A DOCTOR WILL SEE YOU NOW: PHYSICIAN-PATIENT RELATIONSHIPS AND CLINICAL DECISIONS*

ERIN M. JOHNSON
M. MARIT REHAVI
DAVID C. CHAN
DANIELA CARUSI

June 2016

Abstract

The physician-patient relationship is central to the practice of health care, yet little is known about how it affects physician decisions. We compare obstetricians' (OBs') treatment decisions for patients with whom they have a pre-existing clinical relationship (their "own patients") and patients with whom they had no prior relationship ("others' patients") in a setting where the delivering OB is as good as randomly assigned. When OBs deliver their own patients they are 25% (4 percentage points) **more** likely to perform a C-section, a differential that increases in the OB's prior interaction with the patient. We also find that OBs' treatment choices are consistent with OBs receiving greater disutility from their own patients' difficult labors. After a string of difficult labors, OBs are more likely to perform C-sections on their own patients and this pathway can explain the entire overall effect. These treatment differences do not appear to have measurable effects on infants, but mothers delivered by their own OB avoid some short-run complications of labor. (*JEL* I11, J16, J44)

*Corresponding author: M. Marit Rehavi, Vancouver School of Economics, University of British Columbia, 6000 Iona Drive, Vancouver BC V6T 1L4, email: marit.rehavi@ubc.edu. This paper has benefited from discussions with and comments by: Kate Baicker, Loren Baker, Paul Beaudry, Marika Cabral, Joe Doyle, Nicole Fortin, Richard Freeman, Nancy Gallini, Josh Gottlieb, David Green, Florian Hoffman, Mireille Jacobson, Brendan Nyhan, Torsten Persson, Heidi Williams, Crystal Yang, and participants at the Canadian Institute for Advanced Research, the Junior Health Economists Summit, the Robert Wood Johnson Scholars in Health Policy Conference (Michigan), and seminars at the University of British Columbia, the University of Victoria, and Wellesley College. We thank Tessa Johnson for excellent research assistance. Total word count: 10,872 words.

I. INTRODUCTION

Every day physicians face complex and subjective treatment decisions. Physicians are human and thus susceptible to biases. The influences of financial incentives, personal convenience and malpractice concerns on their decisions are well documented. Less studied, but potentially as important, is the effect of physicians' relationships with their patients on clinical decisions. Physicians do not make arm's length decisions for faceless files. They often make clinical recommendations for, perform procedures on, and see the resulting outcomes for patients over the course of repeated interactions. However, little is known about how these physician-patient relationships affect physicians' medical decisions. Do they lead to more intensive treatment? Do they affect patient health?

This is not only of academic interest. These phenomena have broad implications for understanding the effect of familiarity in transactions that depend on human interaction. In health care they are critical for assessing the implications of recent widespread organizational changes in health care delivery. Over the last two decades, the United States has shifted to more finely specialized and fragmented care delivery models. Hospitalists, physicians who provide inpatient care in place of the patient's personal physician were virtually nonexistent in 1996, but with 44,000 hospitalists as of 2014, the specialty is now larger than cardiology (Clark 2014). As of 2010, 38% of hospitals also reported employing obstetric hospitalists ("laborists"), obstetricians who handle labor and delivery but who do not provide prenatal care (Srinivas et al. 2012). Two key questions are how the rearrangement of physician-patient relationships affects the delivery of care, and the mechanisms through which it operates.

Obstetrics is particularly well-suited to studying physician-patient relationships. Prenatal care includes a standard set of 10-12 prenatal appointments over the course of the pregnancy. This concentrated set of interactions creates the opportunity for obstetricians (OBs) to establish relationships with their patients. As a result of this (and in contrast to other clinical settings), strong physician-patient relationships are less likely to be concentrated among the least healthy patients or among those with a high affinity for medical care. Childbirth is also an important component of health care in its own right. It is the leading reason for hospitalization in the United States, and over $12 billion is spent on childbirth each year (Moore, Witt, and Elixhauser 2014).

The first contribution of this paper is to isolate the effect of the physician-patient relationship on physicians' treatment decisions and patient health, by exploiting the unique organizational features of labor and delivery. We use the rotating call schedule of three OB groups at a leading academic medical center. The delivering OB for a patient in these practices is the physician who is on call when the patient is ready to deliver. Since the exact timing of the onset of labor is a random event in unscheduled deliveries, patients who go into labor spontaneously are effectively randomly assigned to their prenatal provider or another OB in the group. OBs are therefore treating, on the same day and in the same hospital, patients with whom they have a longstanding relationship and patients with whom they have very little, if any, familiarity. Moreover, the patients with whom they have a longstanding relationship differ only in that respect, because they are randomly assigned. This setting therefore enables us to isolate the effect of the pre-existing physician-patient relationship and abstract away from differences in practice style (Epstein and Nicholson 2009) or skill (Currie and MacLeod 2013).

When OBs deliver patients for whom they were also the prenatal provider, they are 25% more likely to perform a C-section (4 percentage points). This effect is large and robust. It represents the total effect of the reorganization of the physician-patient relationship on clinical decisions. The treatment effect also varies with the OB's degree of familiarity with the patient, suggesting familiarity is driving the results.

We further investigate the mechanism behind this effect. We present a simple model of the potential role of physician-patient relationships in treatment decisions. The model illustrates the roles of "objective" channels, such as financial considerations and patient health, and "empathetic" channels. The OB's utility is a function of profits, patient health, and their private cost of observing mothers' complications and discomfort. Specifically, OBs experience an empathetic utility penalty above the effect on patient health when they see their patients experience difficult vaginal deliveries and associated complications. This penalty is stronger for more familiar patients. Consistent with our findings, the model predicts OBs will perform more C-sections on patients they know, and this effect will be increasing in the OB's familiarity with the patient. The model also predicts the effect will be larger when vaginal birth's complications and discomfort are more likely or more salient. We use OBs recent experiences in labor to isolate variation in the OB's perception or reaction to vaginal birth's complications that is unrelated to the current patient's true clinical risk, her preferences, and any difference in information the OB may have about her health. The own patient effect is in fact larger among OBs whose patients have recently experienced a string of difficult labors. This evidence is consistent with the empathetic channel playing an important role in treatment decisions.

Consistent with attempting to minimize the mother's immediate complications and discomfort, OBs are 25% less likely to employ vacuum extraction or forceps (2.5 percentage points) on their own patients, procedures that are associated with high rates of maternal trauma. When OBs deliver their own patients the mothers are significantly less likely to experience complications of long or difficult labors such as a laceration in need of repair, fevers, and birth trauma. However, these differences in health appear short-lived, suggesting the complications OBs avoid may not have lasting health impacts. There is no difference in hospital stays after accounting for the longer stay needed to recover from the extra C-sections. In addition, the infants of OBs' own patients have comparable health outcomes to the other infants they deliver. The results, taken together, are consistent with physician-patient relationships affecting clinical decisions through the empathetic channel. OBs' malpractice concerns, clinical information, or reputation concerns may also differ with patient familiarity. We consider each and conclude that these other mechanisms are unlikely to fully explain our results.

The remainder of the paper proceeds as follows. Section II summarizes the existing literature, and Section III provides relevant clinical information on childbirth. Section IV presents the theoretical framework, while Section V describes the empirical strategy. Section VI presents the results, which are discussed in Section VII, and Section VIII concludes.

II. Existing Literature

Patients express more satisfaction when they are treated by physicians they know and who are perceived to be empathetic (Mager and Andrykowski 2002). Patients treated by such physicians may also be more likely to adhere to treatment regimens (Kim, Kaplowitz, and Johnston 2004) and less likely to sue in the event of adverse outcomes (Levinson et al. 1997). There is also experimental evidence that patients' beliefs about a physician's expertise are increasing in the number of visits with the physician (Wasson et al. 1984). Consistent with these stated beliefs and preferences, individuals are willing to pay substantially higher health insurance premiums to continue being treated by providers they know (Dahl and Forbes 2016). However, patient preferences aside, it is unclear whether and how familiarity causes physicians to make different decisions for their patients.

Interestingly, the medical community worries that close prior relationships will affect clinical judgment. In the extreme, the American Medical Association (AMA) recommends that physicians refrain from treating close family members, as "the physician's personal feelings may unduly influence his or her professional medical judgment" (AMA 1993). The literature on cognitive biases also suggests that relationships could have substantial effects on clinical judgment if they lead to increased emotional investment. It is well established that decision-making is affected by being in an emotionally aroused state, often termed a "hot" or "visceral" state. In such states, decision-makers typically overreact and overweight short-run or present gains (see, for example, Loewenstein 2000 and Loewenstein 2005). In the context of labor and delivery this could lead OBs to overweight the risk of complications or to prioritize the immediate (short run) health of the mother. More broadly, it has been hypothesized that agents are influenced by "emotional" considerations in a wide number of settings (Koszegi 2006).

While there is little direct evidence on the effect of physician-patient relationships on clinical decisions, the strength of physician-patient relationships is one of many factors that vary with the fragmentation of care. Several studies have documented a cross-sectional association between fragmented care and health utilization and outcomes (Skinner, Staiger, and Fisher 2006; Romano, Segal, and Pollack 2015). Agha, Frandsen, and Rebitzer (2016) find those who move to an area characterized by higher fragmentation experience significant increases in health care utilization. Chandra, Wright, and Howell (2012) exploit an intervention that increased care continuity in a hospitalist group and find it decreased length of stay and hospital charges. Similarly, two experimental studies find evidence that care continuity increases efficiency (Wachter et al. 1998; Wasson et al. 1984).

The implentation of a hospitalist care model also implictly fragments care and limits the physician-patient relationship. Wachter and Goldman's (2002) meta-analysis of 19 single hospital introductions of hospitalist programs concludes hospitalists improve efficiency without harming patient satisfaction. Abenhaim et al. (2007) finds that treatment decisions do not meaningfully vary across patients OBs deliver themselves and the minority of patients they elect to handoff to a laborist during labor. Other OB laborist studies find a fall in C-section rates following a hospital's adoption of a combined laborist-midwife care model, but cannot separate the effect of the midwife from the laborist (Iriye et al. 2013 and Nijagal et al. 2015). More broadly, the implementation of a hospitalist model is a large bundled intervention. These studies conflate the effects of care continuity, specialization, and being treated by a physician who selects into and is hired as a hospitalist. These confounds could be large. Meltzer et al. (2002) shows that randomly assigning patients to physicians with greater specialization and experience in inpatient care reduces mortality, length of stay, and costs. The estimates that follow isolate the effect of the pre-existing physician-patient relationship and inpatient-outpatient care continuity while holding provider specialization in inpatient care fixed. In fact, the providers are held constant as are the hospital setting, nurses, the patient population and the organizational structure of the practice groups. The only factor that varies is the provider's pre-existing relationship with the patient, providing direct insight into the effect of familiarity in the physician-patient relationship.

III. Clinical Background: Childbirth

OBs have the opportunity to form strong relationships with their patients. Prenatal care typically begins in the 8-10th week of pregnancy. The recommended schedule of care is one appointment every four weeks in the first 28 weeks, one appointment every two to three weeks until 36 weeks, and one appointment per week for the last four weeks of the pregnancy. This amounts to an average of 12 prenatal visits for an uncomplicated pregnancy. This concentrated, high volume of visits creates the opportunity to establish a strong relationship, particularly when compared with other providers who may see a patient once or twice a year and could take half a dozen years or more to amass a comparable number of visits.

