HEDG
HEALTH, ECONOMETRICS AND DATA GROUP

THE UNIVERSITY of York

WP 14/23

Does experience rating improve obstetric practices? Evidence from geographical discontinuities

Sofia Amaral-Garcia; Paola Bertoli & Veronica Grembi

August 2014

york.ac.uk/res/herc/hedgwp

Does Experience Rating Improve Obstetric Practices? Evidence From Geographical Discontinuities*

Sofia Amaral-Garcia
ETH Zurich

Paola Bertoli
University of Economics of Prague

Veronica Grembi
Copenhagen Business School
Baffi Center- Bocconi University

This version: July 2014

Abstract

We provide an assessment of the introduction of experience rating for medical malpractice insurance using 2002-2009 inpatient discharge records data on deliveries from the Italian Region of Piedmont. Considering experience rating as an increase in medical malpractice pressure, we show that such increase decreased the incidence of cesarean sections between 7 and 11.6% with no consequences on a broadly defined measure of complications. Our identification strategy exploits the territorial peculiarities of Piedmont: its 33 hospitals are distributed across 16 Courts' districts, 10 of which use schedules of non economic damages to set compensations for personal injuries and 6 do not. We use this ex-ante policy conditions to distinguish treated from control and implement first a difference in difference analysis, the robustness of which we test through a basic difference in discontinuities specification. We show that our results are robust to the different methodologies, and they can be explained in terms of a reduction in the discretion over obstetric decisions rather than a change in the risk profile of the patients.

JEL Classification: K13; K32; I13

Keywords: Experience rating, Medical Liability Insurance, Difference-in-Differences, Difference-in-Discontinuities, C-sections, Schedules of Damages Compensation

*We thank the participants to the seminars at Copenhagen Business School, ETH Zurich, University of Verona, and to the Spanish Law and Economics Association Annual Meeting for their comments. We are grateful to Giuseppe Carchedi for his study on the Piedmont insurance scheme.

1 Introduction

A large literature has explored whether and how physician behavior reacts to malpractice pressure. Understanding the mechanism of this possible relationship is crucial: when malpractice pressure is too low, physicians might take substandard levels of care which may result in harm to patients; when malpractice pressure is too high, physicians might produce a supra-optimal level of care in order to reduce their legal liability, a practice often referred to as defensive medicine. Both situations are not optimal with respect to levels of care, and can rise significantly healthcare costs: extra medical treatments will be required from injured patients and unnecessary procedures impose higher healthcare costs (and may even harm patients).

Tort reforms have been widely studied in order to assess whether physicians alter their practices when tort reforms change malpractice pressure and, if so, how this might impact health outcomes. A less studied case has been the introduction of experience rating, *i.e.*, adjusting premiums based on claims history. In spite of the fact that experience rating is the norm in many insurance cases, such as health insurance, workers compensation and automotive, it is rarely found in medical malpractice insurance (Fournier and McInnes, 2001; Weiler *et al.*, 1993). Experience rating remains an exception in medical liability insurance, one of the reasons being that physicians' claims experience has a high variability over short periods of time. Therefore, obtaining a stable estimate for the risk is hard in this case (Mello, 2006).[1] Reputation concerns also play a role in neglecting the previous risk exposure at the physician level. However, the rationales used to avoid experience rating at the physicians level do not necessarily find a place when dealing with hospitals' claims experience. It has been noticed that most of the policy related to medical malpractice mainly address individual physician behaviors, while the hospital dimension has been often neglected (Currie and MacLeod, 2008; Shurtz, 2013). Empirical evidence from the U.K. has shown how risk policies designed at the hospital level can substantially decrease infection rates (*i.e.,* Fenn *et al.*, 2013). Sloan (1990) argues that experience rating at the hospital level, a context in which peer review is meaningful, could bring benefits to monitor level of cares and services appropriateness.

In this article, we explore the role of the introduction of an experience rating insurance scheme on births outcomes in Piedmont, an Italian region. Experience rating has been introduced in 2005 for all public hospitals operating in the region and was not accompanied by any reform in the liability system. Experience rating increases the healthcare providers accountability linking the contributions they have to pay to the insurance common fund to their risk exposure. As such experience rating increases malpractice pressure on providers. Childbirth has deserved wide attention in the empirical literature for several reasons: births are one of the most common medical procedures, injuries to newborns are those which gen-

[1] Experience rating at the individual physician level raises important concerns when only prior claims experience count for setting the premium (Ellis *et. al*, 1990). For instance, physicians might have a different set of patients in terms of risk characteristics that would not be captured in the premium. Moreover, the volume of patients that physicians treat during the year might also be an important variable to be taken into account. Furthermore, and considering that awards in medical malpractice cases tend to be highly skewed, there are reasons to believe that the size of the claims should also play a role.

erally result in higher damages given the severe and permanent harm they can cause, and obstetrics is perceived as one specialty particularly hit by medical concerns.[2] In particular, the utilization rate of cesarean delivery is usually a well designed case study since it has in vaginal delivery its natural counter-factual. Using a unique dataset of inpatient discharge records from the National Discharge Records (*Schede di Dimissione Ospedaliera*- SDO) from 2002 until 2009, we assess whether the introduction of experience rating affected the decision to perform a cesarean section rather than a natural delivery, the incidence of (broadly defined) complications, and the incidence of preventable complications as defined according to the Agency for Healthcare Research and Quality (AHRQ, 2003).

Our identification strategy exploits the geographical location of hospitals within the Region. In Piedmont, hospitals are located in different court districts, and hospitals' location determines in which court district claims must be filed in case of litigation involving these hospitals. Hospitals are distributed among 16 court districts: 10 court districts where damage schedules are applied to compute non-economic awards in all personal injury cases, and 6 court districts where schedules are not applied.[3] Schedules have been introduced across Italian court districts as a tool to increase predictability in damages awards while guaranteeing both horizontal equity and vertical inequality (*i.e.*, victims suffering higher levels of injury should receive higher damages; and victims suffering similar injuries should receive an equivalent indemnity amount). Accordingly, we consider hospitals located in a district where compensations are more predictable and suffer of less variance as those under less medical malpractice pressure, compared to those operating in non adopting schedules districts. Once the experience rating is implemented all hospitals will face more malpractice pressure, but those placed into no schedules courts will face more pressure than those placed in schedules courts. First we exploit these territorial differences performing a difference-in-differences (DD). Then we confine our analysis to those hospitals just across the borders of courts districts not adopting schedules implementing a basic specification of a difference in discontinuities approach (Grembi *et al.*, 2014).

Our results, which combine a patient and a hospital level, show that the introduction of the experience rating leads to a reduction in the utilization of cesarean section between 7 and 11.6%, a reduction that is not associated with a change of maternal health measured in terms of complications. The results are robust to several specifications and they are not due to anticipatory effects of the policy. Their magnitude is in line with the results in Currie and MacLeod (2008) where an increase of malpractice pressure associated to the adoption of forms of joint and several liability decrease the use of cesarean sections by 13%. Finally, we investigate the channels of the negative effect on cesareans showing that such effect is

[2]A vast part of the literature on defensive medicine has focused its attention on the conduct of obstetricians. This is due to the fact that obstetrics is believed to be one of the clinical areas where malpractice pressure is more acutely perceived by doctors, who therefore are expected to be more responsive to variations in malpractice liability (Kachalia and Mello, 2011).

