

Private Providers under Public Insurance: The Case of C-sections in Chile

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Abstract

OBJECTIVE

Analyze caesarean section (C-sections) rates as they relate to type of health care insurance and type of hospital.

DESIGN

Observational study.

SETTING

The universe of hospital births in 15 regions in Chile, 2001-2014.

MAIN OUTCOME MEASURES

C-section rates, probability of a C-section by type of insurance and type of hospital; contributions to overall C-section rates by insurance and hospital; medical complications.

RESULTS

Despite common consensus that private insurance is the culprit of the high caesarean section rates in Chile, we find that privately insured births represent a small proportion of all births (on average 12%). We also find that an increasing percentage of publicly insured births occur in private facilities each year, going from less than 2% in 2001 to 24.3% in 2014. Finally, in private maternity units, the average C-section rate among women with public insurance is higher than the average for privately insured women. Approximately 3 out of 4 publicly insured women who opt to give birth in a private hospital will have a C-section. Since 2004 the number of C-sections performed in private hospitals covered by the public health insurance surpassed the number of C-sections covered by the private insurance.

CONCLUSION

We show that the combination of public insurance with private providers is the driving factor behind the overall high C-section rates. We find no evidence that this is driven by self-selection of a riskier population into private providers.

Article summary

Strengths and limitations of this study:

- + We analyze the universe of births in Chile for the period 2001-2014.
- + We calculate the contribution of public/private health insurance and public/private hospitals to the growth of C-section rates.
- + Publicly insured women who opt to give birth in a private hospital pay a fixed copayment, and must have a healthy singleton pregnancy.
- + Lack of socioeconomic measures to characterize mothers more accurately.

1 Introduction

caesarean sections have been part of childbirth since ancient times and have prevented the deaths of countless mothers and newborns.¹ However, C-sections are also among the most commonly performed surgical procedures, in rates that far exceed the WHO recommendation of 15% (Gibbons et al., 2010). This raises the concern about medically unnecessary procedures, which can negatively affect maternal and neonatal morbidity and mortality (Villar et al., 2007; Fisher and Welch, 1999).

Gibbons et al. (2010) estimated the cost of C-section over-utilization to amount U\$S 2.32 billion in 2008. In an effort to contain the rising cost of health care, policy makers around the world have introduced an array of policies to reduce C-section rates. These include reducing the difference in payments for C-sections and vaginal births and requiring a second opinion before performing a C-section, among others (Allin et al., 2015; Baicker et al., 2006; Belizán et al., 1999). The success of these efforts crucially depends on understanding the driving forces behind high C-section rates. In this paper, we analyze the determinants of C-sections as they relate to health insurance and medical providers. Other commonly proposed candidates are: mothers delaying childbirth, multiple births, defensive medicine, specialization and physician economic incentives.²

2 Methods

2.1 Data

The main data source are the administrative records of the universe of all hospital discharges occurred in Chile collected by the Ministry of Health.³ The database contains information about all inpatient stays in Chile, for all types of medical care institutions, for the period 2001 to 2014. From this sample, we have information on the age of the patient, the diagnosis code, number of nights of inpatient stay, type of insurance, type of institution, and county of residence and occurrence. We identify C-sections and vaginal births through the ICD-10CM codes.⁴

For each birth in the data, we create a variable that is equal to 1 if it is a C-section and 0 if it is a vaginal birth. We restrict the sample to singleton births occurred without complications

¹<https://www.nlm.nih.gov/exhibition/cesarean/index.html>

²See Allin et al. (2015) for a summary.

³Departamento de Estadísticas e Información de Salud, Ministerio de Salud del Gobierno de Chile (DEIS, 2017)

⁴We identify C-sections with ICD-10CM codes O820 to O829, and vaginal births with codes O800 to O819 and O830 to O839.

during pregnancy and/or delivery, covered by either the public or a private health insurance, to attain an average of approximately 165,000 observations per year.⁵

2.2 Chile in perspective

C-section represented 45 percent of all births in Chile in 2014. The C-section rate in Chile is much higher than that in other countries: it is the highest among OECD countries and higher than that from other Latin American countries as well. Between 2001 and 2014 the C-section rate in Chile went from 26 to 45%, while the average of the C-section rates among OECD countries was 20 and 27% in 2001 and 2014, respectively.⁶ That is, Chile has above average C-section rates all over the period, and, while in most OECD countries C-section do not increase or increase slowly, Chile's C-section rate has been constantly rising.⁷

Belizán et al. (1999) estimates the average C-section rate among Latin American countries between 1995 and 2000, and conclude that Chile has the highest C-section rate among the analyzed countries. They also show that there is a positive association between socioeconomic indicators and the proportion of caesarean sections in Latin America.

