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# Explaining Source of Payment Differences in U.S. Cesarean Rates: Why do Privately Insured Mothers Receive More Cesareans than Mothers Who are not Privately Insured?

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**Abstract.** The difference in the risk-adjusted cesarean rates of mothers who are and who are not privately insured is divided into components attributable to the following four factors: the practice style of the physician attending the birth, the closeness of the physician-mother relationship, individual nonclinical factors, and the direct influence of private insurance on the physician's treatment decision. Estimates from two expansive, complementary data sets indicate that the most of the differential is attributable to the first two factors, particularly the pairing of privately insured mothers with physicians who are inclined to perform cesareans. There is some evidence that these pairings are not incidental but the result of firm (and possibly consumer) choices.

**Keywords:** cesarean section, source of payment, private insurance, physician practice style
**JEL code:** D11

### STATUS SYMBOL: Affluent Women Have More Cesareans Than Poor Women Do

(*Scientific American*, Oct. 1989).
According to Sidney N. Wolfe of the Public Citizen Health Research Group...physicians overdiagnose complications in affluent childbearing women and then overprescribe cesareans...because the surgical procedure provides a bigger payoff than vaginal delivery does. Indeed...avarice on the part of hospitals and physicians is largely to blame for the fourfold increase in the rate of cesareans since 1970. Physicians have less incentive to perform cesareans on poor women, Wolfe adds, because the financial compensation is usually less.

Mortimer Rosen, who heads the department of obstetrics and gynecology at the Columbia-Presbyterian Medical Center in New York City, agrees with Wolfe that cesareans are overprescribed for affluent women but sees factors other than greed behind the phenomenon. He points out that whereas poor women are usually treated by whoever happens to be on duty when they arrive at the hospital, affluent women often retain a private obstetrician. These obstetricians have more emotional interactions with their patients, Rosen says... As a result, private obstetricians are often too quick to see trouble during labor and delivery and to recommend the surgical remedy.

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## 1. Introduction

A number of cross section microdata studies, spanning many countries geographically and several decades temporally, indicate that mothers covered by private insurance receive more cesarean sections than uninsured or publicly insured mothers do, adjusting for the health of the mother and complications of birth.[1] This source of payment differential in cesarean rates, though widely observed, is poorly understood. Sometimes it is attributed wholly to the direct (causal) influence of private insurance on the physician's choice of delivery method—what we call "differences in treatment." Differences in treatment might arise, for example, because the financial reward for performing a cesarean varies with source of payment, as suggested by the opening excerpt. But other factors—the physician's practice style, the closeness of the physician-mother relationship, and individual non-medical characteristics—may play a role in the cesarean decision and may also be associated with

[1] References both domestic [9,13,16,17,21,23,25,38,39,44,46,50,51] and international [5,7,10,37] abound; more are found in Sakala [41]. Two studies [3,47] find smaller differentials. Both contain more controls than is typical in this literature, but neither tests to see if these smaller effects obtain because of the additional controls, as opposed to, say, the region being studied.

source of payment. While the relevance of these non-clinical influences is recognized in the general literature on cesareans [2,27,45], these factors have been accounted for only rarely, and imperfectly, in studies investigating the source of payment differential in cesarean rates. Therefore, we do not currently have a good understanding of this differential; in particular, we do not know how much of the differential is generated by differences in treatment and how much is generated by other factors that are associated with source of payment.

The primary objective of this paper is to determine how much of the source of payment differential in cesarean rates in the U.S. is attributable to each of the four factors listed above. We do this by estimating cross section regressions on two expansive data sets containing the necessary information, and executing decompositions that break up the differential into four components, one for each set of factors. This is accomplished in Section 5 of the paper, after the model and data are described in Sections 2–4. While source of payment has some effect on the way physicians choose to treat otherwise identical women, the effect is not large. Instead, most of the differential is attributable to differences in physicians' practice styles and differences in the closeness of the physician-mother relationship. That is, privately insured women receive more cesareans mostly because they are paired with physicians who are disproportionately inclined to perform cesareans and because they have closer relationships with their physicians. Evidence in Section 6 suggests that these pairings are not "accidental" but the result of market choices. Section 7 offers conclusions and policy recommendations.

## 2. Clinical and nonclinical factors and use of the cesarean section

The attending physician is ultimately responsible for deciding whether a cesarean will be performed, though he may be swayed by the wishes of the mother. Several influences may play a role in this decision: source of payment; individual clinical factors, such as age; individual non-clinical factors, such as maternal education; factors associated with the physician-patient relationship, such as the amount of pre-natal care received; and the physician's practice style—his propensity to perform a cesarean section conditional on all other clinical and nonclinical factors. In fact, each has been shown to be important in the literature.

*Clinical factors* are the most important predictor of cesarean use. Cesarean sections are strongly preferred to vaginal delivery when the fetus is malpositioned, when there are multiple births, or when there are indications of fetal distress. Cesarean section is also more common when there are problems with the placenta or the umbilical cord, with maternal complications such as diabetes or hypertension, and when the fetus is small (low birthweight) or large (high birthweight). These factors are accounted for in virtually all clinical studies of cesarean use [28]. Hauskneckt and Heilman [26] provide an accessible (layman's) discussion of the clinical indications for cesarean section. Accounting for clinical factors influencing the cesarean decision is called "risk adjusting," so that "risk-adjusted" cesarean rates have been purged of the effects of clinical factors that influence cesarean use. Therefore, differences in risk-adjusted cesarean rates across source of payment groups reflect differences in physicians' choice of delivery method, not differences in clinical factors that warrant use of the cesarean section.

Clinical factors contribute to the higher cesarean rates of privately insured women because they have clinical indications for cesarean section more frequently. Although privately insured mothers may be in better general health, they tend to give birth at later ages, and have more birth complications for that reason.

*Source of payment* has a strong association with cesarean rates in the U.S. and in many other countries, as noted in the introduction. These studies generally include extensive clinical controls, but few controls for nonclinical or relationship factors or for the physician's practice style. Therefore we do not know how much of these association is causal—what we have termed "differences in treatment"—and how much is due to the association of source of payment with these other factors. One plausible reason to expect source of payment to affect the cesarean decision is that private insurance typically reimburses a cesarean more generously than public insurance (Medicaid) does [22]. The size of the effect would depend on the responsiveness of physicians to differences in financial reimbursement. However, financial incentives need not be the only way source of payment influences the choice of delivery method. For example, Haas et al. [24] uncover an effect of source of payment on cesarean rates even when the financial reimbursement for cesarean section does not change.

*Individual nonclinical characteristics* are also associated with cesarean use [29,42]. Previous work has identified a positive association between cesarean rates and maternal education [47], income [17], and Hispanic ethnicity [19]. Some of these variables, such as education, are positively associated with private insurance, while others, such as Hispanic ethnicity, are negatively associated. In the aggregate, therefore, nonclinical factors could contribute to the higher cesarean rates of privately insured mothers, but they also could have no effect.