[3]*Damage schedules*, *scheduled damage tables* or *schedules* are simply tables with entries for the injury severity level and victim's age. Different combinations of age and injury severity lead to different compensation amounts. In the U.S. schedules are used to compute compensations for work related injuries. For more on scheduling damages see, among others, Avraham (2006).

not related to patient selection mechanisms but to a decrease in the discretion over the final decision to perform the surgical procedure.

The paper proceeds as follows. Section 2 provides an overview of the existing theoretical and empirical literature on variation of malpractice pressure and obstetric practices. Section 3 describes the Piedmont experience rating policy and provides some feedback on the schedules system. Section 4 explains the econometric strategy and the data, while the results are discussed in Section 5. Section 6 concludes.

2 Effects of Medical Malpractice Pressure: Theory and Available Evidence

The effects of changes in medical malpractice pressure on the treatment choices of obstetricians have been investigated with empirical studies, but for Currie and MacLeod (2008). Mixed empirical findings have been reached exploiting similar variations in malpractice pressure triggered by tort reforms with reference to the U.S.. For instance, the introduction of caps on damages is considered a decrease in pressure while the introduction of forms of joint and several liabilities has been classified as an increase in pressure. When pressure goes up it has been proved that you might have less obstetric preventable complications (Iizuka, 2013; Currie and MacLeod, 2008), more cesarean sections (Shurtz, 2013), and less cesarean sections (Currie and MacLeod, 2008). Decreases in malpractice pressure have been linked to no impact on cesarean sections (Frakes, 2012; Sloan *et al.*, 1997), less cesarean sections (Localio *et al.*, 1993), and more cesarean sections (Currie and MacLeod, 2008; Dubay *et al.*, 1999).

The theoretical assumption underneath a positive correlation between cesarean sections and malpractice pressure is quite intuitive: doctors prefer csections whenever they face more pressure because through csections they reduce the risk for the babies (*i.e.*, the most expensive potential injured) and they might be more in charge for what it actually happens in the delivery room. Currie and MacLeod (2008) provide a model which contrasts such intuitive approach. They shape doctors' decisions as directly dependent on both patients condition and on the probability of committing an error with possible legal consequences. In a nutshell, they prove that the final effect of a tort reform on the utilization rate of a procedure cannot be uniquely determined *ex ante* on theoretical grounds, providing a framework to interpret the observed changes in medical decisions as a response to the relative risk between performing and not performing a procedure. If we move from a point in which the use of a procedure is excessive, which means it is not related to medical factors, than the probability to commit an error or having bad outcomes is higher with the use of that procedure than without it. This means that whenever an increase in malpractice pressure strikes (*i.e.*, physicians are held more accountable), we expect a decrease in the incidence of that procedure rather than an increase.[4]

[4]By contrast, if the non-performance of the treatment implies a higher risk of being sued in the event of an error than the performance of the same treatment, such a variation in malpractice pressure leads to an

Our contribution relies on the theoretical framework presented by Currie and MacLeod (2008). Over the last three decades, the use of cesarean sections in Italy has constantly increased. While cesarean rates were performed on average in 11% of deliveries in 1980, this number increased to 20% in 1990, and to 38% in 2009 (Meloni *et al.*, 2012), making Italy the main user of cesarean procedures in Europe (Ministero della Salute, 2011) and one of the highest among OECD countries (OECD, 2013).[5] The steady rise in the number of cesarean births does not seem to be accompanied neither by a greater safety for the mother and the child nor by a lower number of intrapartum complications (Meloni *et al.*, 2012). This means that we expect that an exogenous increase in doctors accountability associated to the introduction of experience rating (*i.e.*, higher malpractice pressure), should induce a decrease in the incidence of cesarean sections and their substitution with natural deliveries.

However, experience rating directly affects hospitals while affects individual physicians only indirectly. Hence, we have to assume that in a public healthcare system, where physicians are civil servants working in just one hospital, 1) hospitals are sensitive to the discount they can get to their contribution to the insurance premium, and 2) they are able to translate their priorities on their employees. Empirical evidence from the U.K., which has a health care system very similar to the Italian one, supports such assumptions. Fenn *et al.* (2007) explore the relationship between malpractice liability and the utilization of imagining and scanning diagnostic procedures using data on the UK healthcare facilities. The level of deductibles on the malpractice (public) insurance premiums of each hospital is used as a proxy for risk exposure. They find that hospitals under higher malpractice pressure (*i.e.*, higher expected costs from litigation) report a more frequent use of costly imagining procedures. Fenn *et al.* (2013) use hospitals data on the MRSA (methicillin resistant staphylococcus aureus) infections in England and Wales to show that hospitals react to possible discounts to their liability risk pooling contributions. Facing the possibility to pay less, hospitals manage to lower infection rates.

3 Experience Rating and Schedules

3.1 The experience rating policy

The regional government in Piedmont, as any other Italian region, is in charge of providing healthcare services to its residents through a public system organized in Local Healthcare Units (LHUs).[6] LHUs buy healthcare services by independent hospitals (IH), teaching hos-

increase in the use of the treatment. As they state: "*whether the change in the law results in increases or decreases in procedure use depends on what the relative error rates are when procedures are performed or not performed.*" (Currie and MacLeod, 2008, p. 14).

[5]However, the cesarean birth rate highly differs among regions with remarkable discrepancies between northern and southern areas. Specifically, Southern regions show higher utilization rates than in the north, ranging from 24% in Tuscany and Friuli-Venezia Giulia to almost 60% in Campania (Ministero della Salute, 2013).

[6]Private providers are also involved in providing service as completely private providers or through special agreements with the public system (*private accreditation*). For more references on the organization of the

pitals (TH), or they provide them through their own hospitals. According to a report from the Italian Ministry of Health, in 2010 more than 95% of infants born in Piedmont were delivered in public hospitals (Ministero della Salute, 2013).[7] Public hospitals must provide liability insurance to their medical personnel. Therefore, it is not possible to have hospitals in which physicians are covered by medical liability insurance and others in which physicians are not covered.

From 2005 Piedmont has a regional malpractice liability fund for all public healthcare providers located in the region (*Fondo Speciale per i rischi di responsibilitá civile delle ASL*) and, according to an insurance plan in place since then, the lion share of each hospital's contribution to the fund depends on previous claims. More specifically, the total contribution amount per hospital is obtained by summing up two entries: (i) contributions based on the gross payroll paid by the structure, which account for 30% of the fund; and (ii) contributions based on the average risk exposure of the provider in the past three years (*i.e.*, according to compensation awards), which account for 70% of the fund. The regional fund counted 45 million euro for the period 2005-07 (15ml per year) and 60 million for the period 2008-2010 (20ml per year). Previous to this reform, the insurance plan was based on premiums set as a percentage of the gross payroll and as such, not adjusted according to previous claims (Amaral-Garcia and Grembi, 2014).