2.3 Background and Previous Evidence

Previous evidence has mostly focused on the monetary incentives of physicians (in the context of induced demand models), patients' characteristics, socioeconomic measures, and practice style (Baicker et al., 2006). The available evidence for Chile explores two dimensions: private vs. public hospitals, and private vs. public insurance.⁸

We classify the health care providers in public hospitals, private hospitals, and teaching hospitals. Public hospitals are those that belong to Chile's National Health Service, and private hospitals are owned by private investors. Teaching hospitals are owned by public and private universities, and financed through the universities' budget, composed mainly of tuitions and funds received directly from the National Education budget.⁹ Less than 4% of all deliveries in Chile occur in a teaching hospital. For this reason, and to simplify the analyses, we keep in our working sample only births in non-teaching hospitals.

⁵We do not include births for which we do not know the mothers' insurance, and those covered by the police and the military health insurance.

⁶Chile's data based on authors' calculations based on Patient Discharge Data and OECD data from OECD (2017b) and OECD (2017a).

⁷Figure 1 in the Appendix presents a comparison of C-section rates between Chile and a selection of OECD countries for the period 2001 to 2014.

⁸Angeja et al. (2006) show that for the case of Chile, preferences are not a factor: Chilean women do not prefer caesarean section to vaginal delivery.

⁹Universities' budget in either public and private institutions are quite similar in Chile, for those universities that have teaching hospitals.

Chile's health care system has two non-complementary health insurance providers: individuals have to decide whether to affiliate to the public health insurance or to buy a health insurance in a private company. The affiliates to the public health insurance pay 7% of their income as premium, have to pay copayments, and can receive treatment in public providers or selected private providers. In public hospitals the copayment is increasing with the level of income of the affiliate, whereas in private hospitals the copayment is independent of the income level. The public health insurance also provides services to indigent people only through the public hospitals, free of all charges. Those who decide to buy health insurance in a private company pay premiums that, for the same coverage, varies with the age and gender of the individual. In general, affiliates to private health insurance pay more than 7% of their income as premium, have to pay copayments, and receive treatment only in private hospitals.¹⁰ By 2014, the public health insurance covered 75.2% of Chile's population, and the private health insurance covered 18.5% (FONASA, 2016).¹¹ Affiliates to the private health insurance are mostly adults between 21 and 45 years old, and on average wealthier than affiliates to the public health insurance (CASEN, 2012).

For a group of Latin American countries, including Chile, Belizán et al. (1999) show that the proportion of caesarean sections in private hospitals is higher than that in public ones. Our sample shows that 27% of births in public institutions are C-sections, whereas this rate is more than two times bigger in private institutions, 63%.¹²

Regarding the health insurance provider, Murray (2000) showed that the rate of C-sections among women that delivered in Chile around 1996 with private health insurance is double than that among women covered by the public health insurance. In line with Murray's results, in our sample the C-section rate is 32% for births covered by the public health insurance and 53% for those under private health insurance.¹³

2.4 Analysis of Data

To test the significance of the difference between C-section rates of two groups, we perform t-test and report the corresponding p-value, using a bilateral alternative hypothesis, and assuming that unpaired data have equal variances in both groups.

We perform regression analyses of the probability of delivering by C-section on a series of explanatory variables, that include: a dummy variable that is equal to 1 if the insurance

¹⁰Copayments as a % of the listed price of each medical procedure are included in the health insurance contract. The listed prices of procedures in private hospitals that are paid by the private health insurances are defined via complex negotiation processes between the provider and the insurance company.

¹¹The remaining 6.3% was either not insured or belong to the police or armed forces.

¹²The reported numbers are C-section rates computed pooling observations from 2001 to 2014. The C-section rate in teaching hospitals is 42%.

¹³The reported numbers are C-section rates computed pooling observations from 2001 to 2014.

is private and 0 otherwise, a dummy variable that is equal to 1 if the maternity facility is private and 0 otherwise, maternal age, mothers' county of residence fixed effects to control for time invariant geographic characteristics, and time trends.

The regressions are performed assuming a logit model for the probability of interest. The coefficients of the logit regression are used to compute individual marginal effects. Marginal effects reported in tables are computed as the sample average of the individual effects.

