Physician convenience and cesarean section delivery

Jimena Ferraro, Shagun Khare and Alan Acosta*

August 20, 2021

Preliminary, comments welcome

Abstract

According to the World Health Organization (WHO), cesarean sections should only be performed when medically necessary (a rate estimated between 10% and 15%). In Argentina, the rate of c-sections far exceeds the recommendation. The supplier-induced demand hypothesis, which predicts more c-section deliveries than otherwise medically needed, might be the reason behind this disparity. In this paper, using a survey of pregnant women in Buenos Aires, we study one aspect of the physician's incentives to induce demand: convenience. We look at whether a woman's chance of getting a c-section depends on the period of delivery, i.e. whether it is a working day or not. Setting aside scheduled c-sections, we find that convenience matters, but only in private hospitals. We also find that women who state that they prefer c-sections over natural births have a higher chance of having a c-section in private hospitals. While physicians convenience and mothers preferences do matter, our research finds that the institutional environment plays a defining role in how much these matter.

1 Introduction

The rates of cesarean section, or c-section, births vary widely across different regions. Figure 1 gives an idea of the disparity of rates across the world. There are stark differences between the developed and emerging world, and Latin America,

*We are grateful to the Institute of Clinical Effectiveness and Health Policy (IECS), Argentina, who gave us access and support to the dataset used in this paper, specially to Jose Belizán and Fernando Althabe. In addition, we thank Yinghua He, Henrik Andersson, Bruno Jullien, Marisa Miraldo, Carol Propper, and Marta Ferrary. All errors are our own responsibility.

for example, has rates far exceeding those recommended by the WHO. Of the ten countries with the highest c-section rates, six were in Latin America (Gibbons et al., 2010). Although there are differences across regions, there are also differences within them. Within the same country or same community, a womans chance of getting a c-section may depend on where she lives and which hospital she goes to. Moreover, studies find that factors like race and socioeconomic status may be associated with increased or decreased probability of c-sections (Lewis, 2015). These variations point to the role of nonmedical factors in a womans chance of getting a c-section.

Since 1985 the international healthcare community has considered the ideal target range for the rate for c-sections to be between 10% and 15% (WHO, 2015). C-section deliveries can be life-saving for both mothers and babies; but at population levels, rates higher than 15% are not associated with reductions in maternal and newborn mortality rates. Those c-sections that are avoidable are costly in monetary terms, but may also be inimical to the health of the mother and child (Burns et al., 1995). A c-section birth also limits the possibility of a natural birth for the mother in the future. Further, in the case where a woman prefers a natural delivery, an unnecessary c-section would reduce her welfare. The study of nonmedical factors that incentivize these c-sections is thus interesting from both a public health and a welfare perspective.

Among the nonmedical factors that affect c-section rates are the mother's own preferences, which may affect their demand. These preferences may be shaped by factors like personal beliefs, recovery time, differing costs and convenience. On the other hand, the physician's preferences may be shaped by differences in pay, convenience of scheduling, and time spent on each mode of delivery. As the physician has superior information over the mother, the supplier-induced demand hypothesis predicts more c-section deliveries than otherwise medically needed. Other than the mother and physicians preferences, there is also the institutional environment that plays a role. Insurance terms, hospital facilities, organization of medical teams may all affect c-section rates.

In this paper, we look at one aspect of the physician's incentives - convenience. We look at whether a womans chance of getting a c-section depends on the period of delivery, i.e. whether it is a working day or not. Setting aside scheduled or elective c-sections, we still find that convenience matters, but only in private hospitals. In these hospitals, women who enter labour on a weekend or public holiday are 17% more likely to have an unscheduled or intrapartum c-section than those who are in labour on a weekday. There is no significant difference for women admitted to public hospitals. This difference between private and public hospitals may be attributed

to the institutional environment each one provides.

We also look at the role of women's preferences in determining the mode of delivery. As the data comes from a survey of pregnant women, we have the advantage of information on their professed preferred mode of delivery. We find that preferences do play a role in delivery mode choice when it comes to scheduled c-sections. Women who state that they prefer c-sections over natural births have a higher chance of having a c-section in private hospitals, but it is not the case in public hospitals. We do not find any influence of preferences over intrapartum c-section rates.

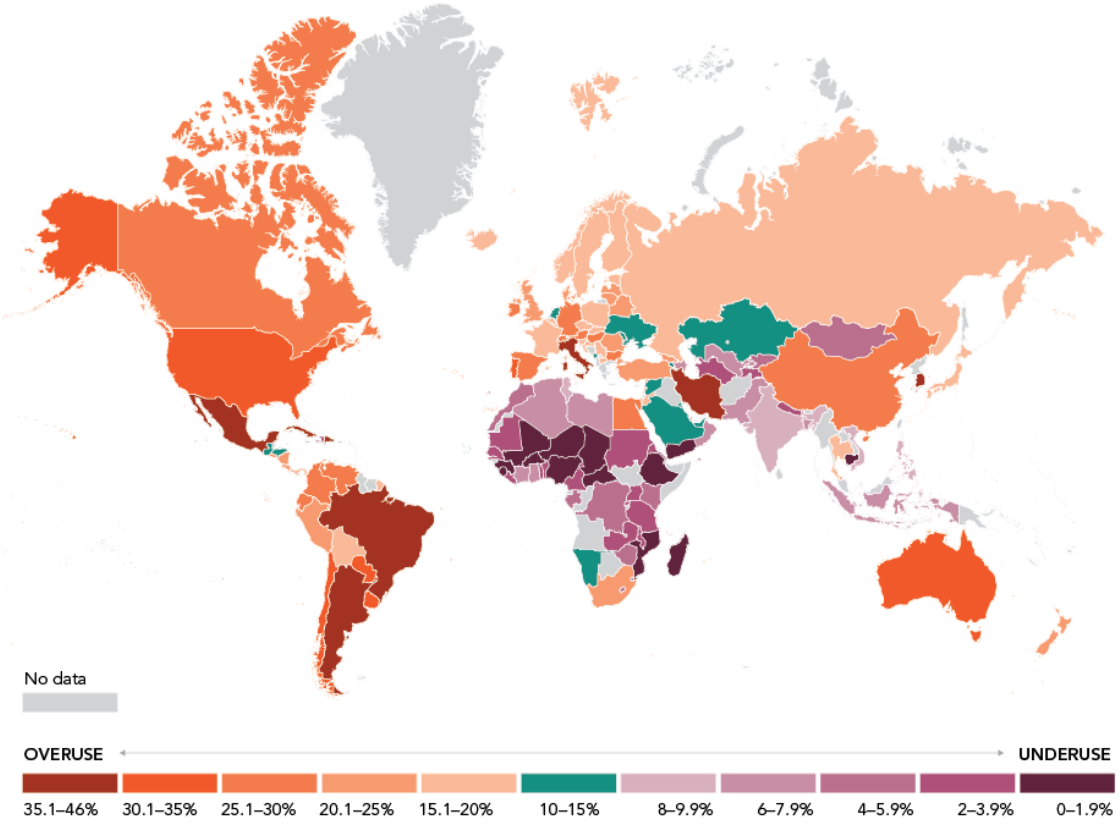
While physicians' convenience and mothers' preferences do matter, our research finds that the institutional environment plays a defining role in defining how much these matter. In Argentina, in private hospitals the mother is assigned to a single physician who takes all decisions regarding the birth, whereas in public hospitals a team of physicians is in charge. Individual physicians agency in public hospitals is thus limited. Changing from a private to a public hospital would reduce a womans chance of undergoing a c-section birth on a working day and it would increase on a holiday or weekend.

The rest of the paper is organized as follows: Section 2 presents related literature on nonmedical factors that affect a woman's chance of having a c-section. Section 3 talks about the medical system in Buenos Aires, Argentina, which is the setting of our paper. Details of the survey data are given in Section 4. In Section 5 we present our identification strategy. Finally, our findings are presented in Section 6, and Section 8 summarizes.

2 Literature review

Past research on non-medical factors influencing caesarean-section rates has looked at physicians' financial incentives (Gruber et al., 1999; Alexander, 2015; Allin et al., 2015; Green, 1978; Lo, 2008), physicians' training (Burns et al., 1995) , as well as at the use of c-sections as a defensive practice against malpractice suits (Kessler and McClellan, 1996; Tussing and Wojtowycz, 1997). A fourth explanation is that of leisure or physician's convenience, which is the focus of this study. This literature can be separated in two. One strand looks at how the hour of the day affects the probability of having a c-section, while the other looks at the impact of the day itself. Spetz et al. (2001) find evidence of increased c-sections in evening hours, but this effect is limited to cases with fee-for-service reimbursement, rather than a fixed salary. Brown (1996) looks at both time of the day as well as the day of the week. He finds that the time of the day is a good predictor for c-sections. The probability

Figure 1: Cesarean sections rates by country



Source: World Health Organization. Infographic: The Huffington Post (2014).

of undergoing a c-section in evening hours - especially on a Friday - is higher than other times of the day. Both Spetz et al. (2001) and Brown (1996) find this effect for elective as well as unscheduled c-sections but more recently, Lefevre (2014) [1] finds otherwise. Looking at US deliveries over 2008-2011, she finds that although there are fewer c-section deliveries in periods around long weekends, this difference can be explained by the scheduling of planned c-section births. Burns et al. (1995), looking at the effect of myriad physician level characteristics on c-section rates, find that convenience does play a role. C-section rates are higher during the daytime, and on a Friday in their data from Arizona, US. However, the authors do not distinguish between planned and unplanned c-sections.