3.2 The Schedules System

In Italy, the majority of malpractice claims (86%) are solved in courts and on average the non-economic part of the compensation is equal to 70% of the final award (Nys, 2009). Between 2002 and 2009, 10 Courts of First Instance out of 16 operating in Piedmont were compensating non-economic damages according to scheduled damages. Aimed at containing the variance of victims' recoveries, schedules are forms of tiered caps: they provide a formula based on the severity of injuries and the age of victims to quantifying non-economic damages. Their implementation was left to each court discretion and the result is shown in Panel (a) of Figure 1 for Piedmont.[8] The introduction of schedules was expected to increase the degree of certainty in assessing compensations, and it is associated to lower malpractice pressure.

Figure 1 about here

Italian Healthcare system see Mapelli (2012).

[7] A number that alleviates concerns with respect to possible patients' selection between private and public hospitals.

[8] Courts started on a voluntary basis to adopt scheduled damages, using the experience of other European countries, mainly France. Medical experts were put in charge of the definition of the percentage points of disability to assign to the possible different injuries (Comandè 2005). In order to guarantee consistency within courts' decisions, monetary values were defined according to the previous cases (Sella 2005). Schedules are not adopted only for medical malpractice injuries but for compensating any kind of personal injuries. For a more detailed explanation of schedules of non economic damages in Italy see Bertoli (2014).

4 Econometric Framework

4.1 Identifying the Effect of Experience Rating

Hospitals operating in courts districts adopting schedules face less malpractice pressure than their neighborhood placed in non adopting schedules courts districts.[9] This means that when the Region implements the experience rating policy, which per se' increases accountability of healthcare providers and consequently malpractice pressure, some hospitals face more pressure than others. Hence, our empirical analysis identifies the effect of an increase in the intensity of malpractice pressure paying particular attention to the interacted effect of operating in a no schedules court (treated) before and after experience rating compared to operating in a schedules court during the same period. Our identification relies on the exogenous distribution of hospitals across Courts' districts, which can be reasonably assumed given that hospitals' location has been set between the beginning of the last century and its Nineties while courts' districts were first designed with the creation of the Italian State (1861) and confirmed in a 1941 Royal decree. Panel (b) of Figure 1 shows the distribution of hospitals across both LHUs districts and Courts districts. Colored Courts are those adopting schedules. Schedules adoption has not been modified between 2002 and 2009.

Hence, $Treated$ is a dummy equal to 1 if the delivery takes place in a hospital located in a court district that does not apply schedules and 0 otherwise, while $Post05$ is a dummy equal to 1 if the delivery was performed in or after 2005 and 0 otherwise. Let us define $Outcome_{iht}$ as one of the four outcomes of interest for every mother i, hospitalized in hospital h, at time t. We assess the impact of experience rating through the following model:

$$Outcome_{iht} = \delta Treated_h * Post05_t + \gamma_t + \alpha_h + Cov1'_{iht}\sigma + Cov2'_{iht}\beta + Cov3'_{iht}\tau + \epsilon_{iht} \quad (1)$$

where γ_t are the year fixed effects, α_h are hospitals fixed effects to control for unobservable characteristics which operate at the hospital level, and δ is the DD estimator.[10] The vectors of covariates represent controls for risk factors at the mother level, $Cov1'_{iht}$, other characteristics of the mother, $Cov2'_{iht}$, and socio-economic characteristics of the municipality where the mother is resident, $Cov3'_{iht}$. Table 1 reports the variables grouped by each vector. Among the control, we use also a dummy which accounts for the case a woman delivered her baby in a hospital outside her LHU ($Patient\ Flow$). This information captures the role of financial incentives, among the others. Services across LHU are paid using the diagnostic related group (DRG) system which are not applied if the services are provided directly from hospital managed from the LHU of residence.[11] The difference in the payment method could make

[9] The court competent for any malpractice claim is the one competent over the district in which the hospital is placed.

[10] For unobservable characteristics of the hospital, we refer not only to the number of beds or the number of operating physicians— only available for some hospitals but not for our entire sample— but also differences in practice styles.

[11] Exploiting the information on the residence municipality of mothers we also calculated the average

providers more sensitive to the economic incentives often associated to the performance of a cesarean section.

Table 1, about here

We first estimate Equation 1 on the entire sample as graphically represented in Panel (b) of Figure 1. As a second step, we estimate the same model on those hospitals in the nearest neighborhood across the court district border, as shown in Panel (c) of Figure 1. The rationale is to reduce unobservable heterogeneities among the treated and the control. Restricting the analysis to those hospitals just across the court district border is equivalent to perform a difference in discontinuity analysis (Grembi *et al.*, 2014). The basic intuition is that, as we move across the court districts, there is a policy change for healthcare providers due to schedules (*i.e.*, geographical discontinuity). Hence, we combine the jump in schedules triggered by the border, a discontinuity analysis, with a before/after analysis, the DD, obtaining a so-call differences in discontinuities (diff-in-disc). In the simpler version of this approach we use only the treated hospitals in a range of 23 kilometers (12 miles).[12] Panel (c) of Figure 1 identifies the hospitals we use in the diff-in-disc specification. Finally, we test the specifications at both the patient and the hospital level. At the hospital level, we generate proportion of outcome of interest and of the covariates. We also exploit the date of the delivery to generate quarterly proportions, so to increase the number of observations available for the empirical analysis.

4.2 The Outcomes

Our main outcome of interest is the decision to perform a cesarean section. However, we also investigate the impact of the intensity of malpractice pressure on the occurrence of complications. The check on complications has an intuitive rationale: the increase in malpractice pressure should trigger higher levels of precaution exposing the patients to less risks, which means less complications. Since complications also refer to any post-treatment consequence, when we analyze the impact on complications we are also running an indirect test of the treatment implications on the health status of the mother. In other words, if the choice of cesarean section is not health related, once obstetricians decide not to perform it anymore we should not expect any improvement of the health status of the patient. To distinguish the two scenarios we use Patient Safety Indicators (PSI) that have been proposed by the Agency for Healthcare Research and Quality (AHRQ) (AHRQ, 2003). These indicators, created with the use of ICD-9-CM codes for diagnosis and procedures, have the benefit of identifying potentially preventable complications with reference to specific types of deliveries.[13]

distance covered by mothers delivering in a treated hospitals, 14.407 km (8 miles) compared to the average distance covered by women delivering in a control hospitals, 14.682 km (9 miles). The difference is not statistically different from zero.

[12]It is impossible to use other bandwidth of the running variable, since we have 6 treated hospitals.

[13]Besides the description available in AHRQ (2003), Iizuka (2013) provides a description on how these indicators have been developed and a test of the impact of medical malpractice related policies on PSI using U.S. data.

