Camouflage and Ballooning in Health Insurance: Evidence from Abortion

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Abstract This paper provides a microeconomic basis for simultaneously explaining two phenomena related to health insurance: camouflage and ballooning. We use abortions in Switzerland as an illustrative example. First, a significant share of abortions is camouflaged by contrived medical coding, and second, there is evidence of ballooning in that jurisdictions with strict enforcement of abortion regulation tend to export the problem to more liberal ones. The analysis differs from the existing literature in that we explicitly model the search effort of an individual seeking a health service, i.e., an abortion or camouflage. Using data provided by a major social health insurer, theoretical predictions are confirmed to a considerable degree. In particular, women who derive a particularly high benefit from an abortion (and even more so, from its camouflage) are less discouraged by strict enforcement than others.

JEL Classification: D47, G22, I18, J13, K42

Keywords: Insurance, abortion, regulation, ballooning

1 Introduction

Abortion is at the crossroads of the economics of health, family, and crime - apart from major ethical issues which will not be considered here. Health economics is involved because the woman considering abortion puts her health at risk unless she seeks help from a trained professional, in which case she also incurs some health care expenditure. There is a connection with the economics of the family since abortion is one way to bring the actual number of children in line with the desired one. In many countries, abortion continues to constitute a crime, at the vary least if performed after a certain time limit (which is usually twelve weeks into pregnancy) and without the necessary legal prerequisites. International comparisons have been used to cast light on the relative importance of these three aspects.

This study provides a microeconomic basis for simultaneously explaining two phenomena related to health insurance (mis)coding: camouflage and ballooning. We use abortions in Switzerland as an illustrative example.[1] First, a (significant) share of abortions is camouflaged by contrived medical coding, and second, there is evidence of ballooning in that jurisdictions with strict enforcement of abortion regulation tend to export the problem to more liberal ones. The analysis differs from the existing literature in that it explicitly models the search effort of an individual seeking a health service, i.e., an abortion or camouflage. We also use a within-country analysis based on individual health insurance records. Such an analysis has the considerable advantage of unified recording, whereas international data tend to suffer from measurement errors caused by reporting differences. In countries where abortion is illegal except under narrowly defined circumstances, the discrepancies between actual and reported Figures are particularly large. In Switzerland abortions are permitted under certain circumstances, but every abortion has to be reported for statistical purposes to the competent health authority (see Section 4).

The health insurance data allows us to study the phenomenon of "ballooning", i.e., the data indicate whether an abortion is performed locally or exported to another jurisdiction resulting in "ballooning" of the problem (but still within the same country). The within-country variation stems from the fact that the health insurer operates in Switzerland, where the 26 cantons (member states) are known to implement federal laws (here, the one of 2002 regulating abortion) with differing degrees of stringency, reflecting their local cultural background. Using this unique data set, we seek to answer three major research questions.

Q1 To what extent is a more strict implementation of the abortion law by a canton associated with a decrease in the rate of abortion recorded by the insurer, ceteris paribus?

[1] Camouflage is one type of miscoding in health insurance. Another important type of miscoding is called upcoding (see, for instance, Silverman and Skinner (2004) , Steinbusch et al. (2007), or Dafny and Dranove (2009).

Q2 To what extent is such a recorded decrease associated with an increase in camouflaged abortions?

Q3 To what extent is such a recorded decrease in a canton associated with an export of abortion to another canton?

These three questions clearly are of relevance to other countries, as well. An answer to $Q1$ informs international policymakers what to expect from variations in the de facto stringency of an abortion regulation, holding other determinants constant. An answer to $Q2$ provides an indication of the extent that policy initiatives may impact on the true rather than the officially recorded rate of abortion. Finally, answering $Q3$ permits to estimate the extent to which countries with a strict stance on abortion might export the problem to others (with Switzerland certainly presenting an upper bound because of the small size of the country and insurance coverage following the migrating patient).

The remainder of the study is structured as follows. Section 2 presents a short literature review. In Section 3, we model the decision-making situation of a (Swiss) woman seeking out a physician who endorses her abortion and possibly camouflages it. Here, we use conditional risk utility functions to extend the approach by Dionne and St-Michek (1991). Section 4 provides a short overview of the abortion law in Switzerland. A set of testable hypotheses derived in the theoretical Section 3 is juxtaposed to the data in Section 5. A discussion of the results, policy implications, and concluding remarks follow.

2 Literature review

Abortion has a long history. Some reasons for aborting have changed over time while others have remained important. According to Caron (2009), most of the abortions in the state of Rhode Island between 1876 and 1938 were conducted by single women in their twenties. Their two main motivations were that they were either not married and feared a loss of reputation or their lover was married to another woman. In contrast, the abortion decision of married women was primarily driven by economic factors, extramarital affairs, or a strong preference for limiting the number of children.

Even if the social and economic situation of women has improved in the last century, the debate about the legal status of abortion has continued, with a strong influence of religion and ethics. Moreover, abortion is still economically very relevant for many families. Several studies have tried to investigate the determinants of the demand for abortion. The classical one-good demand approach was pursued by Medoff (1988), who used an economic model of fertility control to estimate the demand for abortions in the United States. His results show that abortion is a normal good, with an

income elasticity of demand of 0.79 and a price elasticity of -0.81. Being unmarried and employed increases the demand for abortion. Interestingly, catholic religion, the level of education, and the poverty status of a woman do not seem to affect abortion decisions.

Using U.S. data on abortion rates between 1974 and 1988, Blank et al. (1996) take into account supply-side factors (which reflect e.g. costs of search) to analyze the effect of restrictions on Medicaid funding for abortion. They find that stringency of funding implies lower in-state abortion rates while increasing them in neighboring states. According to their estimates, 19-25 percent of low-income women would not have aborted if Medicaid funding was eliminated, confirming the findings of Medoff (1988). Further, parental notification laws were found not to affect abortion rates. Rather, rates are positively related to the number of in-state abortion providers. Blank et al. (1996) argue that this increase arises because of induced *abortion tourism*. Jewell and Brown (2000) investigate the responsiveness of abortion demand to the availability of abortion providers for teenage women, who differ in their decision-making regarding abortion. Their results suggest that abortion rates of teenagers aged between 13 and 17 take the cost of travel into account when deciding to give birth to the child or to abort. They conclude that the longer the distance to obtain abortion within the county, the lower the abortion rates per woman and per pregnancy. An interesting result is that increasing travel cost through lowering provider density has more impact on all women of childbearing age (15-44) than on teenage women only.

More recently, abortion has been analyzed in a multiple-good context. Specifically, Wiecko and Gau (2008) investigate why people can support the anti-abortion movement but advocate the pro-death penalty. They find that biblical literalism explains this contradiction best. In areas with a high density of Christians taking the Bible as the word of God, lower abortion rates prevail, making religion an important determinant in their analysis. Contrary to Medoff (1988), Adamczyk (2008) takes into account individual, contextual, and structural factors trying to explain the decision-making by women regarding an abortion in the premarital phase of their lives. Her focus is on academic aspirations and structural constraints in addition to the religious context. She finds that the likelihood of aborting does increase with identification with a conservative Protestant denomination, but also academic ambition, proximity to an abortion clinic, and the level of public abortion funding in the county of residence. These results coincide with the findings of Blank et al. (1996) and Medoff (1988), showing economic factors to have a major impact.