This paper also looks at the demand side or maternal request of c-sections. While no other paper to our knowledge has looked at data on women's own pro-

[1] She bases her result on the hypothesis that elective c-sections would then be planned for just before or just after the long holiday. If indeed the physician cared about his or her leisure, he would schedule the deliveries further away in time from the long weekend. She finds no evidence of c-sections that were displaced far enough away in time that they would indicate a physician's preference for convenience.

fessed preferences, the role of preferences has been studied more indirectly. Grytten et al. (2013) proxy immigrant mothers' preferences by the c-section rates in their countries of origin. They find a substantial role of mothers' preferences in c-section rates in Norway over 1970-2005. Furthermore, they find higher rates among those women who come from countries that stress freedom and choice and self determination. These preferences play a stronger role in scheduled rather than emergency or intrapartum c-sections. Others papers find evidence of the parents' influence in the choice of birth dates – Lo (2003) looks at increased birth rates on days considered traditionally 'auspicious' by Taiwanese, while Dickert-Conlin and Chandra (1999) and Schulkind and Shapiro (2014) find evidence of a shift of births from the first week of January to the last week of December in the United States, which they attribute to increased child tax benefits accruing to births in the previous calendar year. These papers point to the influence of mothers and more generally that of parents, in birthing decisions.

Considering the role of institutions in determining c-section rates, Tussing and Wojtowycz (1994) and Spetz et al. (2001) find, in the context of the US, that group-model health maintenance organizations (HMO) have lower rates of c-sections than other insurance plans. Arrieta and García Prado (2016) find a role of capacity constraints in delivery mode choice in the public sector in Peru. C-sections may be used as a means to free up beds during high demand periods.

3 Background

In Argentina, hospitals are not required to report c-section rates; and there is no official estimate for neither public nor private hospitals. Unofficial statistics determine the rate to be 35%-40% on average, with a much higher rate in private hospitals (about 50%) than public ones (about 25-30%).[2] With the aim to understand the disparity in the rate of c-sections in public and in private hospitals, it is important to understand the differences in their structure and in the health care they provide.

3.1 Health system in Argentina

The Argentinian health system has two types of hospitals - public ones that are free for everyone, and private hospitals that charge for services. In practice, private hospitals are exclusively accessed by those with either private health insurance or social security cover, both regulated by the Superintendency of Health (SSS), an

[2]Sources: IOMA (2015), IECS

independent legal entity which reports to the Ministry of Health.[3] The part of the population that do not have a formal job and cannot afford to pay a private insurance, receive medical attention in public hospitals.[4] Public hospitals are financed by the Ministry of Health and by the money collected from use of services in the private and in the social security sectors.

3.2 Maternity health care

Maternity health care presents many differences in public and private hospitals, mostly due to their organization before, during and after the baby is born.

In public hospitals, there is not a particular physician or midwife that is in charge of following the prenatal care of a particular woman. On the contrary, all workers in the maternity department work in teams which means that, in a given shift, a woman can receive the medical attention of any of the workers in that shift. During pregnancy, it means that a women might or might not receive the medical attention of the same physician/midwife, and she cannot choose who is the person in charge of the follow up examinations. Something similar happen when the birth day arrives and the woman is admitted into the hospital. During labor, the woman receives care of the group of physicians and midwives that are working at the time she arrives. However, if the woman is still in labor when a new shift arrives, the newcomers continue with her care. Decisions about how to proceed in every case are taken by the group, and neither physicians nor midwives have any particular interest in being present at the moment a woman delivers the baby given that they are paid a flat fee that only depends on the hours they work in their shift.

Private hospitals are organized differently. Women choose a particular physician or midwife during the prenatal care and these are the ones who take care of the women not only during the follow up examinations, but also during the delivery. Women develop a very close relationship with their physicians and midwives, and they demand to them a personalized care. The advantages of this type of relationship is that women feel more confident during their pregnancies given that, at the moment of delivery, they knew the person in charge in advance. This is good either for women but also for private physicians that can better estimate their workload in the upcoming months. However, it also raises disadvantages for both: women become

[3]The social security sector in Argentina caters to those employed in the formal sector. All employers and employees in the formal sector are required to make payments to a trust fund towards this. It covers all workers and their families, as well as those retired. It acts principally as a paying agent, purchasing health services from the private sector

[4]A special case is the fund for retired people, the Programa de Atención Médico Integral (PAMI). It contracts out mainly to private providers, although the demand for health services is also partly directed at the public sector.

too dependent to their private physician/midwife, and physicians might have periods of unexpected hard workload being very difficult to organize themselves. Also, it is more risky for physicians for two reasons: first, because they are paid for delivery which makes them also more dependent to women, and second, because they are the main (if not the only) responsible for the outcome.[5] .

4 Data

The data needed to conduct this analysis was facilitated by the Mother and Childs Health Research Department, Institute for Clinical Effectiveness and Health Policy (IECS) that conducted a prospective cohort study on womens preferences for the mode of delivery. The data set comes from survey data and medical records from 382 pregnant women from September 2010 and December 2011. Enrolled women were surveyed to obtain their socioeconomic characteristics and their preference for mode of delivery during the third trimester, particularly if they preferred to give birth by c-section or vaginal delivery. Women were followed-up until delivery when their actual mode of delivery was assessed and the data from their medical records were collected, including the day but not the hour of delivery.

The selection criteria included first-time mothers-to-be (nulliparous women), aged 18 to 35 years, expecting just one child (singleton pregnancies) and a live fetus over 32 weeks of gestational age. The sample is restricted to women between the ages of 18 and 36 years old, in order to maintain a similar age distribution between the private and public hospitals and to reduce the potential confounding due to differences in the age of participants across hospital types. In addition, women with fertility assisted pregnancies, known pre-existing major diseases, with pregnancy complications, or with a medical indication of elective CS, were excluded from the sample.

The data was collected in three public hospitals and three private hospitals in and around the City of Buenos Aires, which typically see more than 2000 deliveries per year (Mazzoni et al., 2016). The hospitals were chosen based on a convenience sample of locations where other research studies have been conducted by IECS. Out of the 382 women surveyed, 182 were admitted to private hospitals and 198 to public ones.[6][7]

[5]Obstetrics is one of the specialities that faces more malpractice claims, and it accounts for the most payments. Also, physicians in obstetrics and gynecology are projected to face a claim by the age of 45 years (Jena et al. (2011)).

[6]Two women were removed from the dataset: one because she was untrackable during the follow up and another one because she had a multiple pregnancy.

[7]In Argentina, 99% of deliveries occur at either public or private hospitals. The sample is

The data collected about deliveries is quite detailed. In particular, about c-section, we know if it was scheduled or not. This gives us a sizeable advantage with respect to other papers that try to identify the effect of convenience on the mode of delivery given that we expect all scheduled c-sections to be perform on convenient days. From the data we can identify two types of c-sections, intrapartum c-sections (ICS) and elective (or scheduled) c-sections (ECS), and if labor was induced or not. An elective c-section is the one that is scheduled by the doctor to take place before labour begins.[8] Also, an elective c-section can also be on maternal request and it is a decision of the physician and the hospital to listen or not the woman's desire. Far more frequently, the need for a CS isn't obvious until a woman is well into labor. An intrapartum c-section is the one that happens once labour has begun, and there are also many reasons for it, such us when labor is stalled, exhaustion or fetal distress, etc. In many countries, intrapartum c-section are also called "emergency CS". However, in Argentina the denomination is a bit different and emergency c-section could happen during labor or not and, if it is the case, it is indicated in our data.[9]

4.1 Summary statistics

Table 1 summarizes the data on types of delivery modes. In our sample, 34.5% of births in public hospitals and 44% of births in private hospitals were by c-section. The disparity in c-section rates between public and private hospitals is thus about 10%, but this differential is lower than the unofficial estimate for Argentina (see Section 3). Looking further into scheduled and unscheduled c-sections, we see that the larger contributor to this difference is the elective c-section rate. Ten percent of all women in our sample have an elective c-section, but women in private hospitals have them three times more often than those in public hospitals. The rate of intrapartum c-sections – c-sections decided once the woman enters labour – is also higher in private hospitals, but the difference is not as stark. Table 13 in the

compatible with the national data from 2010 that says that 55% of the women delivered in public hospitals, and 44% in private ones (Ministerio de Salud de la Nación. Dirección de Estadísticas e Información de Salud., 2010).

[8]There are multiple reason why the physician may peg a woman for the procedure in advance of her due date such us certain medical conditions, infections, the baby's health, placenta problems, etc.

[9]For example, if the reason for a c-section is *"oligohydramnios and altered doppler"*, this is an elective c-section. However, if the doppler is high altered, the elective c-section should be performed as soon as possible, and this could be considered as an emergency c-section. A case of *"eclampsia"* could end up in an emergency c-section either when the woman is in labour or not. In this case, the emergency c-section could be consider intrapartum c-section or not. Finally, a case of *"placental abruption"* in an emergency, but could also happen during labor or not.

Table 1: Type of deliveries by hospital

	Public	Private	Total
All births	197	182	379
Natural births	129	102	231
as % of all births	65,48%	56,04%	60,95%
C-sections	68	80	148
as % of all births	34,52%	43,96%	39,05%
Elective c-sections	9	27	36
as % of all women	4,57%	14,84%	9,50%
Intrapartum c-sections	57	53	110
as % of women in labour	30,32%	34,19%	32,07%

appendix gives us birth data broken down by hospital.

