Topics

Christiana Stoddard*, Wendy A. Stock and Elise Hogenson The Impact of Maternity Leave Laws on Cesarean Delivery

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Abstract: Through their influence on insurance and relative leave length, maternity leave laws can alter the incentives to choose cesarean delivery. We use a difference-in-difference approach to estimate the impact of state-level maternity leave laws on cesarean delivery. Empirical results suggest that maternity leave laws guaranteeing relatively short leaves are associated with reduced probability of cesarean delivery. Laws that guarantee continued insurance coverage during the leave are associated with an increase in the probability of cesarean delivery among insured women.

Keywords: cesarean section, maternity leave, health insurance

1 Introduction

As is well known, the United States spends more on medical care, both per capita and as a percentage of GDP, than other developed countries. One factor that has been identified in explaining this is the use of more intensive medical treatments in the United States.¹ A number of papers have examined the role of financial incentives in contributing to greater medical intensity. Financial incentives may lead insured patients to demand “too much” health care because of the moral hazard effects of insurance (Newhouse 1993). Similarly, the principal-agent problem may lead health care providers to induce greater demand for medical services when the fee structure results in a financial incentive for higher

¹ See Garber and Skinner (2008) and Chandra and Skinner (2012) for a review of this evidence.

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levels of care.² For example, Gruber, Kim, and Mayzlin (1999) found that the fee differential for cesarean deliveries relative to vaginal deliveries contributed significantly to the rise in cesarean rates, although estimates by Grant (2005) find somewhat smaller effects.

Although insurance and fee-related contributions to medical expenditures have been heavily studied, there has been very little work on other policies that may influence patients' or physicians' medical care choices. This paper focuses on the effects of labor market policies, specifically maternity leave laws, on cesarean deliveries. Cesarean delivery is a potentially a fruitful avenue for identifying incentive effects, as it is a form of care that patients can demand without a clear medical justification. Furthermore, its use has been highly variable over time, with the percentage of all births delivered by cesarean section increasing from 5% in 1965 to 33% in 2010.³ It is also the most commonly performed inpatient surgical procedure in the United States.

Maternity leave laws affect the incentives of both physicians and mothers in theoretically ambiguous ways. Prior to the passage of the federal Family and Medical Leave Act (FMLA) in 1993, a number of states passed leave laws granting mothers time off of work for the birth of a child. In some states, leave laws included provisions mandating continued insurance coverage during the period of leave. There is limited evidence on the degree to which these earlier state-level laws affected insurance coverage, but the Commission on Family and Medical Leave (1996) found the subsequent Federal Medical Leave Act increased the number of firms offering continuation of health insurance benefits during the leave period. Continuity of insurance coverage during a leave could *increase* cesarean rates if insurance coverage provides incentives at the margin for physicians and mothers to deliver by cesarean. Previous research suggests this is plausible: cesarean rates are highest among privately insured patients, followed by those on Medicaid and the uninsured (Grant 2005; Gruber, Kim, and Mayzlin 1999; Keppel, Taffel, and Placek 1982; Stafford 1990, 1991).

Furthermore, research indicates that recovery from cesarean delivery takes longer than for vaginal delivery (Tulman et al. 1991; DiMatteo et al. 1996;

² See Clemens and Gottlieb (2013), Dunn and Shapiro (2012), Hadley et al. (2009), and McGuire (2000) for evidence.

³ The increase has prompted medical authorities including the American College of Obstetricians and Gynecologists (ACOG) and the National Institutes of Health (NIH) to voice concern about the high and increasing rate of cesarean delivery in the United States (ACOG 2000; NIH 1981). Both the U.S. Department of Health and Human Services (USDHHS) and the World Health Organization (WHO) recommend a cesarean rate of 15% among low-risk pregnancies because there is little evidence that maternal and infant health are improved when cesarean rates exceed this level (USDHHS 1990, 2000; WHO 1985, 1999).

Tulman and Fawcett 1988; Lydon-Rochelle, Holt, and Martin 2001; McGovern et al. 2006, 2007; Gjerdengen and Froberg 1991; and DiMatteo et al. 1996). States with generous leave laws may therefore have reduced the recovery costs of this form of delivery, again potentially raising cesarean rates.

On the other hand, prior to the passage of the leave laws, employers often granted relatively longer leaves for cesarean delivery (Berger, Hill, and Waldfogel 2005). The Pregnancy Discrimination Act of 1978 required employers to treat pregnancy and childbirth as medical conditions with the same rights to leave as other medical conditions of temporary disabilities (like a broken leg or a heart attack). This meant that if an employer granted leave for other medical conditions, pregnant women had the same rights. Typically, leave was based on the medical recommendations of a physician. The American Medical Association (AMA) return to work guidelines stipulate that the majority of women can return to a typical job after four to six weeks with a vaginal delivery, but after eight weeks for a cesarean delivery (Reed 2012). This may have created an incentive for cesarean deliveries if some mothers at the margin choose this mode of delivery to receive the additional time at home with their newborns. As a result, maternity leave laws may *decrease* cesarean rates if they establish uniform leave provisions and thus effectively eliminate additional time-off for cesarean delivery.

Consequently, the effect of leave laws is likely to be nuanced, with potentially different effects based on the specific length of leave and insurance provisions. To estimate the impact of leave laws on cesarean rates, we utilize a quasi-experimental framework, in which the change in the probability of giving birth by cesarean among employed women in states that passed leave laws is examined relative to the change in the probability of cesarean among employed women in states that did not pass leave laws.⁴ If leave laws impacted cesarean choices by mothers and physicians, the probability of cesarean should move differently in states that passed leave laws.

The empirical results suggest that state maternity leave laws do affect the incentives of mothers or their physicians for delivery by cesarean section. Furthermore, the specific effect of the laws differs by the length of the leave period, with laws guaranteeing shorter leave lengths associated with reductions in the likelihood of cesarean delivery. Short leave laws are estimated to cause a twelve to twenty point reduction in the probability of having a cesarean section rates.

⁴ We focus on state-level leave laws rather than the FMLA for two reasons. First, since the FMLA potentially impacts women in all states simultaneously, it would be difficult to identify an adequate control group against which to test FMLA impacts. Second, the NSLY (the data source we use for our estimates) switched from annual to biennial surveying beginning in 1994.

This magnitude is consistent with the fact that cesarean section rates in states that never passed a leave law rose from about 10% to about 30% over the period we examine, while in short leave law states, C-section rates remained relatively constant at around 20%. Alternatively, laws that require continuation of insurance coverage are associated with about a 12% increase in the probability of cesarean delivery.

As a check on our results, we compare changes in the probability of cesarean delivery among nonemployed women, since employment leave laws should not impact the delivery choice among the nonemployed. We find no evidence that short leave maternity laws impact cesarean choices among this group. Similarly, laws guaranteeing insurance coverage are not found to affect the probability of cesarean delivery among employed women without employer-provided health insurance. Including laws covering only public sector workers along with laws covering both public and private sector workers does not change the baseline results, although we do find some evidence that the insurance laws most affected public sector workers.

2 Maternity Leave Laws

Prior to the passage of the federal Family and Medical Leave Act (FMLA) in 1993, 22 states had some form of a law granting time off work for maternity disability (disability due to pregnancy, miscarriage, childbirth, or recovery that substantially limits work activities), maternity leave (leave granted to female employees for the birth and care of a new baby), or parental leave (leave granted to both male and female employees for the birth and care of a new baby) for employees. An additional 12 states passed similar laws covering public sector employees only.

Table 1 provides a state-by-state description of the laws over time. All of the laws provide job-protected leave, guaranteeing the employee her job back at the end of the leave period. The laws vary primarily in terms of the timing of their passage, whether they cover only public sector or both public and private sector employees, the length of leave guaranteed, and requirements regarding the continuation of health insurance coverage during the leave.

Focusing first on laws that cover both the private and public sectors (which we title “private sector laws” for brevity), some states (e.g., CO, IL, and WA between 1973 and 1989) passed laws requiring that employers grant employees a “reasonable period” of leave, but did not include a specific leave length guarantee. Other states (e.g., CA, MA, and WA after 1989) passed laws specifying the number of weeks of leave to be granted. Among the 15 states that specified the leave length, most states (e.g., WI, IA, and MN) guaranteed relatively short leave lengths of 13 weeks or less,

Table 1: Detailed description of state-level maternity leave laws.

State	Year	Leave period	Insurance	Law type	Statute/Code	Source(s)
Alaska	1992	18 weeks	Yes	P(PU)	§ 23.10.500 to § 23.10.550; § 39.20.305	NPWF, WB
Arizona	1986	12 weeks	No	P(PU)	§ R2-5-411	Irvin & Silberman, NPWF, State Law Website
Arkansas	1975	24 weeks	No	P(PU)	§ 21.4.210	NPWF, State Law Website
California	1980	16 weeks	No	M,MD	\$12945	Baum, Lenhoff & Becker, NPWF, Waldfogel, WB
	1981	52 weeks	No	P(PU)	§ 19991.6	NPWF, WB
	1991	16 weeks	Yes	P	§ 12945.2	Baum, Irvin & Silberman, Kane, MLR (1992), NPWF, WB
Colorado	1988	RP	No	M	\$80.8(d)	BNA, State Law Website, WB
	–	13 weeks	No	P(PU)	801 P-5-24	Irvin & Silberman, NPWF
Connecticut	1973	RP	No	M,MD	\$46a-60	Baum, BNA, MLR (1974), Waldfogel, WB, Lenhoff & Becker
	1987	24 weeks	Yes	P(PU)	§ 5-248a; § 87-291	Irvin & Silberman, Lenhoff & Becker, MLR (1988), NPWF, WB
	1990	12 weeks	No	P		Baum, Irvin & Silberman, MLR (1989)
	1991	16 weeks	No	P	§ 31-51	MLR (1989), Kane, NPWF, WB
District of Columbia	1991	16 weeks	Yes	P		Baum, Irvin & Silberman, Kane, MLR (1990), NPWF, Waldfogel, WB
Florida	1991	24 weeks	No	P(PU)	§ 110.22; 60 FL ADC 60L-23-.006	Irvin & Silberman, MLR (1990), NPWF, WB
Georgia	1992	12 weeks	Yes	P(PU)	§ 478-1-18; § 45-24-1 to -9	Irvin & Silberman, MLR(1992), NPWF, WB
Hawaii	1983	RP	No	M,MD	\$12-23-1; \$12-23-58	BNA, HI Civil Rights Commission, Kane, Lenhoff & Becker, WB
	1992	4 weeks	No	P(PU)		MLR(1991)

(continued)

Table 1: (continued)