This study extends the literature in two ways. On the one hand, it puts explicit emphasis on a woman's search effort for a suitable physician to perform the abortion. Not only does individual search effort result in a higher probability of a physician issuing the medical certificate legalizing abortion, but it also increases the chance of having it camouflaged in the medical record, which is related to its being performed in another - more liberal - jurisdiction. Therefore, on the other hand, the model provides a microeconomic basis for relating strictness of abortion policy to abortion tourism. The data thus also allows us to study abortion tourism within Switzerland.

3 The model

The model is in the spirit of Dionne and St-Michek (1991), who consider a worker searching for a physician in order to obtain a paid short-term disability leave. In their model, however, the disease categories that are easily verifiable and those that are hardly verifiable are fixed. In this model, the physician decides about the coding.

The camouflage of abortions usually goes along with the reporting physician performing it. Through her search effort, the woman interested in an abortion therefore does not only increase her chance of a physician consenting in principle but also performing it rather than sending her to a colleague (usually outside the canton). Therefore, we need to distinguish three states: no abortion (n), disclosure given abortion (d), and camouflage given abortion (c).

Assuming that a representative woman is a risk-averse person, she will maximize her expected (von Neumann-Morgenstern) utility ($v_n(\cdot)$, with $v' > 0$ and $v'' < 0$). Accordingly, the decision-making problem of a woman wanting an abortion is to maximize

$$\begin{aligned} EU(e) = \rho(e) \cdot v_n\{\overline{W} - C(e) - M_n\} \\ + (1 - \rho(e)) \cdot [\sigma(e) \cdot v_d\{\overline{W} - C(e) - M_d\} + (1 - \sigma(e)) \cdot v_c\{\overline{W} - C(e) - M_c\}], \end{aligned} \tag{1}$$

where her decision variable is effort e, with cost $C(e)$ whose marginal cost C' is constant for simplicity ($C'' = 0$). With a probability that depends negatively on her effort ($\rho' < 0$, $\rho'' > 0$), she fails to find a physician, and her wealth amounts to $\overline{W} - C(e) - M_n$ because contacting physicians inevitably gives rise to a bill and hence involves a (small) copayment which we denote byM_n. However, with probability $(1 - \rho)$, she finds a physician who is willing to endorse the abortion and possibly to perform it. Effort e also influences the conditional probability σ of the physician disclosing the procedure through the appropriate coding of the diagnosis, again with $\sigma' < 0$ and $\sigma'' > 0$.

We assume $\sigma' < \rho'$ in absolute value to reflect the fact that it takes more search effort (marginal effectiveness is lower) to find a physician who is willing to camouflage an abortion than one who just testifies its necessity (without performing it). This is illustrated in Figure 1.

The resulting wealth amounts to $\overline{W} - C(e) - M_d$ because health insurance again makes the woman bear a copayment $M_d > M_n$. This outcome is valued according to the risk utility function $v_d(\cdot)$. However, with probability $(1 - \sigma)$, she succeeds in finding a physician who not only issues the medical confirmation but is also willing to camouflage the procedure (which according to the insurer's experience is indicative of his or her also performing the abortion). Final wealth is then given by $\overline{W} - C(e) - M_c$, with $M_c > M_d$ for at least two reasons. First, it is easy for the camouflaging physician to load the billing by coding a lot of procedures, serving to increase payment received (the great majority of them operate under fee for service). Second, camouflaging requires referral

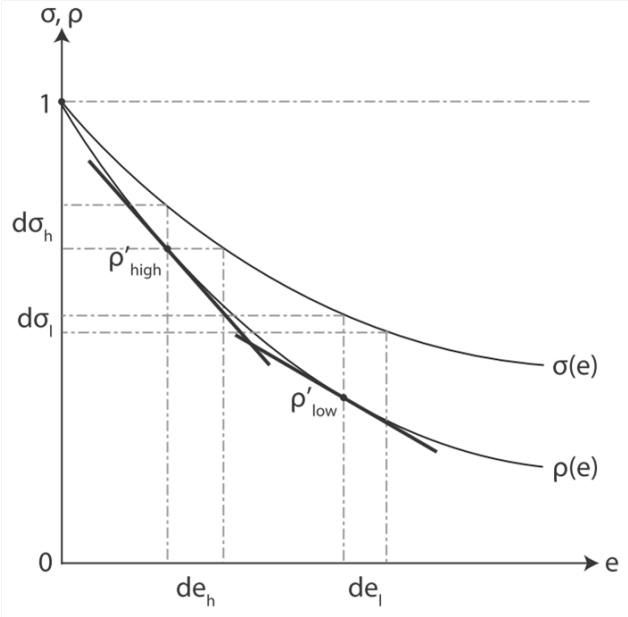

Figure 1 Marginal productivity of search effort

to a private clinic because referral to a physician working in a public hospital would very likely result in disclosure. However, even if the woman has complementary health insurance coverage for accommodation in a private hospital, she still has to come up with a copayment that exceeds the one associated with a stay in a public ward.

The woman's decision-making situation can be illustrated as follows. Clearly, not obtaining an abortion comes close to suffering a loss of quality of life (and potentially, health). It therefore amounts to losing an irreplaceable asset in the sense of Cook and Graham (1977). Three possible conditional risk utility functions are shown in Figure 2: For a woman seeking an abortion, obtaining it secretely is the best possible option. For this reason, $v_c(W)$ runs the highest. The second-best option is obtaining the abortion, but with disclosure. Accordingly, $v_d(W)$ runs second highest. The issue now becomes the marginal utility of risky wealth (MU) in the two states. Following the argument by Eeckhoudt and Schlesinger (2006) that risk-averse decision-makers seek to avoid the accumulation of losses (because this would cause a particularly high loss of utility), the difference between $v_c(W)$ and $v_d(W)$ must be particularly marked when wealth happens to be low. This would be the case when the woman must accept disclosure while at the same time bearing cost of search and copayment that goes along with the treatment. This implies that MU in the state of disclosure must exceed the MU utility in the state of camouflage. The third state is the one of failing to obtain the abortion. Clearly, the pertinent function $v_n(W)$ must run lowest. In addition, this presumably constitutes the accumulation of losses (in terms of copayment and failure to obtain the abortion) that a risk-averse individual would want to avoid the most. Accordingly, MU of risky wealth must be highest in this state (as shown in Figure 1).