This study focuses on decision-making during labor and delivery. The primary treatment decision once labor has begun is the delivery method: vaginal birth or C-section.[1] According to the American Congress of Obstetricians and Gynecologists (ACOG), vaginal birth is the preferred method of delivery in uncomplicated, routine labors (ACOG 2014). Vaginal deliveries avoid major abdominal surgery and the associated maternal mortality and morbidity (Hall and Bewley 1999; Lydon-Rochelle et al. 2000). Vaginal births also utilize fewer resources, require shorter hospital stays, have faster recoveries, and avoid the adverse effects of uterine scar tissue on future fertility and pregnancies (Ananth, Smulian, and Vintzileos 1997; Alpay, Saed, and Diamond 2008; Norberg and Pantano 2016).

However, vaginal delivery is neither safe nor possible for all patients. As labor progresses the OB must trade off the risks of allowing labor to continue against the risks of abdominal surgery. Vaginal deliveries have higher incidence of perineal lacerations and pelvic floor damage, which can lead to sexual dysfunction and incontinence (Fenner et al. 2003; Kammerer-Doak and Rogers 2008; Sultan et al. 1993). Long or difficult vaginal deliveries carry with them additional risks for mothers and infants. In these labors there is a risk of physical injury to the infant (broken clavicle or humerus), and allowing vaginal

1. OBs typically schedule C-sections without attempting labor in situations in which laboring is unsafe or likely to lead to a poor outcome (for example, breech presentation). OBs may also schedule the delivery via medical induction of labor. This is often used when continuing the pregnancy is unsafe for the mother or infant, in cases of maternal hypertension or in pregnancies exceeding 41 weeks gestation.

labor to progress when infants are not tolerating labor well can result in brain damage or infant death (Baskett et al. 2007). Long labors are also associated with fever and infection for mothers (Allen et al. 2009; Laughon et al. 2014). Forceps and vacuum extraction can make it possible to avoid a C-section or expedite the vaginal delivery of the infant in critical situations. However, the OB's application of force to extract the infant can result in neonatal birth injury and perineal trauma with rates as high as 20% (Bailit et al. 2016; Murphy et al. 2001).

IV. THEORETICAL FRAMEWORK

The following stylized model of OB decision-making in childbirth illustrates how objective and empathetic channels can affect treatment decisions. While empathetic considerations have received less attention in traditional models, there is reason to believe they could play an important role. We abstract away from a number of potentially relevant issues, such as OBs' reputation, or malpractice concerns, which are discussed in Section VII. In the model, the OB maximizes her utility by choosing the delivery method for each patient i she treats. Patients differ in how well the OB knows them prior to the birth, $D_{ij} \in \{0, 1\}$, where $D_{ij} = 1$ indicates the OB knows patient i and $D_{ij} = 0$ indicates patient i is unknown.[2] Patients also vary in the clinical risk associated with delivering vaginally, r_i, which we assume is known to the OB.[3]

The OB's ex ante utility consists of her own private return and patient health (see, for example, Ellis and McGuire 1986):

$$V_{ijt} = \big\{c_{ij}\pi - (1 - c_{ij})D_{ij}S(r_i, z_{jt})\big\} + H(c_{ij}, r_i).$$

Patient health, H, is a function of patient risk and the delivery method: $H(c_{ij}, r_i) = (1-c_{ij})h(r_i)$. c_{ij} is an indicator that the patient had a C-section and $h(r_i)$ is the patient's health in a vaginal delivery relative to a C-section, normalized such that patient health in a C-section is zero. For mothers who are unlikely to experience complications in vaginal birth (low r_i), health after a vaginal delivery is higher than health

2. For expositional purposes, we assume D_{ij} is binary, but it could also be a continuous variable that depends on relationship strength. If D_{ij} is continuous, the effect would vary with the magnitude of D_{ij}, but all of the comparative statics would remain the same.

3. In Appendix A we extend the model to allow OBs to have better information about patients they know. Patient risk, r_i, is comprised of two components, ω_j and η_j. OBs observe ω_j for all patients. They observe η_j only for the patients they know. The extended model clarifies how our estimation strategy identifies psychic costs separately from information.

after a C-section ($h(r_i) > 0$), reflecting the fact that C-sections are major surgery with the associated risks and extended recovery time. The health of a mother after a vaginal birth is decreasing in r_i, $\frac{\partial h}{\partial r_i} < 0$, and the point in the distribution where $h(r_i) = 0$ determines the C-section rate that maximizes patient health.

The OB's private return has two components. The first is the OB's relative profits from performing a C-section, π.[4] The second component and the one of interesst, $S(r_i, z_{jt})$, is the OB's disutility ("psychic cost") of witnessing the complications and discomfort of vaginal birth, including perineal lacerations and vaginal trauma, as well as the discomfort and physical stress of a long second stage of labor. These psychic costs are present when the OB knows the patient and are over and above any health effects on the patient which enter the OB's utility through $h(r_i)$. Complications of vaginal delivery may be particularly salient to the delivering OB because they occur in her presence at the time of treatment.[5] $S(r_i, z_{jt})$ naturally varies with true patient risk in vaginal birth, r_i. However, the OB's expected psychic costs also varies with factors z_{jt} that are unrelated to the current patient's true difficulty of vaginal birth. As such z_{jt} vary across OBs and over time. By definition, $S(r_i, z_{jt}) > 0$ and $\frac{\partial S}{\partial r_i} > 0$. We also assume $\frac{\partial S}{\partial z_{jt}} > 0$.

The OB's resulting maximization problem depends on D_{ij}:

$$V_{ijt} = \begin{cases} c_{ij}\pi + (1 - c_{ij})h(r_i), & D_{ij} = 0 \\ c_{ij}\pi + (1 - c_{ij})(h(r_i) - S(r_i, z_{jt})), & D_{ij} = 1 \end{cases}$$

OBs perform C-sections with the following probabilities:

$$\Pr(c_{ij} = 1) = \begin{cases} \Pr\left(h(r_i) \leq \pi\right), & D_{ij} = 0 \\ \Pr\left(h(r_i) - S(r_i, z_{jt}) \leq \pi\right), & D_{ij} = 1 \end{cases}$$

For unknown patients, the OB performs vaginal deliveries as long as the improvement in patient health is greater than the foregone profits. For her own patients, the OB compares the improvement in patient health less her psychic cost, $S(r_i, z_{jt})$, with profits. Because $S_{ijt} > 0$, $\Pr(c_{ij} = 1)$ is higher when OBs

4. π is included because it is a key factor in physician decisions in the literature, but it does not differ across own and others' patients in this setting.

5. Complications of a difficult vaginal delivery are readily apparent during the delivery, and the OB witnesses the difficulty of the labor, lacerations and vaginal trauma occurring. By comparison, serious complications of C-sections are rare, and many of them do not become apparent until after the delivery, when the delivering OB is unlikely to witness them. OBs may also experience disutility from the complications of vaginal delivery, because a different delivery method decision would have avoided the complication (it may cause feelings of regret). Regret is likely to be most severe in the extreme case of a difficult and unsuccessful vaginal delivery. Finally, the longer recovery time associated with a C-section mostly occurs after discharge, decreasing salience for the OB.

know patients ($D_{ij} = 1$). OBs are more likely to perform C-sections on patients they know because these patients' difficult vaginal births will have larger psychic costs. That is, $\Delta \Pr(c_{ij} = 1) \equiv \Pr(c_{ij} = 1|D_{ij} = 1) - \Pr(c_{ij} = 1|D_{ij} = 0) > 0$.

In addition, the gap between the C-section rate of the OB's own and others' patients, $\Delta \Pr(c_{ij} = 1)$, will be larger when the risks of complications from vaginal birth are higher or more salient to the OB. This can occur if there is an increase in objective patient risk, r_i, or due to a change in z_{jt}, which is unrelated to objective risk and therefore patient health. Separating factors that influence the OB's psychic cost of vaginal complications into those that operate through the patient's health and those that are uncorrelated with the true risk of vaginal delivery will provide empirical identification as to whether the effect of D_{ij} occurs through S_{ijt}, as described below.

V. EMPIRICAL STRATEGY

V.A. *The hospital and physician practices*

The clinical setting for this study is a large elite academic medical center in the United States with a highly ranked obstetrics and gynecology program. We focus on deliveries to the three physician groups, herein Groups A, B, and C, for whom we are able to observe records from outpatient prenatal visits as well as inpatient deliveries. Group A is owned by the same firm as the hospital, and OBs are salaried. Groups B and C are private practices and physicians in each group pool revenue.[6] Group A is the largest with an average of 7 OBs who perform 851 deliveries per year. Groups B and C are smaller, with 3 OBs per group and an average of 412 and 301 deliveries per year, respectively. All the groups only employ "attending physicians" as OBs. They do not utilize any medical residents or students. The three groups treat patients of average medical risk (none specialize in "high risk" pregnancies) and have similar practice styles. They choose to induce labor at nearly identical rates: 35%, 34%, and 34%, respectively. They also perform unscheduled C-sections at similar rates (16%, 15%, and 16%).

Patients choose a specific OB in their group to be their prenatal provider. Patients may choose to see other OBs in the group for prenatal care, but in practice the overwhelming majority of visits are with their chosen prenatal OB. All three groups employ a shared call model. One OB is designated as on call

6. Even within groups B and C the finanical incentive to perform a C-section is diffuse and small. Payments from Blue Cross Blue Shield, a large insurer, to these providers do not vary with the birth method. The reimbursements from the other insurers are only 5-10% higher for C-sections.

during each shift and handles all deliveries to group patients that take place during the shift. The groups' offices are not located at the hospital. Therefore, the on-call OB does not schedule clinic appointments during her call shift, though she may perform minor gynecological procedures at the hospital during her call shift. The OBs rigorously follow these rules. We only observe more than one OB delivering during a shift on extremely busy days when the designated back-up OB needed to be called in to assist. Groups B and C share call with each other, such that the OB on call handles deliveries of patients from both B and C during her shift. Only one OB is on call from the two groups at any given time. Groups B and C do not share an office, and do not see each other's patients for prenatal appointments. The payment for the delivery goes to the prenatal provider's practice group. In all groups, patients are informed of the shared call model during their first prenatal visit.

V.B. Data and Key Variables

The data used in this study come from electronic medical records (EMRs) and billing databases which cover both inpatient and outpatient care for the practice groups. The EMR provides the date and time of the birth, the delivery method, and information on clinical risk, measures of complications arising during labor and delivery, and infant APGAR scores. The billing record for the birth includes up to 12 diagnosis and procedure codes for each mother and infant, providing standardized information on patient risk factors, treatments, and outcomes. It also includes the Diagnosis Related Group (DRG) as well as the admission and discharge date for the mother and the infant. We augment these data with patient demographics for mothers and infants, including age, race and ZIP code from the patient master record.

Between 2006 and 2012, 10,408 babies were delivered by physicians in the three practice groups.[7] 500 multiple births, 1 birth with a missing estimated due date and 2 patients from Groups B and C who do not match to the billing records are excluded from the estimation sample. We match the hospital record of the birth to all outpatient prenatal care visits in the 40 weeks prior to the estimated due date.[8] We drop 1,837 Group A patients and 34 Group B and C patients who received their prenatal care at a different site and therefore do not match to prenatal records, leaving 8,036 births.

The exogenous variation in our paper comes from the timing of the natural onset of labor. By defini-

7. For practices B and C the sample begins in October of 2006, because prenatal visit data is only available for these practice groups beginning in March of 2006.