State	Year	Leave period	Insurance	Law type	Statute/Code	Source(s)
Illinois	1984	52 weeks	Yes	P(PU)	\$ 303.148; \$ 415.8c	State Law Website, WB, Irvin & Silberman, NPWF
	1985	RP	No	M,MD	\$2.10; \$5210	BNA, State Law Website
Iowa	1987	8 weeks	No	M,MD	HB 86; \$216:6:2; \$601A	BNA, Kane, Lenhoff & Becker, MLR(1988), WB
Kansas	1972	RP	No	M,MD	\$21-32-6	BNA, State Law Website, WB, Irvin & Silberman, NPWF
Louisiana	1987	16 weeks	No	M,MD	\$23:1008; \$23:341	MLR (1988), NPWF, WB, Kane
Maine	1988	8 weeks	Yes	P,MD		Baum, Lenhoff & Becker, MLR (1989), Irvin & Silberman, Kane, Waldfogel
Maryland	1991	10 weeks	Yes	P	\$843-845; \$843-849	MLR (1991), NPWF, WB
Massachusetts	1988	12 weeks	Yes	P(PU)	\$ 37C	WB, MLR(1989), Irvin & Silberman
	1972	8 weeks	No	M	\$4.11A, \$3.02 (7), \$8.01	Baum, BNA, Irvin & Silberman, Kane, MLR (1973), NPWF, Waldfogel, WB
Minnesota	1988	8 weeks	Yes (PU)	P(PU)		MLR(1989)
	1987	6 weeks	Yes	P	\$181.940-942	Baum, BNA, Irvin & Silberman, WB, Waldfogel
Montana	1984	RP	No	M,MD	\$49-2-310; \$24.9.1201	BNA, Irvin & Silberman, Kane, State Law Website, WB
New Hampshire	1987	RP	No	M,MD	\$1001(b); \$354-A-9; \$402.03; \$201.01	BNA, Lenhoff & Becker
New Jersey	1992	RP	No	M,MD	\$ 354-A:7	NPWF, State Law Website, WB
	1990	12 weeks	No	P	\$ 34:11B-1	Baum, Irvin & Silberman, Kane, MLR (1991), Waldfogel, WB
North Dakota	1989	16 weeks	Yes	P(PU)	\$ 54-52.0-02 to 4-09	Irvin & Silberman, MLR(1990), NPWF, WB
Ohio	1989	RP	No	M,MD	\$ 4112-5-05	Kane, State Law Website
Oklahoma	1989	12 weeks	Yes	P(PU)	\$ 840-2.22; \$ 840.7c	Irvin & Silberman, MLR(1990), NPWF, WB

Oregon	1988	12 weeks	No	M, P	\$ 659.010, \$ 659.360, \$ 659.389, \$ 659.560	Baum, BNA, Irvin & Silberman, Kane, MLR (1988), NPWF, Waldfogel
Rhode Island	1987	13 weeks	Yes	P	\$ 28-48-1, \$ 28-5-38	Baum, BNA, Irvin & Silberman, Kane, Lenhoff & Becker, MLR (1988), NPWF, Waldfogel, WB
South Carolina	1974	RP	No	M(PU)	\$ 8-11-1-40	WB, NPWF
Tennessee	1988	16 weeks	Yes	M	\$ 4-21-408	Baum, BNA, Irvin & Silberman, Kane, Lenhoff & Becker, MLR (1988), NPWF, Waldfogel, WB
Texas	1991	6 weeks	No	P(PU)	HB 1, Article X, § 8.13; TX Session Law § 8.2, § 8.11, § 8.13	State Law Website, WB
Vermont	1989	12 weeks	Yes	M	\$ 471-472	MLR(1990)
	1992	12 weeks	Yes	P	\$ 470-472	Baum, Irvin & Silberman, Kane, NPWF, WB
Virginia	1991	6 weeks	Yes	P(PU)	Dept of Personnel & Training Parental Leave Policy	WB, Virginia Department of Human Resources
Washington	1973	RP	No	M, MD	\$ 162-30-020(5)	Baum, BNA, State Law Website, Waldfogel
	1989	12 weeks	Yes	P	\$ 49.78.020-.030	Baum, Irvin & Silberman, Kane, MLR (1990), NPWF, WB
West Virginia	1989	12 weeks	Yes	P(PU)	\$ 21-5D-1 to -9	Irvin & Silberman, MLR(1990), NPWF, WB
Wisconsin	1988	6 weeks	Yes	P	\$ 103.10	Baum, Irvin & Silberman, Kane, Lenhoff & Becker, MLR (1989), NPWF, Waldfogel

Key: States without maternity leave laws by 1993 are not listed. RP = reasonable period of leave; P = Parental Leave; M = Maternity Leave; MD = Maternity Disability; PU = law applies to public sector only (all other laws apply to private and public sectors). For states where no date was listed by some researchers or if the date was not consistent across researchers, we consulted the state law website, state law library, and/or the state department in charge of the law to obtain the date the law was passed. Because the date that Colorado's public sector law (801 P-5-24) could not be found, we exclude Colorado from any analysis that includes the public sector law variable.

Key to Sources: Baum = Baum (2003a); BNA = Bureau of National Affairs (1989); Irvin & Silberman = Irvin and Silberman (1993); Kane = Kane (1999); Lenhoff & Becker = Lenhoff and Becker (1989); MLR = U.S. Department of Labor, Monthly Labor Review; NPWF = National Partnership for Women and Families (2003, 2012); Waldfogel = Waldfogel (1998); WB = Women's Bureau (1993).

while several others (e.g., CA, LA, and CT after 1991) guaranteed leave lengths of 16 weeks. A total of nine states passed leave laws requiring that health insurance coverage continue during the leave (e.g., MN, RI, and TN).

Figure 1: Number of states with long, short, and reasonable period maternity leave laws.

Note: See Tables 1 and 2 for details on the laws. Long leave laws allow for 16 or more weeks of maternity leave, Short leave laws allow for 13 or fewer weeks of maternity leave (no states had laws that guaranteed between 13 and 16 weeks of leave). Reasonable period laws require that employers grant employees a “reasonable period” of leave, but did not include a specific leave length guarantee.

Figure 1 shows the trend in the number of states that passed reasonable period, short, or long leave laws prior to FMLA. It shows that the expansion of short leave laws largely came between 1987 and 1990, with reasonable period and long leave laws passed more gradually throughout the period.

Public sector leave laws cover only workers in the public sector but otherwise have characteristics generally similar to those of private sector laws. Some states (e.g., SC) passed laws that did not include a specific leave guarantee. Other states (e.g., AK, AZ, AR) passed laws guaranteeing a specific leave length. Nine states (e.g., AZ, HI, MA) passed laws with short leave lengths, while others (e.g., AK, AR, FL) passed laws with longer leave lengths. Interestingly, while the leave lengths among states with private sector laws range up to 16 weeks, the leave lengths among states with public sector laws are much longer, ranging from 16 weeks in North Dakota to six months in Arkansas and Connecticut to one year in Florida and Illinois. As Table 1 shows, most of these more generous public sector laws were passed at roughly the same time as the laws that covered both public and private sector workers.

Table 2 summarizes the attributes of the state laws that we use in the empirical analysis. Columns 1–3 summarize the private sector laws, while

Table 2: Coding of state maternity leave laws.

State	Private sector laws			Public sector laws		
	1	2	3	4	5	6
	Leave law with or without length of leave specified (any leave law)	Leave law with length of leave specified (length-specified leave law)	Leave law with insurance provision (insurance law)	Leave law with or without length of leave specified (any leave law)	Leave law with length of leave specified (length-specified leave law)	Leave law with insurance provision (insurance law)
AK				1992	1992 L(18)	1992
AZ				1986	1986 S(12)	
AR				1975	1975 L(24)	
CA	1980	1980 L(16)	1991	1981	1981 L(52)	
CO*	1988					
CT	1973	1990 S(12); 1991 L(16)		1987	1987 L(24)	1987
DC	1991	1991 L(16)	1991			
FL				1991	1991 L(24)	
GA				1992	1992 S(12)	1992
HI	1983			1992	1992 S(4)	
IL	1985			1984	1984 L(52)	1984
IA	1987	1987 S(8)				
KS	1972					
LA	1987	1987 L(16)				
ME	1988	1988 S(8)	1988			
MA	1972	1972 S(8)		1988	1988 S(8)	1988
MD				1988	1988 S(12)	1988
MN	1987	1987 S(6)	1987			
MT	1984					
NH	1987					
NJ	1990	1990 S(12)				
ND				1989	1989 L(16)	1989
OH	1989					
OK				1989	1989 S(12)	1989
OR	1988	1988 S(12)				
RI	1987	1987 S(13)	1987			
SC				1974		
TN	1988	1988 L(16)	1988			
TX				1991	1991 S(6)	
VT	1989	1989 S(12)	1989			
VA				1991	1991 S(6)	1991
WA	1973	1989 S(12)	1989			
WV				1989	1989 S(12)	1989
WI	1988	1988 S(6)	1988			

Key: States without public or private sector maternity leave laws by 1993 are not listed. *Any leave law*: Year state passed a maternity leave law, regardless of whether a specific period of leave was granted or whether the state included only a “reasonable period” of leave. *Length-specified leave law*: Year state passed a law granting a specified number of weeks of leave; *L* = leave length ≥ 16 weeks; *S* = leave length ≤ 13 weeks; numbers in parentheses indicate number of weeks granted by law. *Insurance law*: Year state passed a law that required that health insurance coverage continue during the period of leave. Note that each of these states’ laws also granted a specified number of weeks for leave (i.e., every state that had a requirement that insurance coverage continue also had a specified leave length in its statute). * Because the date of the CO public sector law could not be found, we exclude CO from any regressions that include the public sector laws.

columns 4–6 summarize public sector laws. Columns 1–4 identify states and years with any form of maternity leave law, regardless of whether the law included a specified leave length or only required a “reasonable period” of leave (*any leave law*). Columns 2–5 identify states and years with leave laws that specified the length of leave to be granted, along with the length of the leave (*length-specified leave law*). The code “L” in these columns denotes relatively long leave lengths (16 or more weeks), and the code “S” denotes relatively short leave lengths (13 or fewer weeks).⁵ The numbers in parentheses indicate the number of weeks of leave guaranteed by the laws.⁶

Columns 3–6 identify states and years with leave laws that require that insurance coverage continue through the leave period (*insurance law*). Each of these states’ laws also granted a specified number of weeks of leave (i.e., every state that had a requirement that insurance coverage continue also had a specified leave length in its statute). However, not every state that passed a length-specified leave law also included an insurance provision, allowing us to disentangle the impact of insurance provisions from the impact of length-specified leave laws.