We perform unadjusted regressions, that include only one covariate, and adjusted regressions, that include the set of covariates detailed above. Standard errors of unadjusted regressions are not robust to heteroskedasticity and cluster, while those for adjusted regressions are robust to both, heteroskedasticity and cluster at the county level.

2.5 Patient involvement

There was no patient involvement in this study.

3 Results

3.1 C-sections by Insurance

Among women with public health insurance, C-sections as percentage of all births represent 32%, while this rate is 53% among women with private insurance, in the period 2001-2014. Table 1 shows that the C-section rate increased for both, public and private health insurance in the period studied, but the increase was higher in the public insurance. As a consequence, the difference in C-section rates between deliveries covered by public and private health insurance became smaller, going from 28 percentage points in 2001 to 15 in 2014. Still, in 2014 the C-section rate among women with public health insurance (42.8%) is significantly lower than that for privately insured women (57.8%). Table 1 also shows that the vast majority of deliveries in Chile are covered by the public health insurance, with a participation above 85% during the period analyzed.

Table 1: C-section rates by Insurance.

Year	C-section rate by insurance (%)			% of births with public insurance
	Public	Private	p-value (a)	
2001	21.2	49.4	<0.0001	87.0
2002	22.2	48.9	<0.0001	86.5
2003	23.9	46.1	<0.0001	87.9
2004	27.1	45.8	<0.0001	89.6
2005	27.8	46.7	<0.0001	89.9
2006	29.5	48.7	<0.0001	89.6
2007	30.1	53.2	<0.0001	89.2
2008	32.9	52.6	<0.0001	89.6
2009	35.3	54.2	<0.0001	87.9
2010	35.6	54.7	<0.0001	88.2
2011	38.0	54.4	<0.0001	87.9
2012	41.0	57.0	<0.0001	85.9
2013	42.4	59.6	<0.0001	85.7
2014	42.8	57.8	<0.0001	84.6

Notes: (a) p-value of the t-test of differences in C-section rates between public and private insurance.

We perform a regression of the probability of a C-section on a dummy variable that is equal to 1 if the insurance is private and 0 otherwise, maternal age, county fixed effects, and time trends. Using all deliveries between 2001 and 2014, we find that a woman with private health insurance has a probability of delivering by C-Section that is 14.3 percentage points higher than a woman with public insurance, even after controlling for individual and geographic level characteristics, confirming Murray (2000)'s findings. However, if we perform the same regression using only deliveries occurred in 2001, and separately, only deliveries occurred in 2014, the aforementioned probability is 21.1 and 13.5 percentage points, respectively. That is, the probability of having a C-section among privately insured women relative to that of publicly insured women has declined in the period under analysis.¹⁴

Summing up, C-section rates by type of insurance and the estimated effect of having private health insurance on the probability of delivering by C-section tell a similar story: even though the C-section rate is lower among publicly insured women, the incidence of C-section in the public insurance has increased in the last years. We delve deeper into the publicly insured group to investigate the consequences of the type of maternity unit where delivery takes place.

¹⁴A complete report of regressions results, including odd-ratios, is presented in Table 6 in the Appendix

3.2 Private providers under public insurance

Table 2 shows that the percentage of deliveries covered by the public health insurance that occurred in private hospitals increased from 1.5% in 2001 to 24.3% in 2014 (from 2,146 to 35,905 births). As mentioned above, the C-section rate in private hospitals is higher than the C-section rate in public hospitals (63% and 26% respectively, using data from 2001 to 2014). Hence, more deliveries in private hospitals that have higher C-section rates than the public ones, help explain the increase in C-section rates of births covered by the public health insurance. Furthermore, C-section rates of women who deliver in a private hospital covered by public health insurance are higher than that of those covered by the private insurance. Table 2 also shows that this is the case since 2001, and that by 2014 the C-section rate in private hospitals of births covered by the public insurance was as high as 78.2%.

Table 2: C-section rates in private hospitals.