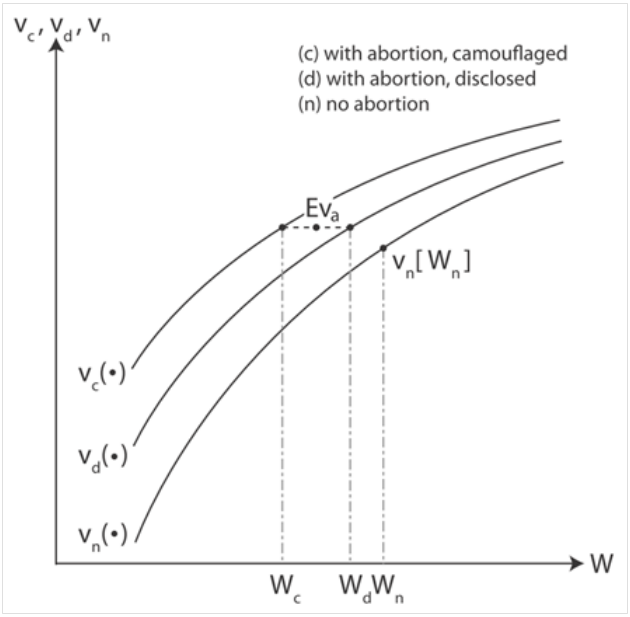

Figure 2 Conditional risk utility functions

The first-order condition for an interior optimum reads,

$$\begin{aligned}\frac{dEU}{de} &= \rho' v_n[W_n] + \rho v_n'[W_n](-C') - \rho'\{\sigma v_d[W_d] + (1-\sigma)v_c[W_c]\} \\ &+ (1-\rho)\{\sigma' v_d[W_d] + \sigma v_d'[W_d](-C') - \sigma' v_c[W_c] + (1-\sigma)v_c'[W_c](-C')\} = 0.\end{aligned} \tag{2}$$

Introducing $Ev_a := \sigma v_d[W_d] + (1-\sigma)v_c[W_c]$ for expected utility of risky wealth in the *abortion* state, one obtains

$$\begin{aligned}\frac{dEU}{de} &= -\rho'\{Ev_a - v_n[W_n]\} - \rho v_n'[W_n]C' - \sigma'(1-\rho)\{v_c[W_c] - v_d[W_d]\} \\ &- C'(1-\rho)\{\sigma v_d'[W_d] + (1-\sigma)v_c'[W_c]\} = 0.\end{aligned} \tag{3}$$

In full analogy, let $Ev_a' := \sigma v_d'[W_d] + (1-\sigma)v_c'[W_c]$ symbolize expected marginal utility in the abortion state. Thus, Eq. 3 can be written as

$$\begin{aligned}\frac{dEU}{de} &= -\rho'\{Ev_a - v_n[W_n]\} - \sigma'(1-\rho)\{v_c[W_c] - v_d[W_d]\} \\ &- C'\{\rho v_n'[W_n] - (1-\rho)Ev_a'\} = 0.\end{aligned} \tag{4}$$

The first term denotes one component of the marginal benefit of additional search effort. It is due to the reduction in the probability of foregoing the expected gain in utility thanks to obtaining the abortion. Neglecting the cost of effort for the moment, there is such a gain if $Ev_a > v_n(W_n)$ for all possible values of $\{\rho, \sigma\}$ and hence effort e. This means that the differences in wealth levels $\{W_c, W_d, W_n\}$ must be relatively small (which is also shown in Figure 1). This in turn requires the

differences in copayments $\{M_c, M_d, M_n\}$ to be small, as well, which is the case because an abortion puts the insured woman beyond most annual deductibles (which range from a mandatory minimum of CHF 300 to a rarely chosen CHF 2,500), subjecting her to a copayment of only 10 percent on the excess over the deductible.

The second term of Eq. (4) denotes the other component of the marginal benefit of search effort. It again hinges on the reduced likelihood [given that abortion is granted, which has probability $(1-\rho)$] of foregoing the utility gain associated with having the abortion camouflaged rather than disclosed. Here, the differences in wealth levels $\{W_c, W_d\}$ and hence copayments $\{M_c, M_d\}$ must be small for this to attain. This condition is satisfied for the reason just given.

The third term of Eq. (4) symbolizes the marginal cost of effort in utility terms. Thus, the extra cost in money terms C' is valued using the probability-weighted MU of risky wealth in the state *no abortion* and *abortion*, respectively, the latter being itself an expected value defined over the probability-weighted MU of the abortion states *camouflage* and *disclosure*.

Three main predictions can be derived from this model. First, denote $A := \{Ev_a - v_n[W_n]\}$ as the expected benefit from performing the abortion. While not directly observable, it typically first increases and then decreases with age (say, beyond age 28) because of the desire to complete one's education and establish a career. Also, A should increase with the number of children already present and be higher for unmarried women. Finally, it is likely to depend on magnitude of risk aversion (see the curvature of the risk utility functions in Figure 2), although the sign of the relationship is ambiguous.Since the first-order condition $dEU/de = 0$ must be satisfied prior and after a change dA, one has the comparative static equation,

$$\frac{\partial^2 EU}{\partial e^2} de + \frac{\partial^2 EU}{\partial e \partial A} dA = 0. \tag{5}$$

Solving for de/dA and assuming the sufficient condition for a maximum $\partial^2 EU/\partial e^2 < 0$ to be satisfied, one obtains

$$\operatorname{sgn}\left[\frac{de}{dA}\right] = \operatorname{sgn}\left[\frac{\partial^2 EU}{\partial e \partial A}\right]. \tag{6}$$

Now let the change $dA > 0$ come about not through a change in wealth levels but merely through an upward shift in the conditional risk utility function (the irreplaceable asset is worth more). This means that the second and third terms of Eq. (4), among them in particular Ev'_a, are unaffected. Therefore, the mixed derivative boils down to

$$\frac{\partial^2 EU}{\partial e \partial A} = -\rho' > 0 \rightarrow \frac{de}{dA} > 0. \tag{7}$$

As was to be expected, search effort is predicted to increase. Note that

$$\text{sgn}\left[\frac{\partial}{\partial\rho}\left(\frac{de}{dA}\right)\right] = \text{sgn}\left[\frac{\partial}{\partial e}\left(\frac{de}{dA}\right)\frac{\partial e}{\partial\rho}\right] = \text{sgn}\left[-\rho''\frac{1}{\rho'}\right] > 0. \tag{8}$$

The initial value of ρ matters because the marginal effectiveness of effort is high if ρ is high (i.e. , the chance of finding a physician willing to endorse abortion is low initially, reflecting strict enforcement by the canton). Conversely, it is low if ρ is low initially (see Figure 1). Moreover, a given additional effort carries over to the probability of disclosure σ, albeit to a lesser extent because marginal effectiveness σ' is comparatively low (see Figure 1). This leads us to the first prediction of the model:

Prediction 1. *Women who derive a particularly high benefit from an abortion (establishing their carrier, already with children, unmarried) undertake more search effort, resulting in a higher likelihood of abortion and (to a lesser extent) of camouflage. Both effects are particularly marked if the likelihood of a physician refusing to endorse the abortion is high initially, as in jurisdictions with strict enforcement.*

This prediction is closely related to research question $Q1$. From Eq. (8), one can see that $sgn[\partial/\partial\rho\{de/dA\}] = \text{sgn}[\partial/\partial A\{de/d\rho\}] > 0$ for continuous functions. Therefore, while a strict enforcement of the abortion law may discourage women from seeking an abortion, it is less effective with those who see a high benefit in it. The second prediction derives from the second term of Eq. (4), $-\sigma'(1-\rho)D$, with $D := \{v_c[W_c] - v_d[W_d]\}$. The term D reflects the benefit from having a camouflaged rather than a disclosed abortion. While it may be correlated with the personal characteristics of the woman concerned (in particular, risk aversion once again), it is more likely to reflect her social environment. In particular, in rural communities with a high degree of social control, D should be high. As before, a change $dD > 0$ reflects an upward shift of the pertinent risk utility function, leaving wealth levels and Ev'_a a unchanged but increasing Ev_a. Performing the comparative statics in full analogy to Eqs. (5) and (6), the expression of interest is

$$\frac{\partial^2 EU}{\partial e \partial D} = -\rho'\frac{\partial Ev_a}{\partial D} - \sigma'(1-\rho) > 0 \rightarrow \frac{de}{dD} > \frac{de}{dA} > 0. \tag{9}$$