3 Background and Theoretical Framework

This paper focuses on the choice by the patient and physician to undertake a cesarean birth. Overall, there is not conclusive medical evidence supporting one delivery method over the other (NIH 2006), and for many mothers the delivery method is indeed a choice. Meikle et al. (2005), for example, find that U.S. rates of elective primary cesarean delivery increased from 20% of all primary cesarean deliveries in 1994 to 28% in 2001, which translates into approximately 166,000 elective cesarean deliveries in 1994 and 274,000 in 2001.⁷ A number of economists have also found that both maternal preferences (Gryttan, Skau, and Sorensen 2013) and maternal financial incentives (Gans and Leigh 2009) impact the probability that a woman chooses to deliver by cesarean section. In addition, researchers have found that 40 to 85% of physicians report that they would

⁵ No states passed laws with mandated leave of 14 or 15 weeks.

⁶ We also estimated the impacts of the laws while distinguishing laws guaranteeing eight or fewer weeks of leave from laws guaranteeing 12 to 13 weeks of leave. Because the estimated impacts of the two length guarantees are similar, we do not present these results in the paper. They are available from the authors.

⁷ A primary cesarean delivery is a cesarean delivery by a woman who has not previously had a cesarean delivery.

perform a non-medically indicated cesarean if requested to do so by the mother (Bergholt et al. 2004; Bettes et al. 2007; Wax et al. 2005).⁸

Although there are many reasons why women and doctors choose one form of delivery over another (e.g., medical factors and medical technology, convenience, fear, personal preference), we focus here on the potential impacts that maternity leave laws have on this choice.⁹ We hypothesize that these impacts occur primarily via differential financial incentives for physicians and differential financial and length of leave impacts for mothers in states with leave laws in place. As we describe below, from the physician's perspective, we hypothesize that leave laws' provisions regarding insurance coverage generate net increases in incentives for cesarean delivery. From the patient's perspective, we hypothesize conflicting impacts of the laws on cesarean rates.

3.1 Physician Incentives

Beginning with Arrow's (1963) work, the agency relationship that exists between physicians and patients has been a popular research topic within the health economics literature. To the extent that physicians act as agents to uninformed patients, they may have incentives to "induce demand" for their services since they both diagnose and recommend treatment (Dranove 1988; Fuchs 1978; Gruber and Owings 1996), although this behavior is potentially kept in check by reputation effects (e.g., Gruber and Owings 1996; Kim 2007; Rock 1988).

One channel through which maternity leave laws may impact physicians' incentives in this agency relationship is through the requirement that health insurance coverage continue through the leave period. Although we have found no studies that directly examine the impact of state leave laws on insurance coverage, in its study of the FMLA, the Commission on Family and Medical Leave (1996) found that the number of firms offering continuation of health insurance benefits during the leave period increased as a result of the FMLA. Of the firms covered by the FMLA, 96% continued health benefits when leave was

⁸ Gheti, Chan, and Guise (2004), however, estimate that only 2–20% would do so based on their survey of physicians in Portland, Oregon.

⁹ See Tussing and Wojtowycz (1992) regarding medical determinants of cesarean delivery; Currie and MacLeod (2013) regarding the role physicians' diagnostic skills play in cesarean delivery; Shiono, McNellis, and Rhoads (1987) regarding changes in medical technology associated with cesarean delivery; Tussing and Wojtowycz (1992) and Marieskind (1979) regarding physicians' increased tendency to deliver by cesarean to minimize the risk of being sued in the event of a poor birth outcome; and Miesnik and Reale (2007) and Penna and Arulkumaran (2003) regarding women's preferences for cesarean because it feels "safer."

taken to care for a newborn or for maternity disability. Of the firms not covered by the FMLA, only 73% continued health benefits when leave was taken to care for a newborn and only 86% continued health benefits when leave was taken for maternity disability. Although the report only focuses on the FMLA, it offers suggestive evidence of the potential impact of the state leave laws on insurance coverage.

With more mothers covered by private insurance after the passage of leave laws, physicians may respond by performing more cesareans on women who would have been uninsured or insured by a less generous insurance plan without the laws' passage. Indeed, several researchers have found that physicians appear to be more likely to perform cesareans on privately insured women, likely due to the higher fee differential paid by private insurance relative to other types of insurance or the uninsured (Grant 2005; Gruber, Kim, and Mayzlin 1999; Haas, Udarhelyi, and Epstein 1993; Keppel, Taffel, and Placek 1982; Keeler and Brodie 1993; Stafford 1990, 1991).¹⁰

3.2 Patient Incentives

Leave laws generate potentially important changes, in both directions, in the incentives for a woman to choose a particular delivery method. As is the case with physicians, insurance coverage changes implied by the laws would be associated with increased cesarean sections at the margin. The impact of the laws' job-protected leave guarantees is more complex, as we discuss below.

3.2.1 Insurance Coverage

Although a cesarean delivery costs, on average, several thousand dollars more than an uncomplicated vaginal delivery, the extra expense of a cesarean delivery over a vaginal delivery to an insured mother is relatively small because only about 11% of the total charges for maternity care are paid out-of-pocket and because charges for even a vaginal delivery generally meet the out-of-pocket maximums of the typical insurance policy (Gold, Kenney, and Singh 1987; Keeler and Brodie 1993). Nonetheless, leave laws' guarantee of insurance coverage

¹⁰ Physicians may also have incentives to deliver by cesarean in cases where labor is taking a long time or extending into the night (Evans et al. 1984; Phillips, Thornton, and Gleicher 1982; Fraser et al. 1987; Penna and Arulkumaran 2003; Keeler and Brodie 1993), but we see no role for leave laws to alter this outcome.

could move women on the margin toward the choice of cesarean delivery, as its additional expense is now more likely to be covered.

It is unlikely that cesarean delivery is preferred to vaginal delivery for scheduling or convenience reasons, as both can be planned in advance and scheduled for a convenient time and date, with vaginal delivery aided by labor induction medication.¹¹ However, Luthy, Malmgren, and Zingheim (2004) and Heffner, Elkin, and Fretts (2003) find that induction of labor increases the risk of cesarean delivery by between 50 and 70%. Thus, if maternity leave laws' guarantee of health insurance coverage generates increases in induction rates, they may have an indirect positive impact on cesarean rates.

3.2.2 Leave Guarantees

The provision of job-protected leave has potentially conflicting impacts on patients' delivery choice incentives through its impact on patients' ability to recover from cesarean and through its impact on the relative length of leave given to mothers who deliver by cesarean.

Research indicates that recovery from cesarean delivery takes longer than for vaginal delivery, but that differences in recovery largely disappear within two months of giving birth (Tulman et al. 1991; DiMatteo et al. 1996; Tulman and Fawcett 1988; Lydon-Rochelle, Holt, and Martin 2001; McGovern et al. 2006, 2007; Gjerdingen and Froberg 1991; and DiMatteo et al. 1996). With the passage of maternity leave laws, women on the margin between the two delivery methods may have become more likely to prefer, or at least not oppose, cesarean delivery because they were guaranteed time off to accommodate the longer recovery period required for cesarean. In addition, physicians may have become more inclined to perform cesareans, knowing that women had leave to accommodate the longer recovery. This may be especially salient in states with long leave guarantees, while women in states with short leave laws may have been less affected by this channel.

Alternatively, prior to the passage of leave laws but after the Pregnancy Discrimination Act of 1978, employers that voluntarily made medical leave available to employees would have had to use the same standards to determine medical leave for pregnancy and childbirth as for other temporary medical conditions. This meant relying on medical recommendations, which stipulated four to six weeks of recovery for vaginal delivery and eight weeks for cesarean

11 The NCHS (2007) reports that rates of induction of labor increased from 10% in 1990 to 23% in NCHS 2005, a 138% increase.

delivery (Berger, Hill, and Waldfogel 2005) *Ceteris paribus*, the longer leave length that was conditional on cesarean delivery may have provided incentives at the margin for mothers to choose a cesarean delivery in order to have more time at home with their newborn. By specifying uniform leave lengths irrespective of the form of delivery, the leave laws eliminated additional time off of work for cesarean births.

However, the impact of uniform leave lengths is likely to differ depending on whether the laws guarantee long or short leaves. Prior to the standardization of uniform leave, an employed mother's choice of a cesarean combined her medical preferences with the benefit of additional time off with her newborn if she had a cesarean (increasing the probability of a C-section) weighed against the difficulty of recovering from a cesarean after the return to work (reducing the probability of a cesarean). After uniform leave laws were imposed, there was no additional time off based on the form of delivery, which would tend to reduce cesarean section rates. Additionally, long leave states provided for a long enough time period that presumably all women would be fully recovered physically by the time they returned to work. This would reduce the cost of cesareans for employed women living in those states, leading to a net effect that is ambiguous. Thus, if the standardization of leave lengths reduces incentives for cesarean delivery, the effect is likely to be bigger in states and years with short leave laws, since those laws impose a tighter constraint on additional time off relative to states and years with long leave laws.¹²

In sum, the insurance component of maternity leave laws may generate increased incentives for physicians and mothers to undertake cesarean deliveries while the impact of the leave length guarantees associated with the laws is likely mixed. The leave guarantees can ensure adequate recovery time from cesarean, which may increase its utilization, especially in long leave states. Alternatively, if the laws eliminate leave time premiums for cesarean deliveries, they may reduce incentives for this form of delivery, especially in short leave states. We present below a difference-in-difference framework to tease out these potential effects.

¹² The literature on how leave laws impacted the incidence of leave taking and the length of leave has produced mixed results. Although some researchers have found that the passage of leave laws led to increased leave taking, taking longer leaves, and increased likelihood of returning to the pre-birth employer (Waldfogel 1998; Berger and Waldfogel 2004; Baum 2003b; Han, Ruhm, and Waldfogel 2009; Glass and Riley 1998), other researchers (Klerman and Leibowitz 1997) found no significant impact of the laws on leave taking among mothers.

4 Empirical Framework

To estimate the impact of leave laws on individual women's cesarean choice, we use a difference-in-difference approach where cross-state variation in state leave laws is utilized to compare outcomes for women in states with leave laws against their counterparts in states without leave laws. In particular, we estimate regressions of the form

$$CSECT_{ijt} = \alpha + \beta_1 anylaw_{ijt} + \gamma_1 X_{it} + \gamma_2 Z_{ijt} + \varepsilon_{ijt} \quad [1]$$

where $CSECT_{ijt}$ is equal to one if child i was delivered by cesarean in year t in state j , and zero otherwise, $anylaw_{ijt}$ is equal to one if the child was born in a state and year when a maternity leave law was in effect, and zero otherwise. X_{it} is a vector of birth, demographic, and health characteristics of child i , and Z_{ijt} is a vector of demographic, health, and economic characteristics of child i 's mother. The exact specification for the error term, ε , varies across specifications¹³.