We focus on PSIs that concern preventable injuries to the mother. Therefore, we focus on obstetric traumas to the mother that can result from two types of deliveries: vaginal delivery with instrument (*Patient Safety Indicator 18*) and vaginal delivery without instrument (*Patient Safety Indicator 19*).[14] The main difference among these indicators is the creation of the population at risk for the adverse event. For instance, a mother receiving a cesarean section is necessarily not considered in the population at risk for obstetric trauma incurred during vaginal delivery (whether one considers with or without instrument). Therefore, the difference among these indicators lies in the delivery method. The AHRQ considers only cases of adverse events developed during the hospital stay, which can be generally identified by the secondary code of diagnosis or procedure. This is an important factor, given that ideally we should be able to exclude cases of potential problems existing already before patient's hospital admission. The use of these indicators is linked to a basic warning: the composition of the reference sample (i.e. natural deliveries) is necessarily affected by the policy. Hence, the incidence of preventable complications on such sample could decrease not just because precaution levels increases, but also because low risk mothers are moved from the cesarean deliveries sample to the vaginal delivery sample.[15]

4.3 Assumptions Validity and Robustness Checks

Our results rely on the identifying assumption that the treated and the control have a pre-treatment common trend in the outcome of interest. An indirect way to check for the validity of this assumption is to test a modified model where the condition of operating in a no schedules court district is interacted with year dummies as described by Equation 2 (Acemoglu *et al.*, 2011). This model introduces leads and lags of the treatment, so that we are able to check if 1) before the introduction of experience rating there was in fact a common trend of the outcome, with the coefficients of the q leads not statistically different from zero, and 2) the policy was more or less effective in the immediate years of its implementation or later on, with the coefficients of the m lags expected to be statistically different from zero for different points in time. Through equation 2 we can address the validity of our results against anticipatory effects and provide a more sharp assessment of the post-treatment effects.

$$Outcome_{iht} = \sum_{t=-q}^{-1} Treated_h * D_t + \sum_{t=0}^{m} Treated_h * D_t + \gamma_t + \alpha_h + Cov1'_{iht}\sigma + Cov2'_{iht}\beta + Cov3'_{iht}\tau + \epsilon_{iht} \quad (2)$$

Finally, we run a robustness check exploiting the information on the day of the delivery: we estimate equation 1 only on the subsample of deliveries performed from Monday to Friday. As shown in Figure 3, there is a substantial drop in cesarean sections over the weekend. As expected, one of the benefit of this type of delivery is that it can be scheduled during regular

[14] Differently from Iizuka (2013), we decided not to include obstetric traumas on cesarean deliveries. This categories may be highly affected by emergency csections, which means deliveries started as natural and ended as cesarean.

[15] A similar warning should be kept in mind every time we present results on the subsample of only vaginal deliveries.

working days and hours. As a consequence, we have an expectation that if a cesarean section is performed during the weekend it is most likely connected to an unplanned event. Plausibly, these are cases in which a normal delivery was expected but, due to complications, it ended up in a csection. Hence, we drop these observations from both the overall and the nearest hospitals samples, and we estimate again our original models.

Figure 3, about here

4.4 Disentangling the Channels of the Effect of Experience Rating on Cesarean Section

The effect on the decision to perform a cesarean section due to experience rating could be channeled by two mechanisms. On the one hand, healthcare providers could be more cautious in selecting their patients, implementing some forms of cream skimming. Even though our case study refers to a public healthcare system, where there are less incentives to select patients who are constitutionally entitled to get access to care, it is easy to imagine that, in a close distance range, physicians could direct patients to the nearest hospital whenever they present substantial risk factors (*i.e.*, negative defensive medicine). This could be an issue especially when dealing with hospitals just across the courts border. If the adoption of experience rating affects the decision to perform cesarean sections through this first channel, then we should see a change in the probability to have a cesarean section as a function of risk factors, which is defined in the literature as the predicted probability of a c-section (Frakes, 2012; Baiker *et al.*, 2006). Alternatively (or additionally), the raise in malpractice pressure could affect the non medical rationales of a csection (*e.g.*, time saving, predictability, refunding). If experience rating affects cesarean section through this second channel, we expect that the reform decreases the importance of non medical factors on the probability of having that procedure, or, in other words, it decreases the discretionary part of the decision over a csection. We test the importance of these two channels moving from the model described in Equation 3.

$$C_{iht} = Cov1'_{iht}\sigma + Cov2'_{iht}\beta + \epsilon_{iht} \tag{3}$$

Equation 3 defines the probability of performing a cesarean section as a function of risk factors as grouped in $Cov1'_{iht}$ and $Cov2'_{iht}$. Once estimated Equation 3, we derive 1) its predicted probability, $\hat{C}_{iht}$, and 2) its residuals, $\hat{\epsilon}_{iht}$. They represent proxies for the first ($\hat{C}_{iht}$) and the second channel ($\hat{\epsilon}_{iht}$) respectively. To relate the channels to experience rating we use $\hat{C}_{iht}$ and $\hat{\epsilon}_{iht}$ as outcomes of Equation 4 below. The parameter of interest is δ. From the sign and the significance of δ we get a better perspective of the mechanisms in place once the reform is introduced.

$$Channels = \begin{cases} \hat{C}_{iht} & = \delta Treated_h * Post05_t + \gamma_t + \alpha_h + \eta_{iht} \\ \\ \hat{\epsilon}_{iht} & = \delta Treated_h * Post05_t + \gamma_t + \alpha_h + \eta_{iht} \end{cases} \tag{4}$$

5 Results

5.1 The Effects of Experience Rating on Obstetric Practices

Table 2 shows the descriptive statistics for the main variables of our analysis. Overall we analyze 265,537 deliveries. On average out of 10 deliveries, 3 were cesarean sections, with an incidence of complications in about 15-17% of the cases, an obstetric trauma in vaginal deliveries around the 0.4% of the time. Given this high level of incidence of csections, we expect that the introduction of experience rating will decrease the use of the procedure whenever it is not strictly related to risk factors.

Panel A of Table 3 displays the DD estimates on the entire sample. Consistent with our expectations, the introduction of experience rating determines a reduction between 3.2 and 2.3% in the utilization rate of cesarean delivery. This corresponds to a reduction by 7% (0.023/0.33) of the average csection rate during the observation period. Results are robust to the inclusion of various additional covariates (models (1) to (4)) and they are confirmed by Panel B of the same table. In the subsample including only the treated hospitals and the related closest hospitals in the control group, the adoption of experience rating turns out to have a stronger negative impact as the estimated decrease in the utilization rate of csections ranges between 5.1 and 3.7%.These estimates represent a 11.6% reduction in the average rate of cesarean delivery of the reference sample (0.037/0.32). Results are confirmed also by our robustness check: model (5) reports the estimates of our baseline specification on the subsamples of deliveries which do not include weekend deliveries. Here the probability to received a cesearean section after the adoption of experience rating decreases between 2.7 (DD) and 4% (Diff in Disc).[16]

Tables 2 and 3, about here

The decrease in cesearean sections is not associated to a change in the incidence of complications, as apparent from Table 4. The points estimate of the coefficients are constant in all the estimated models and the sign is negative, as it should be since we are capturing an increase in the precaution level. However, the impact is not statistically different from zero, so that on average the shift in the delivery type does not really improve mother conditions. Since this results could be driven by the definition of *Complications*, results in Table 5 helps to provide a different perspective. As stated, PSI indicators have been shaped to take into account preventable complications with special reference to obstetric traumas. Results in the subsample of the nearest hospitals (Panel B) are statistically significant even though at 10%. According to these numbers, increasing providers' accountability reduces preventable complications in the sample of vaginal deliveries. However, we know that we could have two channels in place for this effect: an increase in precaution when a vaginal deliveries is performed, or a change in the sample of women undergoing vaginal deliveries with an increase in

[16] All the results are obtained using a Linear Probability Model (LPM) to facilitated the interpretation of the coefficients. We also run the same models using Probit regressions and the marginal effects of the coefficients are equivalent to the ones we obtain with the LPM. Results are available upon request.

the low risk component of such sample triggered by the decrease in the incidence of cesarean sections (selection bias).