Therefore, search effort is predicted to increase when the benefit from camouflaging abortion is higher. As in Eq. (7), the marginal effectiveness of search in terms of finding an endorsing physician (ρ') enters. Moreover, the shift $\partial Ev_a/\partial D$ must be of the same magnitude as the effect of a change dA considered above except for the fact that $dA > 0$ may also be the consequence of a change in $v_n[W_n]$. The second term involves $-\sigma'$, which is positive too. Therefore, the total effect of a change dD almost certainly exceeds that of an equivalent change dA. Finally, note that the sign of the

partial derivative of Eq. (9) w.r.t. ρ is given by

$$\operatorname{sgn}\left[\frac{\partial}{\partial\rho}\left(\frac{de}{dD}\right)\right] = \operatorname{sgn}\left[\frac{\partial}{\partial e}\left(\frac{de}{dD}\right)\frac{\partial e}{\partial\rho}\right] = \operatorname{sgn}\left[\left(-\rho''\frac{\partial Ev_a}{\partial D} - \sigma'\right)\frac{1}{\rho'}\right] > 0. \tag{10}$$

Therefore, a high initial probability of the physician refusing to endorse the abortion serves to increase the magnitude of de/dD.

Prediction 2. *Women who derive a particularly high benefit for camouflaging the abortion (living in a rural community) undertake more search effort, again resulting in more abortions and (to a lesser extent) camouflaged cases. These effects are more marked than those of Prediction 1 and in jurisdictions with strict enforcement of abortion regulation.*

The relationship with research question $Q2$ is evident when the order of differentiation is reversed, as above. For women especially interested in camouflaging abortion, stringency of legal enforcement will have an attenuated effect. The main reason is that they typically undertake more search effort to begin with, causing them to be in a situation where still more effort has only a minor effect on the likelihood of finding a consenting physician (whose initial value is influenced by policy).

Unfortunately, an answer to question $Q3$ (relating to the exporting of abortion to less stringent jurisdictions) cannot be derived from these two predictions without additional assumptions. On the one hand, a more stringent stance on abortion does discourage one type of women, but it also serves to increase the grey zone of camouflage in relative terms (at least in this very simple model that does not distinguish between search for a consenting and search for a camouflaging physician; see Prediction 1). It is difficult to establish whether camouflaging is more associated with on-site abortion or referral to a provider in a less stringent jurisdiction for these women. On the other hand, a stringent stance does not discourage as much a second type of women, who in particular seek to avoid disclosure. This by itself suggests performing the abortion some place else, usually combined with camouflage. On the assumption that referral to a less strict jurisdiction is encouraged as much as on-site abortion among the first type while the second type constitutes the majority, one arrives at

Prediction 3. *Increased stringency of abortion regulation enforcement results in a higher propensity of abortion in less stringent jurisdictions, e.g. a ballooning effect.*

4 Swiss regulation and official statistics regarding abortions

The objective of this Section is to provide an overview of the abortion law in Switzerland and of officially recorded abortion rates. Furthermore, local preferences with regard to abortion are to be related to stringency of regulation (not directly observed) and official abortion rates. An important expression of local preferences is the popular referendum of 2001, according to which the Swiss abortion law was changed to be more liberal.[2] The issue (which will be relevant for Section 5) is whether religious orientation has explanatory power of its own once this expression of preference is taken into account.

In 2002, due to the referendum, Swiss law was changed and allowed abortion on request during the first twelve weeks into pregnancy (Swiss Criminal Code Art. 118-120). From the 13th week on, an abortion is permitted if the termination of the pregnancy is, in the judgment of a physician, necessary in order to prevent the pregnant woman from sustaining serious physical injury or psychological distress. This must be more pronounced the more advanced the pregnancy.

The new Swiss Criminal Code act was implemented by the twenty-six cantons in Switzerland with differing degrees of stringency, which however is not directly observable. Differences concern provider types that are permitted to perform a termination of pregnancy (abortions after the 12th week of pregnancy), and approved counseling services for young women.[3] In Fribourg (FR), for example, obtaining a second opinion is advised but not mandatory, and hospitals with a gynecological unit are permitted to perform an abortion. In Appenzell (AI and AR), a physician must confirm the health risk in writing , and only a cantonal hospital is permitted to perform an abortion.

These regulatory differences give rise to the question of whether they reflect local preferences. For this reason, results of the 2002 referendum are introduced as explanatory variables and related to religious groups. An overview of the geographic characteristics of Switzerland and its cantons including religious groups is shown in Figure 3. The results of the referendum are shown in Table 6 in the Appendix. They indicate the explanatory power of religious groups of the general public on local preferences, since in rather protestant cantons there was normally greater consensus. Therefore, in the rather catholic cantons such as AI, FR, OW, NW, LU, UR, SZ, SO, SG, VS, and TI, a stricter regulation is assumed, which will be helpful in explaining the theoretical predictions of the model. The predictions are studied empirically in Section 5.2 below.

[2] The referendum was possible due to several parties and interest group's effort in collecting the 50,000 voters' signatures required to force a popular referendum on the amendment. The vote was held on 2 June 2002, with 72.2% of Swiss voters supporting the change in law.

[3] All cantons introduced a standardized form for the termination of a pregnancy within the first 12 weeks and a form regarding the mandatory consultation for women under the age of 16. The cantons also developed an information sheet listing available counseling services (Source: http://www.svss-uspda.ch/de/schweiz/umsetzung.html).