Variables in X include the weight of the child at birth and an indicator for whether the child was born low birth weight (less than 5.5 pounds). X also includes whether the mother had prenatal care during the first three months of the pregnancy, the weeks of gestation of the child at delivery, whether the child was female, the birth order of the child, whether the child was part of a multiple birth, and an indicator for whether the mother had experienced a previous cesarean delivery. Alternative specifications exclude variables that might be affected by the leave policy itself, including the child's birth weight and low birth weight indicator, prenatal care, and weeks of gestation.

Variables in Z include the race of the mother, the age and education level of the mother at the time of the birth, the body mass index of the mother before and after delivery, the mother's marital status during the year of birth, an indicator for whether the mother had a health condition that limited the kind of work she could do during the year of the birth, the unemployment rate in the local labor market in the year of the birth, the real family annual income in the year before the birth, and the Armed Forces Qualification Test (AFQT) score of the mother.^{14,15} When we focus the analysis on employed women, Z also includes indicators for the mother's occupation and industry in the birth year, the mother's earnings in the

¹³ We obtain estimated coefficients from linear probability models. Probit estimates are qualitatively and quantitatively similar but result from fewer observations due to perfectly predicted outcomes in some cells. These results are available from the authors.

¹⁴ All dollar amounts were converted to their real (2004) values using the CPI-U.

¹⁵ The AFQT percentile score (scores range from 1 to 99) is a measure of intelligence and was measured in 1980 for the NLSY survey respondents.

quarter before the pregnancy began, an indicator for whether the mother worked full time in the quarter before the birth of the child, and whether or not the mother's employer offered health insurance. Alternative specifications exclude employment-related variables that might be affected by leave policy (i.e., full-time status, earnings, industry, and occupation).

Finally, the all of the regressions estimate state and year fixed effects to account for permanent unobserved differences across states and time. Specifically, the state fixed effects control for any permanent differences among states that may impact both the probability of cesarean delivery and the existence of a maternity leave law in the state. The year fixed effects control for common time trends in cesarean rates across states. The standard errors are corrected for heteroskedasticity and are clustered on state of birth.¹⁶

The impact of leave laws on cesarean rates is captured by β_1 , which measures the change in the probability that a child is delivered by cesarean in states that passed leave laws (the “treatment states”) relative to the change in the probability that a child is delivered by cesarean in states that did not pass leave laws (the “comparison states”). The estimate of β_1 will be positive if women in states that passed leave laws experience a relatively larger increase in the probability of cesarean delivery relative to women in states that did not pass the laws. A positive estimate for β_1 would be consistent with the idea that maternity leave laws generate an increase in cesarean sections via increased insurance coverage, induction of labor (and corresponding cesarean sections), or increased ability to take leave for the longer cesarean delivery recovery time. The estimate of β_1 will be negative if laws generate a relative decrease in cesareans, consistent with the laws reducing the differential leave incentive previously provided to women delivering by cesarean.

Because we hypothesize differential impacts of the laws based on their variation in leave length and insurance coverage, we also allow the law variables to enter our estimating equation with varying specifications. In particular, we can assess the impact of leave length guarantees by including separate indicators for laws' leave length. We do this in eq. [2] (where we eliminate subscripts for ease of readability).

$$CSECT = \alpha + \beta_1 rplaw + \beta_2 longlaw + \beta_3 shortlaw + \gamma_1 X + \gamma_2 Z + \varepsilon, \quad [2]$$

The variables *longlaw* and *shortlaw* correspond to laws guaranteeing 16 or more weeks of leave, and 13 or fewer weeks of leave, respectively, and *rplaw* identifies laws that specify only a “reasonable period” of leave. (Recall that no states specified

¹⁶ For an explanation of standard error clustering in the context of difference-in-difference estimation, see Bertrand, Duflo, and Mullainathan (2004).

leave periods of 14 or 15 weeks.) The coefficient β_2 captures the impact of laws guaranteeing 16 or more weeks of leave, β_3 captures the impact of laws guaranteeing 13 or fewer weeks of leave, all relative to states without leave law provisions.¹⁷

In order to identify the impacts of the insurance coverage provisions of leave laws, we also estimate specifications that include an indicator for insurance laws, as in eq. [3]:

$$CSECT = \alpha + \beta_1 rplaw + \beta_2 longlaw + \beta_3 shortlaw + \beta_4 insurancelaw + \gamma_1 X + \gamma_2 Z + \varepsilon, \quad [3]$$

where *insurancelaw* identifies states and laws that include insurance continuation provisions in addition to leave length guarantees, and β_4 captures these laws' impacts.¹⁸

Finally, we estimate specifications that separately identify the effects of public sector laws, as in eq. [4]:

$$\begin{aligned} CSECT = & \alpha + \beta_1 rplaw + \beta_2 longlaw + \beta_3 shortlaw + \beta_4 insurancelaw \\ & + \beta_5 publiclonglaw + \beta_6 publicshortlaw + \beta_7 public insurancelaw \\ & + \eta_1 rplaw * public + \eta_2 longlaw * public + \eta_3 shortlaw * public \\ & + \eta_4 insurancelaw * public + \eta_5 public longlaw * public \\ & + \eta_6 public shortlaw * public + \eta_7 public insurancelaw * public \\ & + \gamma_1 X + \gamma_2 Z + \gamma_3 public + \varepsilon, \end{aligned} \quad [4]$$

¹⁷ We also estimated the impacts of the laws allowing for distinct effects of 6, 8, 12 and 13 weeks of leave. The estimated coefficients are similar but in some cases there are very few births for the leave-length cell, increasing standard errors. Because of the similar coefficients for laws of less than 13 weeks, we combine these policies in the results we present. The disaggregated policy estimates are available from the authors.

¹⁸ It is also possible to identify the effect of parental leave laws, which are described in Table 1. Parental leave may affect the incentives of married women to give birth by cesarean, but we see the direction of the effects of these laws as even more ambiguous than the effects of maternity leave laws. On the one hand, having a spouse who can take employment leave to help with newborn care during recovery may lead to increased probability of cesarean section. On the other hand, access to parental leave may allow parents to stagger their leaves across time and thus eliminate the differential leave incentive previously provided to women delivering by cesarean. In addition, the insurance provision guarantees extend to husbands in states with parental leave laws, leading to increased probability of cesarean, and the impacts may differ for nonemployed mothers, who are more likely to rely on their spouse's insurance coverage. In regressions that included parental leave laws, we did not find consistent evidence that they had an impact on the probability of cesarean delivery. Because our data do not allow us to distinguish women who are covered by a spouse's insurance coverage, and because estimating the impacts of parental leave laws separately by marital status, own insurance coverage, and employment status resulted in very small sample sizes, we do not further investigate the relationship between parental leave laws and cesarean deliveries.

where *public longlaw*, *public shortlaw*, and *public insurancelaw* identify the public sector laws.¹⁹ The variable *public* is an indicator variable for women employed in the public sector, and the interaction terms between the laws and *public* allow for the private and public sector laws to have different effects for private and public sector workers.²⁰ Thus, the β coefficients in eq. [4] capture the effect of private and public sector laws on private sector workers, while the η coefficients capture any differential effect of private and public sector laws on public sector workers.

4.1 Endogeneity and Selection Issues

One common concern in these types of models is that the leave laws are themselves endogenous: that is, their passage may be related to medical and employment preferences. If this is the case, the estimated effect of the laws may conflate any true causal effect with the effect of these correlated factors. Similarly, if states that adopted leave laws had different trends in cesarean rates relative to other states prior to adopting the laws, the regressions would overstate the effect of the policy change. A second concern is that the leave laws may have led to changes in a range of other decisions, including employment, hours worked, whether to have a child, and how much medical care to seek while pregnant. Changes in these decisions may in fact be the mechanism by which the law raises or lowers cesarean section rates, in which case our estimates should be interpreted as reduced form estimates of the impact of the laws.

However, to aid behavioral interpretations, we use several approaches to investigating these potential endogeneity and selection issues. First, we re-estimate our baseline regressions with state fixed effects, year fixed effects, and state-specific time trends in order to account for differential preexisting trends across states. This will allow for differences across states that may have led to the passage of the laws. Given the somewhat small numbers of observations of births in each state and year, the inclusion of state-specific time trends would reduce the degrees of freedom and the statistical power of our regressions, leading to a higher probability of not finding any significant effects of the

¹⁹ We do not include an identifier for public reasonable period laws (*public rplaw*) because only one state (SC) passed this type of law, so its effect would be captured in the state fixed effect. When we estimate eq. [4] with and without SC included, the reported coefficient estimates in Table 8 are the same in both regressions.

²⁰ The *public* identifier is included as part of the industry indicators in Z in other specifications, but we show it separately in eq. [4] to better illustrate the public and private sector law impacts that we estimate.

laws. Consequently, the fact that we continue to find an effect even after including state-specific time trends makes the results more convincing.

Second, we re-estimate the regressions excluding all employment related variables (full-time status, income, industry, hours, and occupation) and variables that might be related to medical choices (birthweight, prenatal care, and weeks of gestation). These regressions allow for the possibility that the laws may be correlated with changes in employment or health behaviors. We find that the estimated effects of the laws remain consistent with the baseline results.²¹

Third, we estimate our regressions separately for a sample of women who should not be affected by the policy changes. Specifically, we look at the effect of leave laws on nonemployed mothers, and the effect of the insurance laws on employed women without employer-provided insurance. Because leave laws are designed to provide a mechanism for employed mothers to take maternity leave from their jobs, the laws should not have an impact on the delivery choices of nonemployed mothers. A finding of an effect of the laws on nonemployed or noninsured women would be indicative of differential characteristics of the medical establishment or women's preferences in states that passed such laws or of underlying differences in the cesarean section trends in these states. We find no effects of *anylaw*, *longleavelaw*, *shortleavelaw*, or insurance law on the nonemployed in any of our specifications, although in some specifications, the reasonable period laws are associated with a reduction in cesareans among the nonemployed. Similarly, women who did not have insurance offered by their employer at the time of the birth are unaffected by laws guaranteeing insurance coverage. We regard this as strong evidence in favor of the effect of the laws on the medical choices of employed women.

Finally, we directly examine whether states that passed leave or insurance laws differed in observable ways from those that did not. Although state fixed effects control for any permanent differences across states, the concern that the passage of leave laws are endogenous is amplified if time-varying attributes of states are related to the passage of leave laws. We conduct a set of regressions testing whether states that did or did not implement leave laws differed systematically in ways that might be related to medical demand or maternal leave. We do not find any evidence suggestive of systematic differences across states with and without leave laws.