Tables 4 and 5, about here

To prove if the assumptions required for the validity of our estimations hold, we plot the results for equation 2 in Figure 2. Each dot represents the estimated coefficient of a lead or a lag and its relative 95% confidence interval. As it appears from the figure, leads coefficients are not different from zero, whereas lags coefficients are statistically significant staring from the year after the adoption of experience rating. This evidence shows that there are no anticipatory effects of the policy or, in other words, that the common trend assumption is confirmed in our data.

Figure 2, about here

Tables 6 and 7 show the results of equation 1 when the dataset is collapse to quarterly-hospital observations. Robustness of the results on the incidence of cesarean cestions are confirmed: the magnitude of the effect with controls stands in a range between -8.5 (DD) and -15%.[17] Complications are once again not significant, while the negative impact on preventable complications as captured by PSI 18 and 19 is different from zero.We have estimated the same specifications using a negative binomial model and the results are consistent with those shown in the tables. Results are available upon request.

Tables 6 and 7, about here

5.2 Differences in Risk or Differences in Lack of Risk?

Table 8 shows the results of estimating the impact of our treatment on both the predicted probability of a c-section and the residuals derived through equation 3. As it appears from the results, the impact of experience rating on patient sorting according to their risk factors is null. However, interestingly enough, the increase in malpractice pressure does affect the non medical rationales to perform a cesarean section. The magnitude of the effect is a -7% of the average residuals in absolute terms in the DD and -11% in the diff-in-disc specification. This means that experience rating reduces discretion in the use of the analyzed procedure.

Table 8, about here

6 Concluding remarks

We provide an assessment of the introduction of experience rating for medical malpractice insurance. Exploiting a pre-existing policy affecting the healthcare providers, namely the courts' districts adoption or lack of adoption of schedules of non economic damages, we apply

[17]The mean of $Csection$ is 0.354 for the entire sample and 0.37 for the nearest sample.

a DD strategy to evaluate the intensity of the introduction of experience rating itself. Our DD results are also robust to a more local estimation run with a difference in discontinuities specification, which exploits only the treated hospitals and their nearest control hospitals placed on the other side of the court district geographical border. Our analysis shows that the increase in malpractice pressure decreases the incidence of cesarean sections between 7 and 11.6%. This result is quite in line with what has been found by Currie and Macleod (2008), where the reform of the rule of joint and several liability is associated with a decrease of 13% in the use of cesarean sections. Our results are robust to the inclusion of controls for financial incentives, once we include a measure for patient flow, and to the drop of weekend deliveries, when the occurrence of a cesarean section might be mostly related to an emergency procedure. Finally, we investigate the possible channels of the detected effects. We prove that no patient selection mechanism (*i.e.*, negative defensive) has been triggered by experience rating, but we detect a decrease in the discretion over the final decision to perform the surgical procedure not related to medical factors.

References

Agency for Healthcare Research and Quality (AHRQ) (2003). AHQR Quality Indicators: Guide to Patient Safety Indicators. Rockville, Md.

Amaral-Garcia, Sofia and Veronica Grembi (2014). Curb Your Premium! Evaluating State Intervention in Medical Malpractice Insurance, Health Policy, Vol. 114, pp. 139-146.

Avraham, Ronen (2006). Putting a price on pain-and-suffering damages: A critique of the current approaches and a preliminary proposal for change. Northwestern University Law Review, Vol. 100, pp. 05-23.

Baicker, K, Buckles, K., and A. Chandra (2006) Geographic Variation in the Appropriate Use of Cesarean Delivery. Health Affairs 25:355.

Bertoli, Paola (2014). Medical Malpractice in Public HealthCare System: An Empirical Investigation of Scheduled Damages. PhD Dissertation EDLE program.

Comandè Giovanni (2005). Towards a Global Model for Adjudicating Personal Injury Damages: Bridging Europe and the United States, 19 Temp. Intl & Comp. L.J. 241, pp. 241-349.

Currie, Janet and W. Bentley MacLeod (2008). First Do No Harm? Tort Reform and Birth Outcomes. Quarterly Journal of Economics, Vol. 123, pp. 795-830.

Currie, Janet and W. Bentley MacLeod (2013). Diagnosis and Unnecessary Procedure Use: Evidence from C-sections. NBER Working Papers.

Dranove, David, Subramaniam Ramanarayanan, and Andrew Sfekas (2011). Does the market punish aggressive experts? evidence from cesarean sections. The BE Journal of Economic Analysis & Policy 11 (2).

Dranove, D., and Y. Watanabe (2009). Influence and Deterrence: How Obstetricians Respond to Litigation against Themselves and Their Colleagues. American Law and Economics Review 12: 69-94.

Dubay, L., Kaestner, R., and T. Waidmann (1999). The Impact of Malpractice Fears on Cesarean Section Rates. Journal of Health Economics 18: 491-522.

Dubay, L., Kaestner, R., and T. Waidmann (2001). Medical Malpractice Liability and Its Effect on Prenatal Care Utilization and Infant Health. Journal of Health Economics 20: 591-611.

Ellis, Randall P., Cynthia L. Gallup, and Thomas G. McGuire (1990). Should medical professional liability insurance be experience rated? Journal of Risk and Insurance, pp. 66-78.

Fenn, P., Gray, A., and N. Rickman. 2007. Liability, Insurance, and Medical Practice. Journal of Health Economics 26: 1057-1070.

Fenn, P., Gray, A., Rickman, N., Vencappa, D., and O. Rivero (2013). The impact of risk management standards on patient safety: the determinants of MRSA infections in acute NHS hospitals, 2001-2008.Oxford Bulletin of Economics and Statistics, Vol.75 (3), pp. 340-361.

Frakes, M. (2012). Defensive Medicine and Obstetric Practice. Journal of Empirical Legal Studies 9: 457-481.

Fournier, Gary M. and Melayne M. McInnes (2001). The case for experience rating in medical malpractice insurance: an empirical evaluation. Journal of Risk and Insurance, Vol. 68(2), pp. 255-276.

Grembi, V., Nannicini, T., and U. Troiano (2014). Policy Responses to Fiscal Restraints: A Difference-in-Discontinuities Design, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1852523##.

Iizuka, T. (2013). Does Higher Malpractice Pressure Deter Medical Errors? Journal of Law and Economics 56: 161-188.

Kachalia, A., and Mello, M. M. 2011. New Directions in Medical Liability Reform. New England Journal of Medicine 364: 1564-1572.

Localio, A. R., Lawthers, A., Begtson, J., Hebert, L., Weaver, S., Brennan, T., and J. R. Landis (1993). Relationship Between Malpractice Claims and Cesarean Delivery. Journal of the American Medical Association 269: 366.

Mapelli, Vittorio (2012). Il sistema sanitario italiano, Il Mulino, Bologna.

Meloni et al. (2012). The role of caesarean section in modern Obstetrics. Journal of Pediatric and Neonatal Individualized Medicine 1:53-58.