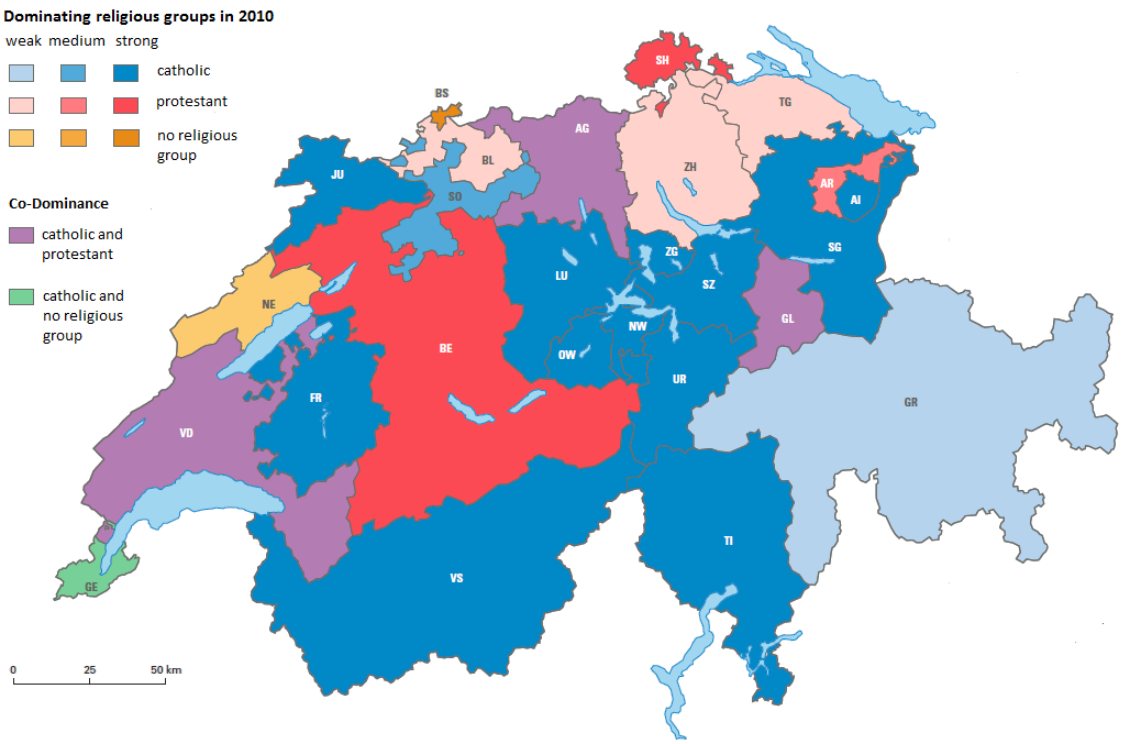

Figure 3 Religious groups in Swiss cantons in 2010. Source: FSO (2012).

According to the Swiss Federal Statistical Office (FSO), approximately 6.3 women per 1,000 performed an abortion between 2004 to 2014 (see Figure 4), with a slight decline since 2011.[4] There are striking differences in abortion rates between cantons (FSO, 2015, p. 2): In Geneva (GE), Vaud (VD), Neuchâtel (NE), Ticino (TI), Basle-City (BS), and Zurich (ZH) the abortions rates (mean 2011-2014) are above average (see Figure 5). In the cantons of central and eastern Switzerland as well as in Fribourg (FR), and Valais (VS), they are below average.[5] This fact is likely to reflect the cultural background of these cantons (since AI, FR, OW, NW, LU, UR, SZ, SO, SG, VS, and TI are catholic cantons, as stated above).

In this context, the differences between the rates distinguished by localization ("canton of abortion" in Figure 5) and the origin of the woman ("canton of residence") is instructive. The more liberal cantons GE, VD, ZH, AR (neighbor to strongly catholic AI), and GR import abortion patients, their rates of abortion exceeding those attributable to their female resident population. The case of Ticino (TI) is exceptional because the canton is predominantly catholic, as well. However, it has several private clinics that attract women from abroad (in particular neighboring Italy (FSO, 2015,

[4] In Switzerland, every abortion has to be reported to health authorities for statistical purposes, with guaranteed anonymity of the woman and medical confidentiality preserved (Swiss Criminal Code Art.119 No. 5). The Swiss Federal Statistical Office publishes statistics regarding abortions using these data (FSO, 2015, p. 4).

[5] Central Switzerland consists of Lucerne (LU), Uri (UR), Schwyz (SZ), Obwald (OW), Nidwald (NW), and Zug (ZG); eastern Switzerland of Glarus (GL), Schaffhausen (SH), Appenzell Inner Rhodes (AI), St. Gallen (SG), Grisons (GR), and Thurgovia (TG).

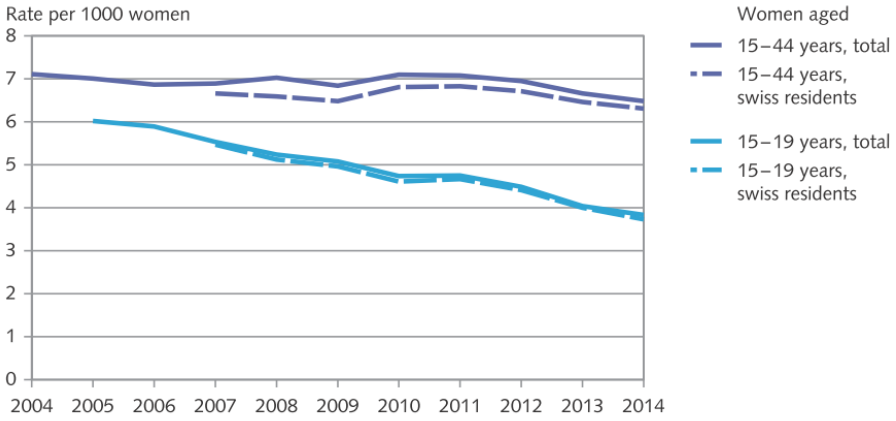

Figure 4 Abortion rate per 1,000 women. Source: FSO (2015, p. 1 (G1)).

p. 2)). Conversely, AI, OW, SZ, VS, and FR exhibit substantially lower rates of abortion than those reported according to women residing in these cantons; they export abortion patients. This constitutes clear evidence of ballooning at the aggregate regional level.

The development of abortion rates varies between cantons, as well. In the canton of Jura (JU), it dropped by approx. 25% from 2007-2010, compared to 2011-2014, SH (+21%), Valais (VS, +18%), NW (+18%), and NE (+17%) (see FSO, 2015, p.2). The reasons for this divergence are not obvious. On the one hand, they may reflect a time change in behavior in that women in the remote, strongly catholic canton of Jura (JU) increasingly turned to contraception; on the other hand, religious reservations against abortion may have weakened in Valais (VS) and Nidwald (NW). It will be interesting to see whether an empirical analysis using individual records can explain not only regional differences but also recent developments.

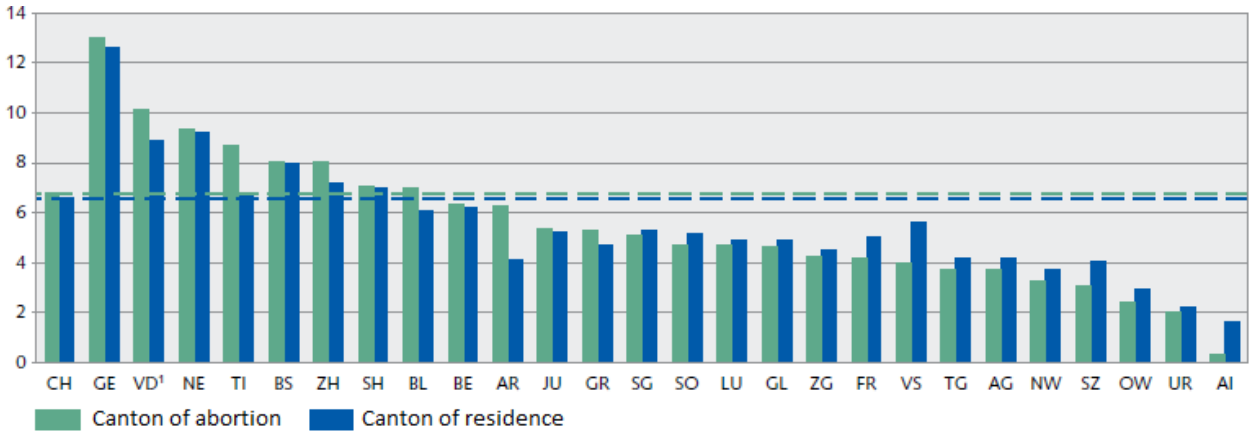

Figure 5 Mean abortion rate per 1,000 women between 15-44 from 2011 to 2014 (per canton of intervention and canton of residence). Source: FSO (2015, p. 2 (G4)).