8. Group A uses the hospital electronic medical record system for outpatient visits. Group B and C use a different electronic medical records system for outpatient visits, but we were able to obtain access to all obstetric outpatient visits for these groups as well.

tion, scheduled C-sections and scheduled inductions of labor do not have a random onset of labor and are therefore excluded from the study.[9] After these exclusions, 3,800 unscheduled births remain. 15 births with missing parity or mother's ZIP code are also excluded for a final estimation sample of 3,785 births.

In this sample, the average and median patient have in excess of 75% of their prenatal visits with their prenatal OB. In contrast, when the OB delivers a colleague's patient, she is delivering a woman for whom she provided less than 5% of the prenatal care. We therefore use whether the OB is the primary prenatal provider as an indicator for the presence of a pre-existing physician-patient relationship. We define OBs' own patients as those patients who saw the OB for the majority of their prenatal care.[10]

In our sample of patients with a natural onset of labor, OBs deliver 711 of their own patients (19%) and 3,074 of their colleagues' patients (Table I). Figure I shows the distribution of the OB's prenatal visits with the patients she delivers for each of these groups. OBs are much more familiar with their own patients. The median patient delivered by their prenatal OB has had 9 prenatal visits with them. Delivering OBs are much less familiar with their colleagues' patients. They have never met 70% of them (prior to the onset of labor) and have had only one visit with 18% of them.

[Insert Figure I]

The mechanism proposed in our model suggests treatment differences arise from OBs' attempts to avoid the perceived future psychic costs of their own patients' difficult deliveries. To test this, we need a source of exogenous variation in the OB's expected psychic cost of a vaginal birth, z_{jt}, that is uncorrelated with patient risk. In our setting, OBs' patients' recent experiences when delivered by other OBs in the handful of births prior to the patient's random onset of labor provides a second source of exogenous variation. It should be uncorrelated with any characteristics of the patient the OB is currently delivering, including her true probability of complication or her objective need for a C-section. Yet, established cognitive biases suggest maternal risk in a vaginal birth may be more salient to or perceived to be inflated by OBs whose patients have just experienced a higher than average rate of maternal lacerations.[11] We therefore use the OB's recent experiences in labor and delivery as a source of exogenous variation in z_{jt}. Specifically, we measure the difficulty of the OB's patients' recent deliveries using the laceration rate of

9. Scheduled C-sections are those identified as scheduled (as opposed to emergent or urgent) in the medical record.
10. Alternately, one could define the primary prenatal provider as the OB seen in the patient's first prenatal visit. 87% of the time the first OB seen for prenatal care is also the most frequently seen OB (82% for Group A, 92% for Group B and 91% for Group C.)
11. For example, the "clustering illusion" is a cognitive bias in which individuals update beliefs too much following a small streak of outcomes similar to a "hot hand" effect. This phenomenon could be reinforced by the availability or recency effect in which more recent occurrences come to mind more easily and distort perceptions of the base probability of a given complication or outcome (Tversky and Kahneman 1974; Croskerry 2002).

her last 15 prenatal patients delivered by other OBs.[12] OBs receive reports on and provide the follow up care for their patients delivered by others. They are therefore aware of the difficulty of their patients' labors and their perceptions of the probability or disutility of a difficult vaginal delivery may be influenced by them. Lacerations result from both OB practice style and factors outside of the OB's control, such as the size and positioning of the infant. Reflecting this, there is wide variation in OBs' average laceration rates in their deliveries, with rates ranging from 30% to 77%. While laceration rates of patients the OB delivers herself are a function of her practice style, the laceration rates of her prenatal patients delivered by other OBs are independent of her treatment choices.[13] Furthemore, other factors that may differ across own and others' patients, such as the OB's information about the patient and patient trust of the OB, should not vary with the experiences of the delivering OB's prenatal patients when delivered by other OBs.

The average laceration rate in each OB's last 15 prenatal patients delivered by her colleagues is 0.53 with a within-OB standard deviation of 0.180. Consistent with this rate being the result of factors outside the OB's control, virtually all of the variation in this rate is within OB over time. Importantly, the within-OB variation in the recent laceration rate of her patients who were delivered by her colleagues is uncorrelated with her current patient's predicted underlying laceration and C-section probability. In a regression of the patient's predicted laceration rate on on the delivering OB's patients' recent laceration rate and OB fixed effects, the point estimate is 0.004 (s.e. 0.013). Similarly when the underlying C-section probability is the dependent variable the coefficient is -0.003 (s.e. 0.020).[14]

V.C. Econometric Model

To identify the effect of the pre-existing physician-patient relationship we assume the onset of labor is orthogonal to the call schedule. For women who go into labor naturally, the delivering OB is as good as randomly assigned. To support this assumption, we show that OBs' own patients are statistically indistinguishable from patients of other providers. Table I summarizes the characteristics of OBs' own patients and the patients of other prenatal providers whom they deliver. The two groups have similar

12. OBs do not only attend unscheduled births. Therefore, this rate is calculated using the birth outcomes in all deliveries to all mothers who attempted a vaginal birth including those whose labors were induced. It does not include scheduled C-sections as there is no attempt at vaginal birth in those instances.
13. Results are robust to using the laceration rate from the OBs' own deliveries of her patients, as an alternate measure.
14. Each patient's ex ante laceration and C-section probabilities are estimated by logistic regression using all the explanatory variables in Table I. These probabilities are then regressed on the laceration rate of the last 15 of the delivering OB's patients who were delivered by other OBs along with delivering and prenatal OB fixed effects.

demographic characteristics and socio-economic status. Both groups of patients are 33 years of age, they have the same racial make-up on average, and they live in ZIP codes with nearly identical per capita income. Their clinical risk factors are also comparable. The only notable difference is that OBs' own patients are slightly less likely to be experiencing a first birth.[15] However, predicted C-section probabilities based on all the variables listed in Table I do not significantly differ across OB's own and others' patients. Moreover, the results that follow are robust to limiting the sample to first births or to low risk first births (those with no risk factors present).

[Insert Table I]

If the delivering OB is as good as randomly assigned, the differences in means across treatments and outcomes are the causal effects of delivering one's own patient relative to a colleague's patient. To improve precision, we also estimate OLS regressions, making use of the full set of clinical and demographic controls. Specifically, we estimate OLS regressions of a binary indicator for C-section on an indicator for being the OB's own patient:

$$y_{ijpt} = \beta D_{ijp} + X_{it}'\gamma + \delta_j + \delta_p + \epsilon_{ijpt} \tag{1}$$

where y_{ijpt} is a dummy variable indicating whether patient i with delivering OB j and prenatal OB p had a C-section during shift t.[16] D_{ijp} is an indicator that the patient was delivered by their prenatal OB, and X_{it} is the set of all variables listed in Table I, including socio-economic status and clinical risk factors. Because we observe each OB delivering their own and others' patients, we can include both prenatal provider and delivering OB fixed effects. Prenatal provider fixed effects control for any sorting of unobserved patient characteristics to providers and groups, while delivering OB fixed effects absorb each provider's practice style in the delivery room. β is the coefficient of interest. It is the difference, ceteris paribus, in the probability of a C-section for an OB's own patients relative to the patients she delivers of other providers. The model predicts $\beta > 0$. OBs perform more C-sections on their own patients to avoid the psychic cost of witnessing mothers they know experiencing complications in vaginal birth.

Another measure of the pre-existing physician-patient relationship is their exposure to the delivering OB during prenatal care, as proxied by the fraction or number of visits. Both capture similar information

15. There are also small, but not systematic, differences in the rates of previous C-section or scar, asthma, and isoimmunity. Less than 10% of previous C-sections and uterine scars occur in women attempting a first birth.
16. 442 patients deliver more than once during the sample period, and they can have different clinical characteristics at each delivery. All results are robust to including year fixed effects and delivering doctor - year interactions.

about relationship strength. We estimate a version of the model replacing D_{ijp} with the share of the patient's prenatal care provided by the delivering OB.[17] This is not our preferred specification because the share of prenatal visits with the primary prenatal OB is in the patient's control and therefore not randomly assigned by the timing of the onset of labor.

Next, we test whether the probability of receiving a C-section varies among the OB's own patients with the extent of the OB's previous interactions with the patient. To that end we estimate:

$$y_{ijpt} = \beta_1 D_{ijp} + \beta_2 F_{ip} * D_{ijp} + \beta_3 F_{ip} + X'_{it}\gamma + \delta_j + \delta_p + \epsilon_{ijpt} \tag{2}$$

where F_{ip} is an indicator that the patient's fraction of visits with her prenatal OB was above the median (79%). If the relationship is driving treatment differences, one would expect the C-section rate to be higher for the OB's patients with whom she has had the most contact ($\beta_2 > 0$). In addition, the strength of relationship with the prenatal OB should not directly affect treatment decisions when patients are delivered by another OB.

Next we turn to the mechanism. We test the hypothesis that the C-section gap between OBs' own and others' patients is increasing in the OB's expected psychic cost of a vaginal birth. We estimate models of the following form:

$$y_{ijpt} = \beta_1 D_{ijp} + \beta_2 z_{jt} * D_{ijp} + \beta_3 z_{jt} + X'_{it}\gamma + \delta_{j\tau(t)} + \delta_p + \epsilon_{ijpt} \tag{3}$$

where z_{jt} is the laceration rate for delivering OB j's last 15 prenatal patients who were delivered by other OBs prior to the shift t in which patient i delivers. The model predicts $\beta_2 > 0$, all else equal, the gap between the OB's own and others' patients will be larger after a recent string of difficult vaginal deliveries. Because z_{jt} is both independent of the current patient's risk and uncorrelated with other factors that may differ across own and others' patients, such as patient preferences or the quality of clinical information, β_2 isolates the treatment difference that arises from the OB's expected psychic costs. Because we use OBs' patients delivered by other OBs it is also unrelated to time-varying trends in an OB's differential practice decisions on own vs. other patients. β_3 reflects short-term objective considerations that apply to both own and others' patients and co-vary with the recent laceration rate, such as short-run hospital shocks while β_1 captures the part of the own-patient effect that does not vary with z_{jt}. To further filter

17. All of the results presented hold when the number of visits with the delivering OB are used in lieu of the share of visits.

out norms and other contemporaneous factors around the time of delivery we control for the delivering OB fixed effect separately for each year ($\tau(t)$).

The C-section decision is important, but it is the not the only treatment decision that affects the mother's risk of injury or discomfort. We also estimate the base model for other treatment choices. Because some of the other treatments are not as common as C-sections (assisted vaginal delivery occurs in less than 10% of births, for example), we estimate logit models as follows:

$$logit(y_{ijpt}) = \beta D_{ijp} + X_{it}'\gamma + \delta_j + \delta_p, \tag{4}$$

where y_{ijpt} is an indicator variable for the treatment of interest, and the marginal effect of D_{ijp} gives the difference in treatment rates for OBs own and others' patients.

Lastly, we test whether OBs are successful in their efforts to avoid unpleasant complications in their own patients' vaginal births. We re-estimate (4) for each maternal and infant health outcome that occurs in at least 1% of births. If OBs' efforts are successful their own patients should have lower rates of maternal complications. The most serious adverse outcomes for mothers and infants are too rare to study in a sample of this size. However, mothers or infants who suffer serious complications are likely to require longer hospital stays. We therefore use the length of the hospital stay as a summary measure of the mother and infant's overall health, and we estimate OLS models of log length of stay on the own patient indicator, as in (1).