²¹ We also estimate the effect of maternity leave policies on employment, and on full-time employment conditional on being employed. Neither is correlated with the passage of a maternity leave law. We also estimate the effect of maternity leave laws on the probability of having a child after the law is passed. However, the estimates indicate a negative relationship, counter to expectations. These results are available from the authors.

5 Data

In addition to the law data documented in Tables 1 and 2, the data used in the empirical analysis come primarily from the National Longitudinal Survey of Youth (NLSY). The NLSY is a nationally representative panel that began in 1979 with a sample of respondents between the ages of 14–21. These respondents were interviewed annually until 1994 and biennially afterward. Because using the biennial data would not accurately account for changes in marriage or other characteristics of mothers in between-sample years, we limit our sample to the pre-FMLA period 1980–1992.²²

The advantage of NLSY data is that they include information on labor market, demographic, and health characteristics, as well as on the children born to NLSY women. Consequently, other research on maternity leave laws has also used this source of data (Baker and Milligan 2010, Baum 2003a, Berger, Hill, and Waldfogel 2005). This also allows us to compare effects for employed and non-employed women, which aids in accounting for any potential endogeneity of leave laws. We can also separately identify the effects of laws that cover only public sector workers from private sector workers. Furthermore, for each child, detailed information about the birth is available, including whether the child was delivered by cesarean. We supplement the NLSY data with the NLSY Geocode data, which allows for identification of the state of birth of the child.

We exclude from the sample any observations with missing values for any of our variables, a small number of births (< 5) that were reported to occur before 20 weeks gestation, any births to mothers who report being self-employed, working for a family business, or working for no pay. Many of the states have relatively few observations for births or C-sections. The number of births and number of C-sections are reported in Appendix Table 10.²³

Because we are interested in employment leave and have concern about insurance coverage (which is generally restrictive regarding preexisting conditions), the estimates limit the sample of employed women to those who were employed during the quarter before the pregnancy began (i.e., during the

²² We do not include births in 1979 in order to include data on mothers' characteristics in the year prior to the birth for 1980 births.

²³ We also estimated our results dropping any state-year cells with small numbers of births (either less than 8 or less than 5). Our results were qualitatively similar to those presented here for short leave laws; long leave laws in some specifications were associated with increased cesarean section rates. However, these results appear to be sensitive to the specific set of states used. These results and results that exclude each state one at a time are available from the authors.

13 week the period four quarters before the birth of the child). Labor market information also includes mothers' industry, occupation, usual hours of work, and real earnings during the quarter before the pregnancy began. Subsequent estimates use non-employed women as an additional comparison group within states to control for state-specific differences in birth outcomes.

Descriptive statistics for births in states with and without maternity leave laws are reported in Table 3. In general, the characteristics of the sample in leave and non-leave states are similar. Our sample includes 635 births in state-years with leave laws (the "treatment group") and 1,738 births in state-years without leave laws (the "comparison group"). Twenty five percent of the births in the treatment sample occurred by cesarean section, while 23% of the births in the comparison sample were by cesarean, but this difference is statistically significant at only the 15% level (two-tailed test).

Table 3 indicates that children in the "treatment" sample were less likely to be classified as low birth weight babies. They also come from families with characteristics associated with higher family income (e.g., their mothers are more educated and more likely to be married). As noted, additional estimates exclude health and employment related outcomes as control variables to account for the potential effect of the law on these choices.

Figure 2 displays trends in average cesarean section rates among NLSY women in states that never had a leave law prior to the federal FMLA, and in states that passed short, long, and "reasonable period" laws prior to the FMLA in 1993. As Figure 1 had illustrated, most of the leave laws were passed between 1987 and 1990. Figure 2 shows that in the 17 states that never passed a law, cesarean rates were around 10% in the late 1980s, rising to close to 30% by the end of the period. Alternatively, it appears that in short leave states, C-section rates hovered around 20% throughout the period. Long leave and reasonable period law states had sharper increases in caesarian section rates during this time. These graphs are suggestive of a possible effect of laws, although Figure 2 obviously does not account for the timing of the laws, for potential state-specific trends that occurred over this period, or for the demographics of our sample.

6 Empirical Results

We estimate the impacts of the laws using the regressions described by eqs [1] through [4], and allowing for the differential leave law specifications described in Table 2. The estimated coefficients on the law variables are presented in

Table 3: Summary statistics for births in states with and without maternity leave laws.

	1		2	
	States with Laws ^a		States without Laws	
	Mean	SD	Mean	SD
Birth and child characteristics				
Cesarean delivery	0.24	0.42	0.22	0.41
Weight of child (ounces)	119.28*	20.37	116.59*	21.63
Born low birth weight	0.07	0.25	0.08	0.28
Had prenatal care by 3 months	0.83*	0.37	0.80*	0.40
Gestation (weeks)	38.68	2.00	38.68	2.18
Child female	0.48	0.50	0.49	0.50
Birth order	1.89*	1.04	1.80*	1.00
Multiple Birth	0.01*	0.10	0.02*	0.14
Previous cesarean delivery	0.11	0.31	0.09	0.29
Mother's characteristics				
AFQT percentile score	41.10*	28.24	39.32*	27.71
Age (year of birth)	26.05*	3.75	24.26*	3.94
BMI just before pregnancy	23.33*	4.59	22.97*	4.60
BMI just before delivery	28.86*	4.83	28.32*	4.87
White	0.55	0.50	0.53	0.50
Black	0.13*	0.33	0.28*	0.45
Hispanic	0.26*	0.44	0.12*	0.33
Other race/ethnicity	0.07	0.25	0.08	0.26
Less than high school education	0.22*	0.41	0.26*	0.44
High school education only	0.38*	0.49	0.42*	0.49
Some college	0.23*	0.42	0.20*	0.40
BA or more education	0.17*	0.38	0.12*	0.33
Married (year of birth)	0.73*	0.44	0.66*	0.47
Health limits kind of work mother can do (year of birth)	0.10*	0.31	0.12*	0.32
Unemployment rate in local labor market (% , year of birth)	7.67*	3.54	8.08*	3.20
Real family annual income (\$000s, year before birth)	55.45*	82.40	45.41*	87.56
Number of observations	899		2,633	

^aStates with laws are those with *any leave law* as described in column 1 of Table 2. Asterisks highlight variables that are statistically different between the two samples at the 10% level (two-tailed tests.)

Figure 2: C-section rates over time by type of maternity leave law.

Note: See Tables 1 and 2 for details on the laws. Long leave laws allow for 13 or fewer weeks of maternity leave (no states had laws that guaranteed between 13 and 16 weeks of leave). Reasonable period laws require that employers grant employees a “reasonable period” of leave, but did not include a specific leave length guarantee. Panel A includes 17 states, Panel B includes 4 states, Panel C includes 8 states, and Panel D includes 20 states. Because of changes in their laws, CT and WA fit into more than one category during this time period; they are excluded from the figures.

Table 4: Effect of leave laws on probability of cesarean section.

	Dependent variable = 1 if birth was by cesarean section				
	1	2	3	4	5
Any leave law	−0.06** (0.03)	−	−	−	−
Reasonable period leave law	−	−0.04* (0.02)	−0.04* (0.02)	−0.04* (0.02)	−0.02 (0.07)
Length-specified leave law	−	−0.08** (0.04)	−	−	−
Long leave law (≥16 weeks)	−	−	0.04 (0.07)	0.04 (0.09)	0.05 (0.11)
Short leave law (≤13 weeks)	−	−	−0.12*** (0.04)	−0.17*** (0.06)	−0.20*** (0.07)
Insurance law	−	−	−	0.09 (0.07)	0.12* (0.06)
Industry and occupation controls	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y
State-specific time trends	N	N	N	N	Y
R-squared	0.27	0.27	0.27	0.28	0.29
Number of observations	1,652	1,652	1,652	1,652	1,652

Note: Table reports estimated coefficients from linear probability models of cesarean section birth for employed mothers. Probit estimates are qualitatively and quantitatively similar but result from fewer observations due to perfectly predicted outcomes in some cells (results available from authors). All regressions include a constant and all the controls for birth and child characteristics and mother’s characteristics listed in Table 3 (estimated coefficients for these variables are in the appendix). Standard errors are reported in parentheses and are clustered at the state level.

p*-value < 0.10; *p*-value < 0.05; ****p*-value < 0.01 (two-tailed tests).

Tables 4 through 8 and the estimated coefficients for the control variables are presented in Appendix Table 11.

Turning first to the control variables, previous cesarean delivery is a strong predictor of current cesarean delivery and the probability of cesarean delivery declines for higher order births. Mothers with higher BMI at delivery are more likely to deliver by cesarean section, while those with lower BMI just before pregnancy are slightly less likely to deliver by cesarean. More educated mothers are also more likely to deliver by cesarean. The estimated coefficients on other control variables are statistically insignificant.

6.1 Baseline Results

Table 4 presents estimates of eq. [1] for employed mothers.²⁴ The point estimate indicates that births in states with any maternity leave law are 6 percentage points less likely to be cesarean than births in states without such laws, although this does not distinguish between the length of the leave guarantee. Indeed, after controlling for difference in leave length guarantees provided by the laws (Column 2), our estimates indicate that births in states with laws guaranteeing a specified length of leave are 8 percentage points less likely to be by cesarean, while births in states with laws that specify a more general “reasonable period” of leave have a smaller reduction in caesarians (negative 4%) relative to states without leave laws.

The impacts of the laws differ markedly depending on the length of leave guaranteed by the laws, as shown in Column 3. Although the point estimate indicates that births in states and years that had guaranteed long leaves were more likely to be by cesarean than births in states without leave laws, this estimate is never statistically significant. In contrast, births in states that guaranteed shorter length leaves were between 12 and 20 percentage points less likely to be cesarean births. These results are consistent with the hypothesis that by specifying relatively short uniform leave lengths, short leave laws eliminated the additional time off of work associated with cesarean delivery, moving mothers at the margin away from preference for a cesarean birth. Finally, guaranteed insurance coverage leads to a 12 percentage point increase in the probability of a cesarean birth, consistent with the hypothesis that the insurance provision of the laws provides incentives for patients, doctors, or both, to deliver by cesarean.

6.2 Accounting for Potential Endogeneity and Selection: Preexisting Time Trends

Because of the significant changes in cesarean section rates over the 1980s and 1990s in the United States, we include state and year fixed effects and the full suite of state and year fixed effects and state-specific time trends in Column 6 of Table 4. These estimates account for any consistent trend in cesarean rates or unobserved characteristics in a given state, allow states with and without laws to have different initial average rates or different average unobserved characteristics, and for there to be common idiosyncratic shocks to cesarean rates in a

²⁴ Summary statistics for the employed and nonemployed samples are presented in Appendix Table 11.

given year. These estimates control for any preexisting differences in the time trends that might be driving the results. The effect of the laws then is identified only by variation in the rate after passage of a law relative to the state's own trend, own average, and relative to the rest of the country in that same period.