Factors associated with the *physician-mother relationship* also influence cesarean rates. The physician's choice of delivery method might be altered if he has become acquainted with the mother in the process of providing her prenatal care, as mentioned in the opening excerpt. Alternatively, the extensiveness of prenatal care might influence the need for cesarean delivery directly [51]. In the U.S., privately insured women typically receive extensive prenatal care with the physician who ultimately delivers the baby. In contrast, fewer publicly insured women receive sufficient prenatal care [31], and a substantial fraction of publicly insured mothers are delivered at the hospital by a staff physician with whom they are not acquainted, as we will show below. These physicians have lower cesarean rates, ceteris paribus [27], perhaps because the closer relationships between privately insured mothers and their physicians make it harder for the physician to "withhold" a cesarean during a difficult delivery, as suggested by the opening excerpt.

Finally, physicians have different *practice styles;* that is, some physicians are more inclined to perform cesarean sections than others, ceteris paribus [2,13]. If mothers were matched with physicians at random, this difference in practice styles would not affect the *aggregate* risk-adjusted cesarean rates of any *group* of mothers. But if privately insured mothers tend to patronize physicians who are inclined to perform cesarean sections, then they will have higher cesarean rates than publicly insured or uninsured mothers, all else equal.

This matching has not been verified in the literature, but there are plausible reasons why it could occur. Many privately insured mothers have more flexibility in choosing a physician than publicly insured mothers do, because Medicaid typically reimburses deliveries at a much lower rate than private insurance does, and so physicians are more reluctant to accept Medicaid patients. If mothers have a preference for cesarean sections, they will tend to seek out those physicians who are inclined to perform many cesareans, and those physicians will accept privately insured mothers more often than mothers covered by Medicaid. (Mothers could learn about these physicians through word of mouth [8] or, in some cases, through public reporting of physician or hospital cesarean rates [40].) Insured mothers would tend to be matched with physicians who are inclined to perform many cesareans. The same thing will happen if mothers do not prefer more cesareans per se but do prize other physician characteristics that are associated with an inclination to perform cesareans.

## 3. Empirical framework

Because we utilize micro (patient-level) data, our empirical model is a discrete choice model that relates the probability a mother will receive a cesarean section from the attending physician to the factors described in the previous section: source of payment, denoted by S; individual clinical factors, denoted by X; individual nonclinical factors, denoted by Y; factors associated with the physician-mother relationship, denoted by R; and the physician's practice style.

Physician practice style could be represented in a statistical model in either of two ways. The indirect method is to identify observable physician characteristics, Z, that are associated with physician practice style. This is not preferable because observable physician characteristics are not closely related to practice style, as shown below. The direct method is to use a separate identifier for each physician in the sample. That is, the regression model includes a set of physician dummy variables $\{D_p,\ p = 1..P\}$, where $D_p$ equals one if the mother was delivered by physician $p$ and zero otherwise. The coefficients associated with these variables, $\{\alpha_p,\ p = 1..P\}$, called physician fixed effects, estimate the physician-specific influence on the choice of delivery method. That is, these fixed effects capture differences in physicians' practice styles.[2]

Thus, the full empirical model is:

$$P(C_{j,p} = 1) = F\left(\sum_{p=1}^{P} \alpha_p D_p \ + \ \beta_1 X_j \ + \ \beta_2 Y_j \ + \beta_3 R_{j,p} + \gamma S_j\right) \tag{1}$$

where $C$ is a binary variable that equals one if a cesarean was performed and zero otherwise, $j$ indexes mothers, and $p$ indexes physicians. Depending on how the function $F$ is specified, this model can be a logit, a probit, or a linear probability model—an ordinary least squares (OLS) regression [20, Chapter 21]. Because this model, at least in theory, contains all clinical and nonclinical influences on the cesarean decision, $\gamma$ captures the effect of differences in the way physicians choose to treat otherwise identical women with different sources of payment—in short, differences in treatment. We will estimate this equation using OLS, for simplicity, as more sophisticated methods have little effect on the results. This equation is:

$$C_{j,p} = \sum_{p=1}^{P} \alpha_p D_p + \beta_1 X_j + \beta_2 Y_j + \beta_3 R_{j,p} + \gamma S_j + \varepsilon \tag{2}$$

We wish to know how much of the risk-adjusted differential in cesarean rates between privately insured women and their counterparts (publicly insured and uninsured women) can be attributed to differences in treatment and to differences in physician practice styles, physician-mother relationships, and maternal nonclinical characteristics across the two groups. Identify privately insured women with superscript PR, for private, and their counterparts with superscript NP, for nonprivate, and let S be a dummy variable that equals one for private women and zero otherwise. Then, estimating equation (2) on all observations, taking the means of all variables for private women and nonprivate women separately, and re-arranging yields the following identity:

$$(\overline{C^{\mathrm{PR}}} - \overline{C^{\mathrm{NP}}}) - \hat{\beta}_1(\overline{X^{\mathrm{PR}}} - \overline{X^{\mathrm{NP}}}) \equiv \sum_{p=1}^{P} \hat{\alpha}_p (w_p^{\mathrm{PR}} - w_p^{\mathrm{NP}}) + \hat{\beta}_2(\overline{Y^{\mathrm{PR}}} - \overline{Y^{\mathrm{NP}}}) + \hat{\beta}_3(\overline{R^{\mathrm{PR}}} - \overline{R^{\mathrm{NP}}}) + \hat{\gamma} \tag{3}$$

where $w_p^{\mathrm{PR}}$ ($w_p^{\mathrm{NP}}$) is the physician $p$'s market share of the private (nonprivate) market. The left side of this identity contains the difference in cesarean rates of private and nonprivate women, adjusted for risk. The right side contains the four components that sum to, or explain, this difference: in order, differences in physician practice styles, differences in individual nonclinical characteristics, differences in relationship factors, and differences in treatment. Thus, this decomposition "explains" the source of payment differential in risk-adjusted

[2] If one can assign an objective "index" to each delivery, indicating the desirability of performing a cesarean section, then differences in physician practice styles imply that different physicians have different "cutoff" levels of the index, above which they a cesarean and below which they will not, will perform all else being equal. (Chetty's [12] model of cesarean delivery uses a similar concept.) The physician fixed effects estimate the different cutoff levels of the physicians in the sample.

The constant is removed from the regression equation because it is collinear with the fixed effects.

cesarean rates in terms of these four factors, which is the main objective of the paper.[3]

### *3.1. Model strengths and limitations*

To assess the strengths and weaknesses of the modeling strategy that we have adopted, it is useful to compare our model to its closest confederate: a wage discrimination model. In this literature, decompositions like equation (3) are used to explain race/gender wage differentials in terms of productive characteristics that are associated with race or gender, such as schooling, and a term that is intended to estimate disparities in treatment—in the wage paid conditional on productivity (for a recent example, see Bayard et al. [6]). Similarly, the decomposition in this paper is an attempt to explain (risk-adjusted) source of payment differences in use of the cesarean section in terms of physician, relationship, and individual characteristics that are associated with source of payment and a term, $\gamma$, that is intended to estimate the direct effect of source of payment on the treatment choices made by physicians. (See Grant [19] for use of a similar decomposition exploring racial differences in use of the cesarean section.)