How are the births spread across time? Figure 2 shows the distribution of births by the day of the week. Here we can notice some interesting trends: private hospitals have a peak of deliveries - mainly c-section deliveries - on Mondays and Fridays. The weekends seem to be relatively calm, with a drop in c-section deliveries. Public hospitals have a peak on Tuesday, though this peak does not seem be attributed to c-sections. In the Appendix, Figure 7 and Figure 8 present the same graphics for elective and intrapartum c-sections, respectively.

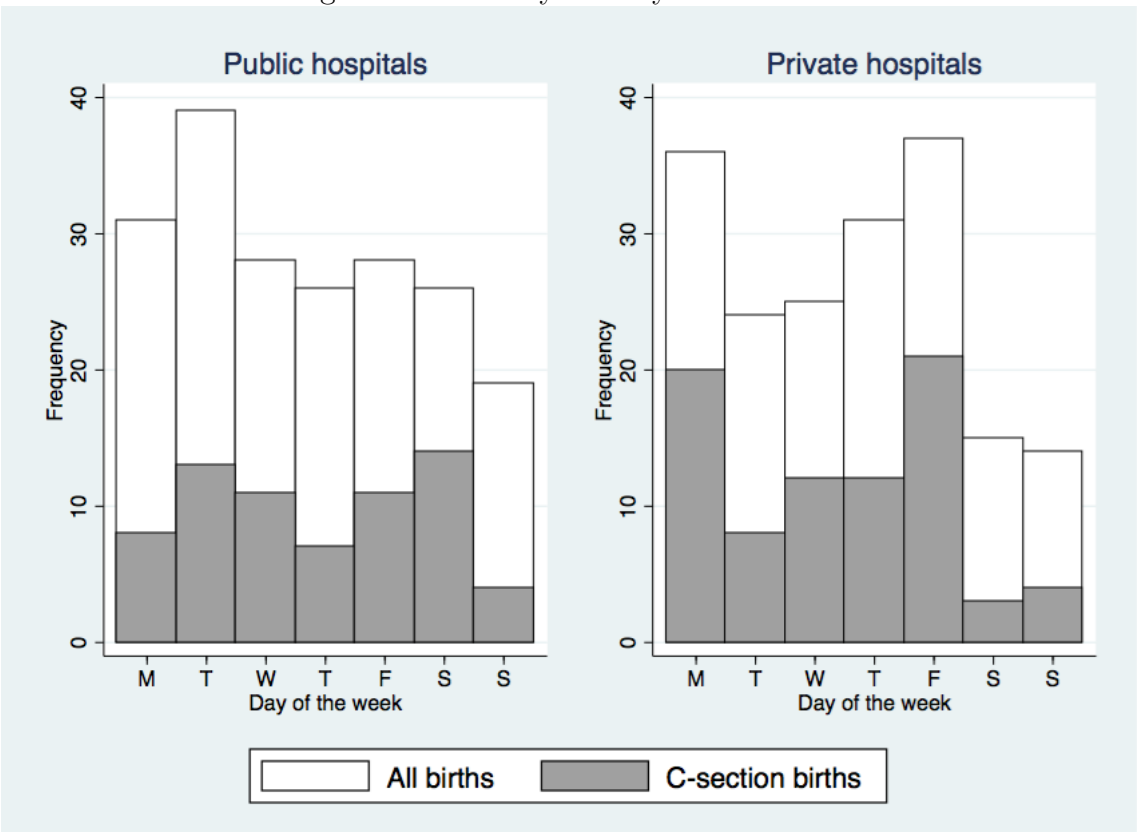
When considering convenience of the physician or their leisure demand, we are not only interested in weekends and weekdays, but also in holidays over the year. Table 2 gives us an idea of how births are spread by working and nonworking days.[10] Here we see that although two-thirds of the days under consideration were working days, three-fourths of babies were delivered on these days. In private hospitals in particular, on average, almost double the number of babies were born on a working day as compared to a nonworking day.

We reports the sociodemographic characteristic of women recruited from public and private hospitals in Table 3. It also reports women preferences for the type of delivery declared during the survey and the actual type of delivery they had.

Women became mothers for the first time at around 26 years old. However, it changes dramatically between hospitals: while in public hospitals women became mothers at almost 23 years old, in private hospitals they do it seven years later (29.9

[10]Our deliveries range from 25 Sep 2010 (Saturday) to 27 Dec 2011 (Tuesday). We begin and and our calendar with these dates. There are 459 days between these two dates (including both dates). Of these, we have 66 weekends (132 days). Of weekend days, 6 days were also public holidays. In addition, 19 public holidays fell on weekdays. Considering public holidays and weekends as inconvenient days where the doctor's demand for leisure is high, we have $132+19 = 151$ inconvenient days, and $459 - 151 = 308$ convenient days.

Figure 2: Births by the days of the week



years old).[11]

In terms of education, more than 90% of women have at least high school education, either complete or incomplete. Nevertheless, the asymmetry between public and private hospitals remains. The majority of women from public hospitals has high school education (71%), but in private hospitals the level of education is higher, where 82% of women have tertiary or university level.

Almost each woman in private hospitals is married or in couple (93.4%), in opposition to public hospitals it is less likely women to be in a stable relationship (69.9%). In addition, women in private hospitals women are more likely to be employed and to be covered by health insurance.

In addition, within the same group of women, it is more likely an older woman in her twenties to be more educated, to be employed, and to be in a stable relationship. Also, considering women of different groups (public vs. private), differences are

[11]This is compatible with the information at national level in 2006 that says the average age of new mothers was 28.1 years. However, this average varies by socioeconomic and educational level of women: 27.2 years old for women who finished college, 23.3 years old for women who completed secondary education, and 21.3 years old for women who completed primary education (Lupica and Cogliandro, 2010).

Table 2: Births by type of day

	Working day	Weekend + public holiday	Total
Total calendar days	308	151	459
	67.10%	32.90%	100.00%
All hospitals			
Births	289	90	379
	76.25%	23.75%	100.00%
Avg. births per day	0.938	0.596	0.826
Public hospitals			
Births	141	56	197
	71.57%	28.43%	100.00%
Avg. births per day	0.458	0.371	0.429
Private hospitals			
Births	148	34	182
	81.32%	18.68%	100.00%
Avg. births per day	0.481	0.225	0.397

bigger. As we mentioned above, public health in Argentina is perceived of being of lower quality than the private one, which results in women of high socioeconomic status to choose to pay for private health. In addition to this, more educated women are more likely to be employed and to receive social security that, in most of the cases, partially cover private health care.

Table 4 presents us information on women's professed preferences. Despite the different characteristics between the two groups of women, we see that there is no significant difference between women's preferences for mode of delivery. Only 8.1% of women in the public sector and 6.5% of women in the private sector expressed a preference towards cesarean section ($p = 0.55$). A minority showed indifference about the mode of delivery in the private sector (6.6%), but none of women in the public sector did. The rate of c-section is higher among the group of women who declare having a preference towards c-section rather than vaginal delivery, in both public and private hospitals (44% in comparison with 34%, and 73% as opposed to 40%, respectively). This numbers would suggest that women's preferences are taken into account when deciding the mode of delivery.

Moreover, among the group of women who are indifferent about the mode of delivery in the private sector, the rate of c-section is closer to the group of women who prefer a c-section, suggesting that indifference could play a role of increasing the rate of c-section in the private sector.

Table 3: Women's characteristics

All hospitals	N	mean	sd	min	max
Age	379	26,214	5,375	18	36
Education					
Elementary School	378	0.093	0.290	0	1
High School	378	0.458	0.499	0	1
Tertiary/University	378	0.450	0.498	0	1
Married/in couple, or not	378	0.812	0.391	0	1
Working or not	375	0.477	0.500	0	1
Insured or not	379	0.464	0.499	0	1
Prefers CS	367	0.074	0.261	0	1
Had CS	379	0.391	0.489	0	1
Public hospitals					
Age	197	22,792	4,104	18	35
Education					
Elementary School	196	0.179	0.384	0	1
High School	196	0.714	0.453	0	1
Tertiary/University	196	0.107	0.310	0	1
Married/in couple, or not	196	0.699	0.460	0	1
Working or not	197	0.157	0.365	0	1
Insured or not	197	0.000	0.000	0	0
Prefers CS	197	0.081	0.274	0	1
Had CS	197	0.345	0.477	0	1
Private hospitals					
Age	182	29,918	3,946	18	36
Education					
Elementary School	182	0.000	0.000	0	0
High School	182	0.181	0.386	0	1
Tertiary/University	182	0.819	0.386	0	1
Married/in couple, or not	182	0.934	0.249	0	1
Working or not	178	0.831	0.375	0	1
Insured or not	182	0.967	0.179	0	1
Prefers CS	170	0.065	0.247	0	1
Had CS	182	0.440	0.498	0	1

Table 4: Preference for mode of delivery and its rate of CS

	Preference for VD	Rate of CS
Public hospital	91.88%	33.70%
Private hospital	93.53%	40.25%
Total	*92.64%*	*36.76%*
	Preference for CS	Rate of CS
Public hospital	8.12%	43.75%
Private hospital	6.47%	72.73%
Total	*7.36%*	*55.56%*
	No preference	Rate of CS
Public hospital	0%	0%
Private hospital	6.59%	66.67%
Total	*6.59%*	*66.67%*

5 Identification strategy

We want to identify the effect of physician's convenience and mother's preferences over the rate of c-sections in public and private hospitals. Given the differences in how these hospitals are organised, we expect these factors to matter more for private hospitals. This is because in private hospitals, each doctor individually handles a birth. This means that they are affected by the timing and duration of delivery, but also that they can take all decisions regarding the delivery. In public hospitals, on the other hand, a team of doctors handles each case. No one doctor has complete say over medical decisions, nor is the burden of delivery only on one doctor.

