ISSN 2704-7407

UNIVERSITÀ CATTOLICA DEL SACRO CUORE
Dipartimento di Economia e Finanza

Working Paper Series

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Working Paper n. 134

October 2024

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del Sacro Cuore

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Marina Di Giacomo
Università degli Studi di Torino

Massimiliano Piacenza
Università degli Studi del Piemonte Orientale

Luca Salmasi
Università Cattolica del Sacro Cuore

Gilberto Turati
Università Cattolica del Sacro Cuore

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Dipartimento di Economia e Finanza
Università Cattolica del Sacro Cuore
Largo Gemelli 1 - 20123 Milano – Italy
tel: +39.02.7234.2976 - fax: +39.02.7234.2781
e-mail: dip.economiaefinanza@unicatt.it

Understanding productivity in maternity wards

Marina Di Giacomo   Massimiliano Piacenza   Luca Salmasi   Gilberto Turati*

October 2024

Abstract

This paper provides a causal estimate of labor productivity in maternity units. We consider an Italian law that defines the staffing requirements of maternity wards according to the annual number of births. We exploit these discontinuities in the availability of medical staff induced by the law to define both instrumental variables and an RDD framework that allows us to estimate the causal effect of different teams of professionals during delivery on the health status of newborns and mothers. The analysis is based on detailed patient-level data on deliveries in an Italian region. We find that maternity units with annual births above the thresholds are more likely to have a "full team" of professionals during delivery. In turn, the presence of a full team significantly affects outcomes. We find an improvement in both neonatal and maternal outcomes, coupled with more intense use of medical procedures, suggesting that larger hospitals are better able to manage deliveries with appropriate treatments to avoid complications than smaller units. In addition, we do not find substantial heterogeneous effects across days of the week, time of day, and nationality of mothers.

Keywords: medical staff; maternity wards; productivity; instrumental variables

J.E.L. Classification: D24, H75, I10, I12, I18, J24, J45, J82

* M. Di Giacomo: University of Torino, Department of Economics, Social Sciences, Applied Mathematics and Statistics (ESOMAS), Torino, Italy (e-mail: marina.digiacomo@unito.it);

M. Piacenza: University of Piemonte Orientale, Department of Law and Political, Economic and Social Sciences (DIGSPES), Alessandria, Italy (e-mail: massimiliano.piacenza@uniupo.it);

L. Salmasi: Università Cattolica del Sacro Cuore, Department of Economics and Finance, Rome, Italy (e-mail: luca.salmasi@unicatt.it);

G. Turati: Università Cattolica del Sacro Cuore, Department of Economics and Finance, Rome, Italy (e-mail: gilberto.turati@unicatt.it).

1 Introduction

Healthcare expenditure has been rapidly growing in the past decades and available estimates suggest it will experience further increase in the future almost everywhere in the world. However, there are different views on why health expenditure is growing (OECD, 2015). Demand-side explanations are mostly based on aging populations and the "time-to-death" hypothesis (e.g., Zweifel et al., 1999; Gruber and Wise, 2002). Supply-side explanations are divided between classical Baumol's disease and modern views, which suggest that health care is no different from other industries in terms of productivity (e.g., Chandra et al., 2016).

According to the latter view, health spending is plagued by large inefficiencies and waste (e.g., Chandra and Staiger, 2020; Shrank et al., 2019). Overtreatment, adoption of ineffective, costly technologies, and inappropriate treatments are all examples suggesting the presence of large room for improvement. Reducing inefficiencies and increasing productivity are ways to address the increasing demand for healthcare services with tightening budgets (Baicker et al., 2012; OECD, 2024). Given its importance, the issue of measuring and explaining productivity in healthcare has recently received increasing attention from scholars (e.g., Chandra and Staiger, 2007; Nicholson and Propper, 2011; Bloom et al., 2015; Skinner and Staiger, 2015; Chandra et al., 2016; Lee et al., 2019).

In this paper, we study labor productivity in maternity wards in the Italian NHS, a universal tax-funded healthcare system managed at the regional level. We aim to estimate the causal effect of medical staff on the health status of newborns and their mothers. The identification strategy exploits the exogenous variation in staffing and equipment requirements imposed on maternity wards by Italian legislation according to the past number of deliveries. The statutory thresholds defined by the law imply discontinuities in the availability of professionals attending deliveries. We use these exogenous jumps to identify instrumental variables for staffing to be used in a 2SLS-IV setting and a regression discontinuity analysis (RDD) to estimate the causal effect of medical staff on health outcomes, avoiding the simultaneity bias arising from the team's choice in response to patient needs.

In analyzing maternity wards, we focus on *intrapartum care*, i.e., care mothers and newborns receive during labor and immediately after birth. The focus on short-term health outcomes is important for at least two reasons. First, decisions taken in the first minutes after birth, known as the "golden minute" (or the "golden hour"), can have a significant impact on long-term health outcomes both for newborns and mothers (e.g., Vento et al., 2009). This makes the estimates of a causal relationship between medical treatments and long-term outcomes sharper than using measures of health later in life, which may reflect the cumulative effect of several treatments that occurred in the past (e.g., Carrillo and Feres, 2019). Understanding the causal impact of medical staff on neonatal health is crucial since neonatal health is a strong predictor of later health outcomes (e.g., Almond et al., 2005), cognitive ability (e.g., Figlio et al., 2014; Bharadwaj et al., 2013), and labor market outcomes (e.g., Black et al., 2007; Almond 2006). Similarly, intrapartum maternal health can have long-lasting effects, like no complications in the postpartum period, better mental health, and higher fertility rates (WHO, 2018; Leinweber et al., 2023). Second, labor and delivery are carried out in a unique environment characterized by the joint presence of many professional workers, including midwives, gynecologists, and pediatricians. For a single patient, the composition of a labor and delivery team can vary widely, even during a single episode, depending on individual patient needs and available clinical resources. However, according to clinical guidelines, a large team of different professionals is crucial for obtaining a good outcome (e.g., ACOG, 2017; Batey et al., 2022).

Our empirical analysis is based on a detailed patient-level dataset covering the universe of births (both vaginal and caesarean) that occurred within the administrative boundaries of Piedmont, a north-western region of Italy, between 2011 and 2013. We consider a production function in which clinical staff is the main input for several health outcomes of both newborns and mothers immediately after childbirth. Clinical staff availability is measured by a binary indicator that equals one if a "full team" of professionals (including at least a midwife, a gynecologist, and a pediatrician) attended the birth, capturing both the size and the composition of the team in terms of skill diversity. To properly identify the effect of full team (FT) availability and composition on health outcomes, in both the 2SLS-IV and RDD models we control for a large set of observable characteristics that account for differences in needs during delivery. We also include local health authority and year fixed effects, which can adjust for systematic differences in the quality of health services across local authorities and over time. Given the three years covered by our data and the focus on maternity units, we expect technological innovation to play a minor role in our setting.

To account for the potential endogeneity of the full team, we exploit the discontinuities in the staff and equipment requirements induced by the law. The law classifies maternities into three groups based on the average number of deliveries in the previous years: (i) units with less than 500 deliveries per year; (ii) units with between 500 and 999 deliveries per year; and (iii) maternity units with 1,000 or more deliveries per year. Based on the volume group to which the maternity unit belongs, the law specifies the medical staff units per shift (in terms of midwives, gynecologists and pediatricians/neonatologists), equipment and supplies (number of obstetric and inpatient beds, number of labour and delivery rooms). We use dummy variables identifying each group as instrumental variables for the "full team" variable, but we also exploit the discontinuities in an RDD framework to complement the IV analysis.

Our identification strategy relies on the assumption that the volume group to which the maternity unit belongs affects health outcomes only through the team of professionals attending the birth. Given the critical responsibilities the team of professionals plays in "producing" birth health outcomes, we believe this assumption is likely correct. We present evidence supporting our results through overidentification tests and the results from a RDD that compares very similar maternity units in treated volumes around the critical thresholds, which are subject to different staff and equipment requirements.

First-stage estimates support the relevance of instruments based on exogenous cut-offs defined by the law. In our RDD samples, we find that maternity units with annual births above the thresholds are more likely to have a FT at delivery relative to those below the thresholds: the probability of having a FT in the delivery room increases by about 36 percent points for maternity units above the 500-births threshold and by about 14 percent points for units above the 1,000-births threshold compared to units just below the thresholds.

Our estimates suggest that a FT of professionals (compared to a smaller and less diverse team in terms of specialization) significantly improves neonatal and maternal health outcomes, especially for vaginal deliveries. Concerning neonatal outcomes, according to our 2SLS results, a full team increases the probability of no need for resuscitation by 2.2 percentage points (about one-fifth of a standard deviation). Interestingly, Apgar scores are significantly lower with a full team: -0.40 points and -0.14 points for one- and five-minute Apgar scores, respectively. A full team also decreases the probability of observing a perfect Apgar score (greater than nine) after birth. However, considering the difference between the Apgar score measured at five minutes and the Apgar score at one minute from birth, we find that the presence of a FT significantly improves the five-minute score relative to the one-minute score. The five-minute score is significantly larger than the one-minute score by 0.25 points (one-forth of a standard deviation). We interpret this result as the effect of the presence of a FT on the health status of a newborn in the few minutes that follow childbirth when compared to a smaller team. Especially the presence of a pediatrician who assists with the birth may positively affect the health status because of her expertise, indicating the FT's active role in improving neonatal health in the first few minutes after birth. For maternal health outcomes, we find that the likelihood of having no major obstetric lacerations increases by about eight percentage points (about one-fifth of a standard deviation) with a full team. At the same time, the likelihood of having an episiotomy, a small surgical cut to facilitate childbirth and prevent complications or vaginal tears, increases by 15 percentage points with a full team, suggesting that a FT performs this treatment when needed to prevent lacerations.

We extend our analysis in two directions. First, we replicate our estimates splitting the sample into three categories: vaginal (or normal) deliveries, emergency caesareans (emergency C-sections), and planned caesareans (planned C-sections). We find that our baseline results are driven only by vaginal deliveries, while there is no effect on the two C-section sub-samples. We interpret this finding as evidence of different production functions for the two procedures: while a vaginal delivery is a medical procedure, a C-section is a specialized surgical procedure requiring a specific team and an operating room.

We then focus only on vaginal deliveries and consider a complementary estimation strategy, an RDD, that allows us to compare maternity units that are very close in terms of workload but differ according to their position above or below the two thresholds set by the law. Our main findings are confirmed: vaginal births above the cut-off are associated with better neonatal and maternal health outcomes, and the results are consistent for the overlapping sample and the two samples around the 500 and 1,000 thresholds. The coefficients are generally larger for larger hospitals, confirming the association between volume and outcomes, with larger hospitals ensuring greater productivity as measured by better health outcomes. Finally, we examine heterogeneous effects across days of the week, time of day, and mother's nationality and find no significant heterogeneous effects.

This study is related to the growing literature studying labor productivity differences in the health sector (e.g., Nicholson and Propper, 2011; Lee et al., 2019, for recent surveys). The relationship between medical staff inputs and patient outcomes has been studied from two main perspectives. First, many studies focus on staffing levels and their association with patient outcomes (e.g., Doyle et al., 2010; Gruber and Kleiner, 2012; Rogowski et al., 2013; Lin, 2014; Matsudaira, 2014; Friedrich and Hackmann, 2017; Carrillo and Feres, 2019; Einav et al., 2022;

Raja, 2023). One typical and unsurprising result is that understaffing (especially nurse understaffing) increases the risk of adverse health outcomes. However, there is some evidence that nurses and physicians may be substitutes (Carrillo and Feres, 2019), and mandated minimum nurse-to-patient ratios have mixed effects on health outcomes (Aiken et al., 2011; Cook et al., 2012; Raja, 2023). Second, other studies focus on the role of health professionals' skill mix, experience, and deployment (e.g., Almond et al., 2010; Bartel et al., 2014; Chan, 2016, 2018; Daysal et al., 2019; Silver, 2020). Evidence points to large cross-physician and professional team differences. Some of these works relate to studies of peer effects and find that relationships with coworkers can either improve communication and coordination, generating positive health outcomes (e.g., Chan, 2016) or trigger perverse effects negatively influencing health outcomes (e.g., Bartel et al., 2014; Chan, 2018). Focusing on the FT, our study adds to the literature by identifying the differences in productivity across different team compositions. In addition, while most of the empirical literature is from the U.S.A., we contribute to measuring productivity in a fully tax-funded healthcare system characterized by public hospitals only, where the lack of residual claimants can heavily affect productivity.[1]

This study is also related to the literature studying hospital crowding (Evans and Kim, 2006; Marks and Choi, 2018; Maibom et al., 2021; Facchini, 2022) and the relationship between volumes and outcomes (e.g. Gaynor et al., 2005). The general lesson from this literature is that high-volume hospitals provide better outcomes than smaller hospitals, but most studies do not focus on the underlying mechanism linking health outcomes to volume. Our findings suggest that the availability of a skill-mixed team of professionals is crucial in explaining health outcomes in maternity units, suggesting that the medical workforce is the main mechanism linking health outcomes with volume. A small body of literature that fits into this framework concerns the study of the health effects of hospital consolidation and closure (Gaynor et al. 2012; Avdic et al., 2019; Avdic et al., 2024). The closure of small hospitals, likely in remote or rural areas, identifies a trade-off between volume and quality, as opposed to patient travel distance and equity. Within this literature, interesting evidence on the effects of maternity unit closures in Sweden is provided by Avdic et al. (2024). Their main findings show that patients not directly affected by closures may suffer if capacity is not sufficiently expanded and hospitals become overcrowded.

[1] Notable exceptions considering European countries are Avdic (2016), Friedrich and Hackmann (2017) and Daysal et al. (2019), which use data from Sweden, Denmark and the Netherlands, respectively. The first two studies do not focus on perinatal medical treatments and outcomes. The last article considers perinatal health outcomes, but only for a small part of the Dutch population, namely low-income mothers.

However, even patients exposed to closures may benefit if their new hospital is of higher quality. Our findings complement this analysis by identifying a possible mechanism, namely the role of the medical workforce.

The remainder of the paper is organized as follows: Section 2 provides essential background information, Section 3 introduces the data and the descriptive evidence, and Section 4 discusses the empirical strategy. We comment on the results in Section 5. Section 6 concludes, discussing the policy implications of our work.

2 Background

The Italian National Health Service (NHS) provides universal coverage, largely free of charge at the point of delivery. According to the Constitution and the law 833/1978 (which established the NHS), the central government guarantees appropriate funding for all the regions to finance a set of essential services (the so-called Essential Levels of Care, *"Livelli Essenziali di Assistenza"*, or LEA), and the regional governments are responsible for the organization and the supply of health care services (e.g., Turati, 2013). The main funding sources are (mostly) national and regional taxes, supplemented by small pharmaceuticals and outpatient care co-payments representing a minor share of total funding.

The current organization of maternal and newborn health services dates to the years 2000-2001 when the *"Progetto Obiettivo Materno Infantile"* (literally "Project targeting mothers and infants," Decrees of the Ministry of Health D.M. 24/04/2000 and D.M. 14/02/2001) become effective. This legislation provides the main guidelines for healthy conception, pregnancy, birthing, and postnatal care. In addition, it determines that pregnancy care belongs to the set of Essential Levels of Care that must be guaranteed in all regions. Since then, a few national and primarily regional implementation decrees have completed the general requirements of the national law.

In this paper, we concentrate on the Piedmont Region, a large and rich region in the North-Western part of the country with a population of around 4.3 million, comparable to countries like Croatia and Ireland. The Piedmont Region fully implemented national guidelines since 2010 (D.G.R. n. 34-8769 of 12/5/2008 and the State-Regions Agreement 16/12/2010). The organization of perinatal care includes four phases: i) antenatal, ii) prenatal, iii) intrapartum, and iv) puerperium. The regional health system provides a wide range of free health services to pregnant women during each phase (e.g., Di Giacomo et al., 2022). These include obstetric visits, fetal ultrasound imaging, laboratory tests, antenatal education programs, and maternity hospitalization.

Our focus here is on the intrapartum phase. The regional network of public hospitals for perinatal care follows a hub-and-spoke organizational design.[2] The network consists of six hub facilities (i.e., second-level maternity units) that provide a full range of health services, including neonatal intensive care, complemented by twenty-six secondary facilities (the spokes, i.e., first-level maternity units) that provide a more limited range of services. First-level maternity units treat women with a gestational age of more than 34 weeks, while second-level units treat women of any gestational age. Figure A1 in the Appendix shows the spatial distribution of maternity units across the regional territory. Mountains surround the regional territory on three sides (north, west, and south). However, despite this geographical configuration, maternity units are fairly evenly distributed across the regional territory. In the event of maternal pathology or premature birth, the woman is referred to a second-level hospital by the regional maternity transport service. [3]

Maternity unit staffing, equipment, and supplies vary according to the hospital level (first- or second- level) and the annual number of births. The number of beds, delivery rooms, midwives per shift, obstetricians, gynecologists, and pediatric/neonatal staff depend on the annual number of births. Table A1 in the Appendix gives a more detailed account of the legal requirements. For instance, the law specifies the minimum number of midwives per shift: for first-level maternity wards, no minimum requirements are defined if the annual number of births is below 500; the law requires two midwives per shift if the annual number of births is between 500 and 999, and at least three midwives for units with more than 1,000 births per year.

In addition, each maternity unit is assessed by a National Birth Path Committee (*Comitato Percorso Nascita nazionale*, CPNn) according to the operational, safety, and technological

[2] Private hospitals play a very minor role in deliveries, as 98% of deliveries take place in public hospitals. The full costs of deliveries are borne by the public budget only in public hospitals.

[3] Gestational age is the number of weeks between the date of conception and the date of birth. A preterm birth (or premature birth) occurs before the 37th week of pregnancy. A term birth is between 37 and 41 weeks. A post-term (prolonged) pregnancy occurs when the baby is born at or after 41 weeks' gestation. If a woman presents to a first level maternity unit at less than 34 weeks' gestation, she will be transferred to a second level hospital. The pregnant woman is transferred to an emergency centre with specific expertise in pathology. Acute maternal transport reduces adverse maternal and neonatal outcomes.

standards defined by the Ministry of Health (Ministero della Salute, 2010). Particular attention is paid to maternity units operating below the 500 births threshold, which may be allowed to operate if they serve geographical areas characterized by problems in accessing healthcare services (like mountain areas). In this case, the regional health departments must submit a reasoned request to the CPNn, which assesses whether the ward meets the necessary quality and safety requirements; if not, the CPNn defines actions to overcome the problems identified. After this process, the regional health department and the CPNn constantly monitor the maternity unit to verify its performance regarding maternal and neonatal health status.

3 Data

3.1 Data sources and sample definition

Our study is based on microdata from the Certificate of Delivery Assistance (*Certificato di Assistenza al Parto*, CeDAP) of the Piedmont region. The Certificate is mandatory and must be completed by the attending midwife or physician within ten days of delivery, but it is generally finalized soon after birth. The certificate contains epidemiological information on the mother's health status, sociodemographic characteristics, risk factors during pregnancy, obstetric procedures, and delivery methods. In addition, it includes any anomalies or congenital anomalies of the infant, causes of death (in case of stillbirth), information on the use of prenatal care services, etc. (for further details, see Decree No. 349 of the Italian Ministry of Health). The sources of all data in the certificate are medical records and official personal data, except for socio-economic information (marital status, educational level, and employment status), which is self-reported. The certificates also report data on the personnel attending the birth, specifying whether (or not) a midwife, a gynecologist, a pediatrician, and a nurse aide participated in the birth.

According to medical guidelines, a “team approach” to perinatal health care delivery involving midwives, obstetrician-gynecologist (OB/GYN) hospitalists, nurses, neonatologists, and other professionals (e.g., respiratory therapists, anaesthesiologists, lactation consultants) is essential to improve the outcome of pregnancy (ACOG, 2017). Given the requirements defined by the Italian regulation, we aim to compare health outcomes at delivery for births attended by a “full team” with those obtained by a smaller team of professionals. Starting from the data, we define the “full team” (FT) as a team including at least a midwife, a gynecologist, and a pediatrician/neonatologist; this is the largest possible team observed in our sample. As an alternative, smaller teams are composed, for instance, only of a midwife or a midwife with a gynecologist.

We consider the years between 2011 and 2013, immediately following the end of the organizational process of maternity wards at the regional level required by the law. We stop our analysis in 2013 to avoid including the period, starting in 2014-2015, when some maternity wards were closed, implying possible attrition problems if only more productive and large wards survive.

Our initial sample consists of 104,559 births in thirty-two public hospitals for which we know the mode of delivery, either vaginal (70% of total births) or caesarean (the remaining 30%). We then apply three sample restrictions. Appendix Table A2 details the number of observations dropped due to each restriction. First, we exclude women who do not live within the administrative boundaries of the Piedmont region. We then exclude second-level maternity units, i.e., the highly specialized hospitals with a neonatal intensive care unit that can treat all pregnancies, including those below 34 weeks gestation. Finally, we exclude observations without data on our control variables, including maternal, delivery, and hospital characteristics. The final sample consists of 55,840 observations. For the RDD analysis, we consider observations around the two relevant thresholds of 500 and 1,000 births per year, with windows of ±250 births; this reduces the sample to maternity units within the range of 250-1250 births per year, corresponding to 35,640 observations.

For some specifications, we split the full sample into three different groups: vaginal deliveries only, emergency C-sections only (i.e., a C-section necessary because of an immediate threat to the life of the woman or the fetus), and planned C-sections only (i.e., a C-section necessary for a specific medical indication like twin pregnancy, breech presentation, transmissible disease, etc.).

Table A3 in the Appendix details the definition, and Table A4 reports the summary statistics of all outcome and control variables.

3.2 Outcome variables

As in Avdic et al. (2024), we consider several newborn and maternal health status indicators at birth as outcome variables in our analysis of the production function of maternity wards. As for newborn health status, we consider the probability of no need to be resuscitated, the Apgar score[4] measured after one minute and after five minutes (and their difference), and the likelihood of no meconium appearance. For the health status of mothers, we use the absence of lacerations of first, second, and third degree, the absence of episiotomy, and the length of the hospital stay.