5 Health insurance data analysis

5.1 Data information and description

A unique data set provided by a large Swiss social health insurer with business in all cantons is used to test the theoretical predictions. The data set contains 80,403 observations on 31,793 women regarding events related to pregnancy between 2003 and 2013. It includes socio-demographics (year of birth, marital status, nationality, and canton of residence, respectively), the number of persons in the family, the composition of the family, and further information if the event is an abortion (the canton where the abortion was performed, the provider type, and provider subtype).

For some example variables and the descriptive information of the data, see Table 1.[6]

variable	observations	min	max	mean	label
`abortion`	80,403	0	1	0.0489	abortion yes=1 other=0
`birth`	80,403	0	1	0.4620	child birth yes=1 0=other
`nperfam`	80,403	1	13	3.2074	number of persons in family
`nkids`	80,403	0	11	1.2054	number of kids in family
`age`	80,403	12	52	30.9708	age of woman in years
`age1218`	80,403	0	1	0.0062	woman's age group (<19)
`unmarr`	80,403	0	1	0.2256	unmarried yes=1 no=0

Table 1 Selected important variables in the data set

Documented events are *consultation for pregnancy* (39,065 observations), *abortion* (3,930 observations), *birth* (37,143 observations), and *miscarriage* (265 observations). Table 2 reveals a telling fact about the frequency of these events according to age groups. Over the years 2003 to 2013, a mere 237 abortion-related consultations were recorded among the youngest (<19) age group, associated with 83 abortions and 175 births. In the next higher age group (19-25), the number of consultations increases 25-fold, that of births 30-fold, but that of abortions only 8.8-fold. This supports the notion that women in this age group had to exert much more search effort (resulting in "suspicious" consultations) to find a physician willing to issue a supporting report and/or to perform the abortion. This interpretation is supported by scaling factors of 107 (consultation), 139 (birth), and only 25 (abortions) in the 26-35 age group, while in the >36 group they are 32, 43, and 13, respectively, physicians are more likely to recognize a health risk.

The majority of the reported abortions were performed in LU (16%), ZH (14%), VD (9%), and AG (12%).[7] As is to be expected, the canton of residence differs from this distribution. Here, Lucerne

[6] For descriptive statistics of the continuous variables see Table 7 in the appendix.

[7] See Table 8 in the appendix.

(LU) accounts for 12% of the documented events the canton of residence, AG for 11% and SG for also 11%.[8]

For reported events, the age of the woman ranges between 12 and 52; in 65% of the documented events, the woman is between 26 and 35 year old. The highest number of abortions (2,067 abortions between 2003 and 2013) is documented in this age category as well (see Table 2).

woman's age group	**consultation**	**abortion**	**child birth**	**miscarriage**	**total**
<19	237	83	175	2	**497**
19-25	5,973	730	5,188	32	**11,923**
26-35	25,409	2,067	24,307	166	**51,949**
>36	7,446	1,050	7,473	65	**16,034**
total	**39,065**	**3,930**	**37,143**	**265**	**80,403**

Table 2 Frequency table for woman's age group and documented events

5.2 Testing the model's predictions

The objective of this Section is the juxtaposition of the predictions in Section 3 with the insurance records. Probit rather than logistic regression is used because only two of the possible four events (see Table 2) are analyzed, obviating the independence of irrelevant alternatives (IIA) assumption. Prediction 1 states that women who derive a particularly high benefit from an abortion undertake more search effort, resulting in a higher likelihood of abortion and (to a lesser extent) of camouflage. If the likelihood of a physician refusing to endorse the abortion is high initially, as in jurisdictions with strict enforcement, both effects should be particularly marked. This calls for interacting indicators of high benefit `unmarr`=1, `nkids` and `age1218` with `strict`=1, the indicator of stringent regulation of abortion (`strict`=1 for AI, FR, OW, NW, LU, UR, SZ, SO, SG, VS and TI (see Section 4)). Finally, dummy variables for the year of the event are included, again in interaction with `strict` because the aggregate data discussed in Section 4 suggests that attitudes may have changed over time in the stringent cantons.

Estimation results and marginal effects for Pr(`abortion`) are displayed in Table 3.[9] As predicted, all three indicators of benefit from abortion have positive signs when interacted with `strict`. This finding is in accordance with extra search effort being undertaken by women who live in cantons with high stringency. With regard to development over time, `y2004_strict` indicates a drop by 3.8 percentage points in abortions compared to the 2003 benchmark in "stringent" cantons; since then, this drop has been tapering off, reaching some 1.1 percentage points. A possible interpretation is

[8] See Table 8 in the appendix.

[9] Observations after 2010 are excluded to be used for a final test.

that women in cantons with stringent implementation of the law migrated to liberal ones in 2003 and 2004 but began to realize that this was not necessary to the same extent as time went on. If correct, this is a first sign of camouflage (with a decline in importance over time, however).

Pr(abortion) VARIABLES	(1) probit coeff	(1) marginal effects
unmarr_strict	0.280***	0.0311***
	(0.0306)	(0.00403)
nkids_strict	0.0740***	0.0068***
	(0.0130)	(0.00119)
age1218_strict	0.315***	0.0375**
	(0.107)	(0.0159)
y2004_strict	-0.713***	-0.0381***
	(0.0689)	(0.00179)
y2005_strict	-0.294***	-0.0218***
	(0.0436)	(0.00252)
y2006_strict	-0.229***	-0.0178***
	(0.0401)	(0.00261)
y2007_strict	-0.233***	-0.0181***
	(0.0396)	(0.00257)
y2008_strict	-0.219***	-0.0172***
	(0.0395)	(0.00262)
y2009_strict	-0.160***	-0.0131***
	(0.0381)	(0.00277)
y2010_strict	-0.127***	-0.0107***
	(0.0376)	(0.00286)
Constant	-1.658***	
	(0.0131)	
Observations	58,050	58,050

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
NOTE: All predictors at their mean value for marginal effects

Table 3 Probit coefficients and marginal effects for `abortion`

Another test for camouflage can be performed by comparing `birth` and `abortion`. Admittedly, some births may be camouflaged as well; however, in most cases they constitute an event that is happily recorded. Moreover, women are predicted to undertake much less search effort because the likelihood (see ρ in eq. (8)) of a physician refusing to help in delivery is very small. This means that the difference between stringent and liberal cantons has a smaller effect in Pr(`birth`) than Pr(`abortion`). In order to compare these effects, it is not appropriate to compare marginal effects in Table 3 and 4, but instead one needs to compare elasticities because there are much more births in the data set than abortions. The probability for `abortion` $= 1$, holding all predictors at the mean, equals $Pr(\texttt{abortion} = 1|\bar{X}) = 0.04322675$. For `birth`, it reads $Pr(\texttt{birth} = 1|\bar{X}) = 0.45733492$.