These estimates strongly suggest that the leave policy effects are not driven by preexisting differences across the states: the signs remain unchanged and the magnitudes of the effects are similar. In fact, controlling for state-specific time trends leads to slightly larger estimated impacts, indicating that guaranteed insurance coverage leads to a 12 percentage point increase in the probability of cesarean birth, consistent with the hypothesis that the insurance provision of the laws provides incentives for patients, doctors, or both, to deliver by cesarean.

6.3 Accounting for Potential Endogeneity and Selection: Employment and Health Controls

A second concern is that the laws may have changed employment probabilities, other employment choices (like occupation and hours worked) or the likelihood of using prenatal care, with attendant effects that may influence cesarean section rates. Accordingly, Table 5 presents estimates that exclude these control variables to explore the sensitivity to the results. If the baseline coefficients are substantially affected, this may indicate that selection into employment or medical decisions is partly driving the results. For example, lack of a leave policy might lead women who were initially less healthy to be more reluctant to be employed full time during pregnancy. This would tend to raise cesarean section rates in non-leave states relative to leave states after controlling for full-time status, which would be consistent with our findings. Alternatively, if leave policies lead to health behaviors that affect infant health and therefore cesarean section rates, controlling for infant health or prenatal care would affect the coefficient estimates for leave.

We take two approaches to deal with this selection concern. First, we re-estimate the equations excluding infant health and health behaviors, employment choices, or both. These results are presented in Table 5, which shows that the baseline results are robust to the exclusion of these variables. This makes the concern of selection less plausible. Second, in ancillary regressions, we estimate whether employment or full-time employment is related to the presence of a law in the state. Because we do not find any significant relationship between the laws and the probability of employment or full-time employment, we do not report the results here.²⁵

²⁵ These results are available from the authors.

Table 5: Effect of leave laws on probability of cesarean section.

	Dependent variable = 1 if birth was by cesarean section				
	Baseline	Exclude child health variables ^a	Exclude employment-related variables ^b	Exclude income variables ^c	Exclude child health, employment-related, and income variables
Reasonable period leave law	−0.02 (0.07)	−0.01 (0.08)	−0.02 (0.07)	−0.02 (0.07)	−0.02 (0.08)
Long leave law (≥16 weeks)	0.05 (0.11)	0.05 (0.11)	0.05 (0.11)	0.05 (0.11)	0.06 (0.11)
Short leave law (≤13 weeks)	−0.20*** (0.07)	−0.21*** (0.07)	−0.19** (0.07)	−0.20** (0.08)	−0.20*** (0.07)
Insurance law	0.12* (0.06)	0.13* (0.07)	0.11* (0.07)	0.12* (0.07)	0.12 (0.07)
Industry and occupation controls	Y	Y	N	Y	N
State fixed effects	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y
State-specific time trends	Y	Y	Y	Y	Y
R-squared	0.29	0.28	0.29	0.29	0.28
Number of observations	1,652	1,652	1,652	1,652	1,652

Note: Table reports estimated coefficients from linear probability models of cesarean section birth for employed mothers. All regressions include a constant and all the controls for birth and child characteristics and mother's characteristics listed in Table 3 (estimated coefficients for these variables are in the appendix). Standard errors are reported in parentheses and are clustered at the state level.

* p -value < 0.10; ** p -value < 0.05; *** p -value < 0.01 (two-tailed tests).

^aChild health variables include birthweight, whether mother obtained prenatal care during the first trimester of pregnancy, and the weeks of gestation.

^bEmployment-related variables include an indicator for full-time status as well as industry and occupation controls.

^cIncome variables include real earnings in the fourth quarter before the birth and real family income.

6.4 Accounting for Potential Endogeneity and Selection: Alternative Control Groups

Another concern is that it may be the case that the presence of a leave law affects the behavior of all women in a state due to either selection changes, due

to changes in the usual practices of physicians in the state. Alternatively, it could be that the law itself is indicative of underlying medical preferences and approaches in the states. An alternative approach to account for potentially endogenous leave laws is to examine the effect of the laws on women who should not have been directly affected by their passage. If leave laws are associated with changes in the probability of cesarean delivery for these alternative control groups, the likelihood that the results are driven by endogenous law passage is more of a concern.

The first control group we use is nonemployed mothers. Table 6 presents estimates of the impacts of the leave specifications for both employed and

Table 6: Effect of leave laws for employed and nonemployed mothers.

Dependent variable = 1 if birth was by cesarean section						
	1	2	3	4	5	6
	Employed	Nonemployed	Employed	Nonemployed	Employed	Nonemployed
Any leave law	−0.05 (0.06)	−0.03 (0.06)	−	−	−	−
Reasonable period leave law	−	−	−0.02 (0.07)	−0.18* (0.09)	−0.02 (0.08)	−0.18* (0.09)
Long leave law (≥16 weeks)	−	−	0.05 (0.09)	0.02 (0.06)	0.06 (0.11)	0.02 (0.07)
Short leave law (≤13 weeks)	−	−	−0.14*** (0.08)	0.08 (0.10)	−0.19** (0.08)	0.02 (0.11)
Insurance law	−	−	−	−	0.11 (0.07)	0.11 (0.07)
State fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
State-specific time trends	Y	Y	Y	Y	Y	Y
R-squared	0.28	0.34	0.28	0.35	0.28	0.35
Number of observations	1,652	1,880	1,652	1,880	1,652	1,880

Note: Table reports estimated coefficients from linear probability models of cesarean section birth for employed and nonemployed mothers. Probit estimates are qualitatively and quantitatively similar but result from fewer observations due to perfectly predicted outcomes in some cells (results available from authors). All regressions include a constant and all the controls for birth and child characteristics and mother's characteristics listed in Table 3, with the exception of *working full time*, *real own wage* and *salary income*, and *employer offers health insurance*, which are not included in any specifications in this table. Estimated coefficients for the control variables are in the appendix. Standard errors are reported in parentheses and are clustered at the state level.

p*-value < 0.10; *p*-value < 0.05; ****p*-value < 0.01 (two-tailed tests).

nonemployed mothers.²⁶ Because leave laws are designed to provide employment leave guarantees for working mothers, we would not expect the laws to impact the nonemployed. Indeed, the presence of a law and the length of the law are not associated with changes in the probability of cesarean delivery among the nonemployed, although in some specifications the “reasonable period” laws have a positive effect at the 10% significance level.²⁷ The results in Table 6 reduce the concern that short leave laws are endogenous and that the regression estimates in Table 4 are simply picking up the effect of some other factor that is correlated with both the state’s passage of a short leave law and the probability of cesarean delivery.

Table 7 presents the results for a second control group based on insurance status. The NLSY data only include information on employer provided insurance for mothers and does not include information on insurance coverage through a spouse’s employer. Table 7 therefore compares the effect of leave laws and insurance continuation laws only on insured and non-insured employed women. Sample sizes for non-insured employed women are smaller (only 384 births), resulting in larger standard errors.

Consistent with the earlier results, insured employed women have a lower probability of cesarean section in short leave states. The point estimates for the length of leave laws for non-insured women are also consistent with the earlier results, but are statistically insignificant.

As shown in Column 1, women who have insurance provided by their employer are 11 percentage points more likely to give birth by cesarean delivery when their state guarantees insurance coverage continuation during maternity leave; non-insured women in these states show no change in their probability of this form of delivery. Again these results reduce the concern that the estimated effects are being driven by other statewide factors.

Table 8 presents results for a third control group, based on public or private sector employment. As noted earlier, the laws in our estimates thus far applied to both public and private sector workers. Some states also passed laws that applied only to public sector workers. The most typical pattern was for a state to pass a public sector law at a similar point in time, but to allow for more

²⁶ Results for employed mothers differ from those presented in Table 4 because the Table 6 results do not include the employment-based control variables to ensure consistency with the results for nonemployed women.

²⁷ In specifications where we limit the sample to include only state-year cells with more than eight births, the estimated coefficients on the *rplaw* variable are insignificant for the nonemployed. The estimated coefficients for the employed are qualitatively similar to those in Table 6.

Table 7: Effect of leave laws for insured and noninsured employed mothers.

	Dependent variable = 1 if birth was by caesarian section	
	1	2
	Insured	Noninsured
Reasonable period leave law	−0.03 (0.04)	−0.06 (0.09)
Long leave law (≥ 16 weeks)	0.09 (0.06)	−0.18 (0.27)
Short leave law (≤ 13 weeks)	−0.19*** (0.05)	−0.12 (0.17)
Insurance law	0.11* (0.06)	−0.07 (0.19)
Industry and occupation controls	Y	Y
State fixed effects	Y	Y
Year fixed effects	Y	Y
R-squared	0.28	0.46
Number of observations	1,268	384

Note: Table reports estimated coefficients from linear probability models of caesarian section birth for employed and nonemployed mothers. Probit estimates are qualitatively and quantitatively similar but result from fewer observations due to perfectly predicted outcomes in some cells (results available from authors). All regressions include a constant and all the controls for birth and child characteristics and mother’s characteristics listed in Table 3. Estimated coefficients for the control variables are in the appendix. Standard errors are reported in parentheses and are clustered at the state level.

* p -value < 0.10; ** p -value < 0.05; *** p -value < 0.01 (two-tailed tests).

generous leave for public sector workers. We examine whether the more global laws and the public sector laws affected private and public sector workers differently by estimating eq. [4].

Table 8 reports these results for *any law* and laws with differing leave length.²⁸ Because of the large number of coefficients to compare, we split the regression results into two columns: Column A reports the baseline coefficients that apply to all workers, and Column B contains the coefficients on terms that are interacted with the indicator variable for public sector workers. Thus the full effect for public sector workers is therefore the sum of the two columns, while

²⁸ Recall that only one state (SC) had a public sector “reasonable period” law, making it impossible to estimate its effect given the use of state fixed effects.

Table 8: Effect of public sector only and public/private sector leave laws for public and private sector workers.