VI. RESULTS

OBs make different treatment decisions for patients they know. Substantive and significant differences in treatment are evident even in the raw means (Table II). The C-section rate when OBs deliver their own patients is 20.1%. It is more than 4 percentage points lower at 15.4% when delivering another OB's patient. This differential also appears to be a function of the OB's familiarity with the patient. Figure II presents the C-section rate when the OB delivers her own patients and colleagues' patients, broken out by the number of prenatal visits the primary prenatal OB had with the patient.[18] The C-section differential is highest when OBs deliver the patients with whom they had the most contact during pregnancy. There is

18. The number of visits with the primary prenatal OB is broken into quantiles such that 20% of patients have the specified range of visits with their primary prenatal OB. Appendix Figure B.I breaks patients into categories based on the fraction of visits with their primary prenatal OB, rather than the number of visits.

no significant C-section differential when OBs deliver patients who are nominally their patient, but with whom they have had very little contact prior to the delivery (patients who had fewer than 6 visits with their prenatal OB over the course of the pregnancy).[19]

[Insert Table II]

[Insert Figure II]

However, OBs do not treat their patients more intensively on all margins and actually perform fewer total procedures on them. OBs are approximately 30% less likely to employ vacuum extraction and forceps on their own patients (3 percentage points), are more likely to allow them to forgo continuous electronic fetal monitoring (EFM), and are less likely to order ultrasounds during labor and delivery. There is no difference in their use of epidural anesthesia or labor augmenting drugs.

Table III displays results from OLS regressions of an indicator that the patient received a C-section on an indicator that the OB has a pre-existing relationship with the patient (1). The first column contains no controls and is thus the raw difference in C-section rates by pre-existing relationship. After including controls for all of the clinical and socio-economic factors listed in Table I, the substantial treatment differences documented in the raw means persist. All else equal, patients delivered by their own prenatal provider are 3.9 percentage points (25%) more likely to receive a C-section (Column 2). The estimates are unchanged by the inclusion of prenatal and delivering OB fixed effects, suggesting that individual OBs make different clinical decisions for patients they know (Column 3).[20] A similar phenomena emerges when the the fraction of prenatal care provided by the delivering OB is used as a proxy for the strength of the pre-existing relationship in place of the own patient indicator. A one standard deviation increase in the fraction of visits provided by the delivering OB is associated with a 1.8 percentage point increase in the C-section rate (0.304×0.059, Column 6).

[Insert Table III]

We find that the differential treatment of the OBs' own patients is a general and robust phenomenon.

19. The same pattern emerges when patients are grouped by the percent of prenatal visits scheduled with their primary prenatal OB (Figure B.I). While the number of prenatal visits is a more natural unit of measurement, an advantage of grouping patients by the percentage of visits with their OB is that it abstracts from the total number of visits required and avoids conflating the health of the patient with their familiarity with the OB. When patients are not delivered by their prenatal OB their probability of receiving a C-section is uncorrelated with the fraction of visits they had with their prenatal OB.

20. The results are robust to estimation with a logistic regression in lieu of OLS (Appendix Table B.2) and to the inclusion of year fixed effects along with their interaction with the delivering OB fixed effects (Appendix Table B.3). Furthermore, the estimates are not driven by the effect of any individual OB (Appendix Table B.4). When the main own patient coefficient is re-estimated excluding each delivering OB in turn, the mean across the coefficients is 0.04, and the estimated own patient effect ranges from 0.033 to 0.047 (each coefficient is statistically significant). Repeating the exercise using the fraction of visits as the measure of relationship strength produces similar results. The mean across the coefficients is 0.06 and ranges from 0.051 to 0.069 and each is statistically significant.

A similar picture emerges when the prenatal OB is defined as the first OB the patient saw in the practice (Table IV, Row 2) instead of the most frequently seen OB. The estimates are also robust to restricting the sample to women giving birth for the first time (Table IV, Row 3). All else equal, women experiencing first births are 4.4 percentage points more likely to receive a C-section when they are delivered by their prenatal provider.

[Insert Table IV]

The practices' policies should generate random assignment and, consistent with that, the ex-ante predicted probability of a C-section is the same for the own and others' patients the OBs deliver. However, policies can be violated. Of most concern would be if the prenatal OB came in specially for high-risk situations that are also more likely to result in a C-section. By observing the exact timing of all births in the practices we are able to reconstruct the shift and find no evidence of this. Furthermore, the estimates are robust to limiting the sample to first births with no pre-existing conditions, a group very unlikely to be high risk or draw extra concern from the OB. They are also robust to excluding preterm births, the babies with a high risk of adverse outcomes at the onset of labor. The other threat to identification would occur if scheduled C-sections or informally scheduled inductions were not recorded as such in the record and thus slipped into the sample. The electronic medical records are extremely rich and, reassuringly, all of the women in the sample had ruptured membranes (colloquially, their "water broke"), indicating that all the women in the sample were in fact in labor. This would not be the case if the sample included any scheduled C-sections. The estimates are also robust to excluding all women with diagnoses for which performing a C-section witout an attempt at vaginal birth is recommended.[21] Inductions are most likely to occur when the infant is over 41 weeks gestational age. The estimates are robust to excluding those deliveries. There is also no difference in the rates of artificial rupture of membranes for own and others' patients, a procedure performed to induce or accelerate labor.

A natural question is whether these findings represent a higher incidence of C-sections or patients simply being more likely to have their C-section performed by their prenatal OB. For example, patients and OBs delivering near shift changes could consider the identity of the next on-call provider in making decisions to speed up or delay a transition to surgical delivery. If patients near shift changes wait until their provider comes on call to do the C-section, or if patients near the end of their OB's shift speed up

21. At the time of this study, an attempt at vaginal birth was considered contraindicated for women with placenta previa, a prior classical C-section, and malpresented infants.

a C-section, this would bias results upwards. Table IV, Columns (5) and (6) exclude births in the three hours prior to and following any shift change. The effects in both samples are similar to each other, and they are not smaller than the effect in the full sample. Similarly, during shifts with a high volume of births (more than 4 births) a second OB may be called in to assist and the allocation of patients to the two OBs present could be affected by pre-existing relationships. The estimates are robust to excluding shifts with a high volume of births.

If the physician-patient relationship is driving this difference in treatment, the effect should be concentrated among the OBs' patients with the strongest prior relationship. In fact, the effects are concentrated among the OB-patient pairs with the greatest amount of previous interaction. Table V, Columns (1) and (2) present estimates of (2). The difference in C-section rates is coming from patients who had above median fractions of their prenatal appointments with their delivering OB. These patients are more likely to receive a C-section when delivered by their prenatal OB. While the fraction of prenatal visits scheduled with the patient's primary prenatal OB is not random, it does not appear to be correlated with patients' need or preferences for C-sections. When not delivered by their prenatal OBs, patients with above median fractions of prenatal visits with their prenatal OBs have the same C-section rate as patients with less concentrated prenatal care.

[Insert Table V]

In order to test our proposed mechanism for the physician-patient effect, we estimate (3), which interacts the own patient indicator with laceration rate of the OB's last 15 prenatal patients delivered by other OBs (Table V, Columns 3-6).[22] OBs are in fact more likely to perform C-sections on their own patients when this recent laceration rate is high, suggesting psychic costs are important. This does not mean OBs view C-sections as preferable to lacerations in general; rather, having recently been exposed to more difficult labors OBs are quicker to switch to a C-section on the margin.

The effect is virtually unchanged with the addition of OB-year fixed effects. OBs are responding to a recent string of (bad) luck rather than responding based on their skill at vaginal birth.[23] In fact, it appears that the OB's reaction to her patients' recent experiences can explain the entire own-patient increase in the C-section rate. The point estimate of the coefficient on D_{ijp} is negative after including this interaction,

22. Results are robust to using fewer or more births in the laceration rate calculation. They are also robust to including quarter-year fixed effects and the simple prenatal OB and delivering OB fixed effects (Appendix Table B.6).

23. If the increase in lacerations is due to short-run fluctuations in the hospital's suitability for managing a long and difficult labor or a change in clinical guidelines, then it would be optimal for the OB to temporarily change her practice style to compensate. However, such a phenomena should effect all the patients she delivers equally.

though not precisely estimated. Consistent with this, having been exposed to a high laceration rate does not generally lead OBs to perform more C-sections. The effects are limited to the patients with whom they have pre-existing relationships and are presumably more emotionally invested.[24] OBs appear only to adjust their treatment decisions in response to the most recent birth experiences, but not the births that preceded them. Their laceration rate in 16-30 prior births has no additional effect on their probability of performing a C-section on their own or others' patients (Columns (5) and (6)). The effect of the OB's recent laceration rate is not a response to a hospital-level or seasonal shock to the true difficulty of vaginal delivery. The coefficient on the recent laceration rate, β_3, is negative and insignificant, suggesting the response is not the result of general time-varying factors that are correlated with laceration rates and affect both own and others' patients. In addition, the estimates are robust to including delivering OB $\times$ quarter-year fixed effects and alternative definitions of the recent laceration rate.[25]

The decision to perform a C-section is a key choice in labor and delivery, but it is not the only treatment decision. Vacuum and forceps are used in 11% of vaginal births (assisted vaginal delivery). These tools can be lifesaving in a difficult delivery, but are also associated with increased risk of serious maternal laceration, pelvic floor damage and increased risk to the infant. These complications may be particularly salient to the OB as they occur while she performs the procedure. Consistent with avoiding maternal discomfort and complications, OBs are 2.5 percentage points less likely to choose to use these tools on patients they know (Table VI, Columns 1 and 2).[26] In addition, women delivered by their own OBs have shorter second stages of labor (the "pushing phase"). Thus OBs appear to be avoiding long, difficult vaginal births when they have a pre-existing relationship with the mother. Beyond the choice of delivery method, other margins of care also suggest that OBs are placing more weight on the comfort and experience of mothers they have relationships with. They are more likely to allow those mothers to forgo continuous EFM (Table VI, Columns 5-6).[27]

[Insert Table VI]

24. As further evidence of this, results from the triple difference regression in which the laceration rate is interacted with the own patient indicator as well as the strong relationship indicator (from Table 5, Columns 1 and 2), suggests that OBs response to recent laceration rates are concentrated among the patients they know best (Appendix Table B.5).

25. Appendix Table B.6, Columns 1-3 and 7-9 use laceration rates in the last 10 and last 20 births. Appendix Table B.5 presents triple difference estimates using both our preferred measure and a recent laceration rate calculated from the last 15 deliveries the OB performed.

26. This does not appear to be a purely mechanical result of a lower rate of vaginal birth. When the C-section is included as a control or when the sample is limited to vaginal births, OBs are still 1.7 and 2.1 percentage points less likely to use these tools, respectively. Results are similar in a nested logit of vaginal delivery, assisted vaginal delivery and C-section, assisted vaginal delivery. Assisted vaginal delivery can account for a maximum of two thirds of the C-section effect.

27. Continuous EFM is convenient for providers, because it allows remote monitoring of patients. However, the monitor limits patient mobility and confines them to bed.

The result of all of these decisions is that women delivered by their prenatal OBs have lower rates of morbidity during their hospital stays (Table VII). They have lower rates of fever and trauma and lacerations in need of repair. However, these reduced morbidity rates do not appear to be significant enough to result in shorter hospital stays (Table VIII). The extra hospital stay to recover from the higher C-section rate offsets any gains from the lower complication rates. After accounting for the extra hospital stay necessitated by the higher rate of C-section, there is no measurable difference in the length of the hospital stays of those delivered by their own OBs. These results suggest that the complications avoided are easily treated or relatively minor. However, we cannot rule out that the lower rates of birth trauma and laceration are associated with less long-run pelvic floor damage and thus improved quality of life.