Year	Births in private hospitals with public insurance		C-section rates in private hospitals by insurance (%)		
	#	% (a)	Public	Private	p-value (b)
2001	2,146	1.5	70.5	49.1	<0.0001
2002	3,562	2.6	67.6	48.3	<0.0001
2003	7,017	5.1	63.1	44.6	<0.0001
2004	11,986	8.6	61.3	44.5	<0.0001
2005	12,957	9.4	61.5	45.0	<0.0001
2006	15,337	11.2	62.2	47.4	<0.0001
2007	14,409	10.5	63.9	52.8	<0.0001
2008	19,674	13.6	70.0	51.6	<0.0001
2009	27,084	17.4	73.6	53.6	<0.0001
2010	24,860	16.1	75.8	54.3	<0.0001
2011	27,739	18.5	76.2	53.8	<0.0001
2012	34,000	23.6	76.2	58.5	<0.0001
2013	34,208	24.1	77.4	59.4	<0.0001
2014	35,905	24.3	78.2	57.2	<0.0001

Notes: (a) Percentage of deliveries occurred in a private provider out of the total number of deliveries covered by the public insurance. (b) p-value of the t-test of differences in C-section rates between public and private insurance.

We perform a regression of the probability of having a C-section on the type of insurance, in the sample of women who delivered in a private hospital, controlling for maternal and geographic characteristics, and time trends. Results are shown in Table 3. We find that the likelihood of having a C-section among women that deliver in a private maternity unit is lower for those privately insured: the odds-ratio using observations in all the period under analysis is 0.56.

Table 3: Marginal effects and odd ratios of having private health insurance on the probability of having a C-section. Sample of deliveries in private hospitals.

	Deliveries between 2001 and 2014		Only deliveries in 2001		Only deliveries in 2014	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
ME	-0.1973	-0.1148	-0.2217	-0.1495	-0.1710	-0.0865
SE	0.0012	0.0080	0.0118	0.0159	0.0035	0.0086
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
OR	0.4130	0.5634	0.4046	0.5056	0.4270	0.6182
SE	0.0024	0.0229	0.0202	0.0370	0.0080	0.0302
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Obs	517,350	515,930	18,244	18,078	56,307	55,911

ME: marginal effect. SE: standard error. OR: odds ratio. Marginal effects are computed using logit regressions. Odds ratios are computed using logistic regressions. In the adjusted regressions we include as covariates a second order polynomial for the age of the mother, dummies that identify county of residence of the mother, and years dummies. Standard error in the adjusted regression are clustered at the county level.

To delve deeper into the role of publicly insured deliveries occurred in private hospitals on the increase of C-section rates in Chile, we compute the contribution to the overall C-section rate of four groups defined by type of insurance and type of hospital. Table 4 shows the results and table 7 in the Appendix reports the weights used in the computations. Since 2008, the C-section rate among publicly insured women who delivered in private maternity units was the highest contributor to the overall C-section rate in Chile. By 2014, the group “private hospital under public insurance” contributed 52.3% to the overall weighted C-section rate (equal to 53%), while the group “private insurance”, including C-sections performed in public and private hospitals, contributed only a 21.4%.¹⁵

¹⁵The remaining 26.3% was generated by C-sections performed in public hospitals and publicly covered. Weights are given by the contribution of each group to the total number of C-sections, computed on a yearly base.

Table 4: Contributions to overall C-section rates by insurance and hospital, in %.

Year	Private hospital		Public hospital		Overall (weighted) C-section rate
	Private insurance	Public insurance	Private insurance	Public insurance	
2001	32.6	9.0	10.2	48.2	29.8
2002	33.3	12.7	7.4	46.6	30.9
2003	24.7	21.6	6.3	47.5	31.4
2004	18.0	29.6	4.5	47.9	33.6
2005	17.2	31.3	4.5	47.0	34.4
2006	17.9	33.9	3.6	44.6	36.5
2007	21.5	30.9	3.4	44.2	37.8
2008	17.0	40.9	2.9	39.1	41.5
2009	18.3	48.1	2.4	31.2	45.8
2010	18.2	46.8	2.1	32.9	46.1
2011	16.7	49.2	2.0	32.1	48.0
2012	18.9	52.7	1.7	26.7	51.7
2013	19.8	51.9	1.6	26.7	53.1
2014	19.7	52.3	1.7	26.4	53.3

We consider these results as evidence that the rise in C-section rates is mostly due to the increasing role of private hospitals as providers of maternal health services to women with public health insurance.

3.3 Patient Risk

In this section we explore the possibility that within women with public insurance, those who anticipate that they will have a medical complication select into private institutions. This would imply that there is a riskier group of patient's who opt into the attention at private hospitals under their public insurance, and therefore a higher rate of C-sections would be reasonably expected. A testable implication in this context would be that health outcomes are worse for this group.