Starting with newborn health status, the variable *No Need for Resuscitation* is a dichotomous variable that is equal to one if the newborn did not need any treatment with drugs, intubation, cardiac massage, or oxygen at birth, and zero if, on the contrary, the newborn needed a treatment. The Apgar scores are important measures to define how well the baby is doing outside the mother's womb: the measures are taken after one and five minutes from birth. *Apgar scores* are predictive of health, cognitive ability, and behavioral problems of children at age three (Almond et al., 2005), of reading and math test scores in grades three to eight (Figlio et al., 2014), and of school attainment, earnings, and social assistance receipt after age eighteen (Black et al., 2007; Oreopulos, 2008). The Apgar score can be classified as follows: scores of 7 and above are considered normal, with 9 and 10 being perfect scores; scores from 4 to 6 are considered fairly low, while scores equal to or below 3 are critically low. A low one-minute score indicates that the newborn requires medical attention but does not necessarily correlate with long-term health problems, especially if the score improves at the five-minute threshold. We consider the two Apgar scores at one and five minutes as continuous variables and the absolute difference between the two scores (*ΔApgar*). We also define two dichotomous indicators for the probability of an Apgar score equal to or higher than 9 (a perfect score) for both the one and five-minute scores. Finally, *No meconium* is a dichotomous variable equal to one if no meconium appears during labor, zero otherwise. Meconium is a thick, sticky substance produced by the intestine of the newborn. Usually, it is released only after birth. If meconium appears during labor, fetal distress may occur as the newborn could aspirate the meconium during labor or delivery. The meconium aspiration syndrome may be a severe problem, resulting in pneumonia and the need for neonatal intensive care.

Considering maternal health outcomes, we use two dichotomous variables for the absence of perineal lacerations or tears, distinguishing first- from second or third-degree lacerations, *No obstetric lacerations 1st degree,* and *No obstetric lacerations 2nd-3rd degree*. Perineal lacerations are common during childbirth. A first-degree laceration involves only perineal skin, while a

[4] The Apgar score is based on a score ranging from 0 to 10, assigned on the basis of five criteria: appearance, pulse, grimace, activity and respiration and is measured after 1 and 5 minutes from delivery.

second or third-degree laceration involves some muscle tissues and usually requires stitches for optimal healing. We also define the variable *No episiotomy*, a dummy variable equal to one if an episiotomy was not needed. An episiotomy is a minor surgery cut to make it easier for the infant's head to pass through for delivery and to prevent complications or a vaginal tear. While episiotomy was a routine procedure in the past, the latest medical guidelines (e.g., ACOG, 2017) suggest that it should be done only for specific medical indications. Finally, we use a proxy for the presence of other maternal and infant complications by introducing an indicator variable *No other complications* equal to one if the number of days of hospitalization is equal to or less than two, corresponding to the standard hospital stay for a vaginal delivery.

We also define some additional outcomes to further understand the impact of medical staff on delivery. First, we consider the mode of delivery, which could be influenced by the presence of different types of professionals in the delivery room. We define the dichotomous variable *Emergency C-section*, which equals one if the birth was an emergency C-section and zero if it was a planned C-section or a vaginal delivery. We also define the dichotomous variable *Assisted vaginal delivery*, which is equal to one if the birth was an assisted vaginal delivery that required the use of special instruments (like forceps or ventouse) to facilitate the delivery. Second, we consider additional outcomes in the case of a vaginal delivery only. The *Breastfeeding* variable is a dummy equal to one if the mother could breastfeed the baby within two hours of giving birth. Early initiation of breastfeeding has positive effects on the health of newborns (reduced risk of infection and mortality); it also facilitates the emotional bonding between mother and child (Hansen, 2016). The dummy *No Kristeller* is equal to one if the Kristeller maneuver - i.e., a controversial and risky procedure implying manual pressure on the fundus of the uterus towards the birth canal - was not performed. We also consider whether the placental expulsion was spontaneous (*Spontaneous afterbirth*), whether oxytocin or prostaglandins were (not) used to speed up the delivery (*No oxytocin* and *No prostaglandins*), and whether the rupture of the membranes was spontaneous (*No amniorrhexis*).

3.3 The "full team" indicator and the other controls

The main regressor of interest in the production function of maternity wards is the "full team" (FT) binary indicator, which equals one if a team of professionals involving at least one midwife, a gynecologist, and a pediatrician (or a neonatologist) attended the birth. As already mentioned, we defined this variable based on our data. Table A5 in the Appendix shows all combinations of professionals attending the deliveries in our sample. The full team is the largest possible combination of professionals we observe. However, the likelihood of observing a FT varies across hospitals classified according to the annual number of births and by mode of delivery. Considering the two relevant thresholds of 500 births and 1,000 births per year, the probability of observing a FT is monotonously increasing with the number of births for vaginal deliveries but not for C-sections. In particular, a FT is observed in 8.6 percent of vaginal deliveries in wards with 250-499 births, 24.3 percent of deliveries in units with 500-749 births, 48.9 percent of births in the 750-999 interval, and 52 percent of deliveries in the 1,000-1,250 interval. The corresponding percentages for emergency C-sections are 64.7 for less than 250-499 births, 85.3 for 500-749 births, 76.3 for 750-999 births, and 89.3 for more than 1,000 births. For planned C-sections, the corresponding percentages are 41 for less than 250-499 births, 82.2 for 500-749 births, 57.8 for 750-999 births, and 86.5 for more than 1,000 births. The most common team composition for vaginal deliveries in maternity units around the 500 births cut-off is midwife-gynecologist, followed by midwife alone below 500 births; for maternity units around the 1,000 births cut-off, the full team is the most common, followed by the midwife-gynecologist and the midwife alone. Finally, the most common team composition for emergency and planned C-sections is *always* the full team, followed by gynecologist-pediatrician. This evidence suggests that the production function of vaginal deliveries is likely different from the production function of C-sections.

After controlling for FT, we include a large set of mother, delivery, and hospital characteristics in all model specifications. The main purpose of including these variables is to control for various aspects of the prenatal environment that may influence newborn and maternal health outcomes at birth (Conti et al., 2020). The mother's characteristics control for her socio-economic attributes, medical conditions, and lifestyle during the pregnancy. We include age, nationality, education level, employment status, marital status, whether the woman is at her first delivery, number of hospital admissions during the pregnancy, weight gain during pregnancy, smoking during pregnancy, and whether the woman experienced past abortions or miscarriages. Since proximity to the hospital may affect the labor stage on arrival (Card et al., 2023), all specifications include the distance from the mother's municipality to the nearest hospital. More than 75% of the mothers in our sample give birth in the closest hospital.

We also include several delivery and infant characteristics: the type of delivery, the use of antibiotics during labor, neonatal head circumference, monitoring of the fetal heartbeat, gestational week, and whether the birth occurred on the weekend, on a night shift, or on a congested day. Women who are at increased risk of having a baby with Group B Streptococcus (group B strep, GBS) disease will be given antibiotics by vein during labor. The antibiotics help protect the baby from infection. The head circumference of the newborn is related to the infant's well-being, and a large fetal head circumference may be associated with complicated labor. Monitoring fetal heartbeat is quite routinely practiced, as an abnormal fetal heart rate may mean that the infant is not getting enough oxygen or that there are other problems: the variable is introduced as a dummy variable equal to one if fetal heartbeat monitoring was not present during labor. Finally, we consider the newborn's gestational age in weeks and the delivery timing by including two dummy variables. The first dummy is for festivities, which is equal to one if the birth occurred during a weekend or a public holiday. The second dummy variable is for nights and is equal to one if the birth occurred during the night shift (from 00:00 a.m. to 08:00 a.m.). To control for congested days, we introduce a dummy variable equal to one if the birth occurred during a "congested day", which we define according to the number of births within the same ward in a defined time window.[5]

We then construct a set of dummy variables for the type of delivery to control for any differences in outcomes due to the type of birth: uncomplicated vaginal delivery; assisted vaginal delivery, e.g., with the use of forceps or ventouse; planned C-section; and emergency C-section.

Finally, we introduce the ratio of femoral neck fractures treated with surgery within two days at the hospital level as a proxy for the hospital's effectiveness: the higher the ratio, the more effective the hospital is from a clinical and organizational point of view. [6] This measure comes from the Programma Nazionale Valutazione Esiti (P.N.E., literally National Program for the Evaluation of Outcomes), a program financed by the Italian Ministry of Health that collects a wide range of information on Italian public and private hospitals to support clinical and organizational audit programs.

[5] We define a time window of eight hours before and eight hours after the birth in the given hospital. We then count the number of births in this window, excluding the birth in question. The dummy variable for congested days is equal to one if the number of births in this time window in the hospital in question is strictly greater than two. For hospitals around 1,000 births, the same dummy variable takes values equal to one if the number of births in the time window is strictly greater than three.

[6] Other indices commonly used as proxies for hospital efficiency relate to 30-day outcomes after acute myocardial infarction. We use the treatment of fractures of the femoral neck because data are available for a larger number of hospitals, as many hospitals may not have a cardiac unit.

4 Empirical Strategy

To estimate the labor productivity in maternity wards, we define a model of individual newborn and maternal health production function by hospitals:

$$Y_{iht} = \beta_1 FT_{iht} + \sum_{k=1}^{2} \rho_k B_{ht}^{k} + \boldsymbol{M}'_{iht}\boldsymbol{\beta_2} + \boldsymbol{D}'_{iht}\boldsymbol{\beta_3} + \boldsymbol{H}'_{ht}\boldsymbol{\beta_4} + \theta_p + \theta_m + \theta_t + \varepsilon_{iht} \qquad (1)$$

where Y_{iht} refers to the newborn or mother i outcomes at birth, discharged by hospital h, in year t. B_{ht} is the number of births in hospital h in year t, entered linearly and squared. They provide a measure of current hospital volume and allow us to account for economies of scale or learning-by-doing effects (Gaynor et al., 2005; Rachet-Jacquet et al., 2021). $\boldsymbol{M}, \boldsymbol{D}, \boldsymbol{H}$ are matrices of mother, delivery, and hospital characteristics that represent risk adjustment variables for the health outcomes at birth.[7] FT is the binary indicator for the presence of a full team of professionals assisting the newborn or mother i during the delivery. The term θ_p is an i.i.d. Local Health Authority component. In particular, the Piedmont region is divided into fourteen areas managed by Local Health Authorities (LHA or *Aziende Sanitarie Locali*), and each authority is responsible for providing health services in its specific geographical area.[8] The terms θ_m and θ_t are i.i.d. month and year components, respectively. These error components are introduced to parameterize possible correlations in health status within the district of the local health authority and within time. The remaining error component ε_{iht} is specific to newborn or mother i. The standard errors are clustered at the hospital, shift, and weekday levels in all specifications to account for the likely correlation of residuals within hospitals, shifts, and weekdays.

The FT coefficient β_1 is the parameter of primary interest. Equation (1) describes the average potential health outcomes of newborns and mothers under alternative assignments of health care teams, controlling for any effects of mother, delivery, and hospital characteristics collected in matrices $\boldsymbol{M}, \boldsymbol{D},$ and $\boldsymbol{H}$. However, estimating the causal impact of the team on maternal and neonatal health outcomes is challenging. One main reason is that the hospital can adjust labor inputs according to the patient's needs. In particular, the presence of a FT will depend on two main factors. First, the characteristics of the mother and the birth may determine

[7] In all specifications, matrix **M** includes the mother's age, nationality, education level, employment status, marital status, whether the woman is at the first delivery, number of hospitalizations during pregnancy, weight gain during pregnancy, smoking during pregnancy, whether the woman experienced previous abortions or miscarriages, and the distance (in Km) between the mother's municipality and the nearest hospital. Matrix **D** accounts for the delivery mode, the use of antibiotics during labor, neonatal head circumference, fetal heart rate monitoring, gestational week, and whether the birth occurred on a weekend, night shift, or congested day. Matrix **H** includes the proportion of femoral neck fractures treated within two days. All definitions are in Table A3 in the Appendix.

[8] Six of the fourteen local health authorities in Piedmont have only one maternity ward.

the composition of the team. These characteristics include the type of pregnancy (singleton or twin), the type of delivery (natural or caesarean), the week of pregnancy (term or preterm), and any medical or obstetric complications that may arise during labor. Second, the characteristics of the hospital and its internal organization may limit the composition of the team, e.g., the time of delivery (night, weekend, or day shift) and, more generally, the availability of hospital staff. Since a FT is not randomly assigned, it will likely correlate with the error components in Equation (1). OLS estimates of the full team coefficient β_1 from Equation (1) are likely to be biased if hospitals choose different observable teams for patients who differ in their unobserved latent characteristics. In addition, the selection of mothers into hospital facilities may not be random. A woman and her partner can choose the hospital where she gives birth. Parents usually choose the nearest maternity hospital. However, the choice is also influenced by the presence of obstetric or medical complications (e.g., high-risk pregnancy, premature birth, diabetes, etc.) or the desire to give birth in the hospital where the doctor/midwife attending the pregnant woman has admitting privileges.

We comprehensively address endogeneity concerns for potential bias due to the endogenous selection of the team and the endogenous selection of patients into hospitals by exploiting the Italian legislation that defines different thresholds for staff and equipment requirements, that increase discontinuously at each threshold. To obtain causal estimates of our parameter of interest, we experiment with two complementary methodologies: we apply the 2SLS-IV strategy on the entire available sample, and the RDD strategy on maternity units around the thresholds.

The 2SLS-IV strategy builds on the research design in Angrist and Lavy (1999), often called the Maimonides' Rule, with which the authors exploit class size cut-offs imposed by a rule in Israel to estimate the impact of class size on educational achievement. Similarly, here, we exploit cut-offs defined by the law to determine maternity care units' staffing, equipment, and supplies according to the yearly number of births to study the impact of labor on health outcomes. Staff and equipment availability discontinuously increases at each threshold since medical staff and equipment requirements change according to the average volume of deliveries in the previous three years: below 500 deliveries, in the interval 500-999, or larger than 1000 (see Table A1). This allows us to define three instrumental indicator variables $\boldsymbol{I}[\boldsymbol{MaternSize}]$ for FT, based on intervals in the number of births in a specific hospital h, in the previous years: the first variable indicates hospitals with fewer than 500 births, the second variable indicates hospitals in the interval of 500-999 deliveries, and the third indicates hospitals with more than 1000 births.

An instrument must fulfil at least three key assumptions to be valid. First, it must be associated with the endogenous variable. In our case, the law requirements make the regressor of interest (FT) partly determined by a known discontinuous function of an observed covariate (the number of births in the previous years). Second, the instrumental variable must not directly impact the outcome other than through the endogenous variable. We exploit the discontinuity in the assignment mechanism as in Angrist and Lavy (1999). Third, it must not share any unobservable/unmeasured common causes with the outcome. We assume that any other effects of the number of births on health outcomes are adequately controlled by the terms included in Equation (1) and "partialled out" of the instrument by the variables in $\boldsymbol{M}, \boldsymbol{D}, \boldsymbol{H}$, and the fixed effects. The first-stage equation for the 2SLS-IV model in (1) is the following:

$$FT_{iht} = \boldsymbol{I}[\boldsymbol{MaternSize}]_h{}'\gamma_1 + \sum_{k=1}^{2}\pi_k B_{ht}^k + \boldsymbol{M}'_{iht}\boldsymbol{\gamma_2} + \boldsymbol{D}'_{iht}\boldsymbol{\gamma_3} + \boldsymbol{H}'_{ht}\boldsymbol{\gamma_4} + \lambda_p + \lambda_m + \lambda_t + \eta_{iht} \quad (2)$$

As in Equation (1), B_{ht} is the number of births in hospital h in year t, while $\boldsymbol{M}, \boldsymbol{D}, \boldsymbol{H}$ are matrices of mother, delivery, and hospital characteristics, while λ_p , λ_m and λ_t are local health authorities, monthly and year-fixed effects, respectively. We repeat the analysis for the full sample of all births and three subsamples: vaginal-only, emergency, and planned C-sections.

A final identifying assumption is that parents do not selectively exploit the rule to deliver in hospitals with larger maternity wards. Selective manipulation could occur, for example, if more educated parents choose hospitals with many births, knowing that this will result in a full team of professionals attending the delivery. In practice, however, parents do not participate in the decision-making process that leads to the actual team of professionals. First, we observe that more than 75% of mothers in our sample deliver at the closest hospital, which is consistent with other studies that similarly find that mothers choose to deliver at the closest hospital (e.g., Phibbs et al., 1993; Currie and MacLeod, 2017; Card et al., 2023). Second, we test for the absence of ad hoc manipulation around the cut-offs and introduce a specification that relies on a regression discontinuity design (RDD). We focus on maternity wards around the 500 and the 1,000 number of births thresholds, and we employ a Fuzzy RDD, where the discontinuities induced by having a number of births above the 500 or the 1,000 births thresholds are used as an instrument for the full health care team. Within this framework, we limit the analysis to hospitals whose number of births is in the bandwidth ±250 births, around the two cut-off points.[9] We thus assume that hospitals located right above or below the threshold are very similar in workload. However, those above are required to have more staff units (and, coherently, additional beds and equipment).

We then estimate the following RDD reduced form model for the two cut-off points considered (either $B^* = 500$ or $B^* = 1000$):

$$Y_{iht} = \pi_1 A_{ht} + \sum_{k=1}^{2} \sigma_k q_{ht}^k + \boldsymbol{M}'_{iht}\boldsymbol{\pi_2} + \boldsymbol{D}'_{iht}\boldsymbol{\pi_3} + \boldsymbol{H}'_{ht}\boldsymbol{\pi_4} + \eta_p + \eta_m + \eta_t + u_{iht} \quad (3)$$

where, like in Eq. (1), Y_{iht} is the outcome at birth of the infant/mother i, in hospital h at time t, while the dummy A_{ht} is equal to one if hospital h at time t is above the considered threshold and zero otherwise. In the specification, we also include the distance to the cut-off point q (and its square), defined as $(B_{ht} - B^*)$, where B_{ht} is the number of births in hospital h, at time t, and B^* is alternatively equal to 500 or 1000, the cut-off points defined by the law. We also include the complete set of mother, delivery, and hospital characteristics ($\boldsymbol{M}, \boldsymbol{D}, \boldsymbol{H}$) while η_p , η_m, and η_t are local health authorities and month- and year-fixed effects, respectively.

We alternatively estimate the specifications in (3) on three different samples: (i) the sample of births occurring in all hospitals within the bandwidths of ±250 births around the 500 and 1,000 thresholds, (ii) the sample of births occurring only in hospitals around the 500 threshold, and (iii) the sample of births occurring only in hospitals around the 1,000 threshold. Also for the RDD approach, we estimate a first stage specification in which FT is regressed on the discontinuity in the availability of staff induced by the law (A_{ht} dummy for being above the threshold):

$$FT_{iht} = \delta_1 A_{ht} + \sum_{k=1}^{2} \tau_k q_{ht}^k + \boldsymbol{M}'_{iht}\boldsymbol{\delta_2} + \boldsymbol{D}'_{iht}\boldsymbol{\delta_3} + \boldsymbol{H}'_{ht}\boldsymbol{\delta_4} + \mu_p + \mu_m + \mu_t + \xi_{iht} \quad (4)$$

[9] We also experiment with different bandwidths around the cut-off points (±100; ±150; ±200) and results do not qualitatively change, even if we find larger standard errors when reducing the bandwidth below 100.

5 Results

5.1 Hospital and patient sorting

Before presenting our results, we discuss the possibility of ad hoc manipulation around the cut-offs as an important concern for the identification strategy based on the Maimonides rules. We present two types of evidence: sorting of hospitals around the cut-offs and balancing tests for the comparability of women and birth characteristics around the cut-offs.

Figure 1 shows the estimated discontinuous density functions for the annual number of births at the hospital level around the two thresholds based on the number of births, according to McCrary (2008). We find no statistically significant evidence of manipulation. A t-test of the null hypothesis of continuity is not rejected for each sample (total sample, vaginal only, and C-sections only) at the usual levels of significance, i.e., the density estimates are consistent with continuity at the two thresholds of 500 and 1,000. This evidence supports the absence of strategic manipulation of hospitals or maternity units into different size groups.

Next, we test for changes in the observable characteristics of women around the cut-offs, checking the smoothness of the control variables around the two thresholds. Table 1 reports a complete set of overidentification tests for the sample of natural births on which we focus the RDD analysis. We estimate local-linear regressions using the set of mothers' and delivery characteristics as dependent variables. In general terms, results suggest that observations just below the 500-births cut-off are similar to those just above regarding a range of maternal and delivery characteristics (column (1) of Table 1). Similarly, observed characteristics are remarkably similar around the 1,000-births cut-off (column (2) of Table 1). However, there are some variables for which we find statistically significant differences. Women giving birth in hospitals just above the 500 threshold are more likely to be Italian, more likely to be employed, less likely to be married, and more likely to be having their first child at a larger gestational age when compared to women giving birth in hospitals below the 500 threshold. They are also more likely to give birth on a congested day and to have gained more weight during pregnancy. On the contrary, women in hospitals above the threshold of 1,000 births have a lower gestational age, and the newborn has a smaller head circumference at birth. They also live further away from the hospital, gain less weight during pregnancy, are less likely to smoke, are less likely to have had a previous abortion, and are less likely to obtain antibiotics during labor than women in hospitals below the threshold of 1,000 births. They also are less likely to be married. For all births above the threshold, we observe a significantly higher hip replacement rate at hospital level, suggesting a higher effectiveness of hospitals above the thresholds. Overall, the evidence suggests that there are differences in some characteristics of women across the thresholds. These characteristics are a mix of demographic and clinical characteristics around the 500 threshold (e.g., Italian nationality, higher gestational age, higher weight gain), whereas they are more medical/clinical characteristics around the 1,000 threshold (e.g., lower gestational age associated with smaller head circumference and lower weight gain, women living further from the nearest hospital).