[Insert Table VII]

[Insert Table VIII]

The infants of mothers who are delivered by their own OBs also do not appear to be substantially healthier (Table IX). While they are significantly less likely to have any breathing issues recorded in first births (Panel B, Columns (1) and (2)), there is no difference in the rate of serious respiratory issues such as meconium aspiration and respiratory distress (Panel B, Columns (3) and (4)). These infants are otherwise indistinguishable from those delivered by other OBs. They are not less likely to have low APGAR scores nor do they have fewer NICU admissions. Finally, like their mothers they do not have measurably shorter hospital stays (Table VIII).

[Insert Table IX]

VII. Discussion

We find that physicians make different treatment decisions for patients they know. They do more C-sections in place of difficult and prolonged vaginal deliveries and extend other comfort-related courtesies to patients they know. These choices are consistent with OBs attempting to spare patients they know complications and discomfort, but can they be explained by other mechanisms?

Concerns about being sued for adverse outcomes (malpractice) are one of the most commonly cited explanations for rising C-section rates. Physicians may believe that patients they know and have a good rapport with will be less likely to sue in the event of an adverse outcome. If they do, OBs should be relatively less concerned about being sued when delivering their own patients and perform fewer C-sections on them (practice less defensive medicine). This is the opposite of what we find. If instead OBs are more fearful of lawsuits from their own patients, one would expect to see them using higher rates of continuous EFM and ordering more supplemental tests. Neither is the case. OBs are significantly more likely to allow their own patients to forgo continuous EFM, and they order fewer tests for them.

Another possibility is that OBs are able to exploit the relationship with their patients to induce demand more effectively. In this setting there is very little direct financial incentive to perform a C-section, so the primary motivation would be to minimize effort and/or make the birth more convenient for the OB. The OB's personal opportunity cost of continuing labor is highest when the patient is the only or last patient in labor during the shift. In those cases, a completed delivery means the OB is free to leave labor and delivery to work or rest. However, the own-patient C-section effect is unaffected by the number of other women in labor at the time of the birth or overall that day (see Appendix Table B.9).[28]

OBs gather information about the patient's pregnancy and medical history during prenatal appointments. However, our results, taken together, do not appear to be the result of OBs being better informed about their own patients' health. It is possible that better information could lead OBs to perform more C-sections on their own patients, but the effect of OBs' recent laceration rates suggests psychic costs are driving the treatment gap (Appendix A). We would also expect for OBs with less information to perform more tests to evaluate risk factors. OBs are not more likely to perform tests to assess the severity levels of risk factors for others' patients (for example, diabetes tests), although OBs are slightly less likely to perform ultrasounds and slightly more likely to allow their patients to forego continuous EFM (Appendix Table B.10). Additionally, the treatment differential is the same size for the group of patients with no pre-existing conditions. This is a group for whom the difference in information between the prenatal OB and other providers is likely to be smallest. For patients who attempt labor, much of the information relevant to the likely success and safety of vaginal delivery is revealed during labor. It is also possible that these groups are particularly adept at handling information transfers across providers.[29] Their high level of experience and skill may also compensate for any information loss.

In addition to better clinical information, OBs may have greater rapport with their own patients. This could facilitate physician-patient communication during labor, making the OB more aware of both the

28. OBs may also want to speed up labor if they are especially busy, but the effect is not larger during the busiest shifts.
29. The groups use electronic medical records and have shared call for an extended period of time. The prenatal provider also submits and regularly updates a "problem list" to the hospital during the second trimester, which the delivering OB can reference in making treatment decisions.

mother's degree of discomfort and her preferences. If mothers feel social pressure to deliver vaginally, they may be more comfortable expressing a desire to end an attempt at vaginal birth and switch to a C-section to their own OB. Similarly, the patient may be more receptive to a change in delivery method when it is proposed by her own OB. However, the fact that the treatment effect appears driven by OBs' experiences in prior shifts suggests that the effect is coming from the OB, not the patient.

Differential reputation costs could also make inducing demand less costly when delivering one's own patients. One notable difference when delivering a fellow OB's patient (compared to one's own patient) is that a fellow OB will get a report of the birth and form an opinion as to the appropriateness of care. If this monitoring by colleagues and any associated reputation concerns were the source of the C-section differential, OBs should be relatively more likely to do a C-section on all of their own patients. Instead we find the differential is concentrated in the patients the OB knows best (Table V). One might also expect OBs to be most concerned about the opinions of their partners in the practice. However C-section rates are not lower for patients of OBs' colleagues from their own practice relative to those of colleagues from other groups, suggesting that they are not attempting to impress their partners with low C-section rates (Appendix Table B.8). Finally, concerns about their colleagues' opinions of their skill cannot explain the laceration results. If they were driving the results, we would expect OBs to be more averse to performing vaginal births on colleagues' patients following a higher than average string of lacerations. Yet, the OB's overall laceration rate and the rate relative to the OB's average only measurably affect the rate at which she performs C-sections on her own patients.

OBs may also be concerned with their reputations with patients. OBs often rely on "word of mouth" for referrals. An OB with a reputation for being too quick to perform a C-section may attract fewer patients. If OBs believe that their own patients will give them the benefit of the doubt when recommending a C-section, they may be less hesitant to recommend one to them. However, to explain the results, the reputation concern would have to vary with the OB's most recent experience (laceration rate) in vaginal births. That is, OBs would have to believe that their own patients (and not others' patients) are more likely to believe a C-section recommendation is warranted in shifts in the weeks after an OB experienced unusually difficult deliveries.

VIII. CONCLUSION

The physician's relationship with her patient has a large effect on her clinical decisions. All else equal, an OB is 25% more likely to perform a C-section on her own patient. To achieve a similar increase in the C-section rate one would need to raise the OB's C-section fee differential by $625 (150% of the average OB fee differential).[30] It is also larger than the effect of major tort reforms which have been estimated to increase the C-section rate by 5-7% (Currie and MacLeod 2008; Shurtz 2014). Similarly, one would need to more than double malpractice premiums to produce an effect of this size.[31]

When treating her own patients the OB appears to be motivated by heightened concern for the mother's immediate well-being. Consistent with that, treatment differences co-vary with the strength of the pre-existing relationship and the OB's perception of vaginal birth's maternal complication rate at the time of delivery. Beyond the C-section decision, OBs' other treatment choices in labor and delivery are also consistent with being more sensitive to their own patients' discomfort. When treating her own patients, the OB is less likely to choose to employ vacuum or forceps to extract the infant. In spite of this, her own patients still have shorter second stages of labor, suggesting that the OB is choosing to perform C-sections to cut off particularly long labors.

These treatment differences appear to be "flat of the curve" for the infant, but not for the mother. When OBs deliver their own patients the mothers experience less trauma and fewer fevers, but the injuries avoided are not so serious as to necessitate longer hospital stays for the mothers delivered by other OBs. To determine social optimality this small benefit must be weighed against the resource and health costs of a substantially higher C-section rate. If the only consideration were medical costs during the birth, the additional C-sections would likely be undesirable.[32] However, the most serious maternal and infant complications (e.g. uterine rupture, asphyxiation) are extremely rare, and the lower rates of maternal complications we do observe could also be associated with less long-term maternal morbidity. It is also unclear if these treatment differences improve patients' private welfare. It will depend on whether

30. A $100 increase (decrease) in the C-section fee differential is estimated to raise (lower) the C-section rate by 4% (Gruber, Kim, and Mayzlin 1999; Alexander 2015). The Healthcare Blue Book lists the physician fees for a vaginal birth and a C-section along with any associated postpartum care as $4,040 and $4,484, respectively.

31. Dubay, Kaestner and Waidmann (1999) estimate that a $10,000 malpractice premium reduction reduces the primary C-section rate by 2% for married, college educated women. The effect varies from 1.4% to 2.4% for other demographic groups. In 2014, the average OB's malpractice premium was $70,000 (authors' calculation of the birth-weighted average malpractice premium from the Medical Liability Monitor survey).

32. Any gains from the lower morbidity we document are not even large enough to off-set the longer hospital stay generated by the higher C-section rate. The care during the initial stay is likely a lower bound on the additional resources used by C-sections as it does not include any re-hospitalizations for wound disruptions or other C-section complications that arise after discharge.

psychic costs bring the OB closer to the weight the mother places on the discomfort and complications in a difficult vaginal birth. However, it would be hard to conclude that a treatment differential that is largely driven by an experienced OB's last few draws in labor (her patients' last 15 deliveries, but not the 15 that preceded them) represents improved clinical decision-making.

This is the first paper, to our knowledge, that demonstrates that physicians treat patients differently when they know them. Policy initiatives that affect provider continuity and relationships should be evaluated in light of this finding. For example, it suggests that the declines in C-section rates experienced by hospitals adopting laborist models could be the product of the elimination of the pre-existing physician-patient relationship, and not simply OB selection into the laborist profession or specialization in labor and delivery. Similarly, health delivery innovations such as patient centered medical homes may not just alter care by increasing coordination and diminishing information loss. The relationships they enable physicians to develop with their patients could also have direct effects on physicians' clinical decisions. Similarly, initiatives in medical education aimed at increasing physician empathy have been motivated by a desire to improve communication and patient satisfaction. To the extent that such initiatives also alter how physicians perceive their patients they could also affect treatment decisions.

In the clinical setting we study, familiarity results in higher treatment intensity and weakly improved patient outcomes. However, it would be wrong to conclude that will aways be the case. In end of life care, for example, minimizing patient discomfort could manifest in fewer interventions and more palliative care. The effects we uncover highlight the need for more research on the physician-patient interaction. Moreover, we study care provided by experienced OBs in an elite, academic medical center. Hospital procedures and the skill of the OBs may limit the potential for adverse health outcomes. Research in other clinical contexts and hospital settings is needed. These factors could also play an important role in a wide variety of advisory and supervisory relationships outside of medicine.

MIT & NBER
UBC & CIFAR
STANFORD & NBER
BRIGHAM & WOMEN'S HOSPITAL

APPENDIX A - EXTENDED MODEL

This appendix extends the model of physician decision-making to allow OBs to have more information about patients they know. Specifically, we model $\mathbf{r_i} = (\omega_i, \eta_i)$, where ω_i is observed by all OBs, while η_i is only observed by the patient's prenatal OB. Without loss of generality we further assume that ω_i and η_i are orthogonal. To focus on the effect of better information about OB's own patients, we model the OB as having unbiased expectations of the average need for a C-section, but better information on their own patients' individual needs for a C-section. To that end we formulate the effect of including η_i on these object as a mean-preserving spread around $E\left[h\left(\mathbf{r_i}\right)|\omega_i\right]$:

$$h\left(\mathbf{r_i}\right) \quad = \quad E\left[h\left(\mathbf{r_i}\right)|\omega_i\right] + \eta_i, \tag{5}$$

where $E\left[\eta_i|\omega_i\right] = 0$.

The OB chooses the delivery method to maximize her expected utility:

$$V_{ijt} = \begin{cases} c_{ij}\pi + (1 - c_{ij})\, E\left[h\left(\mathbf{r_i}\right)|\omega_i\right], & D_{ij} = 0 \\ c_{ij}\pi - (1 - c_{ij})\, S\left(\mathbf{r_i}, z_{jt}\right) + (1 - c_{ij})\, h\left(\mathbf{r_i}\right), & D_{ij} = 1 \end{cases}.$$

Substituting Equation (5), we have

$$\Pr\left(c_{ij} = 1\right) = \begin{cases} \Pr\left(E\left[h\left(\mathbf{r_i}\right)|\omega_i\right] < \pi\right), & D_{ij} = 0 \\ \Pr\left(E\left[h\left(\mathbf{r_i}\right)|\omega_i\right] + \eta_i - S\left(\mathbf{r_i}, z_{jt}\right) < \pi\right), & D_{ij} = 1 \end{cases}$$

D_{ij} can influence the delivery decision, c_{ij}, in two ways. First, as in our standard model, when $D_{ij} = 1$, the OB's psychic cost of vaginal complications, via $S\left(\mathbf{r_i}, z_{jt}\right)$, increases the likelihood of C-sections. Second, the OB has better information on the risk of patients she knows and therefore considers η_i in addition to $E\left[h\left(\mathbf{r_i}\right)|\omega_i\right]$.

