024	0.0038	0.0016	0.0009
	(0.0028)	(0.0100)	(0.0028)	(0.0046)
Std. Mother Count × Other Share	0.0054	−0.0253	0.0089*	0.0021
	(0.0037)	(0.0179)	(0.0047)	(0.0048)
Black Share	0.0092	0.0168	0.0077	0.0090
	(0.0077)	(0.0178)	(0.0081)	(0.0145)
Hispanic Share	0.0028	0.0103	0.0033	−0.0020
	(0.0039)	(0.0148)	(0.0045)	(0.0077)
Other Share	0.0021	0.0138	0.0033	0.0057
	(0.0047)	(0.0218)	(0.0065)	(0.0075)
Observations	784,990	106,278	866,133	287,491
Dependent Mean	0.3556	0.5089	0.4627	0.3719
Adjusted R^2	0.1215	0.0978	0.1124	0.1084

Notes: In this table, we restrict to mothers whose first and second births are both observed in our dataset, excluding first births that occurred on weekends or holidays. Each column presents results for a subsample of mothers belonging to a specific racial or ethnic group. The standardized mother count is constructed within the same hospital in the same year-month. Race shares are based on the composition of mothers on the same hospital-day. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A4: Effect of Standardized Birth Count on Future Fertility and Hospital Choice, Second-birth Sample

	(1)	(2)	(3)	(4)	(5)	(5)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	0.0002	-0.0003	0.0001	-0.00002	0.0003	-0.0001
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)	(0.0001)
Observations	2,894,786	2,894,786	2,894,786	2,894,786	1,164,533	1,164,533
Dependent Mean	0.0955	0.09617	0.2781	0.3175	0.4454	0.0040
Adjusted R^2	0.0185	0.0282	0.0404	0.0538	0.1104	0.0250

Notes: This table restricts the sample to second births from 1989 to 2012. The independent variable is the standardized mother count within the same hospital in the same year-month. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. We exclude first births that occurred on weekends or holidays. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A5: Robustness Check on Medical Procedure Usage - No Demographic or Health Covariates

Panel A: All Mothers					
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0017***	-0.0008***	-0.0038***	-0.0020***	-0.0049***
	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0003)
Observations	10,906,326	4,774,166	10,906,326	10,906,326	4,383,166
Dependent Mean	0.2911	0.0385	0.1172	0.1222	0.5493
Adjusted R^2	0.0721	0.0542	0.1274	0.1969	0.4224
Panel B: First-time Mothers					
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0027***	-0.0015***	-0.0029***	-0.0024***	-0.0040***
	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Observations	4,026,796	1,779,285	4,026,796	4,026,796	1,636,651
Dependent Mean	0.2918	0.0751	0.1439	0.1601	0.6194
Adjusted R^2	0.0330	0.1023	0.1425	0.2253	0.4729

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month, and we only control for the three sets of fixed effects in the regression. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A6: Robustness Check on Future Fertility and Hospital Choice - No Demographic or Health Covariates

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	-0.00004	-0.00003	-0.0003	-0.0004	0.0019***	0.0002***
	(0.0002)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.0001)
Observations	3,313,606	3,313,606	3,313,606	3,313,606	2,136,928	2,136,928
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0038	0.0038	0.0130	0.0128	0.1013	0.5713

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month, and we only control for the three sets of fixed effects in the regression. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A7: Robustness Check on Medical Procedure Usage - Low-risk Mothers Only

Panel A: All Low-risk Mothers					
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0015***	-0.0007***	-0.0036***	-0.0020***	-0.0050***
	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0004)
Observations	9,840,310	4,231,465	9,840,310	9,840,310	3,874,691
Dependent Mean	0.2739	0.0356	0.1098	0.1206	0.533
Adjusted R^2	0.1027	0.0547	0.1325	0.2047	0.4295
Panel B: Low-risk First-time Mothers					
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0026***	-0.0014***	-0.0029***	-0.0023***	-0.0040***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Observations	3,596,512	1,553,487	3,596,512	3,596,512	1,424,079
Dependent Mean	0.2691	0.071	0.1337	0.1594	0.6031
Adjusted R^2	0.0805	0.1084	0.1476	0.2372	0.4809