In studying c-sections, we first make a distinction between those that are scheduled ahead of time (elective c-sections), and those that are initiated only once the woman goes into labour (intrapartum c-sections). We make this distinction because the extent and manner that nonmedical factors may affect their likelihood are different. We expect that preferences should matter for elective c-sections, but not for intrapartum ones. Further, since elective c-sections are planned ahead in time, the date of delivery is more of an outcome of this decision. However, the date of delivery could be a potential predictor of intrapartum c-section rates.

Looking at elective c-sections, we consider whether the hospital (i.e. whether it is private or public) and whether the woman herself prefers a c-section over a natural birth matters. For this we run a probit regression, controlling for women's age as well as hospital level characteristics.[12] For the latter variable, we include hospital

[12]We could control for other socio-economic characteristics of the woman, however age was the only medically important one. Insurance could be important but perfect bifurcation. Trying to be judicial with our use of controls given sample size.

level fixed effects. This is done to control for possible omitted variables that could affect c-section rates such as number of beds or number of doctors.

When it comes to intrapartum c-sections, we exclude from our sample those women who undergo an elective c-section. Doing so, we consider only those that enter labour. Among these, some go on to have intrapartum c-sections and others, natural births. Our main question is how a woman's chance of getting a c-section once in labour is affected by the hospital, and the day that she has gone into labour. Our hypothesis is that doctors would like to avoid work on an inconvenient day, and would want to shift births to days before/after these days – to convenient days. We follow the same regression as for elective c-sections, but also include convenience considerations.

To include physician convenience, we consider different specifications of "convenient days". To understand these, it is easier to understand what we consider as inconvenient days. Convenient days are the complement set of the inconvenient days, i.e. any day that is not an inconvenient day is a convenient day. In the first specification, inconvenient days are simply the weekend and public holidays. The second specification includes these, and also the day before holidays.[13] Since c-sections require follow up care, a doctor may wish to avoid c-sections just before a day off. The third specification is similar to the second one but excludes the previous days before holidays falling midweek (e.g. a holiday on a Wednesday doesnot render Tuesday as inconvenient). In this specification, inconvenient days are weekends, holidays and days that are part of 'long weekends'. Table 12 describes the different specifications visually.

If physicians want to shift deliveries off inconvenient days, then we should expect more c-sections on convenient days. However, there are two different effects that affect the overall rate of c-sections on convenient days. First, there is the effect of elective c-sections. When a delivery is planned in advanced, then physicians choose to schedule it on a convenient day.[14] Second, the effect of intrapartum c-sections: physicians might not want to wait for the normal process of labour and they might decide to proceed with a c-section, even when it was not strictly necessary. The first effect is an affect that we expect either in public and in private hospitals. Nevertheless, the second one is an effect that, in case it exists, it should be observable in private hospitals, where physicians are more interested in speeding up the process.

Our data does not allow us to control for doctor's characteristics. We do not know

[13] If a public holiday is a Monday, given the effect of the long weekend, the previous day is defined on Friday, but if the holiday falls on a Saturday or a Sunday, the previous day is not considered as an inconvenient day in this specification. See Table 12 for more details.

[14] Hospitals are better prepared in case of an emergency, etc.

how training or years of experience etc. could determine delivery mode. However, we can safely exclude physicians financial incentives as a factor. This is because, as mentioned in Section 3, doctors in Argentina are paid for delivery and not for the type of procedure.

We assume different definitions of convenient days. However, all of them have in common that in weeks when there is no public holiday, the convenient period is from Monday to Friday. Physicians may want to avoid working on weekends, so we might observe more c-sections performed during the convenient period.

In weeks where there is a public holiday, several specifications are taken into account depending on the day of the week that this public holiday falls. We do not expect the same effect if a public holiday is observed on a Monday, than if it is observe in mid-week. The reason is quite simple, a holiday on a Monday creates a three-day weekend, also called "long weekend", and it induces workers, for instance, to use them to plan city trips with their families. Physicians are not exempt of it. However, we test different hypothesis and we show that results are robust to different specifications (see Table 12 for more details).

In a first specification, convenient days are defined as any day of the week except Saturday, Sunday and public holidays (conv. day (1)). Our second specification also considers as a non-convenient day the previous day before holidays, whatever it is on Monday or in mid-week. If physicians don't want to put in risk their leisure time, they would rather avoid intrapartum c-sections the days before public holidays also, given that performing an intrapartum c-section means that a private physician has to come back the following day to the hospital to check up the woman and the baby. If a public holiday is a Monday, given the effect of the long weekend, the previous day is defined on Friday, and if it is on Saturday or Sunday, the previous day is not considered (conv. day (2)). Our third specification, considers days before public holidays only when a public holiday is on Monday and a delivery might threaten physicians' leisure time in a long weekend. This specification is similar to our second one, but the difference is that a public holiday in mid-week does not make inconvenient the previous day (conv. day (3)).

To assess the effect of physicians' convenience on the cesarean decision, we initially run probit regressions of the form

$$CS_i = f(\alpha + \beta_1 PrH_i + \beta_2 conv_i + \beta_3 PrH_i \times conv_i + \beta_4 pref\_ces_i + \beta_5 PrH_i \times pref\_ces_i + \beta_6 age_i + \varepsilon_i) \quad (1)$$

where

CS_i	is equal to one if individual i received a c-section, and zero otherwise
PrH_i	is an indicator if individual i delivers in a private hospital
$conv_i$	is an indicator if individual i delivers on convenient day
$pref\_ces_i$	is one if the stated preference of individual i is a c-section
age_i	is the age of individual i at the moment of delivery

We are interested in seeing that given two women with the same $pref\_ces_i$, how the other variables on the RHS affect the outcome CS_i. In this regression, the c-section decision is modelled as a function of the mother's age and preferences, as well as the type of hospital and the type of day of delivery. However, as documented above, the date of delivery is an outcome and not a determinant of elective c-sections and this regression does not illustrate a causal relationship in this case. Our preferred specification is

$$ECS_i = f\left(\alpha + \beta_1 PrH_i + \beta_4 pref\_ces_i + \beta_5 PrH_i \times pref\_ces_i + \beta_6 age_i + \varepsilon_i\right) \quad (2)$$

where ECS_i is equal to one if individual i scheduled a c-section, and zero otherwise;[15] and

$$ICS_i = f(\alpha + \beta_1 PrH_i + \beta_2 conv_i + \beta_3 PrH_i \times conv_i + \beta_4 pref\_ces_i + \beta_5 PrH_i \times pref\_ces_i + \beta_6 age_i + \varepsilon_i) \quad (3)$$

where $IECS_i$ is equal to one if individual i received a c-section, and zero otherwise. As we already mentioned, the specification for elective c-sections takes into account the whole sample (given that this decision is taken over the whole sample). Nevertheless, when using the second specification, we take into account only women that enter labour.

6 Results

The results for all c-sections - elective and intrapartum - are given in Table 5. While we can see the hospital (private or public) matters for c-section rates, the day of delivery only seems to matters in private hospitals.[16] Once we include hospital fixed effects, it is not possible to rely on the coefficient of the variable "Private hospital" anymore. However, we can still trust in the interactions, and convenience

[15] In this specification we do not know if the c-section was scheduled by the doctor for a medical condition or not. However, given the information on women's preferences we can control for the women's will.

[16] The effect of age is positive and significant when we remove the variable "Age sq.".

remains significant for private hospitals. These results, however, do not tell us what determines the rate of c-sections. This is because the day of delivery (variable convenient day or 'Conv. day') could be either a determinant or an outcome of our regressand – depending on whether it is an elective or intrapartum c-section. The next two subsections look at each of these separately, to be able to actually explain the rates that we observe.

6.1 Elective c-sections

An elective c-section is a c-section delivery that has scheduled by the doctor ahead of time. These are usually done because the mother or the fetus are at risk from a vaginal delivery, such as in the case if the baby is in breech position or if the mother has previously had a c-section delivery. Nevertheless, the elective c-section can also be scheduled for the woman's demand.

Table 6 presents the results of the probit estimation of elective c-sections. As the day of the delivery is now an outcome of the decision to have a c-section, we have omitted it from our dependent variables. Specification (2) controls for hospital level fixed effects.[17]

Table 7 gives us the predicted probability of an elective c-section birth for women going to each hospital. Women in private hospitals have a 2.7 times higher probability of planned c-section births than women in public hospitals. However, part of this difference could be explained by the difference of age in the two groups of women itself. To correct for this, Table 8 gives us the probability of an elective c-section for the average aged woman (26 years old) in each hospital. We see that the difference is a little narrower: the probability a 26 year old woman undergoes an elective c-section in a private hospital is double that in a public hospital. Figure 3 gives us these probabilities over all the ages of women in the sample. We see that the probability of having an elective c-section increases unambiguously with age, but remains consistently higher in private hospitals.

[17] In this specification, the observations (338) are fewer than in the first specification as in one of the hospitals, there were no reported elective c-sections (hospid=6, public hospital).