Figure A2 in the appendix plots the same observed characteristics of women and births against the annual number of births at hospital year level around the cut-offs. Again, visual inspection shows that most of the observed characteristics are smoothly distributed around the cut-offs, while a few show some small discrete jumps. To account for these differences, we include all covariates describing maternal and birth characteristics in our analysis.

In addition, Figure A3 shows the proportions of C-sections and emergency C-sections in the total number of births at the hospital year level around the cut-off points. There are no discrete jumps at any of the cut-offs, indicating that the mode of delivery is evenly distributed around the 500 and 1,000 thresholds.

5.2 First-stage estimates

We now discuss the importance of the law requirements on the probability of observing a FT. We first provide a graphical representation of the relation between the instruments and the endogenous variable of the model, namely the full team of professionals attending the delivery. Figure 2 plots the proportion of deliveries attended by a FT against the annual number of deliveries in a particular hospital and year. There is clear evidence of a positive relationship between the probability of observing a full team and the number of deliveries, with some discrete jumps around the 500 and the 1,000 thresholds in the full sample (Panel A of Figure 2) and also in the two sub-samples of vaginal and C-section deliveries (Panels B and C of Figure 2).

Table 2 reports first-stage estimates of Equation (2) in Panel A, and estimates of Equation (4) in Panel B. In Panel A, we consider all births: Column (1) shows the results for the full sample, while columns (2), (3), and (4) report results for the sub-samples of vaginal deliveries, emergency C-sections and planned C-sections, respectively. In all specifications, the dependent variable is *FT*, a binary indicator for the presence of a full team during the delivery.

We include the two instruments: '*500-999'*, which is equal to one if the maternity unit where the childbirth occurred has a number of yearly births in the intervals 500-999, and zero otherwise; and '*Above 1,000'* which is equal to one if the maternity unit has a number of yearly births larger than 1,000, and zero otherwise. They are always positive and significantly different from zero in all specifications. For the full sample of all births, being in a hospital with a number of births falling in the interval 500-999 increases the probability of having a full team of specialists by 34.2 percentage points while being in a hospital with a number of births above 1,000 increases the probability of having a full team of specialists by 71.8 percentage points, with respect to the omitted category (hospitals with less than 500 births per year). Results are similar for the three sub-samples of vaginal, emergency, and planned C-section deliveries. Tests for under- and weak identification suggest that the first stage is very precise, and the instruments are relevant.

In Panel B of Table 2, we also present the first stage results for the smaller RDD sample of vaginal deliveries only around the 500 and 1,000 cut-offs. In column (1) we consider the 'overlapped' discontinuity sample of maternity units in the intervals 250-749 and 750-1,249 births per year, near the 500 and 1,000 cut-offs. In columns (2) and (3), we split the overlapping sample by focusing on the two samples of deliveries from maternity units in the 250-749 and 750-1,249 intervals, respectively

The dichotomous variable 'above thresholds', which equals one for units in the intervals 500-749 and 1,000-1,249 births, and zero for units in the intervals 250-499 and 750-999 births is positive and significant: being above the thresholds increases the probability of having a full team by about 30.8 percentage points. Results from columns (2) and (3) confirm that being above the thresholds significantly increases the probability of a full team by 36 and 14 percentage points for the 500 and 1,000 births cut-offs, respectively.

5.3 2SLS results

Tables 3 and 4 report the 2SLS estimates for the production function in equation (1) on four different samples: the full sample of all deliveries (Panel A) and the three subsamples of vaginal deliveries (Panel B), emergency C-sections (Panel C), and planned C-sections (Panel D). Table 3 shows the results for neonatal outcomes, while Table 4 shows the results for maternal outcomes. Tables A6 and A7 in the Appendix show the corresponding OLS estimates for equation (1).

In Table 3, for the full sample of all deliveries we find that the presence of a full team (FT) increases the probability of no need for resuscitation (column (1) of Table 3) by almost 2.2 percentage points (around one-fifth of a standard deviation), while all Apgar scores (measured after one minute and after five minutes from birth, in columns (2) and (3)) are lower (by 0.40 and 0.14 points, respectively) due to the presence of a FT. Similarly, the probability of having a perfect Apgar score (columns (4) and (5)) decreases by about 9 and 5 percentage points, respectively. These results may be interpreted as evidence of more caution of full teams compared to smaller teams in attributing high Apgar scores, especially one minute after birth. In the medical literature, there is some evidence of interobserver variability of Apgar scores, across different birth settings and providers (O'Donnell et al., 2006). Some studies find a risk of bias of high Apgar scoring in the absence of independent checks against observer bias (Grünebaum et al., 2015; Wiegerinck et al., 2020).[10]

We consider two additional newborn health outcomes to explore potential mechanisms behind the effects observed on the two Apgar scores. Ideally, we would like to pinpoint the gynecologic, obstetric, or pediatric practices that a full team of professionals can perform better than a smaller team, which drives our results. First, we examine the difference between the Apgar score measured at five minutes and the Apgar score at one minute from birth (ΔApgar). We find that the difference between the five-minutes and the one-minute Apgar scores (column (6) of Table 3) increases by 0.25 points with a full team. Our explanation is that the presence of a full team may considerably improve the health status of a newborn in the few minutes that follow childbirth when compared to a smaller team. Especially the presence of a pediatrician who assists with the birth may positively affect the health status because of her/his expertise. Furthermore, the presence of the pediatrician allows the other professionals (gynecologists and midwives) in the team to be more focused on their specific tasks. Second, we consider the presence of meconium, which may cause fetal distress if the newborn aspirates it during labor or birth. The hypothesis that a full team may be more capable of preventing such an adverse

[10] Tables A6 in the appendix shows the OLS results. All coefficients are statistically significant in both the total and vaginal samples. In addition, while the coefficients for no need for resuscitation and no meconium are negative, the coefficients for all Apgar scores are quite similar in size and magnitude to the 2SLS results, that seem to suggest that OLS somewhat overestimates the importance of a full team.

event than a smaller team is not supported by our estimates, since the probability of no meconium (column (7) of Table 3) does not significantly change with a FT.

We repeat the analysis on the sub-samples of vaginal and C-section deliveries. We find that results in the full sample are mainly driven by the results in the vaginal sub-sample, while there are no significant effects in the C-sections sub-samples. For vaginal deliveries, we find that with a full team, there is a higher probability of no need for resuscitation (+1.7 p.p., around one-fifth of a standard deviation), lower Apgar scores (at one and five minutes after birth), and a higher difference between the five-minute and one-minute Apgar scores (+0.26 points, almost one-third of a standard deviation).

Table 4 presents the 2SLS estimates for Equation (1) when we consider the maternal health status at birth as a dependent variable. For the full sample of deliveries (Panel A of Table 4), we find a positive effect for a full team on the probability of not experiencing a second/third-degree laceration (column (2)) and a negative effect for the *No episiotomy* outcome (column (3)). More precisely, women assisted by a full team have a higher probability of undergoing an episiotomy by about 14.5 percentage points. However, more severe lacerations (second or third-degree) are reduced with a full team: the probability of having no second or third-degree lacerations increases by about 8.2 percentage points with a full team. All in all, severe lacerations are avoided thanks to a more intensive surgical intervention that seems to be appropriate in this case. We find no effects of a full team on other complications measured by a longer hospital stay (column (4)). These findings for maternal health outcomes are confirmed for the vaginal birth sub-sample only, but not for the C-section sub-samples (where applicable).

Overall, the full team variable is never significant in the sub-samples of emergency and planned C-sections. Our preferred explanation is that the production function associated with the two procedures is likely to be different due to the highly specialized surgical team, the specific surgical environment and instruments required for a C-section, and generally the different levels of preparation and resources required for the two modes of delivery. The organizational and staffing requirements for normal (vaginal) delivery and C-sections differ in terms of the staff and equipment needed to ensure the safety and well-being of both mother and newborn. While a vaginal delivery usually takes place in a labor room equipped with standard obstetric tools and monitoring systems, a C-section takes place in an operating room with strict sterile conditions and additional sterilized equipment, anesthesia machines, and specialized surgical instruments. In addition, because of its surgical nature, a C-section requires a larger, more specialized team, such as an obstetric surgeon, an anesthetist, surgical assistants, and operating room nurses. While our data allows us to identify the role of a full team for vaginal deliveries, likely, we are not able to fully consider all the specifics of C-sections. For this reason, from now on, we will focus only on vaginal deliveries.

5.4 RDD results on vaginal deliveries

First, we present graphical evidence for neonatal (Figure 3) and maternal (Figure 4) outcomes. Figures 3 and 4 plot neonatal and maternal outcomes against the annual number of births at the hospital year level. If there is an effect, we would expect to see a discontinuous jump in outcomes at the cut-off points. Figures 3 and 4 document some discontinuities in the probability of experiencing the outcome as a function of the annual number of births. For neonatal outcomes, there is a discontinuous change in the variable *No need for resuscitation*, in the Apgar scores (especially at one minute), and the difference in Apgar scores at the cut-off points. For maternal outcomes, some discontinuous jumps are observed for lacerations and episiotomy.

We analyze these data further by showing the results of the reduced form RDD specification in equation (3). Tables 5 and 6 report estimates for the neonatal and women's health outcomes, respectively. [11] In this case, we restrict the sample to maternity units whose number of births is close to the discontinuity points (Angrist and Lavy, 1999). We define three "discontinuity samples" that include only maternity units whose number of births is in the interval ±250 around the cut-offs 500 and 1,000 and an overlapped sample. This allows us to draw several insights from a set of maternity wards that are very similar in workload, but differ in staff units and, therefore, beds and other facilities. The variable of interest is a dichotomous variable for being above the threshold (500-749 births or 1,000-1,249 births per year) in Panel A of Tables 5 and 6; while it is a dichotomous variable equal to one if the number of yearly births is in the 500-749 interval in Panel B, and finally, a dummy variable equal to one if the number of births is in the interval 1,000-1,249 births, in Panels C.

In Table 5, we find that most of the newborn outcomes have a consistent sign across the different samples, although the magnitudes and significance levels may differ. Furthermore, the results are consistent with those in Table 3, where we use a larger sample and a 2SLS strategy.

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[11] The full estimation results are presented in Appendix Table A8.

We find that being above the threshold increases the likelihood of not needing resuscitation, but only significantly above the 500 threshold. We also find that Apgar scores (at one minute and five minutes) and the probability of a perfect Apgar score (greater than nine) are lower for births above the threshold. However, the effect is only significant above the 1,000 threshold. Being above the cut-off improves the difference between the 5-minute Apgar and the 1-minute Apgar for each cut-off. Finally, the probability of no meconium is lower above the 500 cut-off and higher above the 1,000 cut-off.

Table 6 repeats the same analysis for maternal health outcomes. We find a positive effect on the probability of having no severe lacerations (column (2)), which is statistically significant above the 1,000 cut-off. We also find more episiotomies, significant in the overlapped sample and above the 500 cut-off. Finally, the probability of no complications increases above the cut-off of 1,000 births.

Overall, we find that vaginal births above the cut-off are associated with better neonatal and maternal health outcomes in terms of less need for resuscitation, lower Apgar scores that improve between 1 and 5 minutes, and fewer obstetric lacerations associated with more appropriate episiotomy. The results are consistent for the overlapped sample and the two samples around the 500 and 1,000 thresholds, although the magnitude and significance levels may differ. All else being equal, the coefficients are usually larger for larger hospitals around the 1,000 threshold, confirming the positive association between volume and outcomes, as larger hospitals ensure greater productivity, as measured by better health outcomes (e.g., Gaynor et al., 2005; Mesman et al., 2015; Avdic et al. 2024). We also find that there are other positive outcomes above the 1,000 threshold that are not present above the 500 threshold: lower incidence of meconium and shorter length of hospital stay for both mothers and newborns. [12]

5.5 Sensitivity Analysis and Heterogeneous Effects

Table 7 reports results for some additional outcomes. In columns (1) and (2), we consider the full sample of all deliveries and use two specific delivery modes as dependent variables. In

[12] Moreover, if we couple the lower Apgar scores when a full team is present with the fact that larger hospitals above the 1,000 threshold treat worse cases (as discussed in Section 5.1 and Table 1), we can infer that the identified effect represents a lower bound on the true positive effect of a full team on health outcomes, since it includes the negative effect on health of the worse patient population treated in hospitals with a full team. We are grateful to a reviewer for pointing this out.

column (1), we look at *Emergency C-section*, equal to one if an emergency C-section was performed, and zero otherwise. We find a significant negative sign for the overlapped discontinuity sample and above the 500 cut-off. In column (2), we consider as a dependent variable the *Assisted vaginal delivery* dichotomous variable, equal to one if an assisted vaginal delivery (e.g., with the use of forceps or ventouse) was performed. We find positive coefficients: above the cut-off, the likelihood of these practices increases, which is particularly significant in the overlapped sample and above 500 yearly births. Taking the two results together, we find that the likelihood of assisted vaginal delivery increases, while the likelihood of emergency C-section decreases, compared with any other mode of delivery in larger hospitals. A possible explanation is that larger hospitals can better manage cases requiring more effort from the staff. The choice between the two procedures critically depends on the clinical scenario, the newborn's condition, the labor progress, and the mother's health. Emergency C-sections are likely to start as vaginal births and may be necessary in critical situations where the baby or the mother are at risk, or when vaginal labor is not progressing safely. However, when appropriate, an assisted vaginal delivery can avoid the risks of surgery and allow the mother to recover more quickly: it is less invasive and less costly, and it also reduces the risk of complications in future pregnancies.

In Table 7, columns (3) to (8), we then focus on vaginal deliveries only and consider further outcome variables. First, breastfeeding (column (3)) decreases with the threshold and is significant for the overlapped sample and above the 500 threshold. We also find that the probability of not using oxytocin (column (6)), prostaglandins (column (7)), and amniorrhexis (i.e., the rupture of membranes to facilitate delivery, column (8)) decreases across all thresholds. Similarly, the probability of not using a Kristeller maneuver (column (4)) increases in the discontinuity sample and above the 500, while the probability of spontaneous afterbirth (column (5)) decreases above the 500 threshold. These results indicate that larger hospitals make more use of treatments to facilitate birth than smaller hospitals. In other words, larger hospitals "medicalize" deliveries more than smaller ones, managing and controlling the natural birth process with medical interventions, such as the use of oxytocin and prostaglandins to stimulate labor or induced rupture of the membranes, which in turn may hinder breastfeeding. As before, we interpret the "medicalization" of labor in the direction of reducing the risk of complications for both mother and newborn and increasing safety by having medical options available in case of emergencies.

Table 8 shows a placebo analysis considering other neonatal health outcomes that should not be affected by the presence of a full team. The outcomes considered are (i) probability of low birth weight (birth weight less than 2,500 grams), (ii) birth weight (in grams), and (iii) gestational age (in weeks). Only birth weight is positive and significant in panels A and C: birth weight is about 46-47 grams (about one-tenth of the sample standard deviation) higher above the thresholds. None of the other outcomes vary discontinuously around the threshold, confirming that only health outcomes that should be influenced by increased health worker productivity are significantly affected.

Finally, we examine the presence of heterogeneous effects by looking at different periods of the day and week and by taking into account the nationality of the mothers. In the last four rows of Table A4, Panel B, we report summary statistics on the presence of a full team during weekends and weekdays, night shifts and day shifts. We find that the presence of a full team is much less likely on weekends and night shifts than on weekdays and day shifts, usually in the order of less than a third of cases around the 500 cut-off and half of cases around the 1000 cut-off.

Estimation results are presented in Table 9 for neonatal outcomes and Table 10 for maternal outcomes. We split our sample to compare the following: births during weekends and holidays (Panel A of Tables 9 and 10) as opposed to working days (Panel B of Tables 9 and 10), the day shift from 8 a.m. to 11.59 p.m. (Panel C of Tables 9 and 10) as opposed to the night shift from midnight to 7.59 a.m. (Panel D of Tables 9 and 10). We also consider the two subsamples of native and non-native mothers (Panels E and F of Tables 9 and 10). The reduced number of observations in the sub-samples reduces the precision of many estimates. Considering neonatal outcomes first, we do not find clear heterogeneous patterns between weekends and workdays, between day and night shifts, and between native and non-native mothers. The coefficient for no need for resuscitation (column (1) of Table 9) is always positive, but only significant above the threshold of 1,000 for the sample of foreign-born women. The coefficients for Apgar scores (columns (2) to (5)) are mostly positive in the samples above the threshold of 500, while they are negative and mostly significant above the threshold of 1,000. The difference in Apgar scores is always positive (column (6)) and precisely estimated above the 1,000 cut-off. Finally, meconium (column (7)) is more likely to occur above the 500 cut-off, but less likely above the 1,000 cut-off. Overall, the coefficients are very similar for weekends and working days or day and night shifts. The differences, if any, are mainly related to the threshold considered, with better results above the 1,000 threshold compared to the 500 threshold. The results are also consistent across the sub-samples of native and non-native mothers, with greater precision in the estimates for the larger sample of native mothers. Table 10 presents the same analysis for maternal health outcomes. Also in this case, we do not find any substantial heterogeneity. Most of the coefficients for lacerations (columns (1) and (2)) are not precisely estimated. Episiotomy (column (3)) is more likely (and significant) above the 500 cut-off during day shifts as opposed to night shifts and for non-native mothers (in terms of magnitude) as opposed to natives. Finally, the absence of complications (i.e., longer hospital stay after delivery) is less likely above the 500 cut-off for births during day shifts and for native mothers.

6 Conclusions

With an expected growing demand for healthcare services and additional pressures to spending growth from a swift technological innovation, a better understanding of the role of medical staff and its effects on productivity (measured by patient health outcomes) becomes a priority for policymakers worldwide. A growing literature in economics is exploring medical staff productivity along several dimensions. In this paper, we exploit an Italian regulation allowing us to avoid the endogeneity of medical labor to estimate the productivity of a full team of professionals in maternity wards on the general health status of newborns and mothers. We find that a full team of professionals (a midwife, a gynecologist, and a pediatrician) is more likely to be present at delivery in larger hospitals and it is associated with better health outcomes. We also find that a full team is associated with more medical treatments, that are used to avoid complications during labor and delivery for both the mother and her baby.

Our findings carry important policy implications. First, as hospitals above the cut-offs obtain better health outcomes (hence, they are more productive) than those below, we provide additional support to the view that policymakers should concentrate hospital activities in larger and more specialized units. This calls to carefully scrutinize and, possibly, close maternity wards below the 500-childbirths-per-year threshold. However, as the closures are likely to affect patients in remote areas (e.g., Perucca et al., 2019), who would have to travel further to seek maternity care, there is the need to define appropriate mechanisms to avoid closures ending up in increasing disparities of opportunity and, more importantly, risks for neonatal and maternal health even in the short run, before patients and hospitals can adjust to closures (e.g., Avdic et al., 2024; Avdic, 2016).

Second, our findings suggest that one possible underlying mechanism of the volume-outcome relationship is linked to physician and hospital characteristics, such as the skills and availability of specific human resources (e.g., Mesman et al., 2015). In particular, the reduced availability of clinical staff in hospitals slightly below statutory thresholds can create an artificial difference relative to hospitals with very similar workloads but slightly above the cut-offs. This calls for more flexible rules instead of fixed thresholds in the definition of staff needs for each maternity ward.

Acknowledgements: We wish to thank Gabriella Conti, Janet Currie, Carlo Devillanova, Debora Di Gioacchino, Simone Ghislandi, Marit Hinnosaar, Claudio Lucifora, Joan Madia, Francesco Moscone, Cheti Nicoletti, Pau Olivella, Claudio Piga, David Slusky, Odd Rune Straume, Rasmus Wiese, and all seminar participants at the *2023 Economics of the Healthcare Workforce Workshop* (University of Surrey, UK), the *12th Meeting of the Network on Economics of Regulation and Institutions* (University of Genova), the *2022 Meeting of the European Public Choice Society* (University of Minho, Braga), the *26th Conference of the Italian Health Economics Association* (Bocconi University, Milan), the *62nd Conference of the Italian Economic Association* (Università Politecnica delle Marche), the *33rd Conference of the Italian Society of Public Economics* (University of Bari), the *4th Dondena Workshop on Public Policy* (Bocconi University, Milan), the *34th National Conference of Labour Economics* (University of Piemonte Orientale, Novara), the *4th Edition of the American-European Health Economics Study Group* (WU Wien), the *10th Meeting of the Network on Economics of Regulation and Institutions* (Università Cattolica del Sacro Cuore, Rome), the *30th Conference of the Italian Society of Public Economics* (University of Padova), for their helpful remarks on preliminary drafts of this paper. We also thank Maria Maspoli, Paola Ghiotti, and Gloria Prina at the Assessorato Regionale alla Sanità, Regione Piemonte, for giving us access to the CEDAP microdata. All remaining errors are our own. We acknowledge funding from Università Cattolica (grant D32-2022 UNEQUAL).