A further statement about the direction of the effect of η_j on $\Pr\left(c_{ij} = 1\right)$ cannot be made without parametric restrictions. We therefore assume information is additive and normally distributed. That is, we assume that $h(\mathbf{r_i}) = \overline{h} + \omega_i + \eta_i$, where $\overline{h}$ is a measure of average net benefit of vaginal delivery over

C-section, and that[33]

$$\begin{pmatrix} \omega_i \\ \eta_i \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \right).$$

Then we have

$$\begin{aligned} \Delta \Pr(c_{ij}=1) &\equiv \Pr(c_{ij}=1|D_{ij}=1) - \Pr(c_{ij}=1|D_{ij}=0) \\ &= \Pr\left(\overline{h}+\omega_i+\eta_i - S(\mathbf{r_i}, z_{jt}) > \pi\right) - \Pr\left(\overline{h}+\omega_i > \pi\right) \\ &= \text{Information} + \text{Psychic Cost}, \end{aligned}$$

where

$$\begin{aligned} \text{Information} &= \Phi\left(\left(-\overline{h}+\pi\right)/\sqrt{2}\right) - \Phi\left(-\overline{h}+\pi\right); \\ \text{Psychic Cost} &= \Phi\left(\left(S(\mathbf{r_i}, z_{jt}) - \overline{h}+\pi\right)/\sqrt{2}\right) - \Phi\left(\left(-\overline{h}+\pi\right)/\sqrt{2}\right). \end{aligned}$$

The former component (information) is positive as long as $-\overline{h}+\pi$ is negative, i.e., as long as physicians perform vaginal deliveries (with or without η_i). Thus, both psychic cost and information can lead to a higher C-section rate for OBs' own patients. The effect of each channel is therefore an empirical question. z_{jt} only enters the C-section decision through psychic costs. Thus any component or shifter of z_{jt} that is uncorrelated with ω_i and η_i will affect C-section decisions through the psychic cost channel, but not the information channel. If the identifying assumptions stated in the paper hold, then the OB's recent laceration rate will satisfy these conditions and will only operate through psychic costs even in the presence of better information about one's own patients.

References

Agha, Leila, Brigham Frandsen, and James B. Rebitzer, "Causes and Consequences of Fragmented Care Delivery: Theory, Evidence and Public Policy,"Mimeo, Boston University, 2016.

Alexander, Diane, "Does Physician Pay Affect Procedure Choice and Patient Health? Evidence from Medicaid C-section Use,"*Princeton Technical Report,* 2015.

33. The subscript is omitted for simplicity, but $\overline{h}$ can be heterogeneous across OBs.

Allen, Victoria M., Thomas F. Baskett, Colleen M. O'Connell, Dolores McKeen, and Alexander C. Allen, "Maternal and Perinatal Outcomes With Increasing Duration of the Second Stage of Labor,"*Obstetrics and Gynecology,* 113 (2009), 1248-1258.

Alpay, Zeynep, Ghassan M. Saed, and Michael P. Diamond, "Postoperative Adhesions: From Formation to Prevention,"*Seminars in Reproductive Medicine,* 26 (2008), 313-321.

American College of Obstetricians and Gynecologists, "Safe Prevention of the Primary Cesarean Delivery,"*Obstetrics and Gynecology,* 123 (2014), 693-711.

American Medical Association, "Opinion 8.19 – Self-Treatment of Treatment of Immediate Family Members,"*AMA Code of Medical Ethics,* June 1993.

Ananth, Cande V., John C. Smulian, and Anthony M. Vintzileos, "The Association of Placenta Previa with History of Cesarean Delivery and Abortion: A Metaanalysis, "*American Journal of Obstetrics and Gynecology,* 177 (1997), 1071-1078.

Bailit, Jennifer L., William A. Grobman, Madeline Murguia Rice, Ronald J. Wapner, Uma M. Reddy, Michael W. Varner, John M. Thorp Jr., Steve N. Caritis, Jay D. Iams, George Saade, Dwight J. Rouse, and Jorge E. Tolosa, "Evaluation of Delivery Options for Second-Stage Events,"*American Journal of Obstetrics and Gynecology,* 214 (2016), 638.e1-10.

Baskett, Thomas F., Victoria M. Allen, Colleen M. OConnell, and Alexander C. Allen, "Fetal Trauma in Term Pregnancy,"*American Journal of Obstetrics and Gynecology,* 197 (2007), 499.e1-7.

Chandra, Shalini, Scott M. Wright, and Eric E. Howell, "The Creating Incentives and Continuity Leading to Efficiency Staffing Model: A Quality Improvement Initiative in Hospital Medicine,"*Mayo Clinic Proceedings,* 87 (2012), 364-371.

Clark, Cheryl, "Hospitalists' Numbers Quadrupled in Last Decade,"*HealthLeaders Media,* 2014, Available at http://www.healthleadersmedia.com/quality/hospitalists-numbers-quadrupled-last-decade.

Croskerry, Pat, "Achieving Quality in Clinical Decision Making: Cognitive Strategies and Detection of Bias,"*Academic Emergency Medicine,* 9 (2002), 1184-1204.

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

Dahl, Gordon and Silke Forbes, "Doctors Switching Costs in Health Insurance, "Mimeo, Weatherhead School of Management, 2016.

Dubay, Lisa, Robert Kaestner, and Timothy Waidmann, "The Impact of Malpractice Fears on Cesarean Section Rates,"*Journal of Health Economics,* 18 (1999), 491-522.

Ellis, Randall P., and Thomas G. McGuire, "Provider Behavior under Prospective Reimbursement: Cost Sharing and Supply,"*Journal of Health Economics,* 5 (1986), 129-151.

Epstein, Andrew J., and Sean Nicholson, "The Formation and Evolution of Physician Treatment Styles: An Application to Cesarean Section,"*Journal of Health Economics,* 28 (2009), 1126-1140.

Fenner, Dee E., Becky Genberg, Pavna Brahma, Lorri Marek, and John O.L. DeLancey, "Fecal and Urinary Incontinence after Vaginal Delivery with Anal Sphincter Disruption in an Obstetrics Unit in the United States,"*American Journal of Obstetrics and Gynecology,* 189 (2003), 1543-1549.

Gruber, Jon, John Kim, Dina Mayzlin, "Physician Fees and Procedure Intensity: The Case of Cesarean Delivery,"*Journal of Health Economics,* 18 (1999) 473-490.

Hall, Marion H., and Susan Bewley, "Maternal Mortality and Mode of Delivery,"*Lancet,* 354 (1999), 776.

Iriye, Brian K., Wilson H. Huang, Jennifer Condon, Lyle Hancock, Judy K. Hancock, Mark Ghamsary, and Thomas J. Garite, "Implementation of a Laborist Program and Evaluation of the Effect Upon Cesarean Delivery,"*American Journal of Obstetrics and Gynecology,* 209 (2013), 251.e1-6.

Kammerer-Doak, Dorothy, and Rebecca G. Rogers, "Female Sexual Function and Dysfunction,"*Obestetrics and Gynecology Clinics of North America,* 35 (2008), 169-183.

Kim, Sung Soo, Stan Kaplowitz, and Mark V. Johnston, "The Effects of Physician Empathy on Patient Satisfaction and Compliance,"*Evaluation and The Health Professions,* 27 (2004), 237-251.

Laughon, S. Katherine, Vincenzo Berghella, Uma M. Reddy, Rajeshwari Sundaram, Zhaohui Lu, and Matthew K. Hoffman, "Neonatal and Maternal Outcomes with Prolonged Second Stage of Labor," *Obstetrics and Gynecology,* 124 (2014), 57-67.

Levinson, Wendy, Debra L. Roter, John P. Mullooly, Valerie T. Dull, and Richard M. Frankel, "Physician-Patient Communication: The Relationship with Malpractice Claims Among Primary Care Physicians And Surgeons,"*Journal of the American Medical Association,* 277 (1997), 553-559.

Loewenstein, George, "Emotions in Economic Theory and Economic Behavior,"*American Economic Review,* 90 (2000), 426-432.

– –, "Hot-Cold Empathy Gaps and Medical Decision Making,"*Health Psycology,* 24 (2005), S49-S56.

Lydon-Rochelle, Mona, Victoria L. Holt, Diane P. Martin, and Thomas R. Easterling, "Association Between Method of Delivery and Maternal Rehospitalization,"*Journal of the American Medical Association,* 283 (2000), 2411-2416.

Mager, Wendy M., and Michael A. Andrykowski, "Communication in The Cancer Bad News Consultation: Patient Perceptions and Psychological Adjustment,"*Psycho-Oncology,* 11 (2002), 35-46.

"Medical Liability Monitor,"*Annual Rate Survey* (Chicago: Medical Liability Monitor, Inc., 2014).

Meltzer, David, Willard G. Manning, Jeanette Morrison, Manish N. Shah, Lei Jin, Todd Guth, and Wendy Levinson, "Effects of Physician Experience on Costs and Outcomes on an Academic General Medicine Service: Results of a Trial of Hospitalists,"*Annals of Internal Medicine,* 137 (2002), 866-874.

Moore, Jennifer E., Whitney P. Witt, and Anne Elixhauser, "Complicating Conditions Associated with Childbirth, by Delivery Method and Payer, 2011,"*HCUP Statistical Brief 173* (Rockville, MD: Agency for Healthcare Research and Quality, 2014).

Murphy, Deirdre J., Rachel E. Liebling, Lisa Verity, Rebecca Swingler, and Roshni Patel, "Early Maternal and Neonatal Morbidity Associated with Operative Delivery in Second Stage of Labour: A Cohort Study,"*Lancet,* 358 (2001), 1203-1207.

Nijagal, Malini Anand, Miriam Kuppermann, Sanae Nakagawa, and Yvonne Cheng, "Two Practice Models in One Labor and Delivery Unit: Association with Cesarean Delivery Rates,"*American Journal of Obstetrics and Gynecology,* 212 (2015) 491.e1-8.

Norberg, Karen, and Juan Pantano, "Cesarean Sections and Subsequent Fertility,"*Journal of Population Economics,* 29 (2016), 5-37.

Romano, Max J., Jodi B. Segal, and Craig Evan Pollack, "The Association Between Continuity of Care and the Overuse of Medical Procedures,"*Journal of the American Medical Association Internal Medicine,* 175 (2015), 1148-1154.

Shurtz, Ity, "Malpractice Law, Physicians‘ Financial Incentives, and Medical Treatment: How Do They Interact?"*Journal of Law and Economics,* 57 (2014).

Skinner, Jonathan S., Douglas O. Staiger, and Elliot S. Fisher, "Is Technological Change in Medicine Always Worth It? The Case of Acute Myocardial Infarction,"*Health Affairs,* 25 (2006), w34-w47.

Srinivas, Sindhu K., Julie Shocksnider, Donna Caldwell, and Scott Lorch, "Laborist Model of Care: Who Is Using It?"*The Journal of Maternal-Fetal and Neonatal Medicine,* 25 (2012), 257-260.