The analogy to the discrimination literature helps illustrate one major strength and one major limitation of our empirical approach. A major strength is that, in our context, we have more relevant information than labor economists do in theirs. In general, an observable that depends on the interaction of two parties, be it wages or of the method of delivery, can be influenced by the characteristics of either party or by the quality of the relationship between the two parties. The data in our study have a generous amount of information on all three. Labor market studies, in contrast, generally have many indicators of individual productivity but limited information about the employer or the strength of the employer/employee relationship. (See, for example, Macpherson and Hirsch [34], one of the most exhaustive studies of labor market gender wage discrimination, and references therein.) Both can be expected to influence wages through standard economic theory (compensating wage differentials for poor working conditions; efficiency wages; specific human capital). Therefore, given the widespread use of this empirical approach in the labor literature, we have additional reason to be optimistic about its usefulness here.

On the other hand, the decompositions and regression models (equation (2)) on which they are based are reduced form, so they are not able to identify all causal pathways through which source of payment influences the choice of delivery method. This limitation is shared by labor market wage decompositions, which cannot determine the total effect of discrimination on wages if discrimination also effects schooling or other aspects of productivity that are taken as exogenous by the model. In our model, the coefficient $\gamma$ estimates the difference in treatment the average physician extends to women who differ in their source of payment but are identical otherwise. Nevertheless, source of payment might influence treatment in other ways—by influencing the physician the mother chooses to attend her birth, for example, or by influencing the amount of pre-natal care received. These "indirect effects" cannot be estimated by our model, which does not identify the causal effect of source of payment on the choice of physician or the quality of the physician-mother relationship. (Additional inquiry into some of these indirect effects is provided in Section 6.) The model provides estimates of important quantities of interest, but not all important quantities of interest. It can help us understand why different source of payment groups have different cesarean rates, but cannot serve as a structural, behavioral model that would be needed for a full policy analysis.

## 4. Variables and data sources

### *4.1. Florida data*

The analysis utilizes two data sets that are complementary in several respects. The first, called the "Florida Data," is compiled from four sources, the foremost being the 1992 and 1995 Florida Hospital Patient Discharge Data, publicly available from Florida's Agency for Health Care Administration. In addition to the medical diagnoses (up to ten) needed for risk adjustment, these data contain physician and hospital identifiers, source of admission (private/HMO physician or not), type of admission (emergency or not), demographic and payer information, and the zip code of the patient for every patient discharge from (non-federal) Florida hospitals in 1992 and 1995. From the 182,273 births in the 1992 data we culled the following: 12,638 births attended by osteopathic physicians, by physicians performing less than 10 births that year, or by unidentifiable physicians;[4] 6,506 births that do not fall in one of our three payment groups, discussed below; 15,307 births that have uncertain source or type of admission; and one birth with a non-sensical entry for an explanatory variable. This leaves 147,821 observations. In 1995, a similar procedure left 136,763 observations out of an initial set of 165,319 births. For some supplementary regressions, the 1992 data are merged with data on physician characteristics in 1992: age, race, sex, board certification, country of medical degree (U.S. or not), specialty (all based on information from the AMA Handbook and Florida ACOG), patient volume (the number of births, calculated from the Florida Data), and malpractice history (number of suits and total dollar payouts, in logs, for all malpractice cases resolved in Florida from 1985–1992, available from Florida's Department of Insurance). Some characteristics are missing for some physicians.

The presence of physician identifiers and the marketwide scope of the data allow physician fixed effects to be estimated

[3] One can use the more sophisticated Oaxaca/Blinder decomposition method found in the labor economics literature. However, in preliminary regressions, available from the author, the results were not sensitive to the decomposition technique, so this simple method is adopted here.

[4] In these data physicians are sometimes identified by their state license number and sometimes by their Medicaid ID number. These were matched using a proprietary data set supplied by Healthcare Business Services International, Inc. Unidentifiable physicians had unmatched Medicaid ID numbers, unreported license numbers, or, in just a few cases, license numbers of 0 or 99999.

accurately. In addition, three variables serve as indirect indicators of the closeness of the physician-mother relationship: type and source of admission (the physician and mother are less likely to have a close relationship if she has an emergency admission, or if she has been admitted to the hospital by a staff physician), and a dummy for a diagnosis of insufficient prenatal care. Finally, individual nonclinical characteristics are represented by race identifiers and a full set of zip code dummies (as a geographic proxy). The full list of variables used in the main regression specification is presented in the first column of table 1.[5]

### 4.2. National maternal infant health survey

The second data set is the National Maternal Infant Health Survey, available from the National Center for Health Statistics (NCHS). It contains a vast array of information about the delivery, the physical characteristics of the baby, and the health, health behaviors, demographic and physical characteristics, marital status, living arrangements, and labor force status of the mother for a national sample of births in 1988. Low-birthweight, black, Hispanic, and American Indian mothers were oversampled, as well as infant deaths, and so weights must be used. There is substantial attrition in the NMIHS. About 30% of the initial sample of 21,583 observations is lost because mothers did not respond to the questionnaire; of the remainder, about 60% contain all required information (including the matched hospital/pre-natal care provider data). This leaves a final sample of 9,017 births.

The NMIHS is particularly useful for exploring the importance of individual nonclinical factors, because most of its nonclinical information cannot be found elsewhere. The set of individual nonclinical controls, presented in table 1, span multiple dimensions of individual heterogeneity, including (but not limited to) socioeconomic status.[6] While physicians are not identified in the data, additional variables proxy for both physicians' practice styles and relationship factors: dummies for whether the mother's primary pre-natal care provider is a private physician, whether there was early onset of prenatal care (before the sixth month of pregnancy), and whether there were many prenatal care visits (five or more). The full list of variables used in the main regression specification is presented in the second column of table 1. Both data sets use an extensive set of clinical controls, based on Localio et al. [39]. Extensive risk adjustment helps ensure the individual, physician, and relationship variables do not accidentally capture differences in risk.

### 4.3. Source of payment and treatment influences during the sample period

The focal comparison groups in this analysis are private and nonprivate mothers, as defined above. But each category contains a variety of payers, each with different mechanisms for influencing treatment intensity—use of the cesarean section.