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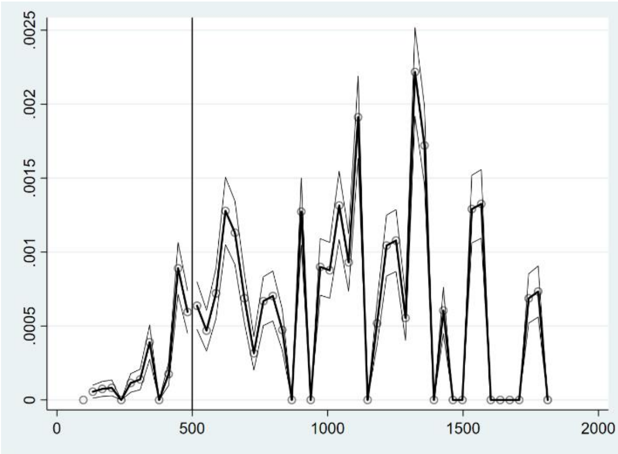
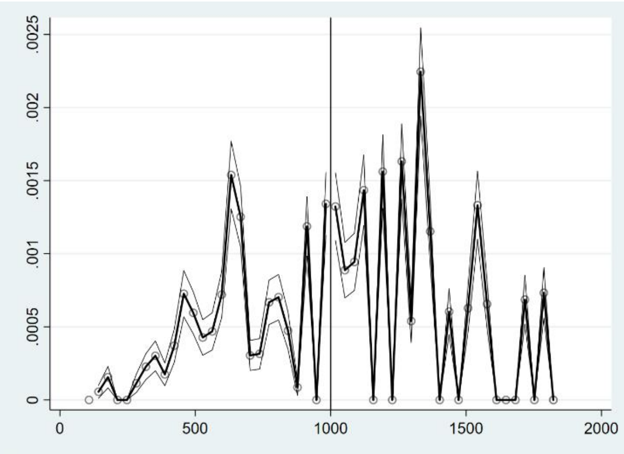
Figure 1. Births distribution across thresholds

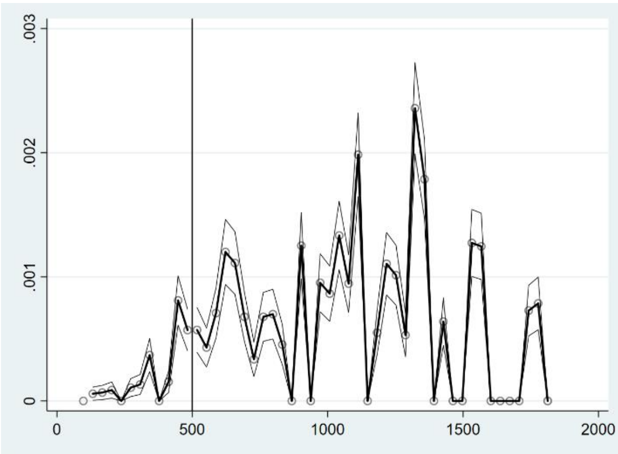
Panel A. Total sample: cut-off 500



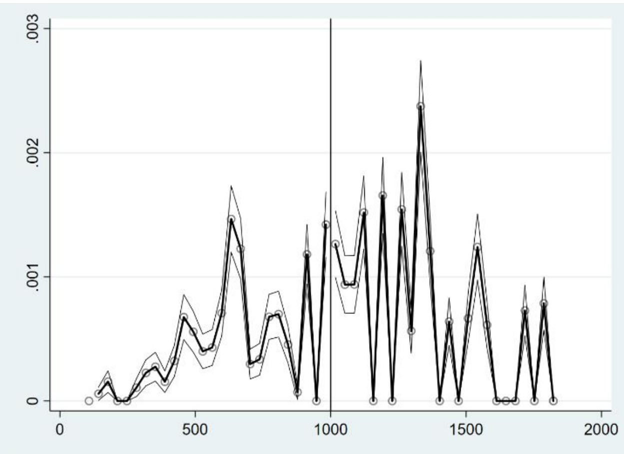
Panel B. Total sample: cut-off 1000



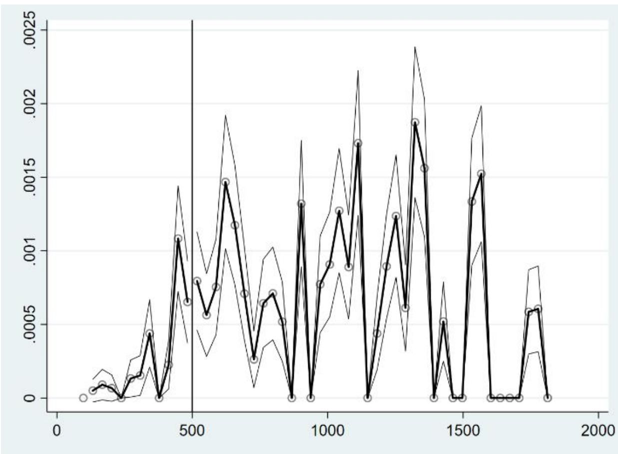
Panel C. Sample of Vaginal births: cut-off 500



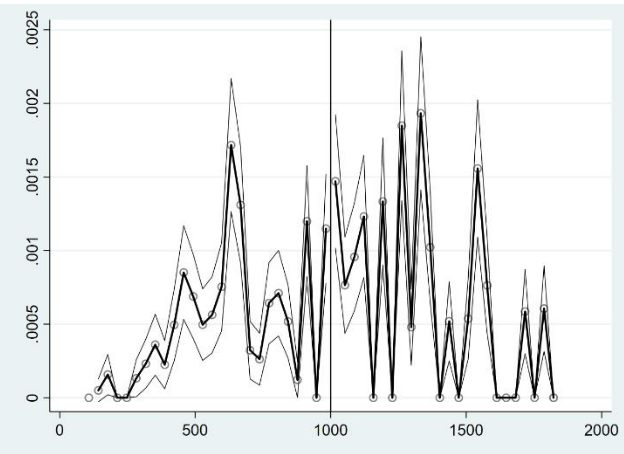
Panel D. Sample of Vaginal births: cut-off 1000



Panel E. Sample of C-section births: cut-off 500



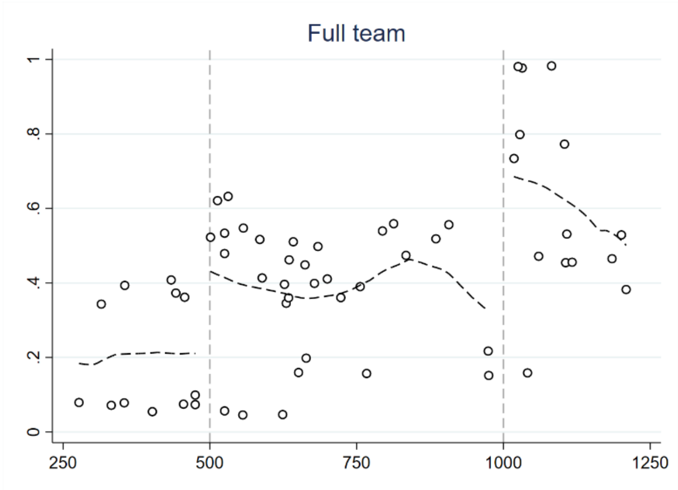
Panel F. Sample of C-section births: cut-off 1000



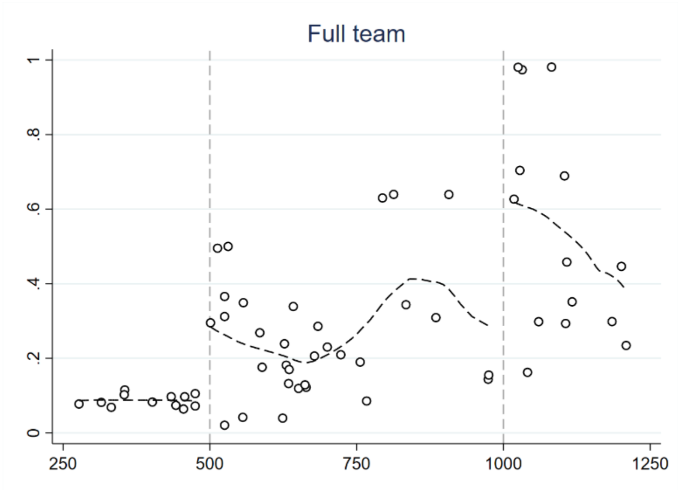
Notes: Each panel represents the estimated discontinuous density functions for the yearly number of births at hospital level (McCrary, 2008). The binsize and bandwidth were chosen using the automatic procedure in DCdensity for Stata (McCrary, 2008). The solid thick line displays the densities of the McCrary (2008) estimator and the solid thin line the associated 95 confidence interval. On the left panels the cut-off point is 500 births per year, while on the right panels the cut-off point is 1000 births. A t-test of the null hypothesis of continuity fails to reject for each panel at any significance level, i.e., the density estimates are consistent with continuity at the thresholds.

Figure 2. Presence of full team during delivery

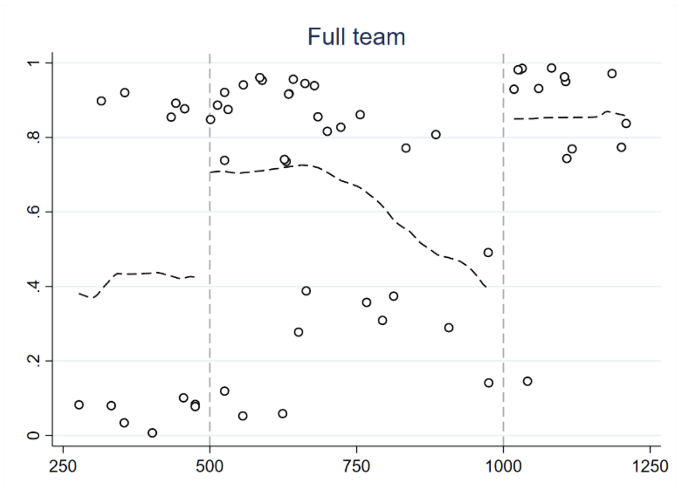
Panel A. Total sample



Panel B. Sample of vaginal deliveries

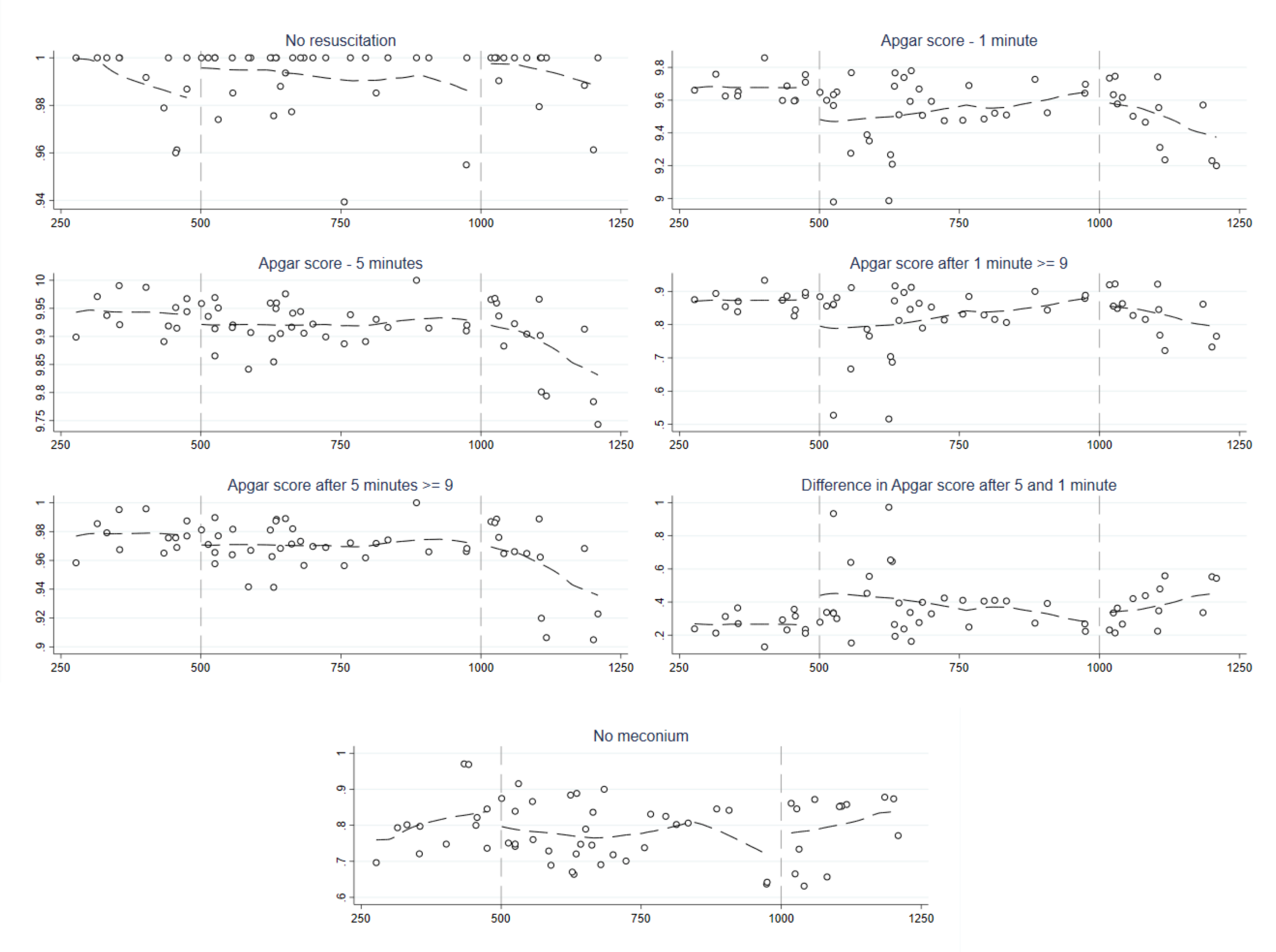


Panel C. Sample of C-sections



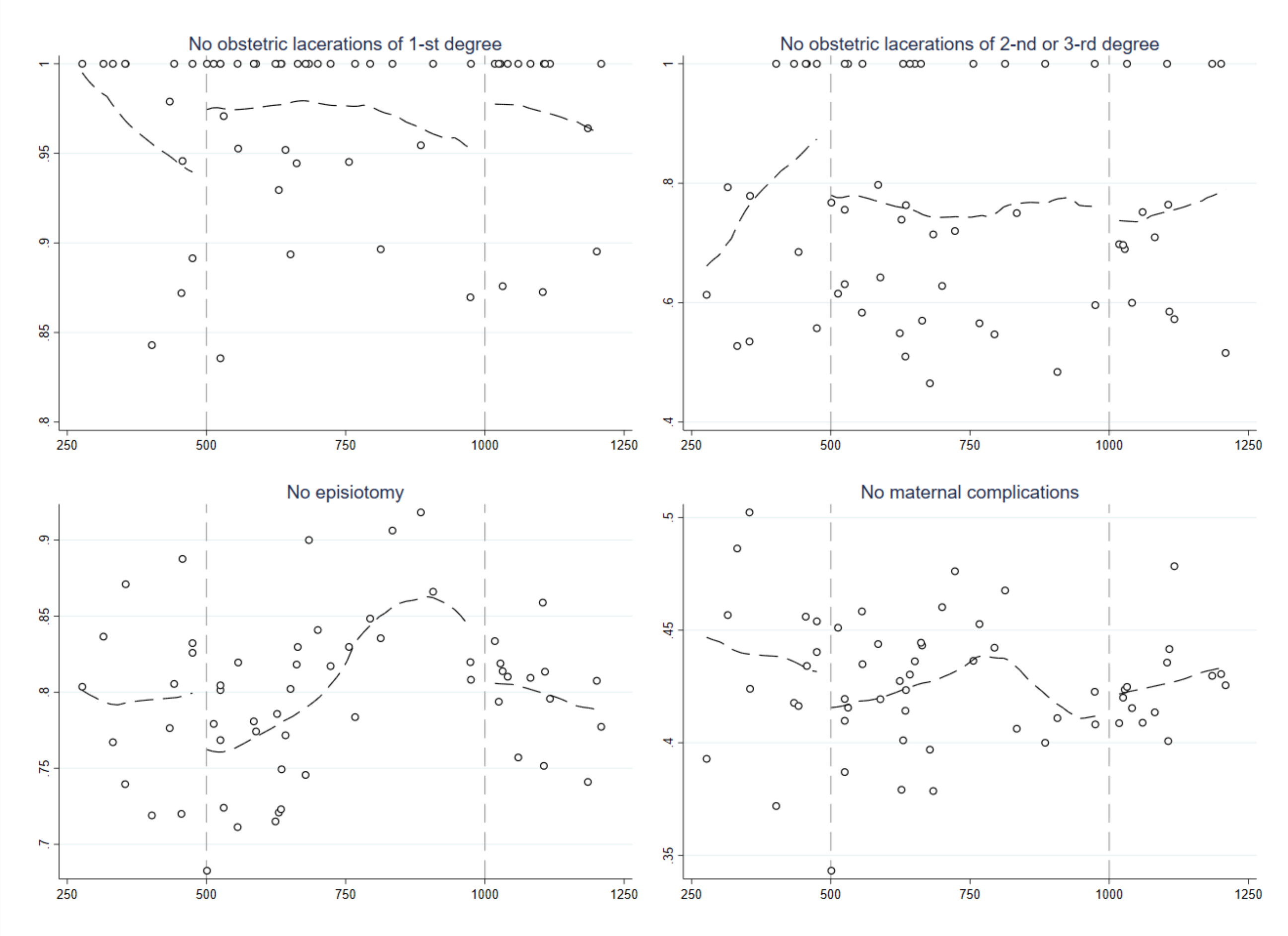
Notes: Each panel represents the annual share of births attended by a full team at hospital level. The y-axis measures the proportion of total (in panel A), vaginal (in panel B) and caesarean (in panel C) births attended by a full team. The x-axis measures the number of births per year. Each point is a hospital-year. The two thresholds are at 500 and 1,000 annual births.

Figure 3. Neonatal health outcomes across thresholds



Notes: Each panel represents the average level of newborn health outcomes (for the sample of vaginal births) at hospital level. The neonatal health outcomes considered are: (i) no need for resuscitation; (ii) Apgar score at 1 minute; (iii) Apgar score at 5 minutes; (iv) proportion of Apgar scores at 1 minute greater than 9; (v) proportion of Apgar scores at 5 minutes greater than 9; (vi) difference between Apgar scores at 5 minutes and 1 minute; (vii) proportion of births without meconium. The y-axis measures health outcomes. The x-axis measures the number of births per year. Each point represents a hospital-year. The two thresholds are at 500 and 1,000 annual births. Variables are defined in the Appendix, Table A3.

Figure 4. Maternal health outcomes across thresholds



Notes: Each panel represents the average level of maternal health outcomes (for the sample of vaginal births) at hospital level. The maternal health outcomes considered are: (i) no obstetric laceration of 1st degree; (ii) no obstetric laceration of 2nd or 3rd degree; (iii) no episiotomy; (iv) no maternal complications. The y-axis measures health outcomes. The x-axis measures the number of births per year. Each point represents a hospital-year. The two thresholds are at 500 and 1,000 annual births. Variables are defined in the Appendix, Table A3.

Table 1: Overidentification tests.

	Vaginal deliveries sample	
	(1)	(2)
	500 births	1,000 births
Age	0.3233	0.0740
	(0.248)	(0.329)
Italian	0.0501**	-0.0327
	(0.025)	(0.024)
Primary education	-0.0077	0.0027
	(0.007)	(0.006)
Secondary education	-0.0195	-0.0212
	(0.019)	(0.020)
Degree	0.0272	0.0185
	(0.019)	(0.022)
Employed	0.0375*	-0.0223
	(0.022)	(0.026)
Married	-0.0374**	-0.1270***
	(0.014)	(0.040)
First child	0.0662***	0.0259
	(0.020)	(0.031)
Delivery week	0.1437**	-0.1406*
	(0.065)	(0.073)
Hip replacement	10.2859***	22.5008***
	(3.574)	(4.403)
Newborn head circumference	0.0797	-0.3066**
	(0.127)	(0.124)
No fetal heartbeat monitoring	0.0015	0.0219
	(0.013)	(0.021)
Week-end	-0.0344	-0.0121
	(0.142)	(0.136)
Night shift	-0.0354	0.0173
	(0.198)	(0.179)
Congestion	0.0740**	0.0003
	(0.030)	(0.000)
Km to closest Hospital	-0.1530	1.0790***
	(0.472)	(0.373)
Hospital admissions	-0.0071	-0.0080
	(0.024)	(0.005)
Weigth gain during pregnancy	2.2808***	-3.6053***
	(0.645)	(0.932)
Smoking during pregnancy	0.0082	-0.0324**
	(0.013)	(0.013)
Previous abortion	0.0081	-0.0235*
	(0.014)	(0.012)
Previous miscarriage	0.0239	-0.0179
	(0.023)	(0.018)
Antibiotics during labor	0.0149	-0.0501**
	(0.022)	(0.021)
Uncomplicated Vaginal delivery	0.0309**	0.0015
	(0.012)	(0.011)
Assisted Vaginal delivery	-0.0234	-0.0649*
	(0.041)	(0.036)

Notes: In each row, we estimate an OLS equation where each single mother, delivery, or hospital characteristic is a placebo outcome regressed on the dummy above threshold, equal to one if the hospital has more than 500 (column 1) or 1,000 (column 2) yearly births. In all columns, we include all vaginal deliveries in maternity units that record yearly births within the ±250 bandwidth around the thresholds of 500 and 1,000, respectively. We include the difference (and its square) between the total number of births at the hospital-year level and the closest threshold (500 or 1,000) in all specifications. The table reports only the coefficient for the above threshold dummy variable. Standard errors (in parentheses) are clustered at the hospital, shift, and weekday level. Appendix Table A3 reports the definition of all variables. Significant levels: *** p<0.01. ** p<0.05. * p<0.1.

Table 2. First stage estimates.