The elasticity of a binary variable is the marginal effect divided by the mean. For example, comparing elasticities for `abortion` and `birth` for the first predictor `unmarr_strict` gives

$$\frac{\varepsilon_a}{\varepsilon_b} = \frac{0.0311}{-0.0361} \cdot \frac{0.45733492}{0.04322675} = |-9.11| > 1 \Rightarrow \varepsilon_a > \varepsilon_b, \tag{11}$$

and similarly, for `nkids_strict` as well as `age1218_strict`, it holds true that $\varepsilon_a > \varepsilon_b$ (even after removing all insignificant predictors). This confirms the prediction: the difference between stringent and liberal cantons has a smaller effect in Pr(`birth`) than Pr(`abortion`).

A comparison of estimated standard errors provides a final test for the importance of camouflage. To the extent that *camouflage* imparts a measurement error to the dependent variable in Pr(`abortion`) that is absent from Pr(`birth`), standard errors as shown in Table 3 are predicted to exceed those in Table 4. Indeed, this is the case for all three indicators of benefits of avoidance used.

Pr(`birth`)	(1)	(1)	(2)	(2)
VARIABLES	probit coeff	marginal effects	probit coeff	marginal effects
unmarr_strict	-0.0914***	-0.0361***	-0.101***	-0.0400***
	(0.0190)	(0.00746)	(0.0180)	(0.00704)
nkids_strict	0.0423***	0.0168***	0.0350***	0.0139***
	(0.00771)	(0.00306)	(0.00627)	(0.00249)
age1218_strict	-0.163**	-0.0640**	-0.151*	-0.0593*
	(0.0822)	(0.0316)	(0.0818)	(0.0316)
y2004_strict	-0.0805***	-0.0318***	-0.0647**	-0.0256***
	(0.0270)	(0.0106)	(0.0252)	(0.00992)
y2005_strict	-0.0846***	-0.0334***	-0.0684***	-0.0270***
	(0.0234)	(0.00918)	(0.0212)	(0.00834)
y2006_strict	-0.0576**	-0.0228***	-0.0412**	-0.0163**
	(0.0224)	(0.00882)	(0.0200)	(0.00789)
y2007_strict	-0.0508**	-0.0201**	-0.0342*	-0.0136*
	(0.0221)	(0.00871)	(0.0196)	(0.00775)
y2008_strict	-0.0257	-0.0102		
	(0.0222)	(0.00878)		
y2009_strict	-0.0271	-0.0108		
	(0.0220)	(0.00870)		
y2010_strict	-0.0282	-0.0112		
	(0.0220)	(0.00869)		
Constant	-0.101***		-0.107***	
	(0.00772)		(0.00690)	
Observations	58,050	58,050	58,050	58,050

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
NOTE: All predictors at their mean value for marginal effects

Table 4 Probit coefficients and marginal effects for `birth`

Since there are many left-out determinants of both Pr(`abortion`) and Pr(`birth`), estimation using a bivariate probit model may result in a gain of efficiency, especially if specifications differ after exclusion of non-significant explanatory variables. Indeed, the ratios of coefficients to standard errors (z values) are consistently higher in Table 5 than in Table 3 and 4, pointing to an effect of camouflage. At the same time the estimated coefficient do not differ much, signaling a degree of robustness of the model. According to the strongly negative $\varrho = -0.9392514$, unobserved factors lower a woman's propensity to seek an abortion and increases her likelihood of giving birth. This finding is quite plausible since her religious orientation and that of her family are among the unmeasured influences.

VARIABLES	(1) Pr(`abortion`) bivariate probit coeff	(1) Pr(`abortion`) marginal effects	(2) Pr(`birth`) bivariate probit coeff	(2) Pr(`birth`) marginal effects
unmarr_strict	0.290***	0.0325***	-0.102***	-0.0402***
	(0.0307)	(0.0041)	(0.0180)	(0.0070)
nkids_strict	0.0839***	0.0077***	0.0345***	0.0137***
	(0.0129)	(0.0012)	(0.00625)	(0.0025)
age1218_strict	0.319***	0.0381**	-0.156*	-0.0609*
	(0.106)	(0.0159)	(0.0817)	(0.0315)
y2004_strict	-0.732***	-0.0385***	-0.0644**	-0.0255**
	(0.0689)	(0.0017)	(0.0252)	(0.0099)
y2005_strict	-0.317***	-0.0230***	-0.0683***	-0.0270***
	(0.0438)	(0.0025)	(0.0212)	(0.0083)
y2006_strict	-0.250***	-0.0191***	-0.0411**	-0.0163**
	(0.0404)	(0.0025)	(0.0200)	(0.0079)
y2007_strict	-0.259***	-0.0198***	-0.0338*	-0.0134*
	(0.0399)	(0.0025)	(0.0196)	(0.0078)
y2008_strict	-0.244***	-0.0188***		
	(0.0389)	(0.0025)		
y2009_strict	-0.185***	-0.0149***		
	(0.0376)	(0.0026)		
y2010_strict	-0.158***	-0.0130***		
	(0.0373)	(0.0027)		
Constant	-1.652***		-0.106***	
	(0.0130)		(0.00690)	
Observations	58,050	58,050	58,050	58,050

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
NOTE: All predictors at their mean value for marginal effects

Table 5 Bivariate probit regression results for `abortion` and `birth`

Turning to Prediction 3, it states that increased stringency of regulatory enforcement results in a higher propensity of abortion in less stringent jurisdictions, e.g. a ballooning effect. While evidence at the individual level will be sought at a later stage of this research, there are clear indications of ballooning at the aggregate level. Figure 6 exhibits frequencies of documented abortions according to the canton where the intervention took place and the canton of residence of the woman. The more liberal cantons AR, GR, VD, and ZH tend to import abortion patients, whereas the strongly catholic cantons AI, FR, OW, SZ, and VS are exporting abortion patients. This pattern squares well with Table 8 in the appendix showing that most abortions recorded by the health insurer took place in ZH, following by AG, and VD (but not AR and GR, where it has low market share). Conversely, the absolute maximum of recoded cases was in LU, where it dominates. On the whole, however, the data provided by this health insurer can be said to be representative of the Swiss population. The canton TI constitutes a special case. While predominantly catholic, it does not export abortions, contrary to e.g. FR with its catholic school. There are two likely reasons for this. First, there are several private clinics in TI that attract patients from outside Switzerland, among them probably abortion patients. Second, catholic Italy is practically next door, which facilitates international ballooning. In fact only 70% of the abortions in TI were performed by Swiss women, for 14% the women have Italian citizenship and the remaining 16% have another nationality.