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. We also exclude mothers that have any of the following health conditions: breech position, diabetes, hypertension (gestational or chronic), herpes, and smoking during pregnancy. The independent variable is the standardized mother count within the same hospital in the same year-month. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A8: Robustness Check on Future Fertility and Hospital Choice - Low-risk Mothers Only

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	-0.0001	-0.00003	-0.0001	-0.0001	0.0019***	0.0003***
	(0.0002)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.0001)
Observations	2,995,267	2,995,267	2,995,267	2,995,267	1,943,754	1,943,754
Dependent Mean	0.1624	0.1631	0.486	0.5582	0.4153	0.0457
Adjusted R^2	0.0061	0.0062	0.0314	0.0288	0.1149	0.5721

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on weekends or holidays, and first-time mothers that have any of the following health conditions: breech position, diabetes, hypertension (gestational or chronic), herpes, and smoking during pregnancy. The independent variable is the standardized mother count within the same hospital in the same year-month. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A9: Robustness Check on Medical Procedure Usage - Include Births on Weekends

	Panel A: All Mothers				
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0003	-0.0007***	-0.0026***	-0.0027***	-0.0048***
	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0004)
Observations	13,947,212	5,977,016	13,947,212	13,947,212	5,483,870
Dependent Mean	0.2701	0.0394	0.1121	0.1267	0.5445
Adjusted R^2	0.1222	0.0567	0.1322	0.2026	0.4183
	Panel B: First-time Mothers				
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0013***	-0.0014***	-0.0017***	-0.0032***	-0.0038***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Observations	5,273,848	2,291,641	5,273,848	5,273,848	2,106,762
Dependent Mean	0.2797	0.0753	0.1378	0.1643	0.6183
Adjusted R^2	0.1163	0.1060	0.1524	0.2321	0.4675

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A10: Robustness Check on Future Fertility and Hospital Choice - Include Births on Weekends

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	-0.00001	-0.000002	-0.0001	-0.0001	0.0016***	0.0002***
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.00005)
Observations	4,358,694	4,358,694	4,358,694	4,358,694	2,817,930	2,817,930
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0063	0.0063	0.0320	0.0294	0.1143	0.5687

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on holidays. The independent variable is the standardized mother count within the same hospital in the same year-month. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A11: Robustness Check on Medical Procedure Usage - Standardization by Hospital-Year

Panel A: All Mothers					
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0014***	-0.0009***	-0.0041***	-0.0023***	-0.0044***
	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0004)
Observations	10,638,785	4,584,565	10,638,785	10,638,785	4,204,038
Dependent Mean	0.2904	0.0384	0.117	0.1225	0.5461
Adjusted R^2	0.1289	0.0522	0.1290	0.1900	0.4131
Panel B: First-time Mothers					
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0026***	-0.0017***	-0.0033***	-0.0027***	-0.0036***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Observations	3,923,046	1,704,186	3,923,046	3,923,046	1,565,840
Dependent Mean	0.2913	0.0753	0.1436	0.1604	0.6173
Adjusted R^2	0.1205	0.0992	0.1470	0.2178	0.4557

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. Here, the independent variable is the standardized mother count within the same hospital in the same year, and we use hospital-year fixed effects instead of hospital-year-month fixed effects. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A12: Robustness Check on Future Fertility and Hospital Choice - Standardization by Hospital-Year

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	0.00002	0.00005	-0.0003	-0.0004	0.0027***	0.0002***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)	(0.00005)
Observations	3,245,187	3,245,187	3,245,187	3,245,187	2,095,500	2,095,500
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0062	0.0063	0.0321	0.0295	0.1142	0.5711

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A13: Robustness Check on Medical Procedure Usage - Standardized Birth Count

Panel A: All Mothers					
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Birth Count	-0.0014***	-0.0008***	-0.0037***	-0.0020***	-0.0049***
	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0003)
Observations	10,638,777	4,584,561	10,638,777	10,638,777	4,204,034
Dependent Mean	0.2904	0.0384	0.117	0.1225	0.5461
Adjusted R^2	0.1297	0.0571	0.1377	0.2010	0.4274
Panel B: First-time Mothers					
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Birth Count	-0.0023***	-0.0015***	-0.0029***	-0.0024***	-0.0041***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Observations	3,923,044	1,704,185	3,923,044	3,923,044	1,565,839
Dependent Mean	0.2913	0.0753	0.1436	0.1604	0.6173
Adjusted R^2	0.1217	0.1087	0.1575	0.2307	0.4736