Panel A. 2SLS sample

	(1) *Full sample*	(2) *Vaginal deliveries*	(3) *Emergency C-Section*	(4) *Planned C-Section*
500-999	0.3418***	0.3270***	0.2528***	0.3628***
	(0.050)	(0.069)	(0.063)	(0.088)
Over 1,000	0.7176***	0.7407***	0.4800***	0.6192***
	(0.092)	(0.121)	(0.091)	(0.114)
Mean of FT	0.515	0.395	0.859	0.798
SD of FT	0.500	0.489	0.348	0.401
F-Stat	32.74	18.79	14.23	14.80
Observations	55,840	39,839	2,815	13,186

Panel B. RDD sample – Vaginal deliveries only

	(1) *Discontinuity sample*	(2) *Sample 250-749 births*	(3) *Sample 750-1249 births*
Above thresholds	0.3080***		
	(0.044)		
500-749		0.3641***	
		(0.038)	
1,000-1,249			0.1391***
			(0.046)
Mean of FT	0.379	0.379	0.508
SD of FT	0.485	0.485	0.500
Observations	24,818	9,754	15,064

Notes: Panel A reports the estimation of equation (2), while Panel B the results for equation (4) where the dependent variable is the endogenous variable *Full Team FT*. The estimates in Panel A are based on the 2SLS sample. The dummy variables '500-999' and 'Over 1,000' are one if the birth took place in a maternity unit with an annual number of births in the corresponding interval, and zero otherwise. The estimates in Panel B are based on the RDD samples: the discontinuity sample in column (1), including all deliveries in maternity units recording annual births within the ±250 range around the thresholds of 500 and 1,000; all deliveries in maternity units recording annual births within the ±250 range around the threshold of 500 (250-749) in column (2); all deliveries in maternity units recording annual births within the ±250 range around the threshold of 1,000 (750-1,250) in column (3). The dummy variables ''; '500-749' and '1,000-1,249' equal one if the delivery took place in a maternity unit with an annual number of births in the corresponding interval, and zero otherwise. In all specifications, we also include mother's characteristics (age, nationality, level of education, employment status, mother's marital status, whether this is the woman's first birth, week of delivery, whether the woman had any hospitalisation during pregnancy, weight gain during pregnancy, smoking, experience of previous abortion and previous miscarriage, distance to nearest hospital) and delivery characteristics (type of delivery, newborn head circumference, fetal heart rate monitoring, weekend delivery, night shift delivery, delivery on a busy day, antibiotics during labour), hospital characteristics (proportion of femoral neck fractures treated within two days), local health authority, month and year fixed effects. Standard errors are clustered at hospital, shift and weekday level. Significant levels: *** p<0.01. ** p<0.05. * p<0.1

Table 3. Effect of a full team on neonatal health outcomes - 2SLS estimates.

	No resusc (1)	Apgar1 (2)	Apgar5 (3)	Apgar1≥9 (4)	Apgar5≥9 (5)	ΔApgar (6)	NoMecon (7)
Panel A (All deliveries)							
FT	0.0215***	-0.3998***	-0.1426***	-0.0904**	-0.0499***	0.2488***	-0.0227
	(0.007)	(0.119)	(0.050)	(0.037)	(0.017)	(0.081)	(0.041)
Mean of Y	0.991	9.519	9.883	0.834	0.958	0.365	0.849
SD of Y	0.0970	1.233	0.627	0.373	0.202	0.968	0.358
F-Stat	32.74	33.40	33.35	33.40	33.35	33.36	32.74
J-Stat	4.169	1.296	7.461	1.363	7.964	0.00265	7.923
J-pval	0.0412	0.255	0.00630	0.243	0.00477	0.959	0.00488
Observations	55,840	54,189	54,180	54,189	54,180	54,152	55,840
Panel B (Vaginal deliveries)							
FT	0.0172**	-0.4004***	-0.1368***	-0.1102***	-0.0506***	0.2602***	-0.0149
	(0.007)	(0.123)	(0.047)	(0.041)	(0.018)	(0.087)	(0.050)
Mean of Y	0.992	9.572	9.900	0.848	0.963	0.328	0.816
SD of Y	0.0906	1.151	0.572	0.359	0.189	0.916	0.388
F-Stat	18.79	19.44	19.45	19.44	19.45	19.43	18.79
J-Stat	2.543	0.0762	2.779	0.263	2.640	0.243	8.189
J-pval	0.111	0.783	0.0955	0.608	0.104	0.622	0.00422
Observations	39,839	38,763	38,753	38,763	38,753	38,738	39,839
Panel C (Emergency C-Sections)							
FT	0.0498	-0.5610	-0.0619	-0.0553	0.0170	0.4703	0.0526
	(0.049)	(0.541)	(0.335)	(0.139)	(0.107)	(0.385)	(0.109)
Mean of Y	0.977	9.034	9.697	0.709	0.898	0.677	0.877
SD of Y	0.151	1.804	1.024	0.454	0.303	1.270	0.329
F-Stat	14.23	13.56	13.45	13.56	13.45	13.56	14.23
J-Stat	4.033	0.00252	2.506	0.209	1.941	1.475	2.595
J-pval	0.0446	0.960	0.113	0.647	0.164	0.224	0.107
Observations	2,815	2,718	2,722	2,718	2,722	2,716	2,815
Panel D (Planned C-Sections)							
FT	0.0243	-0.2143	-0.0932	0.0001	-0.0294	0.0843	-0.0503
	(0.016)	(0.223)	(0.098)	(0.075)	(0.030)	(0.172)	(0.035)
Mean of Y	0.990	9.469	9.875	0.816	0.955	0.408	0.942
SD of Y	0.100	1.287	0.657	0.387	0.207	1.024	0.234
F-Stat	14.80	15	14.97	15	14.97	15.01	14.80
J-Stat	3.209	5.116	11.07	1.985	13.22	1.569	0.197
J-pval	0.0733	0.0237	0.000876	0.159	0.000276	0.210	0.657
Observations	13,186	12,708	12,705	12,708	12,705	12,698	13,186

Notes: Each column presents the IV estimation of Equation (1). The dependent variables are No Resusc (equal to one if the newborn did not need any resuscitation, and zero otherwise) in column (1); Apgar1 for Apgar scores after one minute (ranging from 0 to 10) in column (2); Apgar5 for Apgar scores after five minutes (ranging from 0 to 10) in column (3); Apgar1 ≥9 (equal to one for Apgar 1 greater than nine, and zero otherwise), in column (4); and Apgar5≥9 (equal to one for Apgar 5 greater than nine, and zero otherwise), in column(5); ΔApgar (the difference between Apgar5 and Apgar1) in column (6); No Mecon (a binary variable equal to one if no meconium is present at birth, and zero otherwise) in column (7). FT is the Full team variable. In all specifications, we also include mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (type of delivery, newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The instrumental variables are dummies for the two threshold '500-999' and 'Above 1,000'.The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table 4. Effect of a full team on maternal health outcomes - 2SLS estimates.

	No obstetric lacerations 1st degree	No obstetric lacerations 2nd-3rd degree	No episiotomy	No other complications
	(1)	(2)	(3)	(4)
Panel A (All deliveries)				
FT	-0.0009	0.0816***	-0.1452***	-0.0258
	(0.009)	(0.024)	(0.047)	(0.023)
Mean of Y	0.975	0.826	0.560	0.438
SD of Y	0.155	0.379	0.496	0.496
F-Stat	32.74	32.74	32.74	32.74
J-Stat	0.0558	2.520	0.565	0.0113
J-pval	0.813	0.112	0.452	0.915
Observations	55,840	55,840	55,840	55,840
Panel B (Vaginal deliveries)				
FT	-0.0028	0.0917***	-0.2021***	-0.0114
	(0.012)	(0.030)	(0.067)	(0.026)
Mean of Y	0.965	0.756	0.786	0.434
SD of Y	0.183	0.430	0.410	0.496
F-Stat	18.79	18.79	18.79	18.79
J-Stat	0.785	2.147	0.0301	0.579
J-pval	0.375	0.143	0.862	0.447
Observations	39,839	39,839	39,839	39,839
Panel C (Emergency C-Sections)				
Full team	-	-	-0.0132	-0.0014
	-	-	(0.044)	(0.146)
Mean of Y	1	0.999	0.0139	0.428
SD of Y	0.0178	0.0356	0.117	0.495
F-Stat			14.23	14.23
J-Stat			0.839	0.268
J-pval			0.360	0.605
Observations	2,815	2,815	2,815	2,815
Panel D (Planned C-Sections)				
FT	-	-	0.0037	-0.0392
	-	-	(0.003)	(0.054)
Mean of Y	1	1	0.000893	0.452
SD of Y	0.00829	0.0144	0.0299	0.498
F-Stat			14.80	14.80
J-Stat			0.741	4.297
J-pval			0.389	0.0382
Observations	13,186	13,186	13,186	13,186

Notes: Each column presents the IV estimation results for Equation (1). The dependent variables are No Obstetric lacerations - 1st degree (equal to one if the woman did not experience any 1st-degree lacerations, and zero otherwise) in column (1); No Obstetric lacerations - 2nd-3rd degree (equal to one if the woman did not experience any 2nd/3rd-degree lacerations, and zero otherwise) in column (2); No episiotomy (equal to one if the woman did not experience any episiotomy) in column (3); No other complications (equal to one if the hospital stay was equal to or less than two days, and zero otherwise), in column (4). FTis the Full Team variable. In all specifications, we also include mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (type of delivery, newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The instrumental variables are dummies for the two threshold '500-999' and 'Above 1,000'. The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table 5. Effect of a full team on neonatal health outcomes – RDD reduced form estimates on the vaginal delivery sample.

	No resusc	Apgar1	Apgar5	Apgar1≥9	Apgar5≥ 9	ΔApgar	NoMecon
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A - Discontinuity sample							
Above threshold	0.0033	-0.0862**	-0.0207	-0.0239	-0.0091	0.0617**	0.0014
	(0.004)	(0.038)	(0.016)	(0.014)	(0.006)	(0.029)	(0.024)
Mean of Y	0.992	9.551	9.906	0.840	0.965	0.356	0.787
SD of Y	0.0892	1.173	0.550	0.366	0.184	0.951	0.410
Observations	24,818	24,029	24,028	24,029	24,028	24,017	24,818
Panel B - Sample 250-749 births							
Above threshold	0.0100**	-0.0664	-0.0003	-0.0123	-0.0034	0.0564*	-0.0805**
	(0.004)	(0.046)	(0.021)	(0.014)	(0.007)	(0.032)	(0.037)
Mean of Y	0.993	9.605	9.928	0.850	0.974	0.324	0.771
SD of Y	0.0824	1.054	0.492	0.357	0.160	0.876	0.420
Observations	9,754	9,559	9,561	9,559	9,561	9,556	9,754
Panel C - Sample 750-1249 births							
Above threshold	0.0030	-0.2108***	-0.0535*	-0.1021***	-0.0292*	0.1584***	0.0727*
	(0.005)	(0.066)	(0.031)	(0.025)	(0.015)	(0.057)	(0.042)
Mean of Y	0.991	9.517	9.893	0.834	0.959	0.376	0.796
SD of Y	0.0931	1.240	0.582	0.372	0.197	0.993	0.403
Observations	15,064	14,470	14,467	14,470	14,467	14,461	15,064

Notes: Each column presents the reduced form estimates for Equation (3). Panel A shows results from the sample, including all deliveries in maternity units that record yearly births within the ±250 bandwidth around the thresholds of 500 and 1,000. In Panel B, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 500 threshold (250-749). In Panel C, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 1,000 threshold (750-1,250). In all specifications, we include the following set of controls: the difference (and its square) between the total number of births at the hospital-year level and the closest threshold (500 or 1,000); mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (type of delivery, newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table 6. Effect of full team maternal health outcomes – RDD Reduced form estimates on the vaginal delivery sample.

	No obstetric lacerations 1st degree	No obstetric lacerations 2nd-3rd degree	No episiotomy	No other complications
	(1)	(2)	(3)	(4)
Panel A Discontinuity sample				
Above threshold	0.0056	0.0276	-0.0475***	-0.0049
	(0.007)	(0.021)	(0.017)	(0.014)
Mean of Y	0.969	0.761	0.798	0.427
SD of Y	0.172	0.427	0.401	0.495
Observations	24,818	24,818	24,818	24,818
Panel B Sample 250-749 births				
Above threshold	-0.0050	-0.0031	-0.0998***	-0.0244
	(0.008)	(0.029)	(0.019)	(0.020)
Mean of Y	0.974	0.773	0.787	0.429
SD of Y	0.159	0.419	0.409	0.495
Observations	9,754	9,754	9,754	9,754
Panel C Sample 750-1249 births				
Above threshold	-0.0112	0.0808**	-0.0064	0.0471**
	(0.013)	(0.034)	(0.019)	(0.021)
Mean of Y	0.967	0.753	0.805	0.426
SD of Y	0.180	0.431	0.396	0.495
Observations	15,064	15,064	15,064	15,064

Notes: Each column presents the reduced form estimates for Equation (3). Panel A shows results from the sample, including all deliveries in maternity units that record yearly births within the ±250 bandwidth around the thresholds of 500 and 1,000. In Panel B, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 500 threshold (250-749). In Panel C, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 1,000 threshold (750-1,249). In all specifications, we include the following set of controls: the difference (and its square) between the total number of births at the hospital-year level and the closest threshold (500 or 1,000); mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (type of delivery, newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table 7. Effect of a full team on additional outcomes. RDD Reduced form results

	Emergency C-section	Assisted vaginal delivery	Breastfeeding	No Kristeller	Spontaneous afterbirth	No oxytocin	No prostaglandins	No amniorrhexis
	All deliveries		*Vaginal deliveries*					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A - Discontinuity sample								
Above threshold	-0.0142*	0.0100*	-0.0835***	0.0357**	-0.0179	-0.0298***	-0.0195	-0.0164*
	(0.008)	(0.006)	(0.015)	(0.017)	(0.048)	(0.011)	(0.015)	(0.009)
Mean of Y	0.0514	0.0406	0.858	0.900	0.900	0.894	0.850	0.960
SD of Y	0.221	0.197	0.349	0.301	0.299	0.308	0.357	0.196
Observations	35,067	35,067	24,818	24,818	24,818	24,818	24,818	24,818
Panel B -Sample 250-749 births								
Above threshold	-0.0405***	0.0207**	-0.1150***	0.1349***	-0.0879**	-0.0388***	-0.0079	-0.0255**
	(0.009)	(0.009)	(0.020)	(0.023)	(0.041)	(0.014)	(0.023)	(0.010)
Mean of Y	0.0529	0.0391	0.856	0.891	0.899	0.909	0.836	0.972
SD of Y	0.224	0.194	0.351	0.311	0.301	0.287	0.371	0.164
Observations	14,281	14,281	9,754	9,754	9,754	9,754	9,754	9,754
Panel C - Sample 750-1249 births								
Above threshold	-0.0020	0.0069	-0.0048	-0.0794***	0.2091***	-0.0699***	-0.0674***	-0.0590***
	(0.011)	(0.008)	(0.018)	(0.015)	(0.065)	(0.025)	(0.020)	(0.018)
Mean of Y	0.0505	0.0415	0.859	0.905	0.902	0.885	0.858	0.952
SD of Y	0.219	0.199	0.348	0.294	0.298	0.319	0.349	0.213
Observations	20,786	20,786	15,064	15,064	15,064	15,064	15,064	15,064

Notes: Each column presents the reduced form estimates for Equation (3). Panel A shows results from the sample, including all deliveries in maternity units that record yearly births within the ±250 bandwidth around the thresholds of 500 and 1,000. In Panel B, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 500 threshold (250-749). In Panel C, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 1,000 threshold (750-1,250). In all specifications, we include the following set of controls: the difference (and its square) between the total number of births at the hospital-year level and the closest threshold (500 or 1,000); mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (type of delivery, newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table 8. Placebo outcomes

	Low birth weight	Birth weight	Gestational week
	(1)	(2)	(3)
Panel A - Discontinuity sample			
Above threshold	-0.0027	47.2432***	0.0305
	(0.003)	(12.328)	(0.042)
Mean of Y	0.667	3300	39.36
SD of Y	0.471	431.3	1.481
Observations	24,865	24,816	24,803
Panel B - Sample 250-749 births			
Above threshold	-0.0065	28.1288	0.1197
	(0.006)	(20.583)	(0.070)
Mean of Y	0.660	3312	39.37
SD of Y	0.474	427.5	1.420
Observations	9,760	9,753	9,747
Panel C - Sample 750-1249births			
Above threshold	0.0023	45.8912**	-0.0382
	(0.005)	(19.883)	(0.068)
Mean of Y	0.671	3293	39.36
SD of Y	0.470	433.5	1.517
Observations	15,105	15,063	15,056

Notes: Each column presents the reduced form estimates for Equation (3) for the vaginal deliveries sample. Panel A shows results from the sample, including all deliveries in maternity units that record yearly births within the ±250 bandwidth around the thresholds of 500 and 1,000. In Panel B, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 500 threshold (250-749). In Panel C, we include all deliveries in maternity units that record yearly births within the ±250 bandwidth around the 1,000 threshold (750-1,249). In all specifications, we include the following set of controls: the difference (and its square) between the total number of births at the hospital-year level and the closest threshold (500 or 1,000); mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table 9. Heterogeneity analysis: reduced form results on neonatal health

	No resusc	Apgar 1	Apgar 5	Apgar 1 ≥ 9	Apgar 5 ≥ 9	ΔApgar	No Mecon
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A				**Weekends**			
Sample 250-749 yearly births							
Above threshold	0.0140	0.0218	0.0760**	0.0213	0.0208*	0.0250	-0.0362
	(0.009)	(0.074)	(0.031)	(0.026)	(0.011)	(0.064)	(0.045)
Mean of Y	0.992	9.528	9.898	0.825	0.965	0.377	0.799
SD of Y	0.0888	1.174	0.610	0.380	0.185	0.941	0.401
Observations	3,325	3,248	3,249	3,248	3,249	3,246	3,325
Sample 750-1249 yearly births							
Above threshold	0.0041	-0.1816**	-0.0146	-0.1037***	-0.0116	0.1690**	0.0777*
	(0.006)	(0.083)	(0.042)	(0.035)	(0.016)	(0.066)	(0.038)
Mean of Y	0.992	9.492	9.893	0.826	0.960	0.400	0.810
SD of Y	0.0877	1.274	0.591	0.379	0.195	0.995	0.392
Observations	5,218	5,008	5,004	5,008	5,004	5,004	5,218
Panel B				**Workdays**			
Sample 250-749 yearly births							
Above threshold	0.0039	0.0080	0.0506**	0.0094	0.0154***	0.0267	-0.0699**
	(0.004)	(0.054)	(0.020)	(0.016)	(0.005)	(0.046)	(0.034)
Mean of Y	0.992	9.545	9.912	0.833	0.968	0.368	0.824
SD of Y	0.0909	1.152	0.550	0.373	0.175	0.955	0.381
Observations	10,952	10,714	10,714	10,714	10,714	10,707	10,952
Sample 750-1249 yearly births							
Above threshold	0.0032	-0.1330	-0.0519	-0.0697**	-0.0269*	0.0921	0.0670*
	(0.006)	(0.082)	(0.043)	(0.031)	(0.015)	(0.069)	(0.039)
Mean of Y	0.989	9.482	9.879	0.825	0.955	0.398	0.839
SD of Y	0.104	1.298	0.630	0.380	0.206	1.021	0.367
Observations	15,604	14,929	14,927	14,929	14,927	14,918	15,604
Panel C				**Day shift**			
Sample 250-749 yearly births							
Above threshold	0.0065	0.0355	0.0509**	0.0195	0.0174***	0.0079	-0.0691**
	(0.004)	(0.050)	(0.020)	(0.015)	(0.006)	(0.043)	(0.032)
Mean of Y	0.992	9.548	9.913	0.834	0.969	0.365	0.825
SD of Y	0.0911	1.150	0.548	0.372	0.174	0.954	0.380
Observations	11,765	11,517	11,517	11,517	11,517	11,510	11,765
Sample 750-1249 yearly births							
Above threshold	0.0041	-0.1286*	-0.0104	-0.0714***	-0.0118	0.1193**	0.0666*
	(0.005)	(0.067)	(0.024)	(0.025)	(0.010)	(0.059)	(0.035)
Mean of Y	0.990	9.493	9.888	0.828	0.958	0.395	0.837
SD of Y	0.0986	1.281	0.598	0.377	0.200	1.015	0.369
Observations	17,210	16,476	16,470	16,476	16,470	16,463	17,210

Table 9 - Continued: Heterogeneity analysis: reduced form results on neonatal health outcomes.

	No resusc	Apgar 1	Apgar 5	Apgar 1 ≥ 9	Apgar 5 ≥ 9	ΔApgar	No Mecon
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel D				**Night shift**			
Sample 250-749 yearly births							
Above threshold	0.0055	-0.1488*	0.0632**	-0.0271	0.0088	0.1420**	-0.0488
	(0.011)	(0.076)	(0.030)	(0.026)	(0.015)	(0.055)	(0.049)
Mean of Y	0.992	9.505	9.888	0.818	0.962	0.391	0.784
SD of Y	0.0868	1.195	0.638	0.386	0.192	0.943	0.412
Observations	2,512	2,445	2,446	2,445	2,446	2,443	2,512
Sample 750-1249 yearly births							
Above threshold	0.0023	-0.2462	-0.2079*	-0.1196*	-0.0791**	0.0855	0.0847
	(0.006)	(0.209)	(0.111)	(0.068)	(0.034)	(0.136)	(0.067)
Mean of Y	0.988	9.446	9.856	0.813	0.950	0.415	0.809
SD of Y	0.107	1.344	0.716	0.390	0.218	1.013	0.393
Observations	3,612	3,461	3,461	3,461	3,461	3,459	3,612
Panel E				**Native mother**			
Sample 250-749 yearly births							
Above threshold	0.0038	0.0183	0.0701***	0.0140	0.0210***	0.0437	-0.0541**
	(0.005)	(0.044)	(0.021)	(0.016)	(0.006)	(0.039)	(0.026)
Mean of Y	0.993	9.560	9.916	0.836	0.970	0.357	0.823
SD of Y	0.0818	1.126	0.534	0.370	0.172	0.927	0.382
Observations	9,970	9,738	9,738	9,738	9,738	9,732	9,970
Sample 750-1249 yearly births							
Above threshold	-0.0001	-0.1866**	-0.0635**	-0.0798***	-0.0304**	0.1235*	0.0699**
	(0.005)	(0.078)	(0.024)	(0.029)	(0.012)	(0.069)	(0.034)
Mean of Y	0.990	9.501	9.888	0.830	0.958	0.388	0.839
SD of Y	0.0996	1.266	0.597	0.375	0.201	1.013	0.368
Observations	15,924	15,218	15,216	15,218	15,216	15,210	15,924
Panel F				**Non-native mother**			
Sample 250-749 yearly births							
Above threshold	0.0122	-0.0369	0.0148	0.0021	0.0014	0.0083	-0.0839**
	(0.008)	(0.081)	(0.042)	(0.022)	(0.010)	(0.064)	(0.041)
Mean of Y	0.988	9.496	9.892	0.819	0.963	0.400	0.806
SD of Y	0.108	1.226	0.630	0.385	0.189	1.007	0.395
Observations	4,307	4,224	4,225	4,224	4,225	4,221	4,307
Sample 750-1249 yearly births							
Above threshold	0.0185**	-0.0339	0.0306	-0.0812**	0.0045	0.0999	0.0443
	(0.009)	(0.141)	(0.107)	(0.039)	(0.024)	(0.086)	(0.057)
Mean of Y	0.990	9.431	9.865	0.810	0.953	0.432	0.810
SD of Y	0.102	1.371	0.689	0.392	0.211	1.019	0.392
Observations	4,898	4,719	4,715	4,719	4,715	4,712	4,898

Notes: The table shows the reduced form estimates for Equation (3) for the sample of vaginal deliveries. Panel A shows results for the weekends, separately for the maternity units that record a yearly number of births within the ±250 bandwidth around the 500 threshold (Sample 250-749) and maternity units that record a yearly number of births within the ±250 bandwidth around the 1,000 threshold (sample 750-1,249). Panel B, C, D, E, and F show results for workdays, day shifts, night shifts, and native and non-native mothers, respectively. In all specifications, we include the following set of controls: the difference (and its square) between the total number of births at the hospital-year level and the closest threshold (500 or 1,000), mothers, delivery, and hospital characteristics, local health authority, month and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01. ** p<0.05. * p<0.1

Table 10. Heterogeneity analysis: reduced form results on maternal health outcomes.