Table 5: C-section: C-section: probit estimation

VARIABLES	(1) ces	(2) ces	(3) ces	(4) ces	(5) ces	(6) ces
Private hospital (PrH)	-0.580*	-0.606**	-0.652**	-	-	-
	(0.317)	(0.290)	(0.301)	(0.436)	(0.421)	(0.427)
Conv. day	-0.0882	-0.108	-0.0866	-0.139	-0.151	-0.123
	(0.204)	(0.196)	(0.202)	(0.208)	(0.199)	(0.202)
PrH x Conv. day	0.651*	0.729**	0.762**	0.750**	0.786**	0.831**
	(0.334)	(0.311)	(0.318)	(0.342)	(0.315)	(0.324)
Prefers CS	0.279	0.278	0.281	0.291	0.289	0.294
	(0.328)	(0.329)	(0.328)	(0.335)	(0.336)	(0.335)
PrH x Prefers CS	0.464	0.428	0.423	0.491	0.449	0.446
	(0.541)	(0.542)	(0.543)	(0.552)	(0.552)	(0.553)
Age + 18	0.0327	0.0321	0.0306	0.0277	0.0263	0.0254
	(0.0515)	(0.0516)	(0.0516)	(0.0522)	(0.0523)	(0.0523)
Age sq.	5.28e-05	0.000108	0.000265	-4.64e-05	6.20e-05	0.000188
	(0.00285)	(0.00285)	(0.00286)	(0.00289)	(0.00289)	(0.00289)
Constant	-0.522**	-0.513**	-0.524***	-1.073***	-1.063***	-1.078***
	(0.233)	(0.224)	(0.225)	(0.355)	(0.354)	(0.353)
Observations	367	367	367	364	364	364
Hospital FE	NO	NO	NO	YES	YES	YES
Convenience definition	(1)	(2)	(3)	(1)	(2)	(3)

Notes: columns (1), (2) and (3) use different specifications of convenient days defined in the previous Section. Columns (4), (5) and (6) use the same specification for (1), (2) and (3) but adding fixed effects, respectively.

Standard errors in parentheses

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

To consider the role of women's professed preferences of delivery mode, we turn to Table 9. Here for each group of women (sorted along the dimension of preferences and hospital), we have the expected probability of a c-section. The starkest difference is for women who prefer c-sections over natural births, and who are admitted to private hospitals. Their chance of having a scheduled c-section is five times that of any other class of women. Preferences don't seem to make much of a difference in public hospitals. Figure 4 presents the same information but at each given age. We see that the probability of having a planned c-section increases with age across the board, and that women in private hospitals who prefer c-sections are much more likely to have them. These women seem to explain most of the difference of elective c-section rates between public and private hospitals.

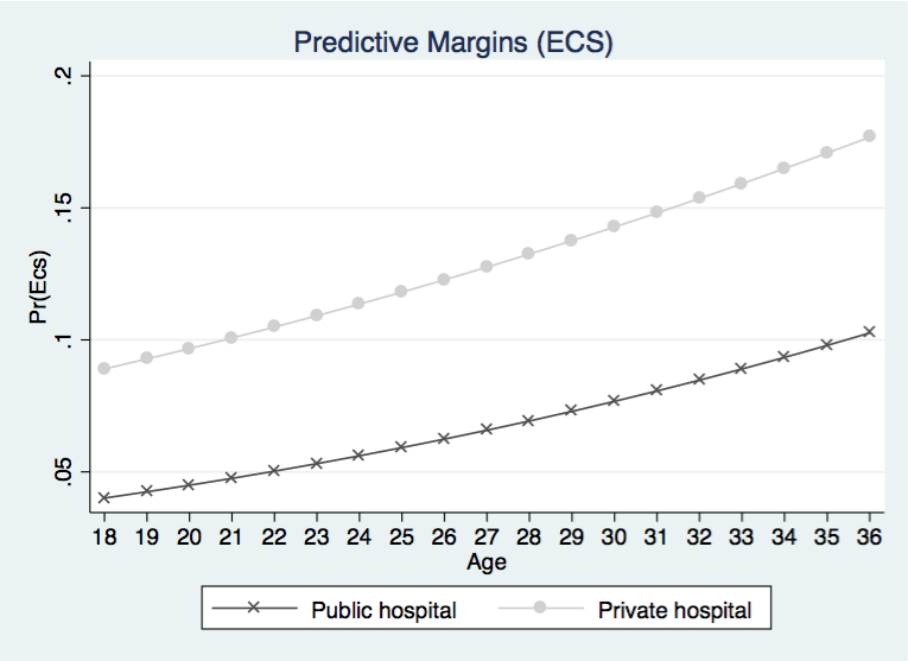
To summarize, women in private hospitals are much more likely to have an elective c-section, especially if they themselves would prefer to have one. These women then give birth during the week (on a convenient day), mostly on a Friday, as we can see from Figure 7 in the Appendix. Those women who have an elective c-section in public hospitals too give birth on weekdays, but the most likely day of birth is a Tuesday and not a Friday.

Table 6: Elective c-section: probit estimation

VARIABLES	(1)	(2)
Private hospital (PrH)	0.339	-
	(0.289)	(0.389)
Age	-0.109	-0.1085
	(0.077)	(0.083)
Age sq.	0.008*	0.007*
	(0.004)	(0.004)
Prefers CS	0.106	0.0412
	(0.532)	(0.578)
PrH x prefers CS	1.087	1.388*
	(0.670)	(0.741)
Constant	−1.492***	−1.813***
	(0.270)	(0.389)
Observations	367	338
Hospital FE	NO	YES

Standard errors in parentheses
$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Figure 3: Predicted probability of undergoing an elective c-section



Note: this is using the specification without FE, without age sq. Similar if both used.

Figure 4: Predicted probability of undergoing an elective c-section

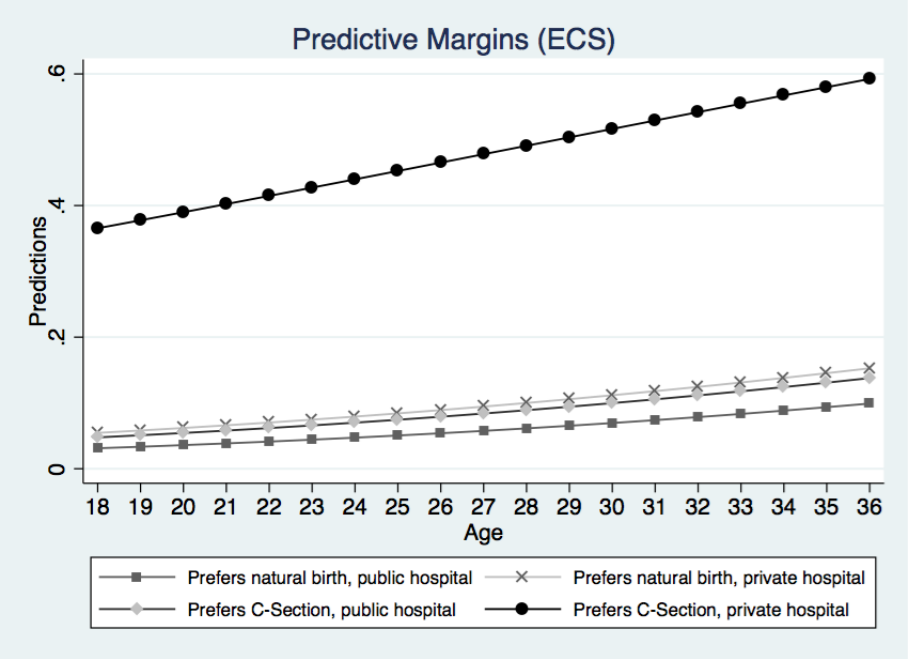


Table 7: Elective c-section: marginal effects for each hospital

VARIABLES	(1)	(2)
Public hospital	0.0467***	-
	(0.0150)	(0.0170)
Private hospital	0.140***	0.145***
	(0.0253)	(0.0250)
Observations	367	338
Hospital FE	NO	YES

Standard errors in parentheses
$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Table 8: Elective c-section: marginal effects for a 26 y.o. in each hospital

VARIABLES	(1)	(2)
Public hospital	0.056***	-
	(0.0191)	(0.0211)
Private hospital	0.113***	0.123***
	(0.0301)	(0.0309)
Observations	367	338
Hospital FE	NO	YES

Standard errors in parentheses
$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Table 9: Elective c-section: marginal effects

VARIABLES	(1)	(2)
Prefers natural birth, public hospital	0.0436***	-
	(0.0151)	(0.0170)
Prefers natural birth, private hospital	0.111***	0.0847***
	(0.0251)	(0.0251)
Prefers c-section, public hospital	0.0650	0.0576
	(0.0615)	(0.0619)
Prefers c-section, private hospital	0.515***	0.553***
	(0.153)	(0.170)
Observations	367	338
Hospital FE	NO	YES

Standard errors in parentheses
$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

6.2 Intrapartum c-sections

As we previously mentioned, an intrapartum c-section is a procedure that takes place once the woman is on labour. During a first-time birth, a first labor lasts 16 hours on average, however, this can vary tremendously.[18] If a woman arrives in the hospital once in labour, we assume that no elective c-section was previously scheduled and so there is no clear indicator that the woman or baby were at risk.[19] Then, this woman might deliver her baby either vaginally or by intrapartum c-section. Figure 8 in the Appendix shows us the distribution of delivery modes once in labour for our sample. Overall, of the women who enter labour, 30.3% go on to have an intrapartum c-section in public hospitals in our sample, while 34.2% have one in private hospitals (Table 14 in the Appendix). So both elective and intrapartum c-section rates are higher in private hospitals, though the difference for intrapartum c-sections is not much (the difference is not statistically significant, $p = 0.05$).