Private payers—commercial insurance—can be classified into three types: traditional indemnity insurance, health maintenance organizations (HMOs), and preferred provider organizations (PPOs). HMOs attempt to control costs three ways: by reducing the financial incentives for treatment using capitation contracts instead of fee-for-service (FFS) reimbursement, by contracting with physicians who are willing to accept lower fees, and by using utilization review, in which some procedures must be approved in advance. PPOs employ the last two methods, and traditional indemnity insurance at most the last method. Because utilization review and capitation contracts are designed to eliminate unnecessary utilization, mothers covered by HMOs and PPOs should have fewer cesareans, ceteris paribus. (Utilization review could influence the cesarean decision, because some "elective" cesareans are performed without a trial of labor, and these cesareans could be subject to utilization review.) However, the effectiveness of these mechanisms in limiting unnecessary treatment in general has not been conclusively demonstrated in the literature; thus the magnitude of the difference is uncertain. (See Dranove [40] for a lengthy discussion of managed care cost control mechanisms and cites concerning the effectiveness of incentives and utilization review.) Tussing and Wojtowycz [48], for example, find small differences in treatment between mothers covered by an HMO/IPA and those covered by traditional indemnity insurance. Our 1988–1995 sample period saw a dramatic expansion in managed care at the expense of traditional indemnity insurance, but even in our final sample year the majority of privately insured patients were covered under FFS (traditional indemnity insurance or a PPO; see table 4).

Nonprivate payers also come in three types: Medicaid FFS, Medicaid managed care, and uninsured (selfpay or charity care). Early in the 1988–1995 sample period, Medicaid eligibility for pregnant women was dramatically expanded, substantially reducing the number of uninsured expectant mothers. Then, in the second half of the sample period Medicaid managed care began to replace FFS. Medicaid managed care began in Florida in 1992, and by 1995 more than 25% of Medicaid enrollees were covered under managed care contracts.

[5] More current hospital data is available from the State of Florida. This older data has three advantages. First, it is temporally close to the other data set, described below, which is from 1988. Second, the zip code information is missing in later years of the data. Third, as discussed below, managed care had only limited penetration within both the private and public insurance markets in the early 1990s, making the two markets more distinct than they would be in later years, when the majority of privately and publicly insured mothers were covered by managed care.

[6] In the NMIHS, some variables are poorly reported while others are redundant. The variables used in the analysis were selected to span the space of relevant individual nonclinical characteristics as completely as possible without dropping too many observations because of missing data or adding superfluous variables. This helps prevent multicollinearity, which could be a problem given the large number of independent variables.

To check for multicollinearity problems, the NMIHS estimations discussed below were supplemented with a principal components analysis, in which the regression model was re-estimated dropping the smallest principal components, those most likely to lead to multicollinearity. There was little change in the coefficient estimates, indicating multicollinearity is not a problem. It is even less of a problem in the Florida Data regressions, which do not have so many individual controls. With a few exceptions (private insurance, age, and physician referral have correlations ranging from 0.3 to 0.5), the correlations between the independent variables were quite small and coefficients were generally significant at the 1% level.

Table 1
List of variables in all specifications.

| Group of variables | Florida data: Main specification | NMIHS: Main specification | Florida data: Stafford replication | NMIHS: Gould replication |
|---|---|---|---|---|
| Source of payment | a dummy variable which equals one if the mother is covered by private insurance and zero otherwise | | | |
| Individual clinical controls | Continuous: age and age squared<br>Discrete dummy variables: placenta previa, abruptio placentae, mild pre-eclampsia, severe pre-eclampsia, uterine hemorrhage, diabetes, hypertension, multiple fetus, face/brow presentation, breech, transverse presentation, premature, cervical incompetence, prior cesarean, herpes, uterine rupture, cord prolapse, low birthweight, high birthweight, dystocia, fetal distress, and disproportion | All of the clinical controls listed for the Florida Data, plus–<br>Continuous: baby's head circumference, baby's length, baby's weight, baby's weight squared, mother's weight, mother's height, log of total birth order, previous stillbirths, previous miscarriages<br>Discrete dummy variables for missing circumference and length information | Discrete: five age dummies, prior cesarean, breech birth, dystocia, fetal distress, other birth complication | Continuous: age, age squared, birth order |
| Individual nonclinical controls | Discrete: zip code fixed effects, black race, other nonwhite race, Hispanic ethnicity, metropolitan area residence | Continuous: mother's years of schooling, father's years of schooling, log of total income, log of cigarettes smoked<br>Discrete: Hispanic, nonwhite, intended to breastfeed, no breastfeeding information, wanted child now, used prophylactics if did not want child now, attended childbirth classes now or for previous pregnancy, employed while pregnant, mother lived with father while pregnant, married, moved during pregnancy, took multivitamins, exercised, drank daily, drank weekly, marijuana weekly, cocaine weekly | Discrete: white, black, Hispanic | Continuous: log of total income<br>Discrete: Hispanic, nonwhite |
| Relationship controls | Discrete: physician referral to hospital, emergency admission to hospital, poor prenatal care | Discrete: prenatal care from a private physician, onset of prenatal care after 5th month of pregnancy, four or less prenatal visits | Discrete: physician referral to hospital, emergency admission to hospital, poor prenatal care | Discrete: prenatal care from a private physician, four or less prenatal visits, onset of prenatal care after 5th month of pregnancy |
| Physician practice style controls | Discrete: physician fixed effects | none directly, but some relationship proxies also indirectly control for physician practice style | Discrete: physician fixed effects | none directly, but some relationship proxies also indirectly control for physician practice style |

*Note*: Data sources given in the text. There are 9,017 observations in the NMIHS sample and 147,821 (136,763) in the 1992 (1995) Florida Data. All means in the NMIHS are weighted using sample weights (final weight).

Still, over all sample years Medicaid FFS was the dominant form of nonprivate coverage (see table 4), and during the sample period fewer than 10% of all Medicaid deliveries were paid by Medicaid managed care.[7]

[7] According to computations generously provided by Michael Roberts of Florida's Agency for Health Care Administration.

Because most private and nonprivate mothers are covered by FFS, it is important to compare the fees offered to physicians under private insurance with paid by Medicaid. Compared to Medicaid, privately insured cesareans reward the physician more generously. In 1989, one year after the NMIHS, the mean difference between cesarean and vaginal fees for privately insured women in the U.S. was $561, compared to $127 for

women on Medicaid, a difference of $434 [23]. The difference was probably larger in Florida, where private insurance reimburses a cesarean more generously than average,[8] whereas Medicaid pays a flat fee that does not vary with the method of delivery. However, one should recognize that there may be a difference between the financial incentives inherent in fee structures and the financial incentives faced by the physician, who may not be the residual claimant on the fees paid by the insurer. A physician employed by a practice or clinic on salary, for example, may have little financial incentive to perform cesareans no matter what the fee structure is. A companion paper, available from the author, explicitly examines how financial incentives influence physicians' choice of delivery method.