	No obstetric lacerations 1st degree (1)	No obstetric lacerations 2nd-3rd degree (2)	No episiotomy (3)	No other complications (4)
Panel A		**Weekends**		
Sample 250-749 yearly births				
Above threshold	0.0164	-0.0212	-0.0537**	-0.0111
	(0.015)	(0.030)	(0.025)	(0.039)
Mean of Y	0.976	0.821	0.621	0.434
SD of Y	0.153	0.384	0.485	0.496
Observations	3,325	3,325	3,325	3,325
Sample 750-1249 yearly births				
Above threshold	0.0026	0.0353	0.0442*	-0.0253
	(0.014)	(0.050)	(0.026)	(0.048)
Mean of Y	0.973	0.799	0.661	0.431
SD of Y	0.161	0.401	0.473	0.495
Observations	5,218	5,218	5,218	5,218
Panel B		**Workdays**		
Sample 250-749 yearly births				
Above threshold	-0.0102	0.0186	-0.0672***	-0.0207
	(0.006)	(0.028)	(0.015)	(0.016)
Mean of Y	0.984	0.853	0.511	0.432
SD of Y	0.124	0.354	0.500	0.495
Observations	10,952	10,952	10,952	10,952
Sample 750-1249 yearly births				
Above threshold	-0.0071	0.0537	-0.0195	0.0270
	(0.013)	(0.033)	(0.017)	(0.023)
Mean of Y	0.976	0.829	0.557	0.428
SD of Y	0.152	0.376	0.497	0.495
Observations	15,604	15,604	15,604	15,604
Panel C		**Day shift**		
Sample 250-749 yearly births				
Above threshold	-0.0057	0.0024	-0.0680***	-0.0276*
	(0.007)	(0.026)	(0.015)	(0.015)
Mean of Y	0.982	0.849	0.520	0.432
SD of Y	0.132	0.358	0.500	0.495
Observations	11,765	11,765	11,765	11,765
Sample 750-1249 yearly births				
Above threshold	-0.0003	0.0441	-0.0144	-0.0043
	(0.012)	(0.029)	(0.017)	(0.023)
Mean of Y	0.976	0.826	0.572	0.428
SD of Y	0.152	0.379	0.495	0.495
Observations	17,210	17,210	17,210	17,210

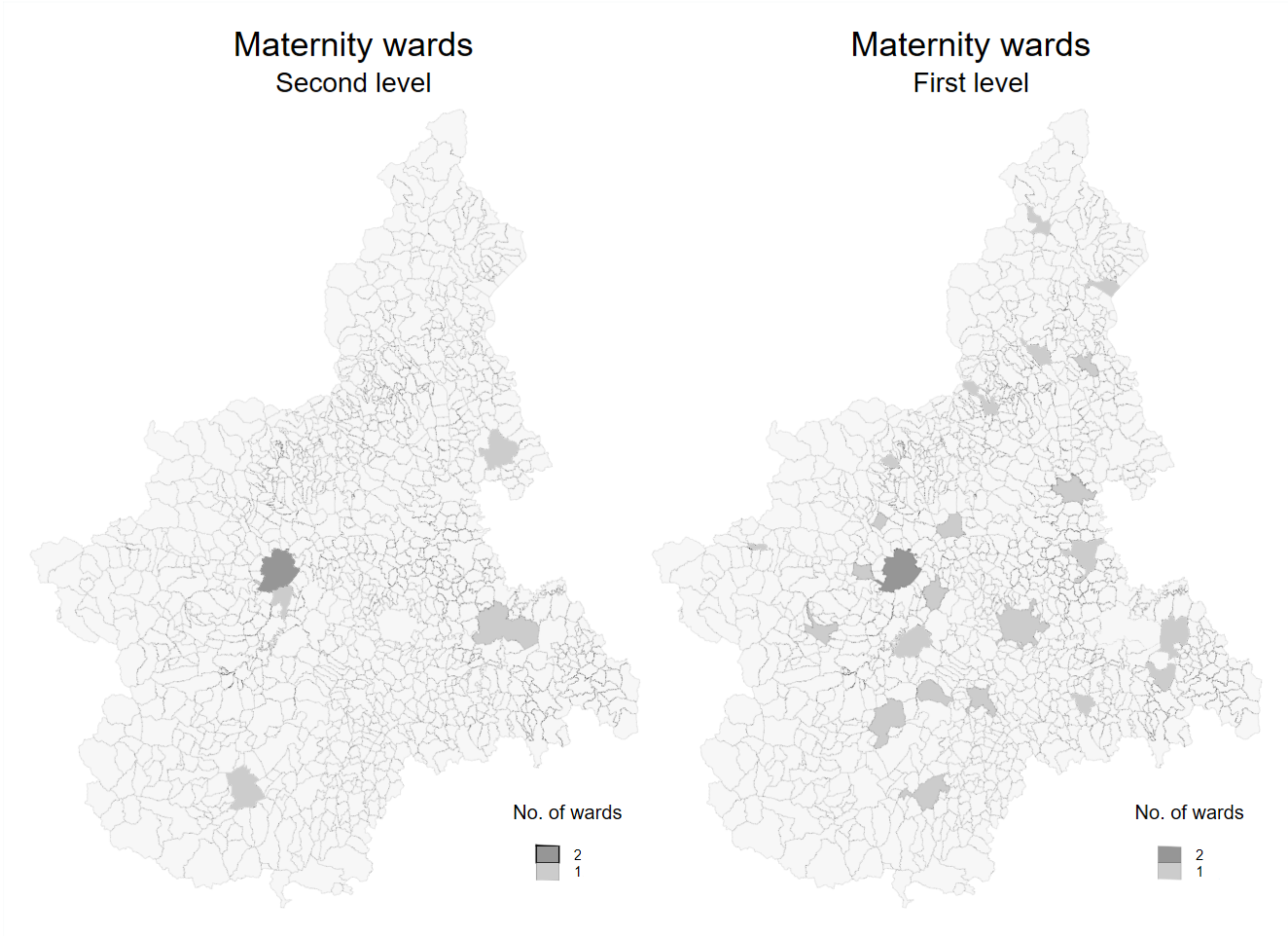
Table 10 - Continued: Heterogeneity analysis: reduced form results on maternal health outcomes

	No obstetric laceration 1-st degree	No obstetric laceration 2nd-3rd degree	No episiotomy	No other complications
	(1)	(2)	(3)	(4)
Panel D		**Night shift**		
Sample 250-749 yearly births				
Above threshold	0.0046	0.0221	-0.0396	0.0177
	(0.006)	(0.030)	(0.029)	(0.041)
Mean of Y	0.983	0.831	0.618	0.432
SD of Y	0.131	0.375	0.486	0.495
Observations	2,512	2,512	2,512	2,512
Sample 750-1249 yearly births				
Above threshold	-0.0247	0.0725	0.0413	0.0877*
	(0.016)	(0.064)	(0.029)	(0.044)
Mean of Y	0.973	0.802	0.637	0.431
SD of Y	0.162	0.398	0.481	0.495
Observations	3,612	3,612	3,612	3,612
Panel E		**Native mother**		
Sample 250-749 yearly births				
Above threshold	-0.0015	0.0130	-0.0495***	-0.0271*
	(0.006)	(0.023)	(0.015)	(0.016)
Mean of Y	0.983	0.845	0.539	0.435
SD of Y	0.129	0.362	0.498	0.496
Observations	9,970	9,970	9,970	9,970
Sample 750-1249 yearly births				
Above threshold	-0.0011	0.0499*	0.0050	0.0169
	(0.010)	(0.029)	(0.016)	(0.022)
Mean of Y	0.976	0.821	0.583	0.429
SD of Y	0.152	0.383	0.493	0.495
Observations	15,924	15,924	15,924	15,924
Panel F		**Non-native mother**		
Sample 250-749 yearly births				
Above threshold	-0.0098	-0.0060	-0.0968***	-0.0041
	(0.009)	(0.034)	(0.021)	(0.029)
Mean of Y	0.981	0.846	0.532	0.427
SD of Y	0.137	0.361	0.499	0.495
Observations	4,307	4,307	4,307	4,307
Sample 750-1249 yearly births				
Above threshold	-0.0128	0.0512	-0.0427	-0.0070
	(0.017)	(0.039)	(0.036)	(0.044)
Mean of Y	0.974	0.824	0.584	0.426
SD of Y	0.160	0.381	0.493	0.495
Observations	4,898	4,898	4,898	4,898

Notes: The table shows the IV estimates for Equation (3) for the sample of vaginal deliveries. Panel A shows results for weekend births, separately for the maternity units that record a yearly number of births within the ±250 bandwidth around the 500 threshold (Sample 250-749) and maternity units that record a yearly number of births within the ±250 bandwidth around the 1,000 threshold (sample 750-1,249). Similarly, Panels B, C, D, E, and F show results for workdays, day shifts, night shifts, and native and non-native mothers. In all specifications, we include the following set of controls: the difference (and its square) between the total number of births at the hospital-year level and the closest threshold (500 or 1,000), mothers, delivery, and hospital characteristics, local health authority, month and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. *Mean of Y* and *SD of Y* report the dependent variable's sample mean and standard deviation, respectively. *Observations* report the number of observations included in the estimation. Significant levels: *** p<0.01. ** p<0.05. * p<0.1.

APPENDIX

Figure A1. Distribution of first level maternity units in Piedmont



Notes: The figures show all municipalities in Piedmont with second-level (left) and first-level (right) maternity units. The darker grey municipality is the regional capital, Turin. The scale is 1 cm : 20 km.

Figure A2. Mother, delivery and hospital characteristics across thresholds

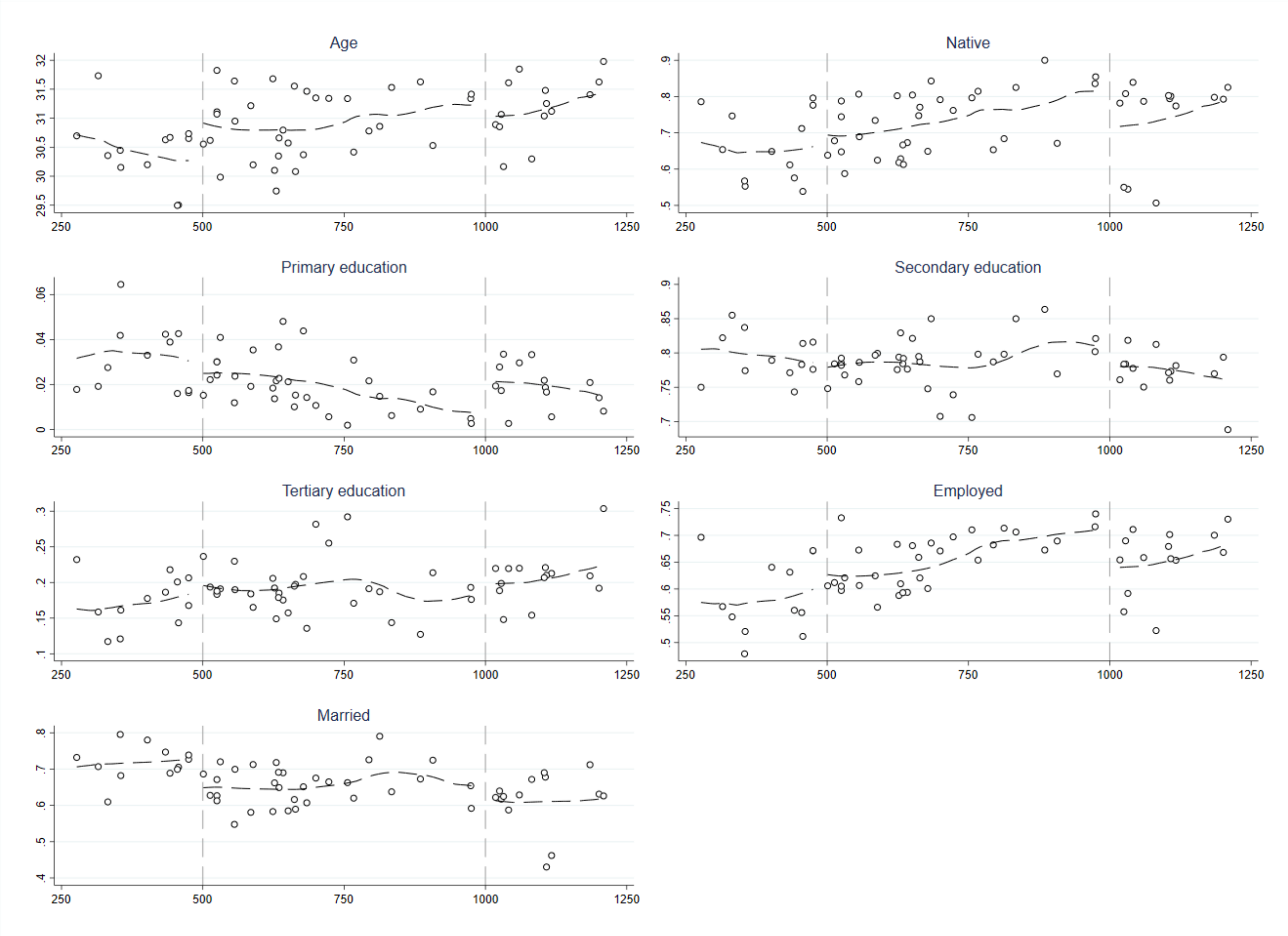
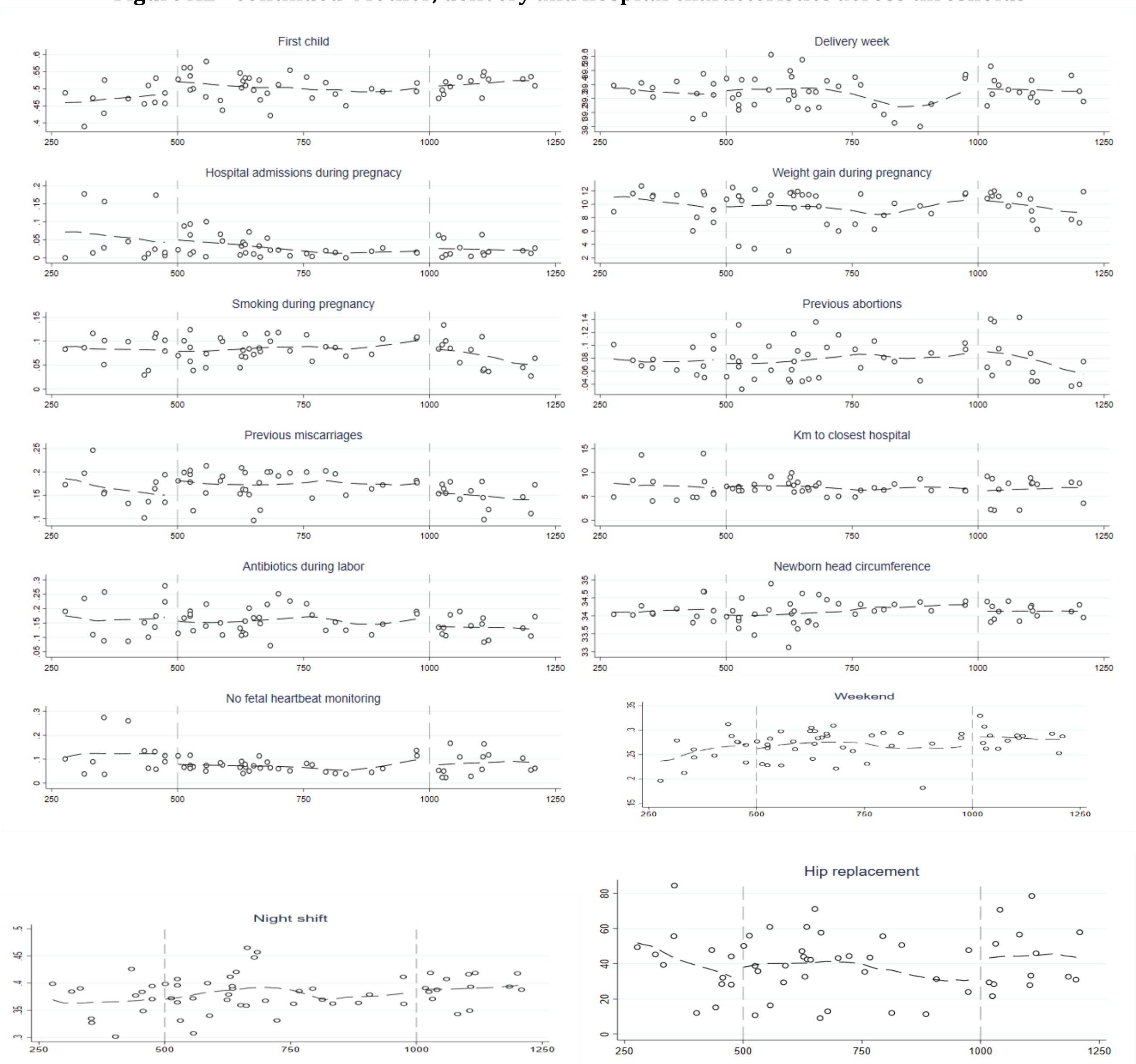
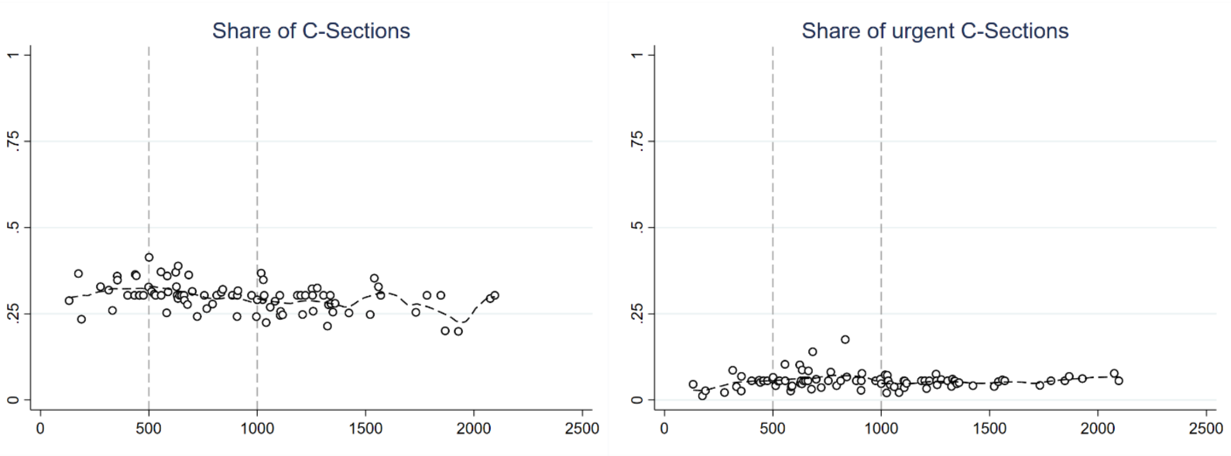


Figure A2 - continued. Mother, delivery and hospital characteristics across thresholds



Notes: Each panel represents the average level of maternal, delivery and hospital (for the vaginal births sample) characteristics at hospital level. The y-axis measures the characteristics of interest. The x-axis measures the number of births per year. Each point represents one hospital-year. The two thresholds are 500 and 1,000 annual births. The last two panels of the Table show the proportions of C-sections and emergency C-sections in the total number of births at the hospital year level against the number of births per year. The variables are defined in Appendix, Table A3.

Figure A3 – Share of C-sections across thresholds



Notes: The figure represents the average share of C-sections (left) and emergency C-sections (right) in the total number of births at the hospital-year level. The x-axis measures the number of births per year. Each point represents one hospital-year. The two thresholds are 500 and 1,000 annual births. The variables are defined in Appendix, Table A3.

Table A1. Legislative provisions

	Maternity care unit level 1			*Maternity care unit level 2*
Yearly Number of deliveries	***≤ 499***	***500-999***	***≥ 1000***	***≥ 1000***
Neonatal Intensive Care Unit (NICU)	No	No	No	Compulsory
Gestational age of mothers (weeks)	≥ 34	≥ 34	≥ 34	Any
Obstetric Emergency Care Unit	No	No	No	Compulsory
Number of beds for obstetric care and hospitalization	No minimum requirement	15	30	It depends on the number of births: 15 beds every 500 annual births.
Number of labor – delivery rooms	No minimum requirement	2	3	It depends on the number of births: 3 rooms below 2,000 annual births; 4 rooms above 2,000 annual births.
Number of midwives per shift	No minimum requirement	2	It depends on the number of births: 3 midwives below 1,500 annual births; 4 midwives for 1,500-1,999 annual birth; and 1 additional midwife every 750 annual births if annual births >2,000.	It depends on the number of births: 3 midwives below 1,500 annual births; 4 midwives for 1,500-1,999 annual births; and 1 additional midwife every 750 annual births if annual births >2,000.
Presence of obstetric-gynecologist personnel	No minimum requirement	24 hours a day	24 hours a day	24 hours a day
Availability of Pediatric – Neonatal care	No minimum requirement	24 hours a day	24 hours a day	24 hours a day

Source: State-Regions conference, 16 December 2010.