Mello, Michelle M. (2006). Understanding medical malpractice insurance: A primer, Princeton, NJ, The Robert Wood Johnson Foundation, Research Synthesis Report n. 8.

Ministero della Salute (2013). Certificato di assistenza al parto (CeDAP), Analisi dell'evento nascita - Anno 2010.

Ministero della Salute (2011). Taglio cesareo: una scelta appropriata e consapevole.

Nys, Herman (2009). The Factual Situation of Medical Liability in the Member States of the Council of Europe, Reports from the rapporteurs, Conference 'The ever-growing challenge of medical liability: national and European responses', Strasbourg 2-3 June 2008, pp. 17-28.

OECD (2013), Health at a Glance 2013: OECD Indicators, OECD Publishing.

Sella, Mauro (2005). I sistemi tabellari, available at: `http://www.personaedanno.it`.

Shurtz, I. (2013). The impact of medical errors on physician behavior: Evidence from malpractice litigation. Journal of Health Economics 32: 331-340.

Shurtz, I. (2014). Malpractice Law, Physicians Financial Incentives, and Medical Treatment: How Do They Interact?. Journal of Law and Economics 57: 1-29.

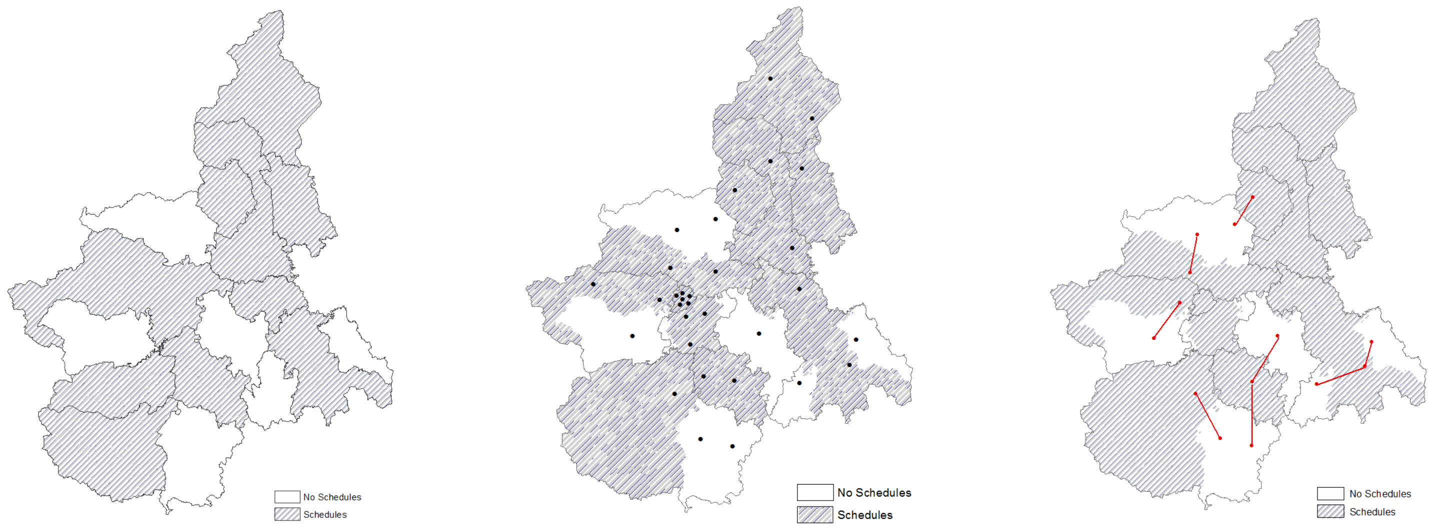
Sloan, Frank A. (1990). Experience Rating: Does it Make Sense for Medical Malpractice Insurance? American Economic Review 80(2): 128-133.

Sloan, F. A., Entman, S. S., Reilly, B. A., Glass, C. A., Hickson, G. B., and H. H. Zhang (1997). Tort Liability and Obstetricians' Care Level. International Review of Law and Economics 17: 245-260.

Weiler, P. C., Hiatt, H. H., Newhouse, J. P., Johnson, W.G., Brennan, T.A., and Leape, L. L. (1993). A Measure of Malpractice: Medical Injury, Malpractice Litigation and Patient Compensation. Cambridge, Harvard University Press.

Tables and Figures

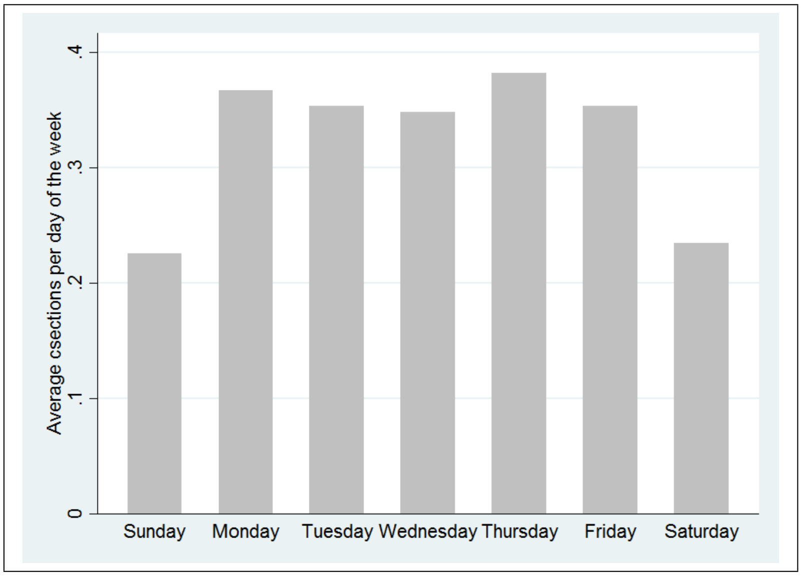
Figure 1: **Schedules Adoption and Hospitals Distribution (2002-2009)**



(a) (b) (c)

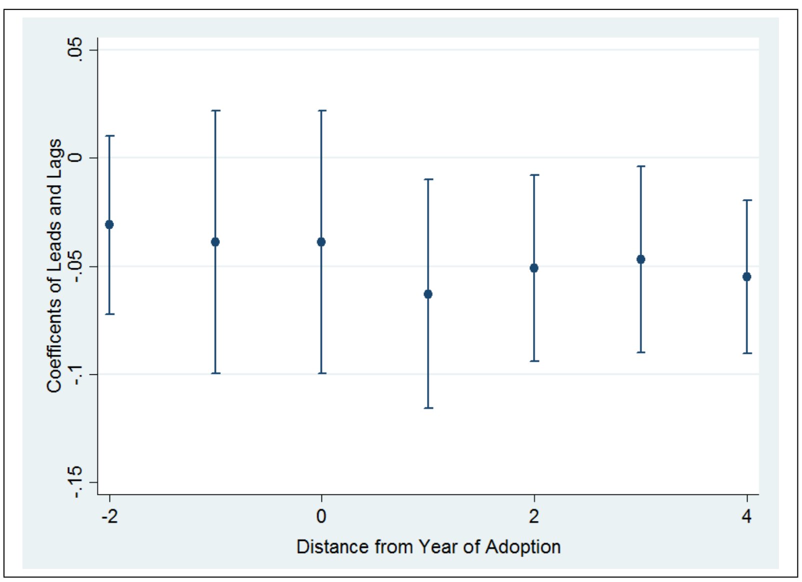
Notes: (a) In black the Courts' districts. (b) In black the LHUs' borders. White areas identify the courts not adopting schedules of non-economic damages. Grey striped areas coincide with courts adopting schedules of non-economic damages. Black dots represent the hospitals located in the Piedmont territory. (c) In black the LHUs' borders. Red dots represent each hospital located in courts not applying schedules damages and the related closest hospital located in courts applying scheduled damages.