## 5. Results

The decomposition in equation (3) breaks the source of payment differential in risk-adjusted cesarean rates into four components, each associated with a set of factors that influence the cesarean decision. A component can be said to "explain" part of the differential if it is positive; larger components explain more of the differential. As equation (3) shows, the largest components will correspond to those factors that differ the most between private and nonprivate women and that have the greatest impact on the cesarean decision. Therefore, before presenting the decompositions, it is useful to discuss how physician, relationship, and individual factors differ between private and nonprivate women.

### *5.1. Source of payment and physician, relationship, and individual factors*

We begin by showing that source of payment is related to physician practice styles. Figure 1 presents a scatterplot of two physician-level quantities for the 1992 Florida Data: "payer mix"—the percentage of births whose principal payer was private insurance, and practice style—the physician fixed effect from equation (2). The fixed effects have been scaled so that their mean equals the mean physician cesarean rate in the sample, so they can be interpreted as physician risk-adjusted cesarean rates. A best-fit line relating the two is also in the figure. This line shows that a positive relationship does exist between the two quantities: privately insured mothers tend to be matched with physicians who are relatively inclined to perform cesareans (who have high risk-adjusted cesarean rates). This matching will help explain part of the source of payment differential in cesarean rates.

Information on the other factors is presented in table 2, which lists the means, for private and nonprivate mothers separately, and regression coefficients for selected variables in vectors X, Y, and R. (All coefficients are multiplied by one hundred, so they convert unit changes in the independent variable into percentage point changes in the probability of a cesarean.) To limit the length of the table and make it easier to read, we have presented a subset of all explanatory variables, suppressed standard deviations and standard errors (in favor of significance levels), and excluded the 1995 Florida Data (since it resembles the 1992 Florida Data). Clinical variables are found at the top of the table, individual nonclinical variables in the middle, and relationship variables at the bottom.

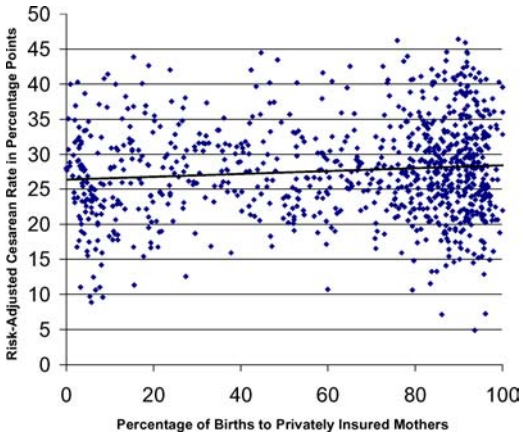


Figure 1. Physician cesarean rates and private/nonprivate patient mix in the 1992 Florida data. (*Note*: Each point represents one physician. The risk-adjusted cesarean rate is calculated as described in the text. The line in the figure represents the best-fit regression line. A total of 1109 physicians are represented.)

Source of payment is associated with the closeness of the physician-mother relationship. The means of the six relationship proxies in table 2 all indicate closer physician-mother relationships and more prenatal care for privately insured women. These variables all have positive coefficients, too, meaning that closer relationships and more prenatal care increase cesarean use. Therefore, relationship factors explain some of the source of payment differential in cesarean rates.

Finally, we examine the individual variables. As other studies find, the clinical variables consistently show more indications for cesarean section among privately insured women. But this is not true with the nonclinical variables. In the NMIHS, these variables do not exhibit a consistent relationship with source of payment, some being larger among private women and others larger among nonprivate women. The regression coefficients are similarly mixed. Therefore the aggregate effect of individual nonclinical variables on the source of payment differential is ambiguous. In both years of the Florida Data, the individual variables are jointly insignificant, and were therefore dropped from the regression and associated decompositions. Therefore, of three sets of variables—physician, relationship, and individual nonclinical—the first two, at least, contribute to the source of payment differential in cesarean rates.

### *5.2. Decompositions*

To quantify the contributions of the physician, relationship, and individual variables to the source of payment differential

[8] In 1993, Florida's increase in total physician fees (all physicians involved in the delivery) for an uncomplicated cesarean (relative to an uncomplicated vaginal delivery) was 37% larger than the national average (*Metropolitan Life Statistical Bulletin*, Oct.–Dec. 1994).

Table 2
Selected means and regression coefficients, by source of payment

| | 1992 Florida data | | | NMIHS data | | |
|---|---|---|---|---|---|---|
| Variable | Private | Nonprivate | Coefficient (*100) | Private | Nonprivate | Coefficient (* 100) |
| Percent of sample | 53.3% | Medicaid: 38.9%<br>Uninsured: 7.8% | – | 61.8% | Medicaid: 19.2%<br>Uninsured: 19.0% | – |
| Cesarean rate | 30.0% | Medicaid: 21.6%*<br>Uninsured: 20.7%* | – | 27.0% | Medicaid: 23.7%*<br>Uninsured: 17.1%* | – |
| Clinical information | | | | | | |
| Age (in years) | 28.7 | 24.2* | 0.02 | 27.9 | 23.8* | 0.29 |
| Number of major diagnoses (Sum) | 0.41 | 0.34* | Positive and significant | 0.40 | 0.32* | Positive and significant |
| Birthweight | – | – | – | 3420 g | 3278 g* | see note |
| Head circumference | – | – | – | 34.36 cm | 34.18 cm | 0.41* |
| Length | – | – | – | 64.28 cm | 61.23 cm* | −0.01 |
| Previous births | – | – | – | 1.23 | 1.41* | $-4.29^{L}$ |
| Miscarriages | – | – | – | 0.25 | 0.17* | 2.92* |
| Demographics | | | | | | |
| Yearly income (1988 dollars) | – | – | – | $35,860 | $15,302* | $0.07^{L}$ |
| Married | – | – | – | 89.6% | 51.3%* | 3.06* |
| Mother's education | – | – | – | 13.8 yrs | 11.8 yrs* | 0.32* |
| Black (Florida) or nonwhite (NMIHS) | 12.2% | 30.2%* | −0.08 | 12.3% | 30.4%* | 1.62 |
| Behaviors/attitudes | | | | | | |
| Exercised during pregnancy | – | – | – | 40.2% | 45.2%* | 1.21 |
| Drank alcohol weekly | – | – | – | 3.4% | 3.1% | 0.32 |
| Smoking (cigarettes per day, nonsmokers included) | – | – | – | 2.1 | 4.0* | $0.80^{*L}$ |
| Attended birth classes | – | – | – | 75.2% | 41.2%* | −1.53* |
| Employed before pregnancy | – | – | – | 74.8% | 45.7%* | 1.21 |
| Want child now | – | – | – | 67.9% | 41.8%* | 0.85 |
| Prophylactic use (if didn't want child now) | – | – | – | 51.1% | 37.8% | −3.33* |
| Plan to Breastfeed | – | – | – | 60.5% | 40.2%* | −0.21 |
| Relationship factors | | | | | | |
| Private/HMO prenatal care | – | – | – | 85.6% | 45.9%* | 2.29* |
| Late prenatal visits (after fifth month) | – | – | – | 2.6% | 14.2%* | −1.70 |
| Few prenatal visits (4 or less) | – | – | – | 10.4% | 25.0%* | −1.21 |
| Emergency admit | 7.5% | 20.5%* | −2.28* | – | – | – |
| Referred by HMO/Personal physician | 95.0% | 71.2%* | 2.45* | – | – | – |
| Poor prenatal care | 0.2% | 2.3%* | −3.49* | – | – | – |