Table A2. Sample Restrictions

	Deliveries	Maternity Wards
1-Full sample	104,559	32
of which:		
Vaginal deliveries	*73,087 (70%)*	
C-Section deliveries	*31,472 (30%)*	
2-Only Residence in Piedmont	101,784	32
3-Only First-level maternity wards	63,068	26
4-Data available for all included controls	55,840	26
5-2SLS sample	55,840	26
of which:		
Vaginal deliveries	*39,839 (71%)*	
C-Section deliveries	*16,001 (29%)*	
6-RDD sample	35,640	23
of which:		
Vaginal deliveries	*24,818 (70%)*	
C-Section deliveries	*10,822 (30%)*	

Notes: The table shows the sequential sample restrictions applied from the full sample (top row) to our final samples (2SLS sample and RDD sample). The "Full sample" consists of all births in Piedmont between 1 January 2011 and 31 December 2013. The row "2- Only residence in Piedmont" restricts the sample to women residing within the administrative boundaries of the Piedmont Region. In the row "3- Only First level maternity wards", we restrict our analysis to first level wards, i.e. those without a neonatal intensive care unit that can only treat pregnancies after the 34th week of gestation. The row “4-Data available for all included controls” excludes observations without data for our control variables (maternal, delivery, and hospital characteristics). In the '2SLS sample' we include all observations that meet the exclusion criteria and then split the total number of observations into vaginal births and caesarean sections. In the 'RDD sample' we include all observations for maternity units within the range of 250-1249 births per year.

Table A3. Variables definition

Variable Name	Description and Sources
Dependent variables	
No resusc	Binary variable equal to one if the newborn did not need any treatment with drugs, intubation, cardiac massage, or oxygen at birth. Source: Cedap
Apgar 1	The Apgar score 1 ranges from 0 to 10, assigned based on five criteria: appearance, pulse, grimace, activity, and respiration. It is measured after 1 minute from delivery. Source: Cedap
Apgar 5	The Apgar score 5 ranges from 0 to 10, assigned based on five criteria: appearance, pulse, grimace, activity, and respiration. It is measured after 5 minutes from delivery. Source: Cedap
Apgar1≥9	Binary variable equal to one if the Apgar score 1 is equal to or higher than nine. Source: Cedap
Apgar5≥9	Binary variable equal to one if the Apgar score 5 is equal to or higher than nine. Source: Cedap
ΔApgar	The absolute difference between the Apgar scores measured after five minutes and one minute. Source: Cedap
No Mecon	Binary variable equal to one if no meconium appears. Source: Cedap
No obstetric lacerations 1st degree	Binary variable equal to one if there are no first-degree lacerations. Source: Cedap
No obstetric lacerations 2nd -3rd degree	Binary variable equal to one if there are no second and third degree lacerations. Source: Cedap
No episiotomy	Binary variable equal to one if there has been no episiotomy. Source: Cedap
No other complications	Binary variable equal to one if the number of days of hospitalization is equal to or less than two. Source: Cedap
Additional dependent variables	
Emergency C-section	Binary variable equal to one if the birth was an emergency C-section. Source: Cedap
Assisted Vaginal delivery	Binary variable equal to one if birth was vaginal with forceps or ventouse. Source: Cedap
Breastfeeding	Binary variable equal to one if mother breastfed within 2 hours after birth. Source: Cedap
No Kristeller	Binary variable equal to one if no Kristeller maneuver was performed at birth. Source: Cedap
Spontaneous afterbirth	Binary variable equal to one if afterbirth or placental expulsion was spontaneous. Source: Cedap
No oxytocin	Binary variable equal to one if oxytocin was not used during delivery. Source: Cedap
No prostaglandins	Binary variable equal to one if no prostaglandins were used during delivery. Source: Cedap
No Amniorrhexis	Binary variable equal to one if spontaneous rupture of membranes (ROM) or no amniorrhexis occurred. Source: Cedap
Main explanatory variable	
Full Team	Binary variable equal to one if a full team of professionals involving at least one midwife, a gynecologist, and a pediatrician attended the birth. Source: Cedap

Controls	
Medical conditions and socio-economic characteristics of the mother	
Age	Age of mother at time of birth, in years. Source: Cedap
Native	Binary variable equal to one if the mother has Italian citizenship. Source: Cedap
Primary Education	Binary variable equal to one if the mother has completed primary (or compulsory) education. Source: Cedap
Secondary Education	Binary variable equal to one if the mother has completed secondary education.
Tertiary Education	Binary variable equal to one if the mother has completed tertiary education (university degree or higher). Source: Cedap
Employed	Binary variable equal to one if the mother reports having a job. Source: Cedap
Married	Binary variable equal to one if the mother is married. Source: Cedap
First child	Binary variable equal to one if the mother had no previous children. Source: Cedap
Delivery week	It represents gestational age in number of weeks. Source: Cedap
Hospital admissions during pregnacy	Number of hospital admissions of the mother during the pregnancy. Source: Cedap
Weight gain during pregnacy	A measure (in grams) of the mother's weight gain during pregnancy. Source: Cedap
Smoking during pregnacy	Binary variable equal to one if the woman reports smoking during the pregnancy. Source: Cedap
Previous abortions	Binary variable equal to one if the woman experienced one or more abortions in the past. Source: Cedap
Previous miscarriage	Binary variable equal to one if the woman had at least one miscarriage in the past. Source: Cedap
Km to closest hospital	A measure (in Km) of the distance between the mother's municipality of residence and the nearest hospital. Source: Cedap, Istat
Delivery characteristics	
Antibiotics during labor	Binary variable equal to one if the mother was treated with antibiotics during labor. Source: Cedap
Newborn head circumference	The measure (in mm) of the circumference of the head of the newborn at birth. Source: Cedap
No fetal heartbeat monitoring	Binary variable equal to one if fetal heartbeat monitoring was not performed during the labor. Source: Cedap
Weekend	Binary variable equal to one if the delivery occurred during the weekend. Source: Cedap
Night shift	Binary variable equal to one if the delivery occurred at night (from 12 p.m. to 8 a.m.). Source: Cedap
Congestion	Binary variable equal to one if the birth took place on a congested date, defined as a window of 8 hours around the birth in question (8 hours before and 8 hours after the birth in the given hospital) with a number of births strictly greater than two in that hospital. For hospitals with an annual number of births between 750 and 1,250, the number of births in the time window is strictly greater than three. Source: Cedap
Delivery Method	It is the delivery method. We introduce as a set of four dummy variables for the type of birth delivery: vaginal delivery, assisted vaginal delivery, planned C-Section, and emergency C-section. Source: Cedap

Hospital characteristics	
Hip replacement	The ratio of femoral neck fractures treated within two days. It varies at hospital-year level. Source: Programma Nazionale Valutazione Esiti (P.N.E., literally National Program for the Evaluation of Outcomes)
Yearly Number of Births	Total number of births at hospital level. Source: Programma Nazionale Valutazione Esiti (P.N.E., literally National Program for the Evaluation of Outcomes)

Table A4. Summary statistics

Panel A. All deliveries

	Full Sample		Sample 250-749 yearly births		Sample 750-1249 yearly births	
	Mean	SD	Mean	SD	Mean	SD
Dependent variable						
No need resuscitation	0.991	0.096	0.992	0.090	0.990	0.100
Apgar 1	9.507	1.241	9.541	1.158	9.485	1.292
Apgar 5	9.893	0.599	9.908	0.565	9.883	0.620
Apgar 1≥ 9	0.828	0.378	0.831	0.375	0.826	0.380
Apgar 5 ≥ 9	0.961	0.194	0.968	0.177	0.957	0.204
ΔApgar	0.387	0.990	0.370	0.952	0.398	1.015
No Mecon	0.827	0.379	0.818	0.386	0.832	0.374
No obstetric lacerations 1st degree	0.978	0.146	0.982	0.132	0.976	0.154
No obstetric lacerations 2nd – 3rd deg.	0.831	0.375	0.846	0.361	0.822	0.383
No episiotomy	0.565	0.496	0.537	0.499	0.583	0.493
No other complications	0.430	0.495	0.432	0.495	0.428	0.495
Independent variables						
Full Team	0.496	0.500	0.364	0.481	0.581	0.493
Age	31.374	5.397	31.111	5.476	31.544	5.338
Native	0.738	0.440	0.699	0.459	0.762	0.426
Primary education	0.021	0.144	0.025	0.156	0.019	0.135
Secondary education	0.782	0.413	0.790	0.408	0.778	0.416
Tertiary Education	0.197	0.397	0.185	0.389	0.204	0.403
Employed	0.651	0.477	0.617	0.486	0.673	0.469
Married	0.646	0.478	0.668	0.471	0.632	0.482
First child	0.506	0.500	0.498	0.500	0.511	0.500
Delivery week	39.160	1.583	39.147	1.534	39.169	1.614
Hospital admissions during pregnacy	0.035	0.184	0.048	0.214	0.027	0.161
Weight gain during pregnancy	10.126	6.398	10.296	6.406	10.017	6.391
Smoking during pregnancy	0.080	0.271	0.087	0.282	0.075	0.264
Previous abortions	0.080	0.271	0.080	0.271	0.079	0.270
Previous miscarriages	0.167	0.373	0.176	0.380	0.161	0.368
Km to closest hospital	6.478	5.984	6.824	6.637	6.255	5.511
Antibiotics during labor	0.127	0.333	0.136	0.343	0.121	0.326
Newborn head circumference	34.171	2.388	34.187	2.701	34.160	2.163
No fetal heartbeat monitoring	0.153	0.360	0.157	0.364	0.150	0.357
Weekend	0.243	0.429	0.234	0.424	0.248	0.432
Night shift	0.350	0.477	0.344	0.475	0.354	0.478
Congestion	0.113	0.316	0.286	0.452	0.001	0.034
Hip replacement	39.825	16.720	39.941	17.090	39.747	16.469
Yearly number of births	835.215	253.319	559.583	114.182	1012.396	129.647

Panel B. Vaginal deliveries

	Full Sample		**Sample 250-749 yearly births**		**Sample 750-1249 yearly births**	
	Mean	SD	Mean	SD	Mean	SD
Dependent variable						
No need resuscitation	0.992	0.088	0.993	0.082	0.991	0.093
Apgar 1	9.534	1.174	9.605	1.054	9.517	1.240
Apgar 5	9.907	0.545	9.928	0.492	9.893	0.582
Apgar 1≥ 9	0.831	0.375	0.850	0.357	0.834	0.372
Apgar 5 ≥ 9	0.965	0.184	0.974	0.160	0.959	0.197
ΔApgar	0.374	0.957	0.324	0.876	0.376	0.993
No Mecon	0.790	0.408	0.771	0.420	0.796	0.403
No obstetric lacerations 1st degree	0.969	0.174	0.974	0.159	0.967	0.180
No obstetric lacerations 2nd – 3rd deg.	0.758	0.428	0.773	0.419	0.753	0.431
No episiotomy	0.796	0.403	0.787	0.409	0.805	0.396
No other complications	0.427	0.495	0.429	0.495	0.426	0.495
Independent variables						
Full Team	0.392	0.488	0.199	0.399	0.508	0.500
Age	30.949	5.376	30.619	5.446	31.149	5.324
Native	0.731	0.444	0.689	0.463	0.756	0.429
Primary education	0.021	0.142	0.026	0.159	0.017	0.130
Secondary education	0.778	0.416	0.784	0.412	0.774	0.418
Tertiary Education	0.202	0.401	0.191	0.393	0.209	0.406
Employed	0.651	0.477	0.615	0.487	0.672	0.469
Married	0.647	0.478	0.674	0.469	0.631	0.483
First child	0.507	0.500	0.500	0.500	0.511	0.500
Delivery week	39.362	1.481	39.372	1.420	39.356	1.517
Hospital admissions during pregnacy	0.031	0.174	0.044	0.205	0.024	0.152
Weight gain during pregnancy	10.099	6.340	10.317	6.310	9.967	6.354
Smoking during pregnancy	0.079	0.270	0.087	0.282	0.074	0.262
Previous abortions	0.080	0.272	0.080	0.272	0.080	0.271
Previous miscarriages	0.161	0.368	0.171	0.377	0.155	0.362
Km to closest hospital	6.522	5.991	6.920	6.706	6.281	5.500
Antibiotics during labor	0.155	0.361	0.169	0.375	0.146	0.353
Newborn head circumference	34.132	2.298	34.138	2.473	34.129	2.185
No fetal heartbeat monitoring	0.089	0.285	0.086	0.280	0.092	0.288
Weekend	0.275	0.447	0.268	0.443	0.280	0.449
Night shift	0.385	0.487	0.380	0.485	0.388	0.487
Congestion	0.104	0.305	0.274	0.446	0.001	0.032
Hip replacement	40.154	16.710	40.224	17.004	40.110	16.523
Yearly number of births	844.322	252.133	562.023	114.366	1014.898	129.724
Full team presence:						
- on weekends	0.111	0.302	0.052	0.210	0.139	0.343
- on workdays	0.281	0.444	0.147	0.344	0.369	0.478
- on night shifts	0.131	0.338	0.055	0.222	0.192	0.387
- on day shifts	0.261	0.428	0.144	0.338	0.316	0.461

Panel C. Emergency C-sections

	Full Sample		**Sample 250-749 yearly births**		**Sample 750-1249 yearly births**	
	Mean	SD	Mean	SD	Mean	SD
Dependent variable						
No need resuscitation	0.978	0.148	0.980	0.141	0.976	0.152
Apgar 1	9.066	1.754	9.056	1.687	9.074	1.800
Apgar 5	9.725	0.987	9.727	0.971	9.723	0.998
Apgar 1≥ 9	0.709	0.455	0.690	0.463	0.722	0.448
Apgar 5 ≥ 9	0.908	0.289	0.906	0.292	0.910	0.286
ΔApgar	0.669	1.240	0.693	1.274	0.652	1.216
No Mecon	0.857	0.350	0.833	0.374	0.874	0.332
No obstetric lacerations 1^{st} degree	1.000	0.023	1.000	0.000	0.999	0.029
No obstetric lacerations 2^{nd} – 3^{rd} deg.	0.999	0.032	0.998	0.050	1.000	0.000
No episiotomy	0.016	0.124	0.021	0.145	0.012	0.108
No other complications	0.415	0.493	0.406	0.491	0.420	0.494
Independent variables						
Full Team	0.819	0.385	0.796	0.403	0.834	0.372
Age	31.460	5.242	31.239	5.209	31.608	5.261
Native	0.742	0.438	0.689	0.463	0.777	0.417
Primary education	0.021	0.142	0.028	0.165	0.016	0.124
Secondary education	0.777	0.416	0.779	0.416	0.776	0.417
Tertiary Education	0.202	0.402	0.194	0.395	0.208	0.406
Employed	0.665	0.472	0.638	0.481	0.683	0.466
Married	0.579	0.494	0.586	0.493	0.574	0.495
First child	0.757	0.429	0.759	0.428	0.757	0.429
Delivery week	39.388	1.697	39.448	1.676	39.347	1.710
Hospital admissions during pregnacy	0.043	0.202	0.048	0.214	0.039	0.193
Weight gain during pregnancy	10.440	6.335	10.406	6.330	10.462	6.340
Smoking during pregnancy	0.079	0.270	0.078	0.268	0.080	0.271
Previous abortions	0.081	0.274	0.079	0.270	0.083	0.276
Previous miscarriages	0.158	0.365	0.156	0.363	0.160	0.367
Km to closest hospital	6.797	6.061	6.715	6.434	6.853	5.800
Antibiotics during labor	0.134	0.341	0.135	0.342	0.134	0.340
Newborn head circumference	34.191	2.771	34.237	3.171	34.160	2.467
No fetal heartbeat monitoring	0.452	0.498	0.453	0.498	0.451	0.498
Weekend	0.270	0.444	0.281	0.450	0.263	0.440
Night shift	0.361	0.480	0.361	0.481	0.361	0.481
Congestion	0.112	0.315	0.278	0.448	0.000	0.000
Hip replacement	39.828	16.507	41.572	16.703	38.643	16.274
Yearly number of births	819.212	244.297	563.062	111.894	991.351	132.755

Panel D. Planned C-sections

	Full Sample		**Sample 250-749 yearly births**		**Sample 750-1249 yearly births**	
	Mean	SD	Mean	SD	Mean	SD
Dependent variable						
No need resuscitation	0.990	0.102	0.991	0.097	0.989	0.106
Apgar 1	9.478	1.271	9.481	1.236	9.476	1.298
Apgar 5	9.893	0.609	9.899	0.608	9.888	0.611
Apgar 1≥ 9	0.817	0.387	0.812	0.391	0.821	0.383
Apgar 5 ≥ 9	0.962	0.192	0.965	0.184	0.959	0.198
ΔApgar	0.416	1.031	0.419	1.040	0.413	1.024
No Mecon	0.936	0.244	0.934	0.248	0.938	0.242
No obstetric lacerations 1st degree	1.000	0.010	1.000	0.000	1.000	0.014
No obstetric lacerations 2nd – 3rd deg.	1.000	0.010	1.000	0.016	1.000	0.000
No episiotomy	0.001	0.029	0.001	0.027	0.001	0.031
No other complications	0.442	0.497	0.447	0.497	0.438	0.496
Independent variables						
Full Team	0.733	0.442	0.701	0.458	0.758	0.428
Age	32.603	5.301	32.347	5.408	32.797	5.211
Native	0.757	0.429	0.728	0.445	0.778	0.415
Primary education	0.023	0.150	0.022	0.148	0.023	0.151
Secondary education	0.797	0.403	0.807	0.395	0.789	0.408
Tertiary Education	0.180	0.385	0.171	0.377	0.188	0.391
Employed	0.650	0.477	0.618	0.486	0.674	0.469
Married	0.658	0.475	0.668	0.471	0.650	0.477
First child	0.447	0.497	0.439	0.496	0.453	0.498
Delivery week	38.522	1.675	38.511	1.605	38.530	1.727
Hospital admissions during pregnacy	0.044	0.205	0.059	0.236	0.033	0.177
Weight gain during pregnancy	10.143	6.578	10.218	6.659	10.086	6.517
Smoking during pregnancy	0.082	0.275	0.088	0.283	0.078	0.268
Previous abortions	0.078	0.268	0.079	0.269	0.077	0.266
Previous miscarriages	0.185	0.389	0.191	0.393	0.181	0.385
Km to closest hospital	6.276	5.942	6.597	6.501	6.032	5.469
Antibiotics during labor	0.044	0.206	0.052	0.222	0.039	0.193
Newborn head circumference	34.278	2.551	34.300	3.125	34.261	2.010
No fetal heartbeat monitoring	0.275	0.446	0.279	0.449	0.271	0.445
Weekend	0.141	0.349	0.139	0.346	0.143	0.350
Night shift	0.245	0.430	0.248	0.432	0.243	0.429
Congestion	0.139	0.346	0.321	0.467	0.002	0.044
Hip replacement	38.854	16.736	38.869	17.287	38.842	16.288
Yearly number of births	812.210	257.052	552.596	113.804	1009.204	128.181

Table A5. Team composition percentages

Team Composition	250-499 yearly births	500-749 yearly births	*Difference above – below 500 yearly births*	750-999 yearly births	1000-1249 yearly births	*Difference above – below 1,000 yearly births*
All deliveries						
Midwife-Gynecologist-Pediatrician – Full Team	20.43	42.85	*22.42*	52.57	61.54	*8.97*
Midwife-Pediatrician	0.21	0.56	*0.35*	4.2	5.47	*1.27*
Midwife-Gynecologist	46.94	40.98	*-5.96*	18.87	17.38	*-1.49*
Pediatrician-Gynecologist	13.09	4.36	*-8.73*	10.3	1.82	*-8.47*
Midwife	14.95	8.75	*-6.2*	12.99	10.38	*-2.62*
Gynecologist	3.92	0.94	*-2.98*	0.58	0.12	*-0.47*
Pediatrician	0	0.02	*0.02*	0.04	0.09	*0.04*
Other	0.46	1.54	*1.08*	0.44	3.19	*2.76*
Vaginal deliveries						
Midwife-Gynecologist-Pediatrician - Full Team	8.64	24.32	*15.68*	48.89	51.98	*3.1*
Midwife-Pediatrician	0.31	0.7	*0.39*	5.81	7.31	*1.5*
Midwife-Gynecologist	67.8	59.18	*-8.62*	25.79	22.75	*-3.04*
Pediatrician-Gynecologist	0.17	0.5	*0.33*	0.33	0.39	*0.06*
Midwife	22.07	12.59	*-9.48*	18.05	14.03	*-4.02*
Gynecologist	0.69	1.16	*0.47*	0.6	0.11	*-0.48*
Pediatrician	0	0	*0*	0.02	0.11	*0.1*
Other	0.31	1.54	*1.23*	0.52	3.31	*2.79*
Emergency C-sections						
Midwife-Gynecologist-Pediatrician - Full Team	64.68	85.27	*20.59*	76.31	89.34	*13.03*
Midwife-Pediatrician	0	0.35	*0.35*	0.19	0.62	*0.43*
Midwife-Gynecologist	2.29	0.87	*-1.42*	2.43	2.01	*-0.42*
Pediatrician-Gynecologist	30.28	10.05	*-20.23*	19.78	4.79	*-14.99*
Midwife	0	0.87	*0.87*	0.37	0.93	*0.56*
Gynecologist	1.83	0.17	*-1.66*	0.37	0	*-0.37*
Pediatrician	0	0	*0*	0.19	0	*-0.19*
Other	0.92	2.43	*1.51*	0.37	2.32	*1.95*
Planned C-sections						
Midwife-Gynecologist-Pediatrician - Full Team	40.98	82.19	*41.21*	57.82	86.46	*28.64*
Midwife-Pediatrician	0	0.25	*0.25*	0.1	0.57	*0.47*
Midwife-Gynecologist	3.98	2.08	*-1.9*	1.02	3.35	*2.33*
Pediatrician-Gynecologist	41.74	13.22	*-28.52*	40.05	5.82	*-34.23*
Midwife	0.25	0.35	*0.1*	0.1	0.6	*0.5*
Gynecologist	12.28	0.49	*-11.79*	0.61	0.15	*-0.46*
Pediatrician	0	0.07	*0.07*	0.1	0.03	*-0.07*
Other	0.76	1.34	*0.58*	0.2	3.02	*2.82*

Notes: The table shows the different types of team composition and the proportions in which they appear in the different samples.