Figure 2: **Csections per Day of the Week**



Note: We plot the average number of csections per day of the week.

Figure 3: **Common Trend (Leads & Lags)**



Notes: Leads and Lags coefficients controlling for $Cov1$, $Cov2$, $Cov3$, and dropping weekend deliveries.

Table 1: **Outcomes and Controls**

Outcomes			Controls		
Complications[a]	**Patient Safety Indicators**[c] **(PSI)**		**Cov1**[a]	**Cov2**[a]	**Cov3**[b]
	Vaginal Deliveries with Instruments (18)	Vaginal Deliveries without Instruments (19)	Mother Level	Mother Level	Mother Municipality Level
Maternal fever	Obstetric traumas	Obstetric traumas	Previous Csection	Age	Average Income
Maternal seizures	Perineal lacerations	Perineal lacerations	Multiple Babies	Nationality	Sea level
Rupture of the uterus	Vaginal traumas	Vaginal traumas	Diabetes	Marital status	Level of urbanization
Coagulation problems	Perineal traumas	Perineal traumas	Eclampsia	Patient flow	Education
Hysterectomy			Placenta		
Prolonged labor			Disproportion		
Dysfunctional labor			Cancer		
Anesthetic complications			Prolong pregnancy		
Fetal distress			Early-onset delivery		
Hemorrhage			Cord prolapse		
Perineal laceration			Use of alcohol/drug		
Cardiac complications			Cephalopelvic disproportion		
Decompression sickness			Hypertension		
Renal failure			Cardiac or lung conditions		
Embolism			Obesity		
Maternal distress			Anemia		
Lung complications			RH Problems		
Other			Sexual transmitted diseases		
			Renal failure		

Note: (a) The controls for clinical risk factors are consistent with what used in Dubay *et al.*(1999), Dubay *et al.*, (2001), Currie and MacLeod (2008 and 2013), Dranove and Watanabe (2009), Dranove *et al.* (2011), and Shurtz (2013 and 2014). (b) The controls at the mother's municipality level are consistent with what used at the county level by Baicker *et al.* (2006). We also include *Sea level* to account for the fact that Piedmont has many mountain municipalities. (c) Patient safety indicators (PSI) are defined according to the classification proposed by the Agency for Healthcare Research and Quality (AHRQ) which relies on the ICD-9-CM codes as identified in AHRQ (2003). *Instruments* refer to the use of forceps or vacuum during the delivery. *Patient flow* identifies deliveries occurred in a hospital outside the mother's LHU. This means that the procedure will be paid using the Diagnostic Related Group system.

Table 2: **Means of Key Variables**

	Entire Sample				Nearest Hospitals			
	All Births	No Schedules	Schedules	Vaginal Deliveries	All Births	No Schedules	Schedules	Vaginal Deliveries
Outcomes								
C − section	0.330	0.336	0.330		0.317	0.336	0.301	
	(0.470)	(0.472)	(0.470)		(0.465)	(0.472)	(0.459)	
Complications	0.172	0.129	0.179	0.200	0.148	0.129	0.164	0.172
	(0.378)	(0.336)	(0.384)	(0.400)	(0.355)	(0.336)	(0.370)	(0.377)
PSI 18 *and* 19	0.004	0.005	0.004	0.006	0.004	0.005	0.004	0.006
	(0.067)	(0.070)	(0.066)	(0.080)	(0.065)	(0.070)	(0.061)	(0.078)
PSI 19	0.004	0.005	0.004	0.006	0.004	0.005	0.004	0.006
	(0.067)	(0.070)	(0.066)	(0.080)	(0.065)	(0.070)	(0.061)	(0.078)
Controls at the mother level								
Risk Factors	0.183	0.172	0.185	0.073	0.162	0.172	0.153	0.043
	(0.387)	(0.377)	(0.388)	(0.261)	(0.368)	(0.377)	(0.360)	(0.203)
Age	31.453	31.030	31.522	31.014	31.127	31.030	31.208	30.695
	(5.077)	(5.197)	(5.053)	(5.043)	(5.103)	(5.197)	(5.023)	(5.075)
Nationality	0.837	0.824	0.839	0.828	0.843	0.824	0.859	0.833
	(0.369)	(0.381)	(0.367)	(0.377)	(0.363)	(0.381)	(0.347)	(0.373)
Marital Status	0.669	0.667	0.670	0.673	0.652	0.667	0.639	0.659
	(0.470)	(0.471)	(0.470)	(0.469)	(0.476)	(0.471)	(0.480)	(0.474)
Patient flow	0.365	0.166	0.398	0.350	0.174	0.166	0.181	0.164
	(0.481)	(0.372)	(0.489)	(0.477)	(0.379)	(0.372)	(0.385)	(0.370)
Controls at the mother municipality level								
Income	21,415.52	20,233.387	21,608.061	21,382.62	20,470.06	20,233.387	20,667.091	20,425.53
	(2,845.706)	(2,335.305)	(2,874.7337)	(2,842.465)	(2,480.429)	(2,335.305)	(2,578.5745)	(2,477.491)
Education	0.063	0.0532	0.065	0.063	0.0516	0.0532	0.050	0.0512
	(0.030)	(0.023)	(0.030)	(0.030)	(0.021)	(0.023)	(0.020)	(0.021)
Low Level of Urbanization	0.156	0.256	0.140	0.152	0.214	0.256	0.180	0.208
	(0.363)	(0.436)	(0.346)	(0.359)	(0.410)	(0.436)	(0.384)	(0.406)
Medium Level of Urbanization	0.461	0.725	0.418	0.469	0.621	0.725	0.534	0.165
	(0.498)	(0.447)	(0.493)	(0.499)	(0.485)	(0.447)	(0.499)	(0.371)
High Level of Urbanization	0.383	0.020	0.442	0.379	0.637	0.019	0.286	0.155
	(0.486)	(0.138)	(0.497)	(0.485)	(0.481)	(0.138)	(0.452)	(0.362)
Sea level	687.525	746.798	677.871	689.758	762.880	746.798	776.268	761.436
	(609.158)	(700.620)	(592.367)	(608.817)	(696.117)	(700.620)	(692.068)	(696.317)
Observations	265,537	37,192	228,345	177,961	81,865	37,192	44,673	55,472

Notes: *Outcomes* are described in Table 1. *Risk Factors* captures the incidence of risk factors as described by dummies in *Cov*1 of Table 1. *Nationality* is equal to 1 if the mother is Italian and 0 otherwise. *Income* is in 2012 euros. *Education* is the share of municipal residents with a college degree as measured in the 2001 Census data. *Level of Urbanization* captures both population density per squared kilometer and the municipality dimension. It is provided by the National Institute of Statistics as measured in the 2001 Census data. *Sea level* is in meters. Variables at the mother level are available through the patient discharge records, while variables at the mother's municipality level are available through the Italian National Institute of Statistic.