There are many thing we want to test in the model for intrapartum c-sections. First, we want to know if the professed preferences for delivery mode is taken into account when women are in labour. Since preferences do not play a role in public hospitals for elective c-sections, we expect this to be maintained for intrapartum ones. Further, we expect preferences to matter less for intrapartum c-sections than for elective c-sections, where the doctor is better disposed to account for nonmedical factors. Second, we want to know if the rate of intrapartum c-sections is higher for private hospitals. If the scheduling effect is real for private hospitals, we should observe a higher rate of intrapartum c-sections only due to the fact that a woman is delivering in a private hospital. But, most importantly, we should observe a higher rate of intrapartum c-sections on convenient days: if physicians in private hospitals can have an effect in the timing of delivery, then we should observe more intrapartum c-sections before and after inconvenient days. Last, but not least, we want to know the effect of age on intrapartum c-sections. Age is often cited as a reason for the rise of c-sections. However, this may be the confounding effect of health issues such as high blood pressure, diabetes or heart disease, which increase with age. In our sample, the women have none of these prexisting conditions and so we can truly isolate the effect of age on the probability of having a c-section.

Table 11 presents our probit estimates for the three specification of convenient days. Results are robust to the different specifications. About the preference for

[18] Even when the early stage of labour can last for two or three days, most of women may not even notice that they are in early labour. Then, most of women are admitted into a hospital when labour is at more advanced levels and delivery is imminent (within 24 hours).

[19] It may be the case that the woman goes into labour before the schedule elective c-section, but we assume this is not the case.

mode of delivery, it seems that it does not change the probability of having an intrapartum c-section. As we previously mentioned, if this preference is taken into account, it is more likely to be significant in elective c-sections.

Older women have a higher probability of having an intrapartum c-section, but its coefficient is not significant. The average predicted probability of undergoing an intrapartum c-section is 33%, but it is 8% lower for an eighteen-year-old woman and reaches 8% higher at 35 years old.[20] This result suggests that increasing maternal age is linked with a higher risk of emergency delivery, in a low-risk, first time mother cohort.[21]

From Table 11 we can also see that delivering in a private hospital on inconvenient days has a negative effect on the probability of having an intrapartum c-section. But most interesting is the result that comes from the coefficient of convenient day and its interaction with private hospital: while being in labour in a convenient day does not change the probability of having an intrapartum c-section in a public hospital (in comparison with inconvenient days), it does increase the probability in a private hospital, in all specifications. Then, what we observe is that even when the overall rate of intrapartum c-section is similar in public and private hospitals, its distribution in convenient and inconvenient days is quite different: physicians in private hospitals shift deliveries off leisure periods, performing more intrapartum c-sections on convenient days.

Table 10: Average discrete effects from the Probit model

Public hospital	
Conv. day	0.284***
Inconv. day	0.342***
Difference	-0.058
Private hospital	
Conv. day	0.380***
Inconv. day	0.212***
Difference	0.168**
All hospitals	
Conv. day	0.325***
Inconv. day	0.286***
Difference	0.04
Standard errors in parentheses	
$^{***}p < 0.01,^{**}\, p < 0.05,^{*}\, p < 0.1$	

[20] The average discrete effect of age is similar in both, private and public hospitals.
[21] Similar results were found in Herstad et al. (2015).

Table 11: ICS: Probit estimation

VARIABLES	(1) ics	(2) ics	(3) ics	(4) ics	(5) ics	(6) ics	(7) ics
Private hospital (PrH)	-	-0.613*	-0.597**	-0.639**	-	-	-
	(0.365)	(0.321)	(0.294)	(0.306)	(0.443)	(0.428)	(0.434)
Conv. day		-0.199	-0.197	-0.158	-0.245	-0.252	-0.186
		(0.208)	(0.201)	(0.204)	(0.213)	(0.206)	(0.209)
PrH x conv. day		0.696**	0.721**	0.743**	0.751**	0.780**	0.777**
		(0.342)	(0.319)	(0.327)	(0.350)	(0.324)	(0.333)
Age	0.055	0.0597	0.0582	0.0570	0.0539	0.0518	0.0508
	(0.559)	(0.0553)	(0.0553)	(0.0553)	(0.0562)	(0.0562)	(0.0562)
Age sq.	-0.002	-0.00197	-0.00186	-0.00170	-0.00194	-0.00180	-0.00164
	(0.003)	(0.00310)	(0.00310)	(0.00311)	(0.00314)	(0.00314)	(0.00315)
Constant	-1.190***	-0.593**	-0.601***	-0.623***	-1.053***	-1.044***	-1.079***
	(0.336)	(0.236)	(0.229)	(0.231)	(0.358)	(0.358)	(0.357)
Observations	340	343	343	343	340	340	340
Hospital FE	YES	NO	NO	NO	YES	YES	YES

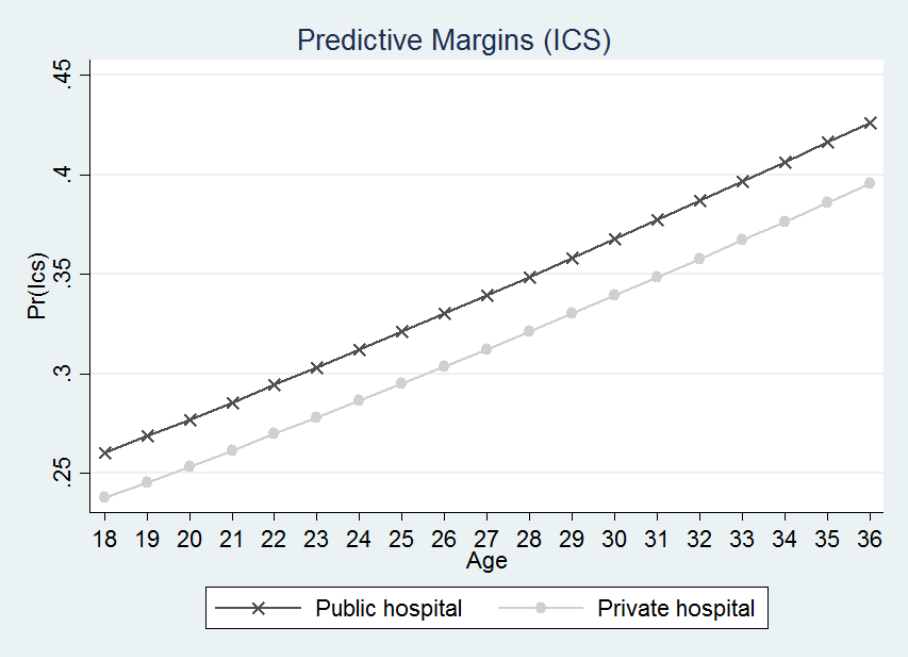
Notes: columns (2), (3) and (4) use different specifications of convenient days defined in the previous Section. Columns (5), (6) and (7) use the same specification for (2), (3) and (4) but adding fixed effects, respectively.

Standard errors in parentheses

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

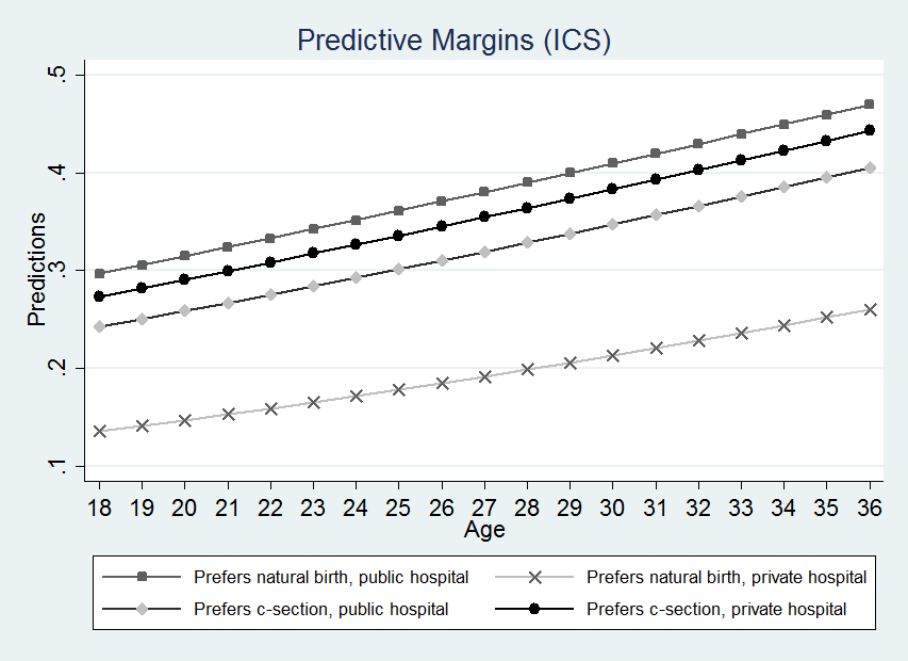
In Table 10 we present the average discrete effects from the Probit Model with fixed effects (results are similar without fixed effects). When we observe the effect of convenient and inconvenient days over hospitals, we find some differences. While in public hospitals the probability of having an intrapartum c-section is a bit higher on inconvenient days (34% versus 29% on convenient days), this difference is not statistically significant ($p = 0.425$). However, for private hospitals we observe the opposite: there is a higher probability of having an intrapartum c-section in convenient days (38% against 21% on inconvenient days) and, in this case, the difference is higher and statistically significant ($p = 0.04$).