Table A6. Effect of a full team on neonatal health outcomes - OLS estimates

	No resusc	Apgar1	Apgar5	Apgar1≥9	Apgar5≥9	ΔApgar	NoMecon
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A - All deliveries	-0.0090***	-0.3319***	-0.1113***	-0.0907***	-0.0407***	0.2230***	-0.0437***
FT	(0.002)	(0.024)	(0.011)	(0.007)	(0.004)	(0.017)	(0.009)
R-squared	0.03	0.08	0.04	0.07	0.05	0.06	0.08
Panel B -Vaginal deliveries							
FT	-0.0126***	-0.4383***	-0.1355***	-0.1242***	-0.0502***	0.3041***	-0.0607***
	(0.002)	(0.036)	(0.015)	(0.010)	(0.005)	(0.024)	(0.010)
R-squared	0.03	0.09	0.03	0.08	0.04	0.07	0.07
Panel C Emergency C-Sections							
FT	0.0003	-0.2726***	-0.1861***	-0.0516**	-0.0599***	0.1234**	-0.0231
	(0.008)	(0.079)	(0.044)	(0.024)	(0.014)	(0.062)	(0.019)
R-squared	0.06	0.06	0.06	0.07	0.06	0.04	0.09
Panel D Planned C-Sections							
FT	-0.0037	-0.0961**	-0.0557***	-0.0229*	-0.0163***	0.0460	-0.0154**
	(0.003)	(0.044)	(0.019)	(0.014)	(0.006)	(0.036)	(0.007)
R-squared	0.04	0.09	0.07	0.08	0.08	0.05	0.04

Notes: Each column presents the OLS estimation of Equation (1). The dependent variables are No Resusc (equal to one if the newborn did not need any resuscitation, and zero otherwise) in column (1); Apgar1 for Apgar scores after one minute (ranging from 0 to 10) in column (2); Apgar5 for Apgar scores after five minutes (ranging from 0 to 10) in column (3); Apgar1 ≥9 (equal to one for Apgar 1 greater than nine, and zero otherwise), in column (4); and Apgar5≥9 (equal to one for Apgar 5 greater than nine, and zero otherwise), in column(5); ΔApgar (the difference between Apgar5 and Apgar1) in column (6); No Mecon (a binary variable equal to one if no meconium is present at birth, and zero otherwise) in column (7). FT is the Full team variable. In all specifications, we also include mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (type of delivery, newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table A7. Effect of a full team on maternal health outcomes - OLS estimates

	No obstetric lacerations 1st degree	No obstetric lacerations 2nd-3rd degree	No episiotomy	No other complications
	(1)	(2)	(3)	(4)
Panel A – All Deliveries				
FT	0.0030*	0.0359***	0.0314***	0.0006
	(0.002)	(0.005)	(0.008)	(0.006)
R-squared	0.07	0.23	0.55	0.03
Panel B - Vaginal Deliveries				
FT	0.0053**	0.0515***	0.0391***	0.0003
	(0.002)	(0.006)	(0.009)	(0.006)
R-squared	0.08	0.21	0.10	0.03
Panel C -Emergency C-Sections				
FT	-0.0000	0.0016	-0.0067	0.0460
	(0.000)	(0.003)	(0.008)	(0.029)
R-squared	0.02	0.02	0.02	0.04
Panel D - Planned C-Sections				
FT	-0.0001	0.0005	-0.0010	-0.0153
	(0.000)	(0.001)	(0.001)	(0.014)
R-squared	0.00	0.00	0.01	0.08

Notes: Each column presents the OLS estimation results for Equation (1). The dependent variables are No Obstetric lacerations - 1st degree (equal to one if the woman did not experience any 1st-degree lacerations, and zero otherwise) in column (1); No Obstetric lacerations - 2nd-3rd degree (equal to one if the woman did not experience any 2nd/3rd-degree lacerations, and zero otherwise) in column (2); No episiotomy (equal to one if the woman did not experience any episiotomy) in column (3); No other complications (equal to one if the hospital stay was equal to or less than two days, and zero otherwise), in column (4). FT is the Full Team variable. In all specifications, we also include mothers' characteristics (age, nationality, education level, employment status, marital status of the mother, whether the woman is at her first delivery, delivery week, whether the woman experienced hospitalizations during the pregnancy, the weight gain during the pregnancy, smoking, experiences of previous abortions and previous miscarriage, distance to the closest hospital), delivery characteristics (type of delivery, newborn head circumference, monitoring of fetal heartbeat, weekend delivery, night shift delivery, delivery on a congested day, antibiotics during labor), hospital characteristics (the ratio of femoral neck fractures treated within two days), local health authority, month, and year fixed effects. The standard errors are clustered at the hospital, shift, and weekdays level. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

Table A8. Estimation results for the covariates of RDD reduced form specification

Panel A. Vaginal deliveries, sample 250-749 yearly births

	No resusc	Apgar 1	Apgar 5	Apgar 1 ≥ 9	Apgar 5 ≥ 9	ΔApgar	No Mecon	No obst. Lacer. 1st degree	No obst. Lac. 2nd/3rd degree	No episiotom y	No complic
	(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(11)	(12)
Above threshold	0.0100**	-0.0664	-0.0003	-0.0123	-0.0034	0.0564*	-0.0805**	-0.0050	-0.0031	-0.0998***	-0.0244
	(0.004)	(0.046)	(0.021)	(0.014)	(0.007)	(0.032)	(0.037)	(0.008)	(0.029)	(0.019)	(0.020)
N. births	-0.0001	-0.0006	-0.0002	-0.0003	-0.0000	0.0005	-0.0002	0.0002**	0.0007**	0.0006***	0.0003*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N. births sq	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	0.0000	-0.0000*	0.0000**	0.0000**	0.0000**	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mother age	-0.0002	-0.0048**	-0.0031**	-0.0016**	-0.0008**	0.0019	-0.0017**	0.0010***	0.0003	0.0066***	0.0005
	(0.000)	(0.002)	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Native	0.0014	0.0754***	0.0137	0.0229**	0.0049	-0.0528**	0.0170	0.0014	-0.0071	-0.0007	0.0124
	(0.002)	(0.027)	(0.013)	(0.009)	(0.004)	(0.020)	(0.013)	(0.005)	(0.012)	(0.009)	(0.012)
Secondary Ed.	0.0081	0.1141*	0.0183	0.0450*	0.0107	-0.0964	-0.0019	-0.0112	-0.0666***	0.1197***	-0.0962***
	(0.008)	(0.067)	(0.028)	(0.023)	(0.011)	(0.064)	(0.027)	(0.009)	(0.019)	(0.025)	(0.029)
Tertiary Ed.	0.0120	0.1392**	0.0451	0.0481**	0.0194*	-0.1027	0.0052	-0.0101	-0.0726***	0.1501***	-0.0706**
	(0.009)	(0.068)	(0.028)	(0.024)	(0.011)	(0.064)	(0.029)	(0.009)	(0.020)	(0.025)	(0.030)
Employed	-0.0001	-0.0081	0.0028	0.0004	-0.0001	0.0058	0.0103	-0.0003	-0.0008	0.0179*	-0.0122
	(0.002)	(0.028)	(0.011)	(0.010)	(0.004)	(0.023)	(0.011)	(0.004)	(0.008)	(0.009)	(0.011)
Married	-0.0058***	0.0099	-0.0239***	0.0107	-0.0056*	-0.0351*	0.0009	0.0063*	-0.0128	0.0624***	-0.0122
	(0.002)	(0.022)	(0.008)	(0.008)	(0.003)	(0.019)	(0.008)	(0.004)	(0.008)	(0.009)	(0.012)
First child	-0.0047**	-0.0766***	-0.0462***	-0.0271***	-0.0111***	0.0378*	-0.0466***	0.0118***	0.0359***	0.2127***	0.0112
	(0.002)	(0.025)	(0.011)	(0.009)	(0.004)	(0.019)	(0.007)	(0.004)	(0.010)	(0.010)	(0.010)
Delivery week	-0.0007	-0.0142	-0.0009	-0.0050	0.0001	0.0094	-0.0404***	0.0000	0.0065***	0.0166***	0.0521***
	(0.001)	(0.011)	(0.005)	(0.003)	(0.002)	(0.008)	(0.003)	(0.001)	(0.002)	(0.003)	(0.003)
Hip-rep	-0.0000	-0.0020**	0.0000	-0.0007**	0.0000	0.0020***	-0.0002	0.0002	0.0014***	-0.0001	0.0005
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head-circ	-0.0004	0.0071	0.0044	-0.0009	0.0013	0.0031	-0.0040**	0.0005	0.0032**	0.0072***	-0.0078***
	(0.000)	(0.007)	(0.003)	(0.001)	(0.001)	(0.003)	(0.002)	(0.000)	(0.001)	(0.002)	(0.002)
No heart monit	-0.0085*	-0.1887***	-0.0288	-0.0600***	-0.0160**	0.1599***	-0.0200	0.0000	0.0142	-0.0103	-0.0111
	(0.005)	(0.042)	(0.018)	(0.014)	(0.007)	(0.038)	(0.019)	(0.006)	(0.015)	(0.014)	(0.020)
Week-end	0.0001	-0.0113	0.0007	-0.0039	-0.0015	0.0104	-0.0006	-0.0053	-0.0037	0.0163*	0.0155
	(0.002)	(0.021)	(0.010)	(0.006)	(0.004)	(0.016)	(0.011)	(0.004)	(0.011)	(0.010)	(0.011)
Night	0.0008	0.0341*	-0.0010	0.0084	0.0003	-0.0319**	0.0141	-0.0023	0.0000	-0.0053	-0.0150
	(0.002)	(0.018)	(0.009)	(0.005)	(0.003)	(0.013)	(0.013)	(0.003)	(0.011)	(0.009)	(0.009)
Congestion	0.0009	0.0451*	0.0025	0.0168**	0.0049	-0.0444**	0.0257**	-0.0043	-0.0088	0.0042	-0.0106
	(0.002)	(0.025)	(0.011)	(0.008)	(0.003)	(0.022)	(0.010)	(0.004)	(0.009)	(0.009)	(0.012)
Km closest hosp	0.0000	-0.0012	-0.0005	-0.0003	-0.0002	0.0010	-0.0011	0.0002	0.0002	-0.0002	-0.0001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Hosp. Admiss	0.0090***	-0.0791	-0.0095	-0.0287	-0.0056	0.0688	-0.0268	-0.0128	0.0123	0.0190	0.0589**
	(0.001)	(0.054)	(0.025)	(0.018)	(0.010)	(0.042)	(0.022)	(0.008)	(0.020)	(0.022)	(0.023)
Weight gain	-0.0001	0.0004	0.0015*	-0.0005	0.0004*	0.0011	-0.0018**	0.0000	-0.0000	0.0021***	0.0004
	(0.000)	(0.002)	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Smoke	0.0016	0.0017	0.0146	-0.0003	0.0032	0.0107	-0.0327**	0.0011	0.0051	-0.0251*	-0.0121
	(0.002)	(0.039)	(0.012)	(0.013)	(0.004)	(0.036)	(0.015)	(0.006)	(0.013)	(0.013)	(0.013)
Prev abortion	0.0010	-0.0133	-0.0076	-0.0089	0.0014	0.0077	-0.0042	0.0096	-0.0118	-0.0290**	-0.0233
	(0.002)	(0.038)	(0.023)	(0.014)	(0.007)	(0.032)	(0.019)	(0.006)	(0.014)	(0.014)	(0.018)
Miscarriage	-0.0032	0.0088	-0.0128	0.0039	-0.0038	-0.0283	0.0077	-0.0042	0.0054	-0.0050	0.0276**
	(0.003)	(0.030)	(0.013)	(0.011)	(0.004)	(0.028)	(0.012)	(0.005)	(0.013)	(0.012)	(0.013)
Antibiotics	0.0021	0.0242	0.0224*	0.0025	0.0080**	-0.0026	-0.0229*	0.0068*	-0.0029	-0.0137	-0.0098
	(0.002)	(0.021)	(0.012)	(0.008)	(0.004)	(0.016)	(0.012)	(0.004)	(0.010)	(0.012)	(0.014)
Assited Vaginal	-0.0245***	-0.7629***	-0.1914***	-0.2534***	-0.0741***	0.5695***	-0.0688***	0.0198***	0.1956***	0.1321***	-0.0234
	(0.007)	(0.060)	(0.034)	(0.017)	(0.012)	(0.048)	(0.021)	(0.004)	(0.018)	(0.009)	(0.020)
Constant	1.0103***	10.0943***	9.9019***	1.1259***	0.9530***	-0.2295	2.7562***	0.9027***	0.7367***	-0.4774***	-1.2197***
	(0.038)	(0.486)	(0.233)	(0.133)	(0.079)	(0.322)	(0.131)	(0.062)	(0.136)	(0.137)	(0.141)
Deliv. week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,747	9,552	9,554	9,552	9,554	9,549	9,747	9,747	9,747	9,747	9,747

Panel B. Vaginal deliveries, sample 750-1249 yearly births

	No resusc	Apgar 1	Apgar 5	Apgar 1 ≥ 9	Apgar 5 ≥ 9	ΔApgar	No Mecon	No obst. Lacer. 1st degree	No obst. Lac. 2nd/3rd degree	No episiotomy	No complic
	(1)	(2)	(3)	(4)	(5)	(6)	(8)	(1)	(2)	(3)	(4)
Above threshold	0.0030	-0.2108***	-0.0535*	-0.1021***	-0.0292*	0.1584***	0.0727*	-0.0112	0.0808**	-0.0064	0.0471**
	(0.005)	(0.066)	(0.031)	(0.025)	(0.015)	(0.057)	(0.042)	(0.013)	(0.034)	(0.019)	(0.021)
N. births	0.0000	-0.0019***	-0.0006***	-0.0004*	-0.0002***	0.0013**	0.0016***	0.0004**	-0.0008**	-0.0000	0.0000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N. births sq	-0.0000	-0.0000**	-0.0000**	-0.0000**	-0.0000**	0.0000**	0.0000***	0.0000***	-0.0000	-0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mother Age	-0.0001	-0.0068***	-0.0018**	-0.0015**	-0.0008**	0.0051***	-0.0018***	0.0003	0.0010	0.0034***	0.0018**
	(0.000)	(0.002)	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Native	0.0024	0.0974***	0.0212*	0.0264***	0.0063	-0.0758***	0.0271***	0.0029	-0.0146*	-0.0070	-0.0040
	(0.002)	(0.031)	(0.012)	(0.009)	(0.004)	(0.022)	(0.008)	(0.003)	(0.008)	(0.009)	(0.009)
Secondary Ed.	0.0077	0.0448	0.0128	0.0132	0.0025	-0.0333	-0.0116	-0.0097	-0.1141***	0.1970***	-0.0070
	(0.007)	(0.077)	(0.031)	(0.026)	(0.009)	(0.062)	(0.026)	(0.011)	(0.019)	(0.028)	(0.031)
Tertiary Ed.	0.0074	0.0709	0.0218	0.0186	0.0067	-0.0499	0.0069	-0.0085	-0.1124***	0.2044***	-0.0216
	(0.007)	(0.085)	(0.031)	(0.029)	(0.010)	(0.069)	(0.028)	(0.011)	(0.020)	(0.031)	(0.028)
Employed	-0.0025	-0.0021	-0.0034	0.0059	-0.0019	-0.0001	-0.0062	-0.0018	0.0035	0.0283***	0.0020
	(0.002)	(0.022)	(0.011)	(0.006)	(0.003)	(0.018)	(0.008)	(0.003)	(0.007)	(0.007)	(0.011)
Married	-0.0001	0.0279	0.0143	0.0074	0.0052	-0.0151	0.0018	0.0086***	0.0052	0.0534***	-0.0070
	(0.002)	(0.021)	(0.012)	(0.006)	(0.004)	(0.017)	(0.007)	(0.003)	(0.009)	(0.007)	(0.010)
First child	-0.0029	-0.0765***	-0.0194	-0.0270***	-0.0102**	0.0588***	-0.0419***	0.0154***	0.0650***	0.2019***	-0.0168**
	(0.002)	(0.020)	(0.013)	(0.005)	(0.004)	(0.013)	(0.008)	(0.004)	(0.010)	(0.006)	(0.007)
Delivery week	0.0007	0.0149*	0.0139***	0.0050*	0.0047**	-0.0009	-0.0392***	0.0008	0.0049**	0.0161***	0.0551***
	(0.001)	(0.009)	(0.005)	(0.003)	(0.002)	(0.006)	(0.003)	(0.001)	(0.002)	(0.003)	(0.005)
Hip-rep	0.0002***	0.0013	-0.0000	0.0007***	0.0002	-0.0014*	-0.0005	-0.0000	-0.0012***	0.0003	-0.0002
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head-circ	0.0002	-0.0025	0.0005	-0.0013	-0.0002	0.0031	-0.0033**	0.0017***	0.0015	0.0094***	-0.0090***
	(0.000)	(0.004)	(0.002)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
No heart monit	-0.0074*	-0.3346***	-0.0838***	-0.0835***	-0.0295***	0.2515***	-0.0372***	-0.0015	0.0422***	0.0019	0.0004
	(0.004)	(0.048)	(0.021)	(0.014)	(0.009)	(0.038)	(0.012)	(0.006)	(0.011)	(0.011)	(0.013)
Week-end	0.0025**	0.0281	0.0185*	0.0050	0.0078**	-0.0090	-0.0087	-0.0017	0.0087	0.0073	0.0119
	(0.001)	(0.023)	(0.010)	(0.008)	(0.004)	(0.020)	(0.009)	(0.003)	(0.006)	(0.006)	(0.009)
Night	-0.0015	-0.0182	-0.0021	-0.0016	-0.0018	0.0168	0.0115	0.0010	-0.0046	-0.0014	0.0008
	(0.002)	(0.024)	(0.010)	(0.008)	(0.004)	(0.019)	(0.009)	(0.003)	(0.005)	(0.005)	(0.008)
Km closest hosp	-0.0002	-0.0006	-0.0006	-0.0003	-0.0000	-0.0000	-0.0003	0.0004	0.0001	-0.0002	0.0007
	(0.000)	(0.002)	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Hosp. Admissions	-0.0087	0.0222	0.0227	0.0101	0.0062	0.0010	-0.0061	-0.0049	0.0211	0.0018	0.0377
	(0.006)	(0.055)	(0.023)	(0.018)	(0.008)	(0.047)	(0.017)	(0.011)	(0.021)	(0.019)	(0.027)
Weight gain	0.0000	-0.0013	0.0006	-0.0004	0.0001	0.0018	-0.0022***	0.0000	-0.0009*	0.0017***	-0.0005
	(0.000)	(0.002)	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Smoke	0.0029	0.0470	0.0176	0.0065	0.0058	-0.0290	-0.0120	-0.0060	-0.0111	-0.0375***	-0.0028
	(0.003)	(0.034)	(0.014)	(0.011)	(0.005)	(0.028)	(0.012)	(0.007)	(0.011)	(0.014)	(0.013)
Prev abortion	-0.0036	-0.0561*	-0.0219	-0.0115	-0.0081	0.0298	-0.0265***	0.0033	0.0069	-0.0145	0.0235
	(0.003)	(0.032)	(0.018)	(0.009)	(0.006)	(0.029)	(0.009)	(0.005)	(0.010)	(0.011)	(0.017)
Miscarriage	-0.0023	-0.0327	-0.0303**	-0.0094	-0.0080*	0.0027	0.0008	-0.0086*	0.0040	0.0076	-0.0090
	(0.002)	(0.030)	(0.014)	(0.009)	(0.005)	(0.023)	(0.009)	(0.004)	(0.008)	(0.009)	(0.010)
Antibiotics	-0.0011	-0.0263	-0.0172	-0.0058	-0.0064	0.0080	-0.0366***	-0.0028	0.0037	0.0056	-0.0181*
	(0.002)	(0.025)	(0.015)	(0.008)	(0.004)	(0.022)	(0.008)	(0.003)	(0.009)	(0.008)	(0.010)
Assisted Vaginal	-0.0177***	-0.9884***	-0.2361***	-0.2858***	-0.0940***	0.7518***	-0.0709***	0.0296***	0.1991***	0.1178***	-0.0212
	(0.006)	(0.091)	(0.047)	(0.019)	(0.017)	(0.060)	(0.018)	(0.003)	(0.016)	(0.008)	(0.015)
Constant	0.9500***	8.9060***	9.3260***	0.6362***	0.7924***	0.3122	2.7250***	0.8434***	0.7473***	-0.5004***	-1.5199***
	(0.038)	(0.403)	(0.239)	(0.130)	(0.080)	(0.289)	(0.175)	(0.058)	(0.115)	(0.106)	(0.187)
Deliv. week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,064	14,470	14,467	14,470	14,467	14,461	15,064	15,064	15,064	15,064	15,064

Notes: Each column presents the reduced form estimates for Equation (3). In Panel A, we include vaginal deliveries in maternity units that record yearly births within the ±250 bandwidth around the 500 threshold (250-749). In Panel B, we include vaginal deliveries in maternity units that record yearly births within the ±250 bandwidth around the 1,000 threshold (750-1,249). The standard errors are clustered at the hospital, shift, and weekdays level. Significant levels: *** p<0.01, ** p<0.05, * p<0.1

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