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the standardized birth count within the same hospital in the same year-month. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A14: Robustness Check on Future Fertility and Hospital Choice - Standardized Birth Count

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Birth Count	0.00003	0.00004	-0.0002	-0.0003	0.0018***	0.0002***
	(0.0002)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.0001)
Observations	3,245,186	3,245,186	3,245,186	3,245,186	2,095,498	2,095,498
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0062	0.0063	0.0323	0.0298	0.1145	0.5705

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on weekends or holidays. The independent variable is the standardized birth count within the same hospital in the same year-month. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A15: Robustness Check on Medical Procedure Usage - Exclude 0-birth Dates in Standardization

Panel A: All Mothers					
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0013***	-0.0008***	-0.0037***	-0.0020***	-0.0048***
	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0003)
Observations	10,636,405	4,583,879	10,636,405	10,636,405	4,203,431
Dependent Mean	0.2904	0.0384	0.1170	0.1225	0.5462
Adjusted R^2	0.1297	0.0571	0.1377	0.2010	0.4274
Panel B: First-time Mothers					
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0023***	-0.0015***	-0.0028***	-0.0023***	-0.0039***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Observations	3,922,287	1,703,989	3,922,287	3,922,287	1,565,669
Dependent Mean	0.2913	0.0753	0.1436	0.1604	0.6174
Adjusted R^2	0.1217	0.1087	0.1575	0.2307	0.4736

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month, excluding dates with no births at a particular hospital in the standardization calculation. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A16: Robustness Check on Future Fertility and Hospital Choice - Exclude 0-birth Dates in Standardization

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	-0.00001	0.000003	-0.0002	-0.0003	0.0018***	0.0002***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)	(0.0001)
Observations	3,244,528	3,244,528	3,244,528	3,244,528	2,095,109	2,095,109
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0062	0.0063	0.0323	0.0298	0.1145	0.0138

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month, excluding dates with no births at a particular hospital in the standardization calculation. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A17: Robustness Check on Medical Procedure Usage - Standardization by Number of Licensed Obstetric Beds

	Panel A: All Mothers				
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Bed Occupancy Rate	0.0071	-0.0064***	-0.0334***	-0.0246***	-0.0375***
	(0.0052)	(0.0011)	(0.0045)	(0.0034)	(0.0053)
Observations	6,319,790	5,101,516	6,319,790	6,319,790	4,685,792
Dependent Mean	0.314	0.0383	0.1325	0.1507	0.5291
Adjusted R^2	0.1120	0.0573	0.1250	0.1869	0.4128
	Panel B: First-time Mothers				
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Bed Occupancy Rate	-0.0111**	-0.0122***	-0.0201***	-0.0310***	-0.0316***
	(0.0044)	(0.0022)	(0.0048)	(0.0043)	(0.0052)
Observations	2,381,109	1,925,256	2,381,109	2,381,109	1,771,277
Dependent Mean	0.3101	0.0744	0.1671	0.1977	0.6022
Adjusted R^2	0.1025	0.1095	0.1485	0.2178	0.4645

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the occupancy rate of licensed obstetric beds (number of mothers who delivered, divided by the number of licensed obstetric beds) at the hospital-day level, instead of the standardized mother count. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A18: Robustness Check on Future Fertility and Hospital Choice - Standardization by Number of Licensed Obstetric Beds

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Bed Occupancy Rate	0.0038	0.0040	0.0015	0.0015	0.0141***	0.0013*
	(0.0033)	(0.0033)	(0.0043)	(0.0055)	(0.0050)	(0.0007)
Observations	1,636,714	1,636,714	1,636,714	1,636,714	1,124,318	1,124,318
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0058	0.0058	0.0317	0.0289	0.0803	0.0136

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on weekends or holidays. The independent variable is the occupancy rate of licensed obstetric beds (number of mothers who delivered, divided by the number of licensed obstetric beds) at the hospital-day level, instead of the standardized mother count. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A19: Robustness Check on Medical Procedure Usage - Standardize by 2-day Average