We find no evidence of higher rates of complications (medical complications, miscarriages or C-sections with complications) among women with public insurance at private institutions. On the contrary, the bulk of complications for this group occur at public hospitals (93.8%, 94.7%, and 85.9%, respectively).¹⁶

We also find that the length of stay at public hospitals is higher than that at private hospitals (3.55 vs 2.45, p-value of the difference < 0.0001), and that among patients with public

¹⁶The small number of maternal deaths in the sample, 113 throughout the period, does not allow for an analysis by insurance and institution.

insurance, length of stays are also larger at public hospitals than at private ones (3.58 vs 2.43, p-value of the difference < 0.0001). Thus, there is no evidence in the length of stay that outcomes are worse for mothers with public insurance delivering at private institutions (assuming that worse outcomes require longer stays).

Table 5: Patient risk indicators.

Type of risk	All:			With public insurance: % in public hospital
	total number 2001-2014	% with public insurance	% in public hospital	
Medical complications	651,781	90.2	85.7	93.8
Miscarriages	395,847	85.8	83.6	94.7
Csections with complications	66,552	85.5	75.3	85.9

Finally, and importantly, is an institutional characteristic that provides evidence against the hypothesis of selection into private institutions by riskier mothers. Almost all births occurring in private hospitals under public insurance are financed under a type of DRG based payment, a payment associated with diagnosis (PAD), in which the patient covers a copayment of 25 percent of a fixed (and previously known) sum. Patients can opt into this scheme at week 37, under physician prescription, and should have a healthy pregnancy. They can choose from an array of affiliated providers. Complications due to mother’s health, prematurity related complications, and multiple births are not covered.¹⁷ The price paid by the mother is the same, independent of the mode of delivery.

4 Discussion

We examined the determinants of caesarean sections in Chile, using the universe of births for the period 2001 to 2014. We relate C-section rates with the type of insurance and the type of institution. We find that privately insured births represent a small proportion of all births, 12% in the period under study. We also find that an increasing percentage of publicly insured births, occur in private facilities each year, going from less than 2% in 2001 to 24.3% in 2014. Finally, in private maternity units, the C-section rate among women with public insurance is higher than among women privately insured. Since 2004 the number of C-section performed in private hospitals covered by the public health insurance surpassed the number of C-sections covered by the private insurance.

Despite common consensus that private insurance is the culprit of the high caesarean section rates in Chile, we show that it is the combination of public insurance with private providers

¹⁷More details in: <https://www.fonasa.cl/sites/fonasa/beneficiarios/coberturas/pad/prestaciones/09>.

that drives the overall higher rates. We find no evidence that this is driven by self-selection of a riskier population into private providers, that is, there is no reason to think that publicly insured women delivering at public hospitals are healthier than the ones delivering at private hospitals.

Many possible reasons have been advanced to explain the higher rates of C-sections. One is the profit motive (Allin et al., 2015; Gruber et al., 1999). However, under the PAD scheme the payment is the same for a C-section birth and for a vaginal birth. If payment is then not a determinant, what drives high C-section rates? As it has been pointed in the literature (Currie and MacLeod, 2013), C-sections take less time and can be scheduled at convenient times for doctors/institutions, which implies a higher number of procedures that can be performed per day, increasing profit. Another alternative, as advanced by Currie and MacLeod (2013) and Chandra and Staiger (2007) relates to physician practice style and physician specialization in high tech procedures. Data availability limits the possibility of analyzing separately the profit motive and the specialization or practice style motives, though the institutional setting indicates that as only healthy mothers are eligible, there should be no gains for intensive treatment (C-sections). This will be the subject of future research.

5 Strengths and limitations of this study

The main limitation of this study relates to the lack of socioeconomic measures in the dataset that would allow characterizing mothers more accurately. We include age as a control variable, and include county of residence fixed effects in our estimations. Furthermore, data availability limits the possibility of analyzing separately the profit motive and the practice style for the hospitals. However, what this study adds to the literature is a thorough examination of the roles of insurance and providers for the universe of births in Chile throughout 2001-2014.

6 Conclusion

Despite the common understanding that either private insurance and/or private hospitals are driving high C-section rates, this paper shows that it is the combination of public insurance with private providers that carry the highest C-section rates. Roughly 3 out of 4 publicly insured women who opt to give birth in a private hospital will have a C-section. Moreover, there is no evidence that these women should be more likely to have a C-section because it is medically necessary - i.e. they are not riskier patients. These findings indicate that there is a need to re-examine the relation of public insurance with its private providers if caesarean sections rates are to be reduced.