*Note*: Data sources given in the text. There are 9,017 observations in the NMIHS sample and 147,821 (136,763) in the 1992 (1995) Florida Data. All means in the NMIHS are weighted using sample weights (final weight). A star (*) denotes that the nonprivate means differ from the insured means at the 5% level or better (the first row excepted). The L superscript ($^{L}$) means that the variable is entered into the regression in logs. In the NMIHS, the low birthweight and high birthweight dummies were each significant, but both coefficients on the quadratic in birthweight were insignificant.

in cesarean rates, we use the decomposition given in equation (3). The basic results are presented in the first six columns of table 3. Results are to be read vertically. Of these six decompositions, three compare private and nonprivate women, one for each data set, and another three compare privately and publicly insured women. Results differ across data sets but the private/nonprivate decompositions are quite similar to the private/public decompositions.

Risk-adjusted cesarean differentials range from one percentage point to nearly four percentage points; the 1992 Florida

Table 3
Decompositions of the source of payment differential in cesarean rates.

| | Private/Medicaid | | | Private/Nonprivate | | | Private/Nonprivate | | |
|---|---|---|---|---|---|---|---|---|---|
| | NMIHS 1988 | FL DATA 1992 | FL Data 1995 | NMIHS 1988 | FL Data 1992 | FL Data 1995 | Remove 3 Disses (NMIHS) | Replicate Stafford (FL 1992) | Replicate Gould (NMIHS) |
| Unadjusted differential in cesarean rates[a] | 3.67 | 8.47 | 5.07 | 6.86 | 8.62 | 5.69 | 6.97 | 8.62 | 4.99 |
| Contribution of risk adjustment | 1.77 | 4.78 | 4.07 | 4.73 | 4.98 | 4.33 | 4.64 | 4.15 | 3.63 |
| Risk-adjusted differential in cesarean rates | 1.90 | 3.69 | 1.00 | 2.13 | 3.64 | 1.36 | 2.33 | 4.47 | 1.36 |
| Components attributable to differences in: | | | | | | | | | |
| Treatment | 1.18 | 0.84 | 0.37 | 0.69 | 1.30 | 0.65 | 1.19 | 2.23 | 0.85 |
| Relationship and physician factors | 1.41 | 2.85 | 0.63 | 1.27 | 2.34 | 0.71 | 1.64 | 2.29 | 1.78 |
| Physician | – | 1.81 | 0.19 | – | 1.39 | 0.24 | – | 1.47 | – |
| Relationship | – | 1.04 | 0.44 | – | 0.95 | 0.47 | – | 0.82 | – |
| Individual nonclinical factors | −0.71 | not sig. | not sig. | 0.15 | not sig. | not sig. | −0.51 | −0.05 | −1.28 |

*Note*: All numbers are in percentage points. See the text for details. The "3 Disses" are distress, dystocia, and disproportion. The study by Gould et al. focused on primary cesarean section only, and so repeat cesareans are removed from the sample. For sample sizes and data details, see Table 1.
[a]Location controls are included in the calculation of the unadjusted cesarean differentials in the NMIHS, to make the two samples–one regional, one national–more comparable.

Data has the largest differential and the 1995 Florida Data the smallest. These differentials are a little smaller than those typically found in the literature cited above.

While differences in treatment do contribute to the cesarean differential, they usually comprise less than half, often much less. Differences in treatment range from 0.3 percentage points to 1.3 percentage points, which, while important, is a small fraction of the 25% cesarean rate that spans these three samples.

Most of the differential is explicable, instead, by physician and relationship factors. In every decomposition, these factors together account for more than half of the differential, with a combined effect ranging from 0.6 to 2.8 percentage points. This always exceeds the contribution of differences in treatment. In the Florida Data, which allows physician and relationship factors to be separated, the two are roughly equal in importance.

Finally, individual nonclinical differences do not contribute much to the differential. As noted previously, the individual nonclinical controls in both the 1992 Florida Data and 1995 Florida Data were jointly insignificant, implying a contribution of zero. In the NMIHS, the contribution of individual nonclinical factors is positive but small in one decomposition and negative in the other. Inequities in use of the cesarean section (after adjusting for risk) are mostly attributable to differences in the practice style of the attending physician and differences in the closeness of the physician/patient relationship, with differences in treatment playing a smaller role and individual nonclinical differences playing little or no role.

### *5.3. Robustness of risk adjustment*

The final three columns of table 3 present additional private/nonprivate decompositions that use alternate methods of risk adjustment. They are used to explore the robustness of our results and adjust for possible biases.

The first decomposition removes three important diagnoses from the risk adjustment: dystocia (failure of labor to progress), fetal distress (low fetal oxygen), and disproportion (the fetus is too large to fit through the birth canal), jointly termed the "three disses." These somewhat subjective conditions might sometimes be coded in order to justify a cesarean ex post [2, 44]. If so, risk-adjusted cesarean differentials would be underestimated by the model. On the other hand, removing these variables might leave some genuine source of payment differences in risk unaccounted for, which could bias $\gamma$ in the other direction.[9] To reduce the extent of this problem, the decomposition is conducted using the NMIHS, which contains objective information about the size of the mother and baby that is highly predictive of the incidence of the three disses. The final two decompositions in table 3 simply adopt the individual (clinical and nonclinical) controls used by two related, well-known studies: Stafford [6] and Gould et al. [17, Appendix]. These controls are listed in table 1.

All three decompositions show that estimates of the risk-adjusted private/nonprivate cesarean differential are not highly sensitive to the form of risk adjustment employed. No estimate differs from its original counterpart (the original model applied to the same data) by more than one percentage point; some are larger than in the original, others smaller. Estimates of differences in treatment, on the other hand, are consistently

[9] Age is positively related to the incidence of birth complications such as the three disses, and is also positively associated with the incidence of private insurance. Because both factors lead to increased use of cesarean section, estimates of differences in treatment ($\lambda$) will be biased away from zero.