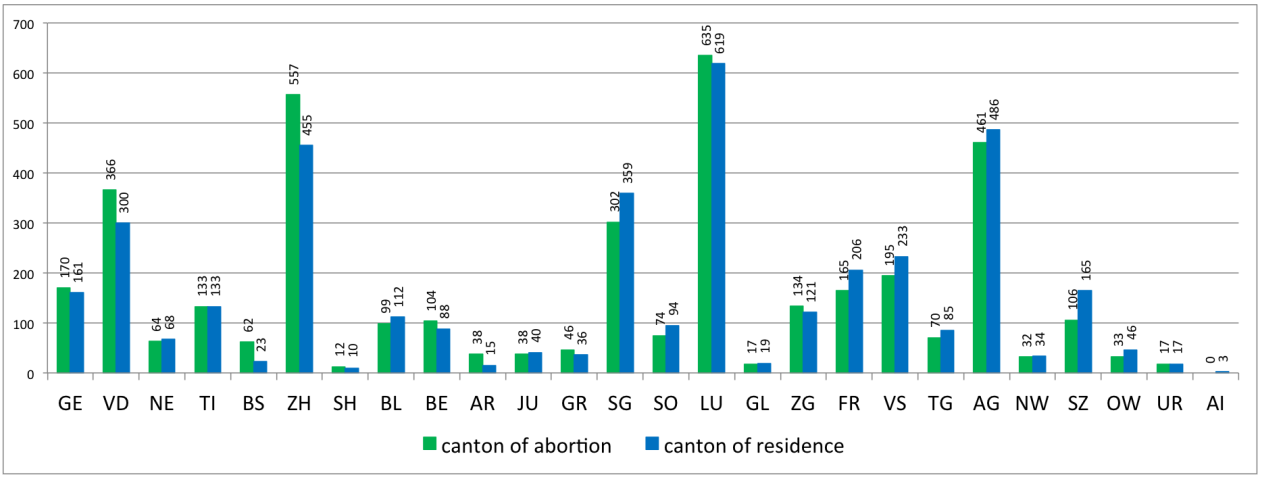

Figure 6 Documented abortions per canton of intervention and canton of residence (2003-2013)

6 Implications for social policy

This analysis sheds light on a trade-off, between respecting local preferences and cost of search: On the one hand, some of the Swiss cantons implement federal regulation concerning abortion in a stringent way because of a popular mandate. After all, in the more liberal cantons there was normally greater consensus on the referendum of 2002. On the other hand, stringent implementation

causes women to undertake costly effort in search of a physician who is willing to issue the necessary supporting report and/or perform the intervention. There are clear indications suggesting that this search also induces "abortion tourism" within Switzerland. This phenomenon could be mitigated by mandating cantons to implement the federal law in a uniform way, thus preserving equality in face of the law. Yet this would mean that marked differences in regional preferences are disregarded, causing a loss in economic welfare.

The findings of this paper point to a difficult trade-off for social policy. A federal mandate to harmonize implementation would save many women substantial cost of search and reduce "abortion tourism"; however, it would override important differences in local preferences expressed in the outcome of the referendum held in 2002. It depends upon the distributions of female search costs in the Swiss society (and the different cantons) whether a federal mandate to harmonize implementation seems justifiable on welfare grounds.

7 Concluding remarks

Using a large data set from a Swiss social health insurer, this paper studies two phenomena related to health insurance: camouflage and ballooning. The present analysis differs from the existing literature in that search effort of a woman seeking an abortion, possibly combined with camouflage, is explicitly modeled and analyzed. Stringent local enforcement in some Swiss cantons (but not in others) of the outcome of a popular referendum on abortion held in 2002 permits to derive testable predictions, most of which receive a considerable measure of empirical support. In particular, there is evidence of ballooning in that women residing in jurisdictions with strict enforcement undertake extra costly search effort, often resulting in migration to another, more liberal jurisdiction. Moreover, a comparison with births suggests that a significant share of abortions is camouflaged by contrived medical coding, when the woman has residency in a "strict" jurisdiction.

The current study has several limitations that result from the availability and content of the data. The health insurer does not collect information about a woman's working status, her level of education, the household income, as well as her religious orientation. In particular, the amount of search and camouflage cannot be estimated directly but has to be inferred from a comparison between abortion and (more openly disclosed) births. Moreover, the dummy variable indicating whether a canton is stringent in its implementation of the pertinent federal law is somewhat imperfect. Finally, popular sentiment regarding abortion, as expressed in the 2002 referendum, may well diverge from implementation, which has several dimensions itself (e.g. mandate to have the intervention performed in the cantonal hospital). Still, the finding that these cantonal differences induce costly search and "abortion tourism" is likely to be robust.

8 Appendix

8.1 Swiss Referendum (2002) - Votes

Canton	% Yes	% No
ZH	77.5%	22.5%
BE	73.4%	26.6%
LU	60.1%	39.9%
UR	50.7%	49.3%
SZ	57.4%	42.6%
OW	56.3%	43.7%
NW	63.1%	36.9%
GL	70.8%	29.2%
ZG	70.8%	29.2%
FR	71.1%	28.9%
SO	70.0%	30.0%
BS	81.8%	18.2%
BL	79.8%	20.2%
SH	67.4%	32.6%
AR	65.1%	34.9%
AI	39.9%	60.1%
SG	58.8%	41.2%
GR	63.8%	36.2%
AG	68.9%	31.1%
TG	59.8%	40.2%
TI	63.2%	36.8%
VD	85.7%	14.3%
VS	45.9%	54.1%
NE	85.4%	14.6%
GE	87.8%	12.2%
JU	68.3%	31.7%

Table 6 Results of 2002 Swiss referendum (No. 487)

8.2 Data information

stats	yearevt	ybirth	age	npersfam	nadults	nkids	nyouth
N	80403	80403	80403	80403	80403	80403	80403
mean	2008.539	1977.568	30.97077	3.207393	1.711628	1.20539	.2903747
sd	2.652641	5.644367	5.192864	1.144357	.782223	.8640749	.6630506
p50	2009	1978	31	3	2	1	0
min	2003	1956	12	1	0	0	0
max	2013	1998	52	13	7	11	6

Table 7 Descriptive statistics for continuous variables (2003-2013)

Canton	Canton of residence		Canton of abortion	
	Freq.	Percent	Freq.	Percent
AG	8,859	11.02	461	11.73
AI	288	0.36	0	0.00
AR	472	0.59	38	0.97
BE	2,958	3.68	104	2.65
BL	2,451	3.05	99	2.52
BS	357	0.44	62	1.58
FR	8,135	10.12	165	4.20
GE	2,396	2.98	170	4.33
GL	345	0.43	17	0.43
GR	592	0.74	46	1.17
JU	828	1.03	38	0.97
LU	9,875	12.29	535	16.16
NE	1,266	1.58	64	1.63
NW	633	0.79	32	0.81
OW	1,313	1.63	33	0.84
SG	8,545	10.63	302	7.68
SH	175	0.22	12	0.31
SO	2,805	3.49	74	1.88
SZ	4,662	5.80	106	2.70
TG	1,758	2.19	70	1.78
TI	1,878	2.34	133	3.38
UR	859	1.07	17	0.43
VD	3,834	4.77	366	9.31
VS	4,886	6.08	195	4.96
ZG	2,278	2.83	134	3.41
ZH	7,906	9.84	557	14.17
Total	**80,354**	100.00	**3,939**	100.00

Table 8 Canton of residence for documented events and canton of abortion (2003-2013)

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