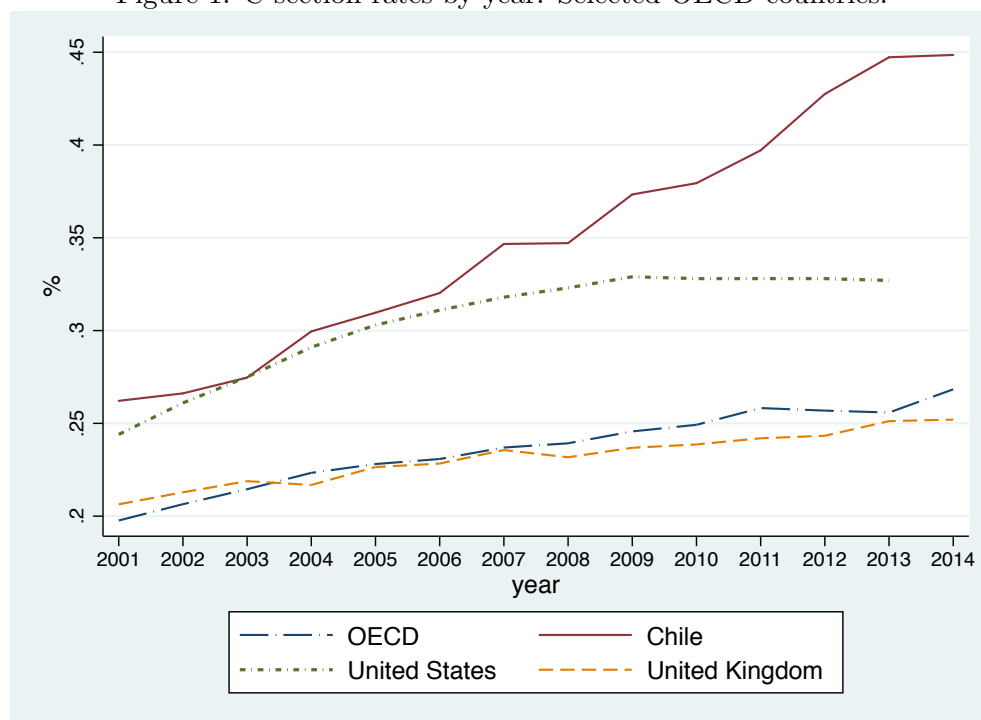
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7 Appendix

Figure 1: C-section rates by year. Selected OECD countries.



Source: DEIS (2017) (Chile), OECD (2017b) and OECD (2017a) (OECD countries except Chile)

Notes: OECD is the unweighted average of C-section rates for Australia, Austria, Belgium, Chile, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Ireland, Israel, Italy, Luxembourg, Netherlands, Poland, Slovenia, Spain, Sweden, United Kingdom, United States.

Table 6: Marginal effects and odd ratios of having private health insurance on the probability of having a C-section.

	Deliveries between 2001 and 2014		Only deliveries in 2001		Only deliveries in 2014	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
ME	0.1877	0.1426	0.2291	0.2114	0.1691	0.1345
SE	0.0009	0.0128	0.0025	0.0098	0.0034	0.0161
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
OR	2.3253	2.0368	3.6293	3.7012	2.0011	1.8381
SE	0.0095	0.1357	0.0556	0.2523	0.0286	0.1373
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Obs	2,284,605	2,280,604	160,707	160,057	165,499	165,263

ME: marginal effect. SE: standard error. OR: odds ratio. Marginal effects are computed using logit regressions. Odds ratios are computed using logistic regressions. In the adjusted regressions we include as covariates a second order polynomial for the age of the mother, dummies that identify county of residence of the mother, and years dummies. Standard errors in the adjusted regressions are clustered at the county level.

Table 7: Weights, in %.

Year	Private hospital		Public hospital	
	Private insurance	Public insurance	Private insurance	Public insurance
2001	19.8	3.8	6.0	70.4
2002	21.3	5.8	4.4	68.5
2003	17.4	10.7	3.6	68.3
2004	13.6	16.2	2.8	67.3
2005	13.1	17.5	2.7	66.6
2006	13.8	19.9	2.2	64.1
2007	15.4	18.3	2.3	64.0
2008	13.7	24.3	2.0	60.0
2009	15.7	29.9	1.8	52.6
2010	15.5	28.5	1.7	54.4
2011	14.9	31.0	1.6	52.6
2012	16.7	35.7	1.9	45.7
2013	17.7	35.6	1.3	45.3
2014	18.4	35.6	1.3	44.7