Table 4
Extended payer breakdown of treatment effects.

| | NMIHS 1988 | | Florida data 1992 | | Florida data 1995 | |
|---|---|---|---|---|---|---|
| Source of payment | Share of Patients | Regression coefficient (times 100) | Share of patients | Regression coefficient (times 100) | Share of patients | Regression coefficient (times 100) |
| Traditional indemnity | 61.8%[#] | – | 22.2% | – | 13.1% | – |
| HMO | – | – | 15.4% | 0.59 (0.28) | 22.1% | −0.12 (0.29) |
| PPO | – | – | 13.7% | −0.36 (0.27) | 20.3% | −0.11 (0.28) |
| Medicaid | 19.2% | −0.07 (1.04) | 38.9% | −1.05 (0.26) | 37.0% | −0.42 (0.27) |
| Uninsured | 19.0% | −1.01 (0.86) | 7.8% | −1.64 (0.32) | 7.5% | −1.89 (0.36) |

Standard errors in parenthesis. [#]HMOs and PPOs are not separately identified in the NMIHS, but probably had a small market share in 1988.

larger in these new models, though never by more than one percentage point. Even then, however, the contribution of differences in treatment to the risk-adjusted cesarean differential is always smaller than the contribution of physician and relationship factors. Therefore, this finding is robust to the form of risk adjustment employed.[10]

### *5.4. Extended results on differences in treatment*

The source of payment classifications used in the decompositions above are fairly broad. In order to explore differences in treatment at a finer level, we conducted supplementary regressions that allow five different source of payment categories: HMO, PPO, Medicaid, and uninsured, each represented by a dummy variable, and traditional indemnity insurance, the omitted (reference) category. Table 4 presents regression coefficients on these dummies for each of the three samples, along with "market shares" of the various source of payment categories. These coefficients estimate differences in treatment between the appropriate category and traditional indemnity insurance; comparisons between any two categories can be performed by comparing the appropriate coefficients.

Several empirical regularities stand out from these regressions. The first is that differences in treatment are strongest, by far, between privately insured mothers and uninsured mothers. These values range from one to two percentage points across the three data sets, and are easily statistically significant. One possibility is that physicians perform fewer cesareans on uninsured women to lessen their financial obligations; another is that they do this because they don't expect to get paid. The second regularity is that there are no clear differences in treatment between traditional indemnity insurance, HMOs, and PPOs. These coefficients are always small and, with one exception, insignificant. Although managed care organizations attempt to limit unnecessary health care utilization, they do not appear to have been successful at this as far as the cesarean section is concerned. The third regularity is that the difference in treatment between privately insured mothers and publicly insured mothers is fairly small and possibly zero. The largest coefficient signifies a one percentage point difference; the other two a small and insignificant difference. Thus, the most striking differences in treatment occur when comparing privately insured women with those who are uninsured.

The larger point, however, should not be lost in these details: in general, differences in treatment by source of payment are quite small. The largest difference, between privately insured and uninsured women, reaches two percentage points at most. If we remove uninsured women from the analysis—they comprise less than one-twelfth of all births—then the difference is likely to be no larger than one percentage point between any two of the remaining four source of payment categories. The widespread source of payment differences in cesarean rates noted by previous researchers are not primarily due to differences in treatment. Some could be due to differences in risk, captured by the more extensive risk controls included in our regressions; much else is due to physician and relationship factors.

## 6. Physician-mother matching: Further investigation

A striking result of the previous section was the discovery of a positive association between privately insured women and physicians who are relatively inclined to perform cesareans.[11] Here we explore this association more closely, to try to determine its origin. Three testable hypotheses can help explain this association:

[10] The risk-adjusted source of payment cesarean differentials in this paper are much smaller than those implied by the studies of Stafford and Gould et al. These results show that the empirical specification does not explain the difference, because the differentials are similar under all methods of risk adjustment. A likely alternative is the samples used. Stafford and Gould et al. both used mid-1980s data from California. Unpublished research using the Healthcare Cost Utilization Project (HCAD-3) from the Agency for Healthcare Research and Quality, available from the author, shows that risk-adjusted cesarean rates were very high relative to the national average, and to Florida, in California during the late 1980s. Cesarean differentials may also have been high in addition.

[11] The association between privately insured women and physicians with high *unadjusted* cesarean rates is mostly because of risk: privately insured women have a greater clinical risk of cesarean section. It is the association between privately insured women and physicians with high *risk-adjusted* cesarean rates that was uncovered previously and is being investigated here.

- *Hypothesis 1*: Other physician characteristics that influence physician-mother matches are positively associated with private insurance and with physicians' inclinations to perform cesareans.
- *Hypothesis 2*: Physicians with many privately insured patients tend to perform more cesareans on all their patients, whether privately insured or not: practice style is influenced by payer mix. This hypothesis has been suggested by Dranove [14], though not for cesareans specifically.
- *Hypothesis 3*: Managed care restrictions steer mothers to physicians who are inclined to perform cesareans. (It is not clear, though, why a managed care organization would want to do this.)

Because we have data on the characteristics of most (602 of 1109) of the physicians in the 1992 Florida Data, we can test Hypothesis 1 in a simple way. First we relate physicians' practice styles—which are the fixed effects estimated in equation (2)—to the characteristics of those physicians, using a regression. (Symbolically, $\alpha$ is regressed on Z.) This tells us how practice style is related to observable physician characteristics. Then, using the means of these physician characteristics in the private and nonprivate subsets of the data, we can calculate the contribution of physician characteristics to the source of payment cesarean differential, in the same way that each component of the original decomposition was calculated. The regression coefficients and variable means are presented in table 5.

The table shows that privately insured women use higher quality physicians, as expected. For example, the means of board certification and age (a proxy for experience) and the incidence of a U.S. medical degree are all higher for this group.

Table 5
Physician characteristics and source of payment.

| Variable | Nonprivate mean | Privately insured mean | Regression coefficient (times 100) |
|---|---|---|---|
| Physician's birth year | 1947.63 | 1943.98 | −0.05 |
| Hispanic | 0.14 | 0.15 | 3.29* |
| Board certified | 0.73 | 0.78 | −1.35* |
| Male | 0.91 | 0.89 | 1.13 |
| Nonwhite | 0.24 | 0.12 | 0.22 |
| Not in private practice | 0.28 | 0.06 | −2.28* |
| Not an obstetrician | 0.02 | 0.01 | 3.14 |
| U.S. medical degree | 0.66 | 0.73 | −2.60* |
| Number of malpractice suits prior to 1992 | 1.41 | 1.47 | 0.23 |
| Log(1+total payout) in Suits | 4.92 | 5.15 | 0.03 |
| Births attended | 326.15 | 190.80 | −0.00 |
| $R^2$ | – | – | 0.12 |

*Note*: The aggregate source of payment difference in cesarean rates explained by these physician characteristics is 0.199 percentage points. $N = 602$. Regression coefficients are on the independent variables listed, with the physician's risk-adjusted cesarean rate as the dependent variable.
*Means the coefficient is statistically significant at $p \leq 0.05$ in a two-tailed test.