Table 3: **Cesarean Sections**

	All				No Weekends
Coefficient	(1)	(2)	(3)	(4)	(5)
Panel A: DD					
δ	-0.032***	-0.022**	-0.023**	-0.023**	-0.027**
	(0.0116)	(0.0101)	(0.010)	(0.010)	(0.011)
$Cov1$	No	Yes	Yes	Yes	Yes
$Cov2$	No	No	Yes	Yes	Yes
$Cov3$	No	No	No	Yes	Yes
Observations	265,537	265,537	265,537	265,532	202,273
Panel B: Diff-in-Disc					
δ	-0.051***	-0.038**	-0.037**	-0.037**	-0.040**
	(0.00939)	(0.0155)	(0.015)	(0.015)	(0.016)
$Cov1$	No	Yes	Yes	Yes	Yes
$Cov2$	No	No	Yes	Yes	Yes
$Cov3$	No	No	No	Yes	Yes
Observations	81,865	81,865	81,865	81,864	62,043

Notes: δ is the coefficient of $Treated * Post05$. All regressions include both years and hospitals fixed effects. $Cov1$, $Cov2$, and $Cov3$ are listed in Table 1. Linear probability model regressions. Standard errors clustered at the hospital level in parenthesis. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 4: **Complications**

	All Births					Only Vaginal Deliveries				
					No Weekends					No Weekends
Coefficient	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: DD										
δ	-0.038	-0.041	-0.041	-0.041	-0.036	-0.058	-0.060	-0.060	-0.060	-0.054
	(0.0310)	(0.0335)	(0.033)	(0.033)	(0.032)	(0.0474)	(0.049)	(0.048)	(0.048)	(0.049)
$Cov1$	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
$Cov2$	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
$Cov3$	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Observations	265,537	265,537	265,537	265,532	202,273	177,961	177,961	177,961	177,957	129,268
Panel B: Diff-in-Disc										
δ	-0.0385	-0.042	-0.043	-0.043	-0.036	-0.065	-0.067	-0.068	-0.068	-0.060
	(0.0595)	(0.0636)	(0.063)	(0.063)	(0.060)	(0.0791)	(0.082)	(0.082)	(0.082)	(0.081)
$Cov1$	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
$Cov2$	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
$Cov3$	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Observations	81,865	81,865	81,865	81,864	62,043	55,923	55,923	55,923	55,922	40,481

Notes: δ is the coefficient of $Treated * Post05$. All regressions include both years and hospitals fixed effects. $Cov1$, $Cov2$, and $Cov3$ are listed in Table 1. All regressions were run on the subsample including only natural deliveries. Linear probability model regressions. Standard errors clustered at the hospital level in parenthesis. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 5: **Injuries to Mother (Patient Safety Indicators)**

	All Vaginal Deliveries (PSI 18-19)					**Vaginal Deliveries Without Instruments (PSI 19)**				
					No Weekends					No Weekends
Coefficient	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: DD										
δ	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.00198)	(0.002)	(0.002)	(0.002)	(0.002)
$Cov1$	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
$Cov2$	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
$Cov3$	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Observations	265,537	265,537	265,537	265,532	202,273	177,961	177,961	177,961	177,957	128,339
Panel B: Diff-in-Disc										
δ	-0.003*	-0.003*	-0.003*	-0.003*	-0.003*	-0.004*	-0.004*	-0.004*	-0.004*	-0.005*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.00213)	(0.002)	(0.002)	(0.002)	(0.002)
$Cov1$	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
$Cov2$	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
$Cov3$	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Observations	81,865	81,865	81,865	81,864	62,043	55,472	55,472	55,472	55,471	40,168

Notes: δ is the coefficient of $Treated * Post05$. All regressions include both years and hospitals fixed effects. $Cov1$, $Cov2$, and $Cov3$ are listed in Table 1. All regressions were run on the subsample including only natural deliveries. Linear probability model regressions. Standard errors clustered at the hospital level in parenthesis. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 6: **Results Hospital Level**

	Csections		**Complications**			
			All Births		**Only Vaginal Deliveries**	
Coefficient	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: DD						
δ	-0.033**	-0.030**	-0.041	-0.029	-0.067	-0.052
	(0.014)	(0.013)	(0.028)	(0.024)	(0.046)	(0.043)
$Controls$	No	Yes	No	Yes	No	Yes
Observations	1,054	1,054	1,054	1,054	1,054	1,054
Panel B: Diff-in-Disc						
δ	-0.060***	-0.055***	-0.040	-0.041	-0.067	-0.070
	(0.016)	(0.017)	(0.048)	(0.034)	(0.070)	(0.050)
$Controls$	No	Yes	No	Yes	No	Yes
Observations	447	447	447	447	447	447

Notes: δ is the coefficient of $Treated * Post05$. All regressions include both years and hospitals fixed effects. The dependent variable represents the quarterly incidence of csections at the hospital level.$Controls$ includes the quarterly incidence at the hospital level of $Cov1$, $Cov2$ and $Cov3$ as listed in Table 1. OLS regressions. Standard errors clustered at the courthouse level in parenthesis. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 7: **Injuries to Mother (Patient Safety Indicators): Hospital Level**

	All Vaginal Deliveries (PSI 18-19)		**Vaginal Deliveries Without Instruments (PSI 19)**	
Coefficient	(1)	(2)	(3)	(4)
Panel A: DD				
δ	-0.002*	-0.002*	-0.005**	-0.005**
	(0.001)	(0.001)	(0.002)	(0.002)
Controls	No	Yes	No	Yes
Observations	1,054	1,054	1,054	1,054
Panel B: Diff-in-Disc				
δ	-0.003***	-0.003***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Controls	No	Yes	No	Yes
Observations	447	447	447	447

Notes: δ is the coefficient of $Treated * Post05$. All regressions include both years and hospitals fixed effects. The dependent variable represents the quarterly incidence of mother's injuries at the hospital level. The incidence of PSI 18 *and* 19 is calculated out of the total number of vaginal deliveries, while PSI 19 is calculated only out of the sample of vaginal deliveries without instruments. *Controls* includes the quarterly incidence at the hospital level of $Cov1$, $Cov2$ and $Cov3$ as listed in Table 1. OLS regressions. Standard errors clustered at the courthouse level in parenthesis. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 8: **The Channels: Patient Selection and Non Medical Cesareans**

Coefficient	PPC	Residuals
DD		
δ	-0.008	-0.024**
	(0.011)	(0.010)
Year FE	Yes	Yes
Hospitals FE	Yes	Yes
Observations	265,532	265,532
Diff-in-Disc		
δ	-0.016	-0.035**
	(0.016)	(0.014)
Year FE	Yes	Yes
Hospitals FE	Yes	Yes
Observations	81,864	81,864

Notes: δ is the coefficient of $Treated * Post05$. PPC=Predicted probability of performing a cesarean section on the base of risk factors according to estimation of Equation 2 through linear probability model and the related residuals coincide with *Residuals*. OLS regressions. Standard errors clustered at the hospital level in parenthesis. Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.