Dependent variable = 1 if birth was by cesarean section				
	1		2	
	A	B	A	B
	Private sector employee	Public sector employee interaction ^a	Private sector employee	Public sector employee interaction
Private sector laws^b				
Any leave law	-0.05 (0.07)	0.07 (0.05)	—	—
Reasonable period leave law	—	—	-0.02 (0.08)	0.03 (0.08)
Long leave law (≥16 weeks)	—	—	0.08 (0.12)	-0.02 (0.16)
Short leave law (≤13 weeks)	—	—	-0.16** (0.08)	-0.13 (0.09)
Insurance law	—	—	0.05 (0.06)	0.13* (0.07)
Public sector laws^b				
Any leave law	-0.14** (0.07)	0.10 (0.07)	—	—
Long leave law (≥16 weeks)	—	—	-0.11 (0.08)	0.23 (0.16)
Short leave law (≤13 weeks)	—	—	-0.24 (0.09)	0.13 (0.17)
Insurance law	—	—	0.05 (0.12)	-0.08 (0.12)
Public sector worker	—	-0.06* (0.03)	—	-0.06* (0.03)
State fixed effects		Y		Y
Year fixed effects		Y		Y
State-specific time trends		Y		Y
R-squared		0.29		0.30
Number of observations		1,652		1,652

Note: Table reports estimated coefficients from linear probability models of cesarean section birth for public sector and private sector mothers. All regressions include a constant and all the controls for birth and child characteristics and mother's characteristics listed in Table 3. Standard errors are reported in parentheses and are clustered at the state level.

^aThe numbers in the columns labeled "B Public Sector Employee Interaction" are the estimated coefficients on the law variable listed in each row interacted with an indicator for public sector workers. See eq. [4] for a description. Because we include state fixed effects and only one state (SC) passed a public sector reasonable period leave law, that variable is not included in the regressions. The number public sector worker in the regression is 243.

^bPrivate sector laws cover both private and public sector workers. Public sector laws cover only public sector workers.

* p -value < 0.10; ** p -value < 0.05; *** p -value < 0.01 (two-tailed tests).

the differential effects of the laws on public relative to private sector workers are captured by the estimates in Column B. Our baseline results are essentially unchanged and the effect of laws that should apply to both public and private sector workers has similar effects for both groups. Public sector laws do not appear to have a significant effect on either public or private sector workers, although the number of public sector workers in our data may be too small to allow for the identification of these laws.

6.5 Accounting for Potential Endogeneity and Selection: Correlates with Law Passage

The differential results for the employed versus nonemployed and insured and noninsured are not likely to result if short period maternity leave laws are endogenous, since state factors correlated with the passage of maternity leave and cesarean delivery would be likely to affect all groups of mothers if that were the case. However, our final approach to addressing concerns about endogeneity is to directly examine state-specific factors that might be expected to be correlated with both the passage of maternity leave laws (e.g., the level of healthcare demand in the state) and with the probability that a woman gives birth by cesarean section.

We approach this issue by estimating the probability that a state has a maternity leave law in place in a given year as a function of state-level characteristics that might be related to the demand for medical services and maternity leaves. For each state-year combination in our sample, we used the NLSY data to construct measures of the number of births, the female employment rate, the percent of women married, and the number of women reporting a health condition that limited the kind of work they could do. We also obtained information on the percentage of women in each state legislature by year for our sample period from the National Conference of State Legislatures and the Center for the American Woman and Politics.²⁹ The results of these estimates are presented in Table 9, where the columns present estimates of the impacts of these variables on *any leave law*, *long leave law*, *short leave law*, and *insurance law*.

The variables *number of women reporting a health condition that limits work* and *percent of state's legislators female* are statistically related to the probability that a given state has a maternity leave law in place in a given year, but the impacts of these two variables are not robust across specifications. States and

²⁹ This data is available at: <http://www.ncsl.org/legislatures-elections/wln/women-in-state-legislatures-2011.aspx>.

Table 9: Testing for endogeneity of maternity leave laws.

	Dependent variable = 1 if state had law in place			
	1	2	3	4
	Any Leave Law	Long Leave Law	Short Leave Law	Insurance Law
Female employment rate in state	−0.06 (0.05)	−0.01 (0.03)	−0.01 (0.04)	−0.05 (0.03)
Percent females married in state	0.07 (0.05)	0.00 (0.03)	0.04 (0.04)	0.02 (0.03)
Number of births in state	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Number of women with health condition that limits work	0.00 (0.01)	0.01** (0.00)	0.01 (0.01)	0.00 (0.01)
Percent of state's legislators female	−0.64 (0.59)	−0.76*** (0.30)	−0.17 (0.43)	0.69* (0.37)
State fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
R-squared	0.73	0.67	0.60	0.39
Number of observations	508	508	508	508

Note: Table reports estimated coefficients from linear probability models of law being in place by state and year. Standard errors are in parentheses.

* p -value < 0.10; ** p -value < 0.05; *** p -value < 0.01 (two-tailed tests).

years with higher numbers of women reporting a health condition that limits the kind of work they can do are slightly more likely to have long leave laws, but there is no relationship between this variable and the existence of other types of leave laws. States and years with higher percentages of female legislators are less likely to have long leave laws and more likely to have leave laws with insurance provisions, but no more or less likely to have other types of maternity leave laws. Because the results reported earlier indicate that longer leave laws and leave laws with insurance provisions are both associated with *higher* probability of cesarean delivery, the opposing signs of the estimated coefficients on *percent of state's legislators female* are inconsistent with the notion that the leave laws are systematically endogenous.³⁰

³⁰ In addition, in a regression of *birth by cesarean section* on the percent of the state's legislature that is female plus the other controls listed in Table 9, the estimated coefficient on *percent of state's legislators female* is statistically insignificant.

7 Conclusion

Rates of cesarean delivery have increased dramatically since 1965, with nearly a third of all current births in the United States being delivered by cesarean. While medical providers and mothers consider a host of health-related costs and benefits in making this decision, there has been less information about broader incentives that might induce the use of more intensive medical services. This paper contributes to previous research by estimating the impact of state maternity leave laws on cesarean delivery.

Theoretically, the predicted impact of the leave laws on cesarean rates is ambiguous. In some states, leave laws also guaranteed health insurance coverage during leave, reducing the additional financial costs and therefore increasing the incentives for this form of delivery. Cesareans also impose additional health costs if mothers are required to return to work prior to recovery. States that passed particularly long mandated leaves may have reduced this potential cost, further raising cesarean rates. However, in states without uniform leave provisions, employers often provided “bonus” time off for a cesarean delivery in accordance with medical leave recommendations. After uniform leave laws were imposed, there was no additional time off based on the form of delivery, which would tend to reduce cesarean section rates. The net effect therefore is likely to depend on the specifics of the law, particularly on the insurance provisions and provisions regarding the length of leave.

The empirical evidence presented in this paper suggests that state maternity leave laws do alter the incentives of mothers or their physicians when deciding on the method of delivery. Laws that guaranteed shorter leaves (and thus perhaps eliminated “bonus” time off routinely given to mothers who deliver by cesarean) decrease the probability of cesarean delivery by between 12 and 20 percentage points relative to states without maternity leave laws. Controlling for whether a state passed a length-specified leave law, laws that guarantee insurance coverage are associated with a 12 percentage point higher probability of cesarean delivery. We find no evidence that preexisting trends drive these results, that short leave laws affect alternative control groups of mothers who should be unaffected by the policy, or that the passage of the laws was correlated with employment and medical conditions in the state.

The estimates suggest that the incentives of patients and doctors for more medically intensive procedures not only reflect medically related costs and benefits but also are highly sensitive to a broader set of incentives, including those related to finances, employment, and time caring for family members. Employment-related policies are therefore an important and largely overlooked area with potentially important impacts on overall health care costs.

Appendix

Table 10: Number of births by state and year from 1980–1992.

State		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
AL	Total	12	7	11	8	6	12	8	15	4	4	9	9	4
	C sections	5	2	2	2	3	3	3	7	2	1	3	5	1
AK	Total	0	2	1	1	2	1	0	0	1	1	1	1	0
	C sections	0	0	0	1	1	0	0	0	0	0	0	1	0
AZ	Total	3	4	2	6	4	6	6	7	5	2	3	2	2
	C sections	0	0	0	2	1	3	2	1	1	0	1	1	0
AR	Total	5	4	4	1	2	2	1	2	1	3	3	5	2
	C sections	0	0	0	0	0	1	0	0	0	2	0	0	0
CA	Total	19	30	35	33	36	50	28	36	39	33	41	25	24
	C sections	2	9	8	10	3	20	7	9	12	11	12	9	10
CO	Total	3	6	12	11	2	7	8	6	5	9	3	4	6
	C sections	1	2	2	3	1	2	2	0	0	2	0	1	1
CT	Total	3	5	7	3	4	11	5	12	8	6	5	9	4
	C sections	0	0	0	0	2	3	1	1	3	1	0	1	1
DE	Total	0	0	0	0	0	1	0	0	0	0	0	0	0
	C sections	0	0	0	0	0	1	0	0	0	0	0	0	0
DC	Total	2	1	1	2	0	0	1	0	2	0	1	2	0
	C sections	0	0	0	1	0	0	0	0	1	0	0	0	0
FL	Total	11	11	7	10	11	17	7	10	13	21	10	4	14
	C sections	1	1	3	2	3	4	2	3	2	5	2	0	5
GA	Total	12	10	14	13	13	19	9	7	4	10	13	5	5
	C sections	0	0	2	0	4	5	0	1	1	2	5	1	2
HI	Total	0	0	0	0	0	1	0	0	0	0	0	0	0
	C sections	0	0	0	0	0	0	0	0	0	0	0	0	0
ID	Total	0	0	0	0	0	0	0	0	0	0	1	0	0
	C sections	0	0	0	0	0	0	0	0	0	0	0	0	0
IL	Total	6	8	8	9	12	7	7	6	7	11	17	11	8
	C sections	0	1	1	1	2	0	1	0	1	0	4	4	1
IN	Total	2	3	3	3	5	5	4	5	10	9	5	4	1
	C sections	1	1	0	2	1	1	1	2	1	0	2	1	0
IA	Total	2	0	2	3	4	4	0	1	3	2	4	2	2
	C sections	0	0	1	1	1	0	0	0	0	0	1	0	0
KS	Total	1	2	3	1	3	4	3	0	2	1	1	4	3
	C sections	0	0	1	0	0	2	1	0	1	1	0	1	2
KY	Total	1	4	1	4	3	4	0	5	2	0	1	0	1
	C sections	0	0	0	1	0	0	0	0	0	0	0	0	0

(continued)

Table 10: (continued)