Sultan, Abdul H., Michael A. Kamm, Christopher N. Hudson, Janice M. Thomas, and Clive I. Bartram, "Anal-Sphincter Disruption During Vaginal Delivery,"*The New England Journal of Medicine,* 329 (1993), 1905-1911.

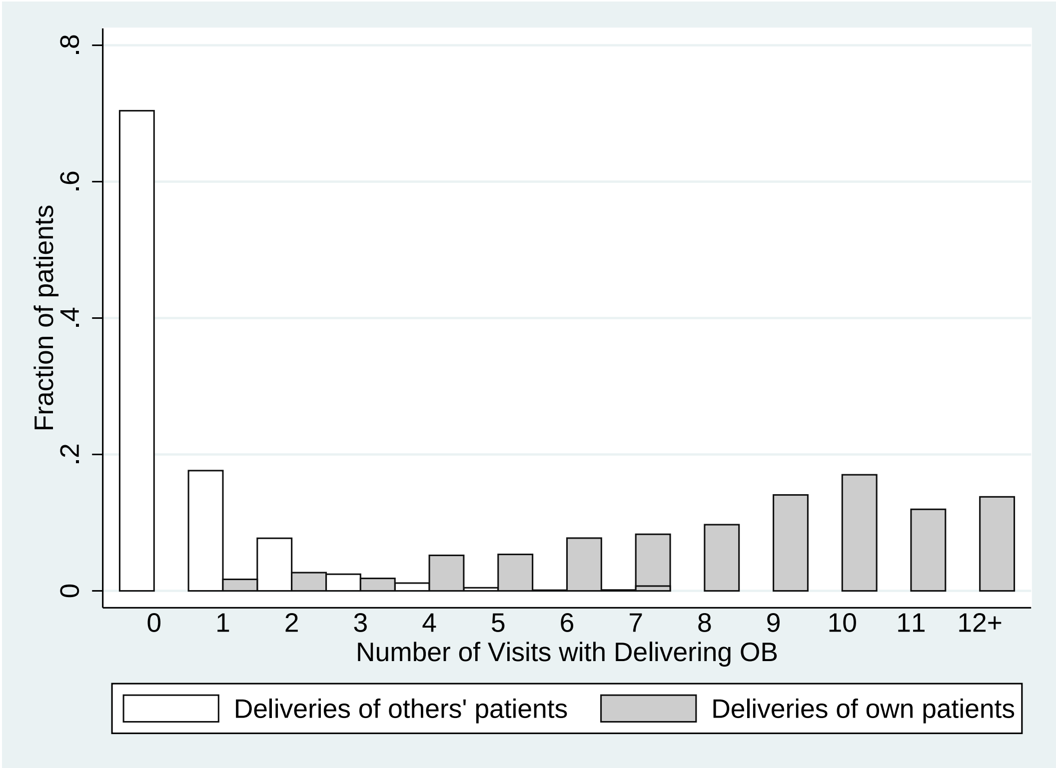
Tversky, Amos, and Daniel Kahneman, "Judgement under Uncertainty: Heuristics and Biases,"*Science,* 185 (1974), 1124-1131.

Wachter, Robert M., and Lee Goldman, "Hospitalist Movement 5 Years Later,"*Journal of the American Medical Association,* 287 (2002), 487-494.

Wachter, Robert M., Patricia Katz, Jonathan Showstack, Andrew B. Bindman, and Lee Goldman, "Reorganizing an Academic Medical Service: Impact on Cost, Quality, Patient Satisfaction, and Education,"*Journal of the American Medical Association,* 279 (1998), 1560-1565.

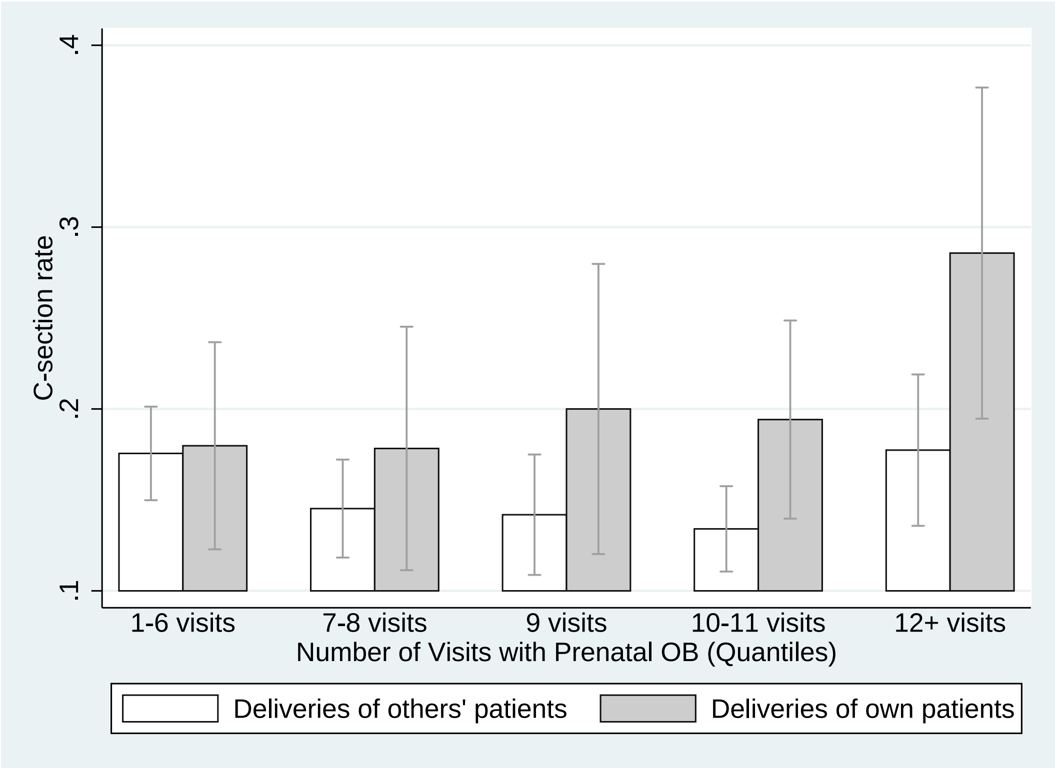
Wasson, John H., Arthur E. Sauvigne, Peter Mogielnicki, Walter Frey, Carol H. Sox, Catherine Gaudette, and Alice Rockwell, "Continuity of Outpatient Medical Care in Elderly Men: A Randomized Trial,"*Journal of the American Medical Association,* 252 (1984), 2413-2417.

FIGURE I Number of Visits with Delivering OB During Pregnancy



The height of each bar represents the fraction of patients with the number of prenatal visits the patient had with the delivering OB specified on the X-axis.

FIGURE II Mean C-section Rate by Number of Visits for Own and Others' Patients



Bars plot the average C-section rate of patients by the quartile of the number of prenatal visits with the prenatal OB. Horizontal brackets provide 95% confidence intervals.

TABLE I CHARACTERISTICS OF OBS' OWN PATIENTS AND OTHER OBS' PATIENTS

	Own Patient		Other OB's Patient	
	Mean	Std. Dev.	Mean	Std. Dev.
Socio-economic Status (%):				
Maternal Age (years)	33.1	[4.49]	33.0	[4.33]
Age 35 - 39	28.6	[45.2]	27.5	[44.7]
Over 40	5.06	[21.9]	4.33	[20.3]
Mother's Race:				
White	68.6	[46.4]	67.6	[46.8]
Black	7.31	[26.1]	8.33	[27.6]
Hispanic	5.06	[21.9]	5.50	[22.8]
Other	19.0	[39.2]	18.5	[38.9]
Married	81.4	[38.9]	80.8	[39.4]
Per capita income ($)	33,437	[12,704]	33,256	[12,499]
Risk Factors (%):				
Nulliparous birth	48.9*	[50.0]	54.2*	[49.8]
Previous C-section or scar	9.14*	[28.8]	6.57*	[24.8]
Malposition or Malpresented	6.19	[24.1]	5.01	[21.8]
Premature rupture of membranes	5.34	[22.5]	6.70	[25.0]
Under 37 weeks gestation	5.20+	[22.2]	6.96+	[25.5]
Over 41 weeks gestation	3.80	[19.1]	2.73	[16.3]
Gestational age (weeks)	39.3	[1.66]	39.2	[1.98]
Obesity and morbid obesity	0.703	[8.36]	0.651	[8.04]
Diabetes	3.52	[18.4]	3.51	[18.4]
Hypertension	3.09	[17.3]	3.35	[18.0]
Anemia	0.563	[7.48]	0.878	[9.33]
Clots and clotting disorders	0.422	[6.49]	0.488	[6.97]
Asthma	2.11+	[14.4]	3.32+	[17.9]
Thyroid	3.94	[19.5]	4.20	[20.1]
Heart	0.985	[9.88]	1.04	[10.2]
Lung	2.53	[15.7]	3.45	[18.2]
Placenta previa	0.844	[9.15]	0.976	[9.83]
Isoimmunity	3.66+	[18.8]	2.37+	[15.2]
Oligohydramnios	1.27	[11.2]	0.976	[9.83]
Pelvic anomaly	3.66	[18.8]	3.42	[18.2]
Short or incompetent cervix	0.703	[8.36]	0.553	[7.42]
Placental condition	2.39	[15.3]	1.95	[13.8]
Physical obstruction	1.27	[11.2]	0.911	[9.50]
Tumors	1.41	[11.8]	1.72	[13.0]
Intrauterine growth restriction	0.563	[7.48]	0.748	[8.62]
Other rare conditions†	0.281	[5.30]	0.39	[6.24]
Birth weight (grams)††	3,361	[509]	3,355	[500]
Predicted Probabilities				
C-section	17.0	[21.7]	16.1	[20.0]
Laceration	55.6	[14.3]	56.0	[13.6]
Observations	711		3,074	

Notes: Means and standard deviations are calculated from the main estimation sample as described in Section 5.2.

† Other rare conditions include renal failure, epilepsy, lupus, vasa previa, and deep transverse arrest.

†† Defined for 3,060 observations (not available for 2012).

††† Predicted probabilities from logistic regression using all of the socioeconomic status variables and risk factors listed above.

+ denotes differences in other OB and prenatal OB means that are significant at the 10% level, * at the 5% level, and ** at the 1% level.

TABLE II PRENATAL CARE AND TREATMENTS OF OBS' OWN PATIENTS AND OTHER OBS' PATIENTS

	Own Patient		Other OB's Patient	
	Mean	Std. Dev.	Mean	Std. Dev.
Prenatal Care:				
Percent of visits with delivering OB	77.1**	[18.3]	4.28**	[8.01]
Percent of visits with prenatal OB	77.2**	[18.1]	74.7**	[18.7]
Percent of visits with second prenatal OB†	23.2	[26.1]	22.9	[24.1]
Number of prenatal visits	11.4	[2.93]	11.5	[3.01]
OB's patients' laceration rates:				
Last 15 prenatal patients delivered by other OBs	53.5	[16.6]	53.0	[17.2]
Last 16-30 patients delivered by other OBs	50.0	[20.3]	49.9	[20.7]
Treatments in labor & delivery (%):				
C-section	20.1**	[40.1]	15.4**	[36.1]
Assisted vaginal delivery	7.03*	[25.6]	9.92*	[29.9]
Total procedures (procedures)	12.3*	[4.69]	12.8*	[5.23]
Epidural anesthesia	92.4	[26.5]	91.6	[27.7]
Augmented labor	61.2	[48.8]	59.2	[49.2]
Total tests (tests)	7.77+	[3.64]	8.07+	[4.19]
No continuous EFM	12.7**	[33.3]	8.43**	[27.8]
Ultrasound	2.53+	[15.7]	3.9+	[19.4]
Observations	711		3,074	

Notes: Means and standard deviations are calculated from the main estimation sample as described in section 5.2.