Nevertheless, the eleven physician characteristics used in this regression explain remarkably little of the variation in practice styles: the $R^2$ statistic is only 0.12. Furthermore, the net effect of physician characteristics on the source of payment differential is quite small: only 0.2 percentage points. While privately insured women tend to see higher quality physicians, these physician characteristics are sometimes associated with higher risk-adjusted cesarean rates, and sometimes with lower rates, and on net the positives and negatives tend to cancel out. Hypothesis 1 has little support.

Hypothesis 2 can be tested by comparing changes in practice styles between 1992 and 1995 to changes in the payer mix between those same two years, to see if they are positively related. This can be done with the Florida Data, because most physicians practicing in 1992 are still practicing in 1995. (Specifically, 835 of the 1109 physicians in the 1992 sample are present in the 1995 sample.) We took the difference between the fixed effects estimated in 1995 and 1992 and related it to the change in the fraction of the physician's patients who were privately insured over that same period. The regression was very imprecise—the adjusted $R^2$ was negative—and the coefficient estimate was small and insignificant. (A ten percentage point increase in the fraction of patients that were privately insured increased the cesarean rate by 0.04 percentage points.) There is no evidence of a "payer mix effect" on physicians' practice styles.

To test Hypothesis 3, we conducted decompositions, analogous to those in table 2, in which privately insured mothers are separated into three categories—traditional indemnity, HMO, and PPO. Separate decompositions are conducted, each of which compares one of these private insurance categories to nonprivate mothers, using the 1992 and 1995 Florida Data. Comparing the physician components across these decompositions allows us to determine whether or not managed care constraints encourage mothers to use physicians who are inclined to perform cesarean sections.

The results are presented in table 6. In these decompositions, the relationship component and differences in treatment show considerable uniformity across private payers: each is about one percentage point in 1992 and one-half percentage point in 1995. But there is great variety in the physician component. In both years it is largest for HMOs and small, but positive, for traditional indemnity insurance. Since physician choice should be least constrained under traditional indemnity insurance, it appears that managed care constraints on physician selection operated to increase the cesarean rate, at least for HMOs. Why this would occur is not clear: it is in HMOs' interest to select physicians who are inclined to perform less-expensive vaginal deliveries, but instead they do the opposite.

Confirmation of Hypothesis 3 shows that market forces are responsible for at least part of the association between privately insured women and physicians who are inclined to perform cesareans. And other explanations based on market forces may also be tenable, but cannot be tested directly here. Foremost among these is the possibility that privately insured women prefer physicians who are inclined to perform cesareans, and

Table 6
Decompositions of risk-adjusted cesarean rates–extended payer breakdown.

| | Florida data 1992 | | | Florida data 1995 | | |
|---|---|---|---|---|---|---|
| | Traditional Indemnity | HMO | PPO | Traditional Indemnity | HMO | PPO |
| Risk-adjusted differential in cesarean rates | 3.07 | 5.52 | 2.51 | 1.18 | 2.11 | 0.64 |
| Components attributable to differences in: | | | | | | |
| Treatment | 1.15 | 1.74 | 0.79 | 0.67 | 0.55 | 0.56 |
| Relationship factors | 0.93 | 0.92 | 1.01 | 0.48 | 0.43 | 0.50 |
| Physician factors | 1.00 | 2.86 | 0.71 | 0.03 | 1.13 | −0.42 |

*Note*: All Comparisons are between nonprivate mothers and the payer group indicated. All numbers are in percentage points.

choose them in part for that reason.[12] (This possibility could explain the positive physician components for women on traditional indemnity insurance in our decompositions.) Source of payment contributes to inequities in treatment in childbirth in (at least) two ways: by directly influencing the physician's choice of delivery method and by influencing the identity, and hence the practice style, of the physician attending the delivery. Supply-side factors—managed care constraints on physician selection—contribute to this phenomenon, but demand-side factors, such as a consumer preference for physicians who are inclined to perform cesareans, may contribute as well.

## 7. Discussion and conclusion

Privately insured women receive more cesareans than publicly insured or uninsured women do. Much of this can be attributed to differences in risk—privately insured mothers are older and have more birth complications—but a differential of one to four percentage points remains even after extensive risk adjustment. This differential cannot be interpreted as purely behavioral—resulting from differences in the way physicians choose to treat otherwise identical women with different sources of payment. Instead, more than half of this differential is explained by differences across source of payment categories in the practice style of the physician attending the birth and in the physician-mother relationship. In contrast, differences in the treatment of privately insured and publicly insured mothers explain little of the differential—at most one percentage point. (Disparities in treatment are two to three times larger when comparing privately insured and uninsured mothers.) Why these effects are so small is not directly explored in this paper, but it might be that financial incentives are less important than previously supposed for explaining inequalities in treatment during childbirth.

A longstanding policy debate surrounds the vast increase in the U.S. cesarean rate, which rose from 5% in 1970 to nearly 25% in 1990: how much of this increase is attributable to economic considerations, and how effective would incentives be at reducing cesarean use [32, 35, 49]? Our findings contribute to this debate by finding a relatively small effect of the incentives (financial and otherwise) associated with private insurance on the physician's choice of delivery method. This suggests, in contrast to some other studies [17, 23, 26], that economic considerations are not significantly responsible for the increase in cesareans between 1970 and 1990 and that changes in incentives alone are not likely to substantially reduce the cesarean rate in the United States (as was suggested in the opening excerpt).

The importance of physician and relationship factors in explaining the source of payment differential in cesarean rates also has important policy implications. Changes in policy variables, such as insurance coverage or Medicaid fees, may directly influence the choice of delivery method but may also influence physician selection (the number of mothers delivered by physicians who are inclined to perform cesareans) and the physician-mother relationship (such as the amount of prenatal care obtained). For example, Baker and Royalty [14] find that increases in Medicaid fees increase the fraction of patients seen by private sector physicians; in our study these physicians tend to have higher risk-adjusted cesarean rates. In order to predict the total effect of a policy change on the cesarean rate, therefore, one must combine the direct effect on physician behavior with the indirect effects on physician selection and the physician-mother relationship.

Policies influencing market competition might also influence the cesarean rate by influencing physician selection. Section 6 provided evidence that these forces operate on the supply side, through managed care. Here high rates of cesarean section were encouraged, not discouraged, by market forces. (See Carlsen and Grytten [11] for a similar idea in a different health-related context.) This contrasts with another explanation for excessive utilization, the standard inducement model, in which physicians perform excess procedures because of the financial reward but are limited by market forces in doing so.

[12] Anecdotal evidence supports the plausibility of this hypothesis. Wall [49] reports a survey in which 14% of low-risk, first or second time mothers preferred a cesarean ex ante; ex post 24% would have preferred a cesarean. Mothers in physician families, who presumably are well informed, have much higher cesarean rates than their counterparts, controlling for income, age, and medical characteristics [15]. And in three studies [1,30,36], one-third to one-half of those mothers who were eligible and/or encouraged by their obstetricians to attempt a trial of labor for a vaginal birth after cesarean opted not to do so.

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