State		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
LA	Total	1	3	3	4	4	5	3	2	1	4	3	0	4
	C sections	0	1	1	0	0	0	1	1	0	1	0	0	3
ME	Total	0	0	1	0	2	0	0	1	0	0	0	0	1
	C sections	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Total	2	2	2	1	5	3	6	4	3	2	3	8	5
	C sections	0	0	0	0	1	1	2	0	0	0	0	1	0
MA	Total	1	1	10	6	5	7	3	10	7	4	3	3	0
	C sections	0	1	2	1	1	2	0	2	3	1	0	0	0
MI	Total	11	11	10	12	13	18	8	19	12	20	17	13	10
	C sections	1	1	0	1	2	2	2	6	8	7	10	5	5
MN	Total	4	7	3	5	9	3	7	9	2	14	5	2	3
	C sections	0	2	2	0	2	0	1	0	0	0	2	1	1
MS	Total	4	3	5	7	3	3	3	1	3	5	2	2	0
	C sections	0	0	0	1	1	1	1	1	0	0	0	1	0
MO	Total	5	7	12	6	12	6	5	8	5	15	4	10	5
	C sections	1	0	0	0	3	0	1	2	2	8	0	3	0
MT	Total	2	4	5	2	3	1	4	2	0	1	1	1	1
	C sections	1	0	1	1	2	0	0	1	0	1	0	1	1
NE	Total	1	2	2	0	2	5	0	2	1	3	0	1	1
	C sections	0	0	0	0	0	0	0	2	0	0	0	0	0
NV	Total	0	0	0	0	1	0	0	0	0	1	0	0	1
	C sections	0	0	0	0	0	0	0	0	0	1	0	0	0
NH	Total	0	0	0	0	0	1	0	0	1	0	0	0	1
	C sections	0	0	0	0	0	0	0	0	0	0	0	0	0
NJ	Total	4	10	7	6	12	6	4	7	8	10	11	6	9
	C sections	0	2	1	2	2	3	2	2	2	4	3	1	2
NM	Total	2	3	3	6	2	3	2	1	3	5	4	3	2
	C sections	0	1	0	0	0	1	0	0	0	2	2	2	1
NY	Total	9	14	16	8	18	18	14	16	15	22	19	21	11
	C sections	2	2	1	1	3	5	1	6	3	4	4	5	3
NC	Total	5	12	19	7	18	15	13	10	13	17	7	5	7
	C sections	1	1	4	1	5	3	2	1	5	3	1	1	2
ND	Total	0	0	0	0	0	1	0	0	0	1	0	0	0
	C sections	0	0	0	0	0	0	0	0	0	0	0	0	0
OH	Total	8	17	15	13	16	18	20	7	21	17	16	17	11
	C sections	0	1	6	2	4	4	5	2	7	5	4	3	1
OK	Total	5	6	6	3	3	6	5	4	7	8	2	2	5
	C sections	1	1	1	1	0	1	0	1	1	1	1	0	0
OR	Total	2	2	1	1	1	1	0	5	1	1	4	0	0
	C sections	1	1	0	0	0	0	0	0	0	0	0	0	0

(continued)

Table 10: (continued)

State		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
PA	Total	11	7	10	17	15	14	9	11	15	8	11	10	7
	C sections	0	1	0	2	2	3	2	0	4	1	2	0	2
RI	Total	0	0	0	0	1	0	0	3	1	1	0	1	1
	C sections	0	0	0	0	0	0	0	0	0	0	0	0	0
SC	Total	2	9	9	11	12	12	5	9	7	7	3	6	4
	C sections	0	0	2	3	4	0	2	2	2	2	1	2	2
SD	Total	2	1	2	0	1	3	1	2	2	0	0	0	0
	C sections	0	0	1	0	0	0	0	1	1	0	0	0	0
TN	Total	2	6	5	7	7	3	6	3	9	5	2	5	0
	C sections	0	1	0	1	1	1	2	0	1	0	1	1	0
TX	Total	22	14	27	26	21	24	19	17	10	26	21	20	17
	C sections	5	2	5	9	6	5	7	4	2	7	8	7	5
UT	Total	1	2	0	0	4	1	2	2	1	0	1	0	0
	C sections	0	0	0	0	2	0	0	0	0	0	0	0	0
VT	Total	3	1	1	0	2	0	1	1	1	0	0	0	1
	C sections	0	1	0	0	0	0	0	0	0	0	0	0	1
VA	Total	6	8	10	11	4	8	2	5	7	7	7	2	3
	C sections	1	0	6	0	0	2	2	0	4	5	4	0	0
WA	Total	4	5	2	9	8	4	4	4	7	5	6	8	6
	C sections	1	1	0	0	0	1	2	0	0	2	2	0	2
WV	Total	4	5	3	2	3	6	4	1	3	6	2	2	4
	C sections	0	0	0	0	2	2	2	0	1	1	1	1	0
WI	Total	5	12	9	19	10	14	6	8	9	17	10	7	14
	C sections	1	6	3	6	1	2	1	2	4	4	1	1	7
WY	Total	0	0	0	0	0	0	0	1	0	0	0	0	0
	C sections	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: For each state, the table reports the total number of births in the first row and the number of cesarean births in the second row. Highlighted cells indicate states and years with any maternity leave law. See Tables 1 and 2 for details on the laws.

Table 11: Estimated coefficients on control variables.

	1		2		3	
	Employed		Employed		Nonemployed	
	Coeff.	St. err.	Coeff.	St. err.	Coeff.	St. err.
Birth and child characteristics						
Weight of child (ounces)	−0.01	0.01	−0.01	0.01	0.00	0.00
Weight of child-squared	0.00	0.00	0.00	0.00	0.00	0.00
Born low birth weight	0.10	0.08	0.09	0.08	0.00	0.05
Had prenatal care by 3 months	−0.01	0.02	−0.01	0.02	0.02	0.02
Gestation (weeks)	0.00	0.01	−0.01	0.01	0.00	0.01
Child female	0.00	0.02	0.00	0.02	−0.03**	0.01
Birth order	−0.11***	0.01	−0.11***	0.02	−0.08***	0.01
Multiple birth	0.10	0.12	0.01	0.14	0.16***	0.06
Previous cesarean delivery	0.63***	0.04	0.64***	0.04	0.64***	0.03
Mother's characteristics						
AFQT percentile score	0.00	0.00	0.00	0.00	0.00	0.00
Age (year of birth)	0.01*	0.01	0.01**	0.00	0.01*	0.00
BMI just before pregnancy	−0.01*	0.01	−0.01*	0.01	−0.01	0.00
BMI just before delivery	0.02***	0.00	0.02***	0.00	0.01***	0.00
White	−0.01	0.06	−0.03	0.05	0.00	0.02
Black	−0.03	0.05	0.00	0.05	0.00	0.05
Hispanic	0.01	0.03	0.00	0.00	−0.06*	0.03
High school education only	0.02	0.03	0.03	0.04	−0.01	0.02
Some college	0.00	0.03	0.01	0.04	−0.03	0.03
BA or more education	0.02	0.05	0.02	0.05	0.01	0.05
Married (year of birth)	0.02	0.03	0.03	0.03	−0.02	0.02
Health limits kind of work mother can do (year of birth)	−0.02	0.03	−0.01	0.03	0.03	0.03
Unemployment rate in local labor market (% , year of birth)	0.00	0.00	0.00	0.00	0.00	0.00
Real family annual income (\$000s, year before birth)	0.00	0.00	0.00	0.00	0.00	0.00
Working full time (4 th quarter before birth)	−0.01	0.02	−		−	
Real own wage and salary income (\$000s, 4 th quarter before birth)	0.01	0.00	−		−	
Employer offers health insurance (year of birth)	0.03	0.03	−		−	
Number of observations	1,652		1,652		1,880	

Note: Column 1 reports estimated control variable coefficients and standard errors from the regression reported in Table 4 Column 5. Columns 2 and 3 report estimated control variable coefficients and standard errors from the regressions reported in Table 6 Columns 5 and 6, respectively.

p*-value < 0.10; *p*-value < 0.05; ****p*-value < 0.01 (two-tailed tests).

Table 12: Summary statistics for employed and nonemployed mothers.

	1		2	
	Employed		Nonemployed	
	Mean	SD	Mean	SD
State leave law characteristics				
<i>Private sector laws</i>				
Any leave law	0.28*	0.45	0.23*	0.42
Reasonable period of leave law	0.09*	0.29	0.07*	0.26
Length-specified leave law	0.19*	0.39	0.16*	0.37
Long leave law (≥ 16 weeks)	0.12	0.33	0.12	0.33
Short leave law (≤ 13 weeks)	0.07*	0.22	0.03*	0.17
Insurance law	0.05*	0.21	0.03*	0.16
<i>Public sector laws</i>				
Any leave law	0.21*	0.41	0.18*	0.38
Reasonable period of leave law	0.03	0.17	0.03	0.16
Long leave law (≥ 16 weeks)	0.16	0.36	0.14	0.35
Short leave law (≤ 13 weeks)	0.03*	0.17	0.02*	0.13
Insurance Law	0.06*	0.23	0.03*	0.17
Birth and child characteristics				
Cesarean delivery	0.25*	0.43	0.20*	0.40
Weight of child (ounces)	117.79	21.42	116.83	21.27
Born low birth weight	0.08	0.27	0.08	0.28
Had prenatal care by 3 months	0.86*	0.34	0.76*	0.43
Gestation (weeks)	38.61*	2.19	38.74*	2.09
Child female	0.49	0.50	0.49	0.50
Birth Order	1.60*	0.82	2.02*	1.12
Multiple birth	0.02	0.13	0.02	0.14
Previous cesarean delivery	0.10	0.30	0.10	0.30
Mother's characteristics				
AFQT percentile score	47.50*	27.21	32.99*	26.62
Age (year of birth)	25.94*	3.58	23.65*	3.99
BMI just before pregnancy	23.21*	4.54	22.93*	4.65
BMI just before delivery	28.67*	4.79	28.27*	4.92
White	0.57*	0.49	0.50*	0.50
Black	0.21*	0.41	0.27*	0.44
Hispanic	0.15	0.35	0.16	0.37
Other race/ethnicity	0.07	0.26	0.08	0.26
Less than high school education	0.10*	0.30	0.38*	0.49
High school education only	0.44*	0.50	0.38*	0.48
Some college	0.25*	0.43	0.17*	0.37
BA or more education	0.21*	0.40	0.08*	0.26
Married (year of birth)	0.78*	0.42	0.60*	0.49

(continued)

Table 12: (continued)

	1		2	
	Employed		Nonemployed	
	Mean	SD	Mean	SD
Health limits kind of work mother can do (year of birth)	0.10*	0.30	0.12*	0.33
Unemployment rate in local labor market (%, year of birth)	7.50*	3.12	8.39*	3.39
Real family annual income (\$000s, year before birth)	60.20*	94.69	37.22*	76.78
Working full time (4th quarter before birth)	0.82	0.38	–	–
Employed in Public Sector	0.15	0.35	–	–
Real own wage and salary income (\$000s, 4th quarter before birth)	5.68	3.71	–	–
Employer offers health insurance (year of birth)	0.77	0.42	–	–
Number of observations	1,652		1,880	

Asterisks highlight variables that are statistically different between the two samples at the 10% level (two-tailed tests).

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