† The second prenatal provider is the second most frequently seen OB during prenatal care.

+ denotes that differences between own and other's patients' means are significant at the 10% level, * at the 5% level, ** at the 1% level.

TABLE III THE PHYSICIAN-PATIENT RELATIONSHIP AND C-SECTION DECISIONS

	(1)	(2)	(3)	(4)	(5)	(6)
Own Patient	0.048*	0.039**	0.040**			
	[0.017]	[0.013]	[0.011]			
OB's Share of Prenatal Visits				0.066**	0.055**	0.059**
				[0.019]	[0.016]	[0.014]
Controls?		Yes	Yes		Yes	Yes
Fixed Effects?			Yes			Yes
Observations	3,785	3,785	3,785	3,785	3,785	3,785
Adjusted R^2	0.0023	0.27	0.28	0.0027	0.27	0.28

Notes: Table displays OLS estimates of (1). Own patient is an indicator the delivering OB was the patient's primary prenatal provider. OB's share is the share of the patient's prenatal visits provided by the delivering OB. Controls are the full set of socio-economic and clinical factors summarized in Table I. Prenatal provider and delivering OB fixed effects are included as indicated. Standard errors, clustered by the delivering OB, are in brackets.
$^{+}$ denotes significance at the 10% level, * at the 5% level, and ** at the 1% level.

TABLE IV THE PHYSICIAN-PATIENT RELATIONSHIP AND C-SECTION DECISIONS - ROBUSTNESS

	Observations	Own Patient Coefficient
Baseline:		
Baseline (all births)	3,785	0.040**
		[0.011]
Alternate defintion of prenatal OB (First visit)	3,785	0.034**
		[0.011]
Alternate Samples:		
First births	2,015	0.044*
		[0.020]
Low risk first births	1,487	0.040
		[0.030]
Excluding preterm births	3,534	0.049**
		[0.013]
Excluding births with contraindications for attempting vaginal birth†	3,587	0.042**
		[0.014]
Excluding gestational ages over 41 weeks	3,674	0.033*
		[0.012]
Excluding births 3 hours pre shift change	3,297	0.051**
		[0.015]
Excluding births 3 hours post shift change	3,313	0.047**
		[0.012]
Excluding births high volume shifts	3,623	0.036**
		[0.012]

Notes: Each cell is the coefficient on own patient from a separate regression. All regressions include the controls and fixed effects as indicated in Table III, Column (3). Standard errors, clustered by the delivering OB, are in brackets.
$^+$ denotes significance at the 10% level, * at the 5% level, and ** at the 1% level.
† Contraindications for attempting vaginal birth are malpresented infants and placenta previa.

TABLE V THE EFFECT OF RELATIONSHIP STRENGTH AND OB'S RECENT EXPERIENCE ON C-SECTION DECISIONS

	(1)	(2)	(3)	(4)	(5)	(6)
Own Patient	0.011	0.0070	-0.011	-0.039	0.0078	-0.052$^+$
	[0.032]	[0.019]	[0.048]	[0.027]	[0.065]	[0.029]
Own Patient×Strong Relationship	0.072$^+$	0.066*				
	[0.039]	[0.024]				
Strong Relationship	-0.018	-0.012				
	[0.014]	[0.012]				
Own Patient × OB Laceration Rate Last 15 Births			0.11	0.15**	0.14$^+$	0.13*
			[0.078]	[0.047]	[0.070]	[0.060]
Own Patient × OB Laceration Rate Last 16-30 Births					-0.071	0.043
					[0.12]	[0.072]
OB Laceration Rate Last 15 Births			-0.040	-0.047$^+$	-0.036	-0.030
			[0.042]	[0.027]	[0.047]	[0.031]
OB Laceration Rate Last 16-30 Births					-0.0076	-0.064$^+$
					[0.035]	[0.033]
OB × Year Fixed Effects?		Yes		Yes		Yes
Observations	3,785	3,785	3,783	3,783	3,783	3,783
Adjusted R^2	0.0032	0.29	0.0023	0.29	0.0021	0.29

Notes: Columns (1) - (2) are OLS estimates of (2). Strong relationship is an indicator the patient had over 79% of prenatal visits with her primary prenatal OB (the median). Columns (3) - (4) are OLS estimates of (3). Columns (5) - (6) additionally include the OB's laceration rate in her 16-30 previous births. Columns (2), (4), (6) contain full set of controls, prenatal OB fixed effects, delivering OB × Year fixed effects. OB × Year Fixed Effects are the full set of interactions of Year and delivering OB indicators. Standard errors, clustered by the delivering OB, are in brackets.

$^+$ denotes significance at the 10% level, * at the 5% level, and ** at the 1% level.

TABLE VI ADDITIONAL DECISIONS DURING LABOR AND DELIVERY

	Assisted Vaginal Delivery		Length of Second Stage		No Continuous EFM	
	(1)	(2)	(3)	(4)	(5)	(6)
Own Patient	-0.032**	-0.025*	-0.18**	-0.11*	0.038**	0.035**
	[0.011]	[0.0100]	[0.042]	[0.051]	[0.0068]	[0.0078]
Controls?		Yes		Yes		Yes
Fixed Effects?		Yes		Yes		Yes
Observations	3,785	3,779	3,205	3,205	3,785	3,749
Adjusted R^2	0.0026	0.13	0.0028	0.16	0.0049	0.043
Mean of dependent variable	0.0938		0.968		0.0922	

Notes: Columns (1) - (2) and (5) - (6) contain average marginal effects from logistic regressions of (4). Columns (3) and (4) contain estimates from OLS regressions of Equation 1. The length of the second stage of labor is measured in hours. Standard errors, clustered by the delivering OB, are in brackets.

$^+$ denotes significance at the 10% level, * at the 5% level, and ** at the 1% level.

TABLE VII MATERNAL OUTCOMES

	Any Complication		Laceration Repair		Fever		Trauma	
Panel A: Full Sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own Patient	-0.032**	-0.034**	-0.044**	-0.011	-0.019*	-0.020*	-0.012^{+}	-0.013*
	[0.012]	[0.012]	[0.015]	[0.0088]	[0.0095]	[0.0094]	[0.0059]	[0.0059]
C-section		0.086**		-0.71**		0.075**		0.021*
		[0.028]		[0.028]		[0.017]		[0.0091]
Assisted Vaginal		0.066**		-0.064**		0.053**		0.012^{+}
		[0.021]		[0.020]		[0.012]		[0.0067]
Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,782	3,782	3,785	3,785	3,752	3,752	3,589	3,589
Pseudo R^2	0.067	0.076	0.12	0.39	0.15	0.18	0.078	0.086
Mean of dependent variable	0.172		0.683		0.0741		0.0279	

Panel B: First Births	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own Patient	-0.045*	-0.048*	-0.035*	0.0028	-0.025	-0.026^{+}	-0.025*	-0.025*
	[0.020]	[0.020]	[0.014]	[0.016]	[0.015]	[0.015]	[0.011]	[0.011]
C-section		0.12**		-0.51**		0.12**		0.011
		[0.033]		[0.020]		[0.024]		[0.012]
Assisted Vaginal Delivery		0.092**		-0.035*		0.078**		0.012
		[0.030]		[0.014]		[0.021]		[0.0091]
Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,011	2,011	2,014	2,014	1,998	1,998	1,790	1,790
Pseudo R^2	0.066	0.080	0.17	0.55	0.10	0.14	0.13	0.13
Mean of dependent variable	0.228		0.688		0.121		0.0352	

Notes: Table contains average marginal effects from logistic regressions of (4). Standard errors, clustered by the delivering OB, are in brackets.

$^{+}$ denotes significance at the 10% level, * at the 5% level, and ** at the 1% level.

TABLE VIII LENGTH OF HOSPITAL STAY

	Log Length of Stay (Birth to Discharge)			
	Mothers		**Infants**	
Panel A: Full Sample	(1)	(2)	(3)	(4)
Own Patient	0.020*	-0.0050	0.013	-0.0048
	[0.0076]	[0.0075]	[0.015]	[0.010]
C-section		0.67**		0.64**
		[0.0087]		[0.016]
Assisted Vaginal Delivery		0.031^{+}		0.048*
		[0.017]		[0.021]
Controls?	Yes	Yes	Yes	Yes
Fixed Effects?	Yes	Yes	Yes	Yes
Observations	3,779	3,779	3,198	3,198
Adjusted R^2	0.23	0.63	0.40	0.54
Mean of dependent variable	0.845		0.906	

Panel B: First Births	(1)	(2)	(3)	(4)
Own Patient	0.036^{+}	0.0091	0.016	-0.0051
	[0.018]	[0.0069]	[0.027]	[0.018]
C-section		0.67**		0.66**
		[0.011]		[0.028]
Assisted Vaginal Delivery		0.034*		0.043*
		[0.014]		[0.020]
Controls?	Yes	Yes	Yes	Yes
Fixed Effects?	Yes	Yes	Yes	Yes
Observations	2,013	2,013	1,696	1,696
Adjusted R^2	0.20	0.71	0.43	0.60
Mean of dependent variable	0.915		1.00	

Notes: Table contains average marginal effects from OLS regressions of (1) using log number of days from birth to discharge. Standard errors, clustered by the delivering OB, are in brackets. 6 mothers with 0 length of stay were excluded from the analysis.
$^{+}$ denotes significance at the 10% level, * at the 5% level, and ** at the 1% level.

TABLE IX INFANT OUTCOMES

	Any Respiratory Issues		Serious Respiratory Issues		Low APGAR		Admission to NICU	
Panel A: Full Sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own Patient	-0.017	-0.016	-0.0093	-0.0084	0.012	0.012	-0.0029	-0.0019
	[0.012]	[0.012]	[0.0070]	[0.0070]	[0.0089]	[0.0089]	[0.0078]	[0.0073]
C-section		0.041**		0.013^{+}		0.043**		0.037**
		[0.012]		[0.0067]		[0.015]		[0.0095]
Assisted Vaginal		0.045**		0.032**		0.043**		0.026^{+}
		[0.0099]		[0.0056]		[0.011]		[0.014]
Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,180	3,180	3,065	3,065	3,150	3,150	3,160	3,160
Pseudo R^2	0.17	0.18	0.11	0.12	0.095	0.11	0.26	0.27
Mean of dependent variable	0.0962		0.0388		0.0511		0.0570	

Panel B: First Births	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own Patient	-0.045*	-0.044*	-0.016	-0.015	0.0086	0.0081	-0.018	-0.017
	[0.018]	[0.018]	[0.015]	[0.014]	[0.015]	[0.015]	[0.013]	[0.012]
C-section		0.020		0.0033		0.045**		0.035*
		[0.020]		[0.011]		[0.014]		[0.017]
Assisted Vaginal Delivery		0.034**		0.021*		0.042**		0.017
		[0.013]		[0.010]		[0.012]		[0.021]
Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,680	1,680	1,477	1,477	1,666	1,666	1,667	1,667
Pseudo R^2	0.21	0.21	0.16	0.16	0.11	0.13	0.28	0.29
Mean of dependent variable	0.110		0.0460		0.0630		0.0678	

Notes: Table contains average marginal effects from logistic regressions of (4). Low APGAR is an indicator the infant had a 1-minute APGAR score below 7. Standard errors, clustered by the delivering OB, are in brackets.
$^{+}$ denotes significance at the 10% level, * at the 5% level, and ** at the 1% level.