Figure 5: Predicted probability of undergoing an intrapartum c-section



However, even when we would expect that convenience plays a key role in increasing the rate of intrapartum c-section in private hospitals on convenient days, we observe that the effect is on inconvenient days: a woman that delivers in a private hospital, conditionally on not being scheduled a c-section, has a significant lower probability of having an intrapartum c-section on inconvenient days (see Figure 6). This result might be due to the fact that more women schedule c-sections in private hospitals, which means that, at this stage of pregnancy, only healthier women are considered.

Figure 6: Predicted probability of undergoing an intrapartum c-section



7 Discussion/Further analysis

Even when we know that physicians are not paid differently for the mode of delivery, hospitals receive higher refunds. Then, we cannot identify if hospitals exert a pressure on physicians to increase the number of c-sections by sharing with them the premium they get from performing a c-section rather than a natural delivery.

1. We could control for induction in natural births, this is another instrument to speed up a birth process.

2. Is selection after elective c-section the only reason why we observe fewer intrapartum c-sections in private hospitals on holidays/weekends?

3. How many births displaced from inconvenient to convenient day by elective c-sections (fewer admissions in private hospitals on weekend bc of peak of elective c-sections on Friday?)

4. We assume labour has been entered on the same date as date of delivery. This may not be the case. We should also look at the day before the DOB.

5. We could do a better job at excluding other incentives, especially at hospital level. However, so far, we couldn't get more data on how much hospital gains from each procedure, or revenues in general.

8 Conclusion

From our study of c-sections in Argentina, we find that there are marked differences in outcomes in the private and public hospitals. A woman's chance of having a scheduled or elective c-section birth is much higher (more than double) if she is admitted to a private than a public hospital. Moreover, if she herself prefers a c-section over a traditional delivery, she is about five times likely to get one in a private hospital than a public one. Among those women who enter labour, a third go on to have an intrapartum c-section in both hospitals. However, behind the similar rates of intrapartum c-sections is a hidden story.

For intrapartum c-sections, the day of labour is crucial to the outcome in private hospitals. On a working day, women are twice more likely to give birth with a c-section than on a weekend or a holiday. In public hospitals, the rates of c-sections do not vary much by day. Though a woman is much less likely to have a c-section in a private hospital on a nonworking day; given that there are twice more working days than nonworking days, and that weekends see fewer women enter labour (perhaps due to the peak of scheduled c-sections on Fridays), the overall rates of intrapartum c-sections are similar for private and public hospitals.

Controlling for preexisting health conditions, age has a slightly positive effect on the chance of having a c-section, but there is a large variance in its impact and as such we do not find it to be significant.

Lastly, we do not find evidence that delivering in a public hospital, where physicians work in teams, is associated with a lower rate of c-sections in comparison with private hospitals, where women are followed up by a single physician. What we do find is that private hospitals schedule more c-sections and also perform more intrapartum c-sections on convenient days.

References

Alexander, D. (2015). Does physician pay affect procedure choice and patient health? evidence from medicaid c-section use. *mimeo*.

Allin, S., Baker, M., Isabelle, M., and Stabile, M. (2015). Physician incentives and the rise in c-sections: Evidence from canada. *NBER Working Paper Series*, page 21022.

Arrieta, A. and García Prado, A. (2016). Non-elective c-sections in public hospitals: capacity constraints and doctor incentives. *Applied Economics*, pages 1–13.

Brown, H. S. (1996). Physician demand for leisure: implications for cesarean section rates. *Journal of Health Economics*, 15(2):233–242.

Burns, L. R., E., G. S., and R., W. D. (1995). The effect of physician factors on the cesarean section decision. *Medical Care*, 33(4):365–382.

Dickert-Conlin, S. and Chandra, A. (1999). Taxes and the timing of births. *Journal of Political Economy*, 107(1):161–177.

Gibbons, L., Belizán, J. M., Lauer, J. A., Betrán, A. P., Merialdi, M., Althabe, F., et al. (2010). The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage. *World health report*, 30:1–31.

Green, J. (1978). Physician-induced demand for medical care. *Journal of Human Resources*, pages 21–34.

Gruber, J., Kim, J., and Mayzlin, D. (1999). Physician fees and procedure intensity: the case of cesarean delivery. *Journal of health economics*, 18(4):473–490.

Grytten, J., Skau, I., and Sørensen, R. (2013). Do mothers decide? the impact of preferences in healthcare. *Journal of Human Resources*, 48(1):142–168.

Herstad, L., Klungsyr, K., Skjrven, R., Tanbo, T., Forsn, L., byholm, T., and Vangen, S. (2015). Maternal age and emergency operative deliveries at term: a populationbased registry study among low-risk primiparous women. *BJOG: An International Journal of Obstetrics & Gynaecology*, 122(12):1642–1651.

IOMA (2015). La Scaleia: El aumento de las cesáreas es una problemática socio sanitario. Available at http://www.ioma.gba.gov.ar/aumento-cesareas.php. [Accessed: 06/06/2016].

Jena, A. B., Seabury, S., Lakdawalla, D., and Chandra, A. (2011). Malpractice risk according to physician specialty. *New England Journal of Medicine*, 365(7):629–636.

Kessler, D. and McClellan, M. (1996). Do doctors practice defensive medicine? *The Quarterly Journal of Economics*, 111(2):353–390.

Lefevre, M. (2014). Physician induced demand for cesarean sections: does the convenience incentive matter? In *Health & Healthcare in America: From Economics to Policy*. Ashecon.

Lewis, K. (2015). The story behind C-sections in America: A state-by-state analysis and a new C-section predictor for pregnant women. Available at https://amino.com/blog/c-section-rates-in-america-state-by-state-analysis-new-c-section-predictor-pregnant-women/. [Accessed: 27/06/2016].

Lo, J. C. (2003). Patients attitudes vs. physicians determination: implications for cesarean sections. *Social Science & Medicine*, 57(1):91–96.

Lo, J. C. (2008). Financial incentives do not always work an example of cesarean sections in Taiwan. *Health Policy*, 88(1):121 – 129.

Lupica, C. and Cogliandro, G. (2010). Cuadernillo estadstico de la maternidad n 4 : madres en la argentina : persistencias y transformaciones en los ltimos 20 aos. *Observatorio de la Maternidad*.

Mazzoni, A., Althabe, F., Gutierrez, L., Gibbons, L., Liu, N. H., Bonotti, A. M., Izbizky, G. H., Ferrary, M., Viergue, N., Vigil, S. I., et al. (2016). Womens preferences and mode of delivery in public and private hospitals: a prospective cohort study. *BMC pregnancy and childbirth*, 16(1):1.

Ministerio de Salud de la Nación. Dirección de Estadísticas e Información de Salud. (2010). Estadísticas Vitales. Anuario 2010. Buenos Aires. Available at www.deis.gov.ar/publicaciones/archivos/serie5nro54.pdf. [Accessed: 23/05/2016].

Schulkind, L. and Shapiro, T. M. (2014). What a difference a day makes: quantifying the effects of birth timing manipulation on infant health. *Journal of Health Economics*, 33:139–158.

Spetz, J., Smith, M. W., and F., E. S. (2001). Physician incentives and the timing of cesarean sections: Evidence from california. *Medical Care*, 39(6):536–550.

The Huffington Post (2014). Brazil isnt the only country with a startlingly high c-section rate. Available at www.huffingtonpost.com/2014/04/16/c-section-rates_n_5161162.html. [Accessed: 06/06/2016].

Tussing, A. D. and Wojtowycz, M. A. (1994). Health maintenance organizations, independent practice associations, and cesarean section rates. *Health services research*, 29(1):75.

Tussing, A. D. and Wojtowycz, M. A. (1997). Malpractice, defensive medicine, and obstetric behavior. *Medical care*, 35(2):172–191.

WHO (2015). WHO statement on caesarean section rates. Available at www.who.int/reproductivehealth/publications/maternal_perinatal_health/cs-statement/en/.