	Panel A: All Mothers				
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	0.0001	-0.0010***	-0.0040***	-0.0019***	-0.0044***
	(0.0002)	(0.0001)	(0.0003)	(0.0002)	(0.0004)
Observations	8,440,229	3,639,730	8,440,229	8,440,229	3,334,160
Dependent Mean	0.2887	0.0391	0.1224	0.1223	0.5456
Adjusted R^2	0.1267	0.0582	0.1404	0.2015	0.4273
	Panel B: First-time Mothers				
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0008***	-0.0016***	-0.0042***	-0.0018***	-0.0037***
	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
Observations	3,138,812	1,368,220	3,138,812	3,138,812	1,256,178
Dependent Mean	0.2933	0.0761	0.1509	0.1589	0.6169
Adjusted R^2	0.1193	0.1107	0.1614	0.2299	0.4757

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births where either the date or the day before occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month based on the average number of mothers on the mother's day of delivery and the day before. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A20: Robustness Check on Future Fertility and Hospital Choice - Standardize by 2-day Average

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	-0.0001	-0.0001	-0.0004	-0.0004	0.0020***	0.0001***
	(0.0002)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.0001)
Observations	2,595,964	2,595,964	2,595,964	2,595,964	1,676,041	1,676,041
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0063	0.0064	0.0324	0.0300	0.1142	0.5696

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births where either the date or the day before occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month based on the average number of mothers on the mother's day of delivery and the day before. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A21: Robustness Check on Medical Procedure Usage - Regional Level Measure

	Panel A: All Mothers				
	(1)	(2)	(3)	(4)	(5)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0001	-0.0003***	-0.0014***	-0.0013***	-0.0018***
	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0003)
Observations	9,805,829	4,250,495	9,805,829	9,805,829	3,900,495
Dependent Mean	0.2902	0.0389	0.1181	0.1237	0.5484
Adjusted R^2	0.1297	0.0572	0.1384	0.2005	0.4261
	Panel B: First-time Mothers				
	(6)	(7)	(8)	(9)	(10)
	All C-sections	C-section after Labor Trial	Labor Induction	Labor Augmentation	Epidural
Std. Mother Count	-0.0006**	-0.0005**	-0.0007***	-0.0014***	-0.0017***
	(0.0003)	(0.0002)	(0.0003)	(0.0002)	(0.0004)
Observations	3,615,525	1,580,316	3,615,525	3,615,525	1,452,761
Dependent Mean	0.2908	0.0764	0.1449	0.1622	0.6183
Adjusted R^2	0.1214	0.1086	0.1588	0.2301	0.4763

Notes: We present the results on medical procedure usage using the regression specification in Equation 3, excluding births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month based on the total number of mothers within a 15-mile radius. Standard errors are clustered at the hospital zipcode level. In panel B, we restrict to mothers with no reported previous births. Information on C-section after labor trial was first available in 2005, and information on epidural was first available in 2006. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A22: Robustness Check on Future Fertility and Hospital Choice - Regional Level Measure

	(1)	(2)	(3)	(4)	(5)	(6)
	Fertility after 2 Years		Fertility after 5 Years		Second Birth	
	Any	Total	Any	Total	Switched the Place of Birth	Switched to non-Hospital
Std. Mother Count	-0.0006**	-0.0006***	-0.0005	-0.0004	0.0012***	0.0002***
	(0.0002)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.0001)
Observations	2,985,999	2,985,999	2,985,999	2,985,999	1,931,797	1,931,797
Dependent Mean	0.1615	0.1622	0.483	0.5544	0.4146	0.04529
Adjusted R^2	0.0061	0.0061	0.0315	0.0291	0.1162	0.5741

Notes: Columns (1)-(4) restrict the sample to first births from 1989 to 2012. Column (5) and (6) restrict the sample to mothers whose first and second births are both observed in our dataset. We exclude first births that occurred on weekends or holidays. The independent variable is the standardized mother count within the same hospital in the same year-month based on the total number of mothers within a 15-mile radius. Switching a place of birth includes switching to another hospital or to a non-hospital setting. Switching to non-hospital means either the mother gave birth at home or at a birth center. * significant at 10%, ** significant at 5%, *** significant at 1%.