A Appendix: Tables

Table 12: Convenient days

		(1)	(2)	(3)
Normal Week	Tuesday	x	x	x
	Wednesday	x	x	x
	Thursday	x	x	x
	Friday	x	x	x
	Saturday			
	Sunday			
	Monday	x	x	x
Week with long weekend (ex.: on Monday)	Tuesday	x	x	x
	Wednesday	x	x	x
	Thursday	x	x	x
	Friday	x		
	Saturday			
	Sunday			
	Monday			
Week with mid-week holiday (ex.: on Wednesday)	Tuesday	x		x
	Wednesday			
	Thursday	x	x	x
	Friday	x	x	x
	Saturday			
	Sunday			
	Monday	x	x	x

Figure 7: Elective c-section births by the days of the week

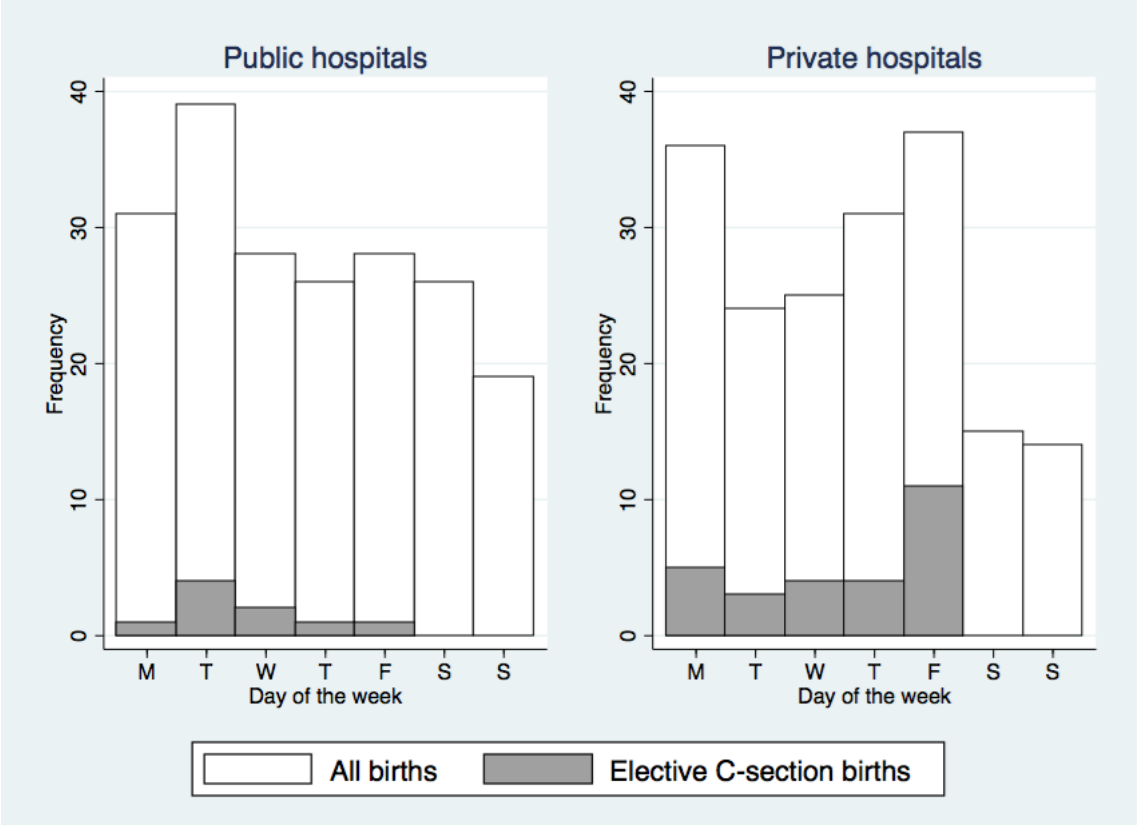
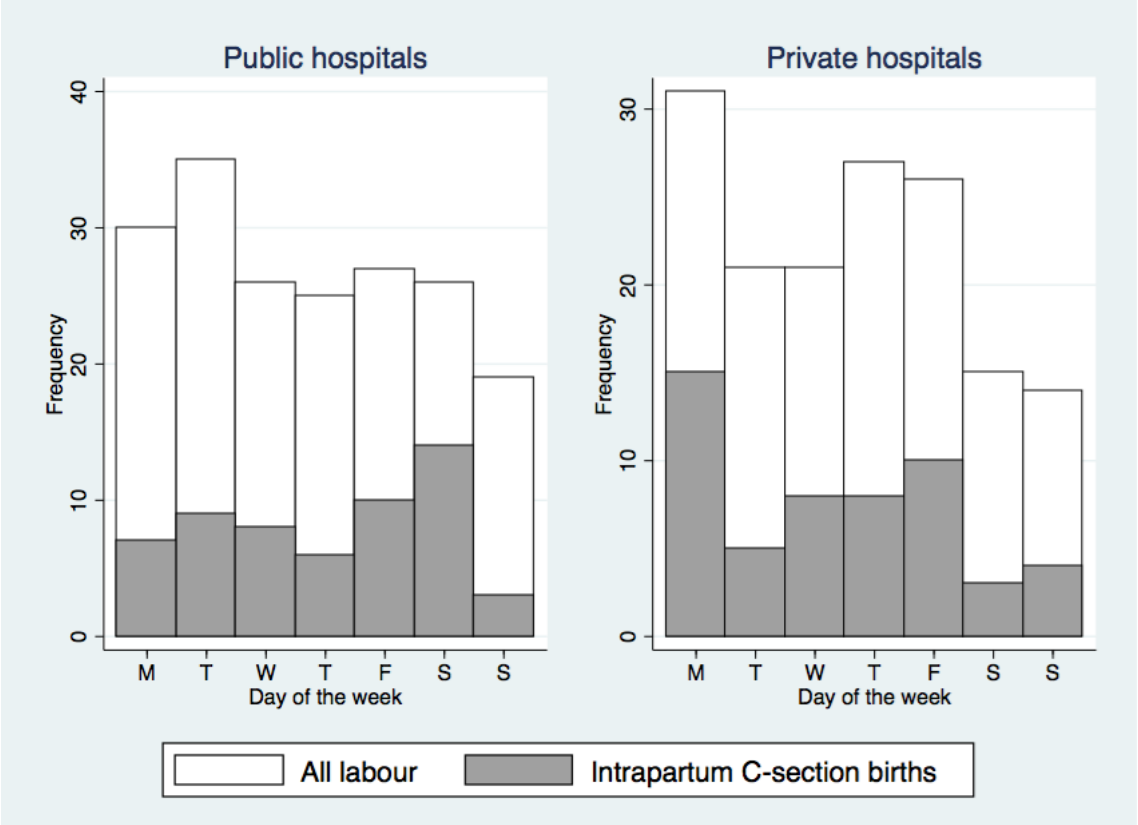


Figure 8: Intrapartum c-section births by the days of the week



The difference between 'all labour' and 'intrapartum c-section births' are the natural deliveries.

Figure 9: Predicted probability of undergoing a c-section

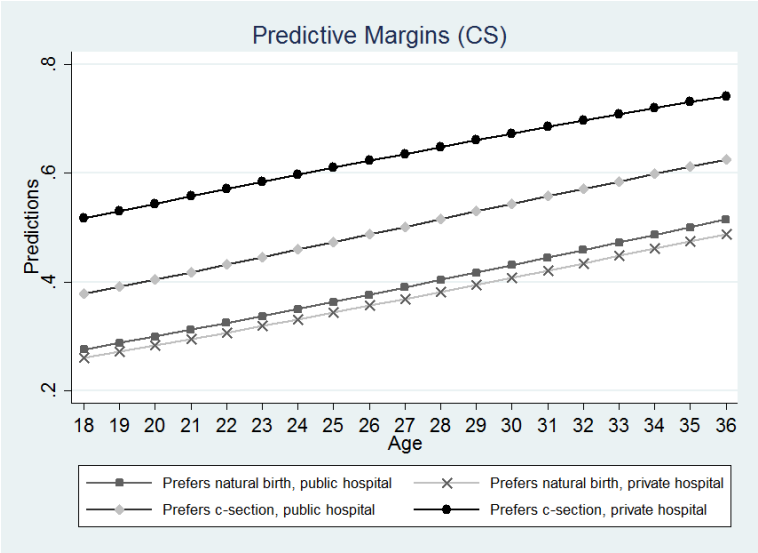


Table 13: Number and type of deliveries per hospital

Type	Name	Mode of Delivery CS	VD	Total
Public	Hospital Magdalena V. de Martínez	24	53	77
	Hospital Materno Infantil Dr. Carlos Gianantonio	39	54	93
	Hospital Comunal de Tigre	4	22	26
	Other public	1	0	1
	Subtotal	*68*	*129*	*197*
Private	Hospital Italiano de Buenos Aires	43	46	89
	Centro de Educación Médica e Investigaciones Clínicas Norberto Quirno (CEMIC)	17	20	37
	Hospital Británico de Buenos Aires	20	33	53
	Others	0	3	3
	Subtotal	*80*	*102*	*182*
	At home	0	1	1
	Total	**148**	**232**	**380**

Figure 10: Predicted probability of undergoing a c-section

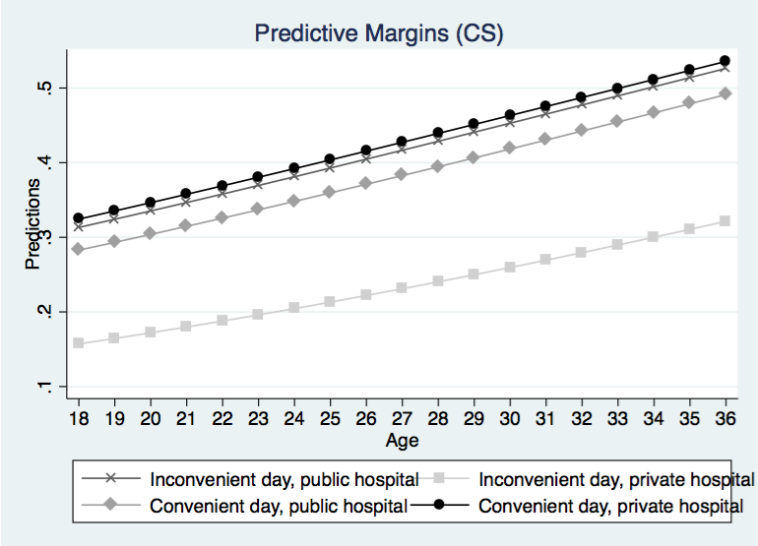


Table 14: Mode of delivery (intrapartum)

Mode of delivery	Public hospital	Private hospital	Total
VD	69.7%	65.8%	233
ICS	30.3%	34.2%	110
Total	188	155	343