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Transfer Payment Systems and Financial Distress: Insights from Health Insurance Premium Subsidies

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ABSTRACT

Transfer Payment Systems and Financial Distress: Insights from Health Insurance Premium Subsidies*

How should payment systems of means-tested benefits be designed to improve the financial situation of needy recipients most effectively? We study this question in the context of mandatory health insurance in Switzerland, where recipients initially received either a cash transfer or subsidized insurance premiums (a form of in-kind transfer). A federal reform in 2014 forced cantons (i.e. states) to universally switch to in-kind provision. We exploit this setting based on a difference-in-differences design, analyzing rich individual-level accounting data and applying a machine learning approach to identify cash recipients prior to the reform. We find that switching from cash to in-kind transfers reduces the likelihood of late premiums payments by about 20% and of government debt collection for long-term missed payments by approximately 16%. There is no evidence for a negative spillover effect on the timely payment of the non-subsidized coinsurance bills for health services after the regime change.

JEL Classification: D14, G52, H24, I13

Keywords: health insurance, transfers, cash subsidies, in-kind transfers, financial distress, debt collection

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1 Introduction

Many countries maintain significant redistribution programs offering transfers to individuals with limited financial resources. Means-tested benefits are thereby targeted to help people buy necessary goods and services. It is understood that financial difficulties that arise due to too little available resources should be overcome. However, financial distress can also be the result of limited planning abilities and limited self-control. For given resources, people's well-being might be lower due to the misallocation of means and to the mental strain related to difficulties in keeping finances in order.[1] In this latter case, aspects of transfer systems other than generosity might turn out to be crucial. In particular, payment modalities offer a means with which to simplify the spending decisions of poor individuals and households and to reduce their exposure to the temptations of short-term liquidity.[2] This aspect has, however, received limited attention so far, despite the rich literature on the possibility of transfer payouts being either in cash or in-kind (see, e.g, Currie and Gahvari, 2008, for a review)[3]

In this paper, we study the effect of transfers via cash versus the provision of subsidized services (a form of in-kind transfer) on the financial distress of recipients. We do this in the context of mandatory health insurance with community rated premiums, i.e., premium payments that mark a major expenditure for most households. Specifically, we test the hypothesis that the limited discretion when health insurance premiums are individually subsidized improves payment behavior for mandatory coverage when compared to a cash transfer of equal magnitude. We can test this hypothesis by exploiting an ideal setting in which health insurance is mandatory and the transfers are individually determined independently of the payment system. This allows us to identify the effect of an important property of the procedural design of means-tested benefits absent any confounding influence of benefit generosity and consumption choice, i.e., in our case, whether to buy health insurance or not.

The concrete institutional context is a federally imposed change from cash to in-kind transfers of premium subsidies for needy individuals within the mandatory health

[1] There is a rich literature in behavioral household finance documenting how financial illiteracy and cognitive as well as motivational limitations negatively affect people's financial and subjective well-being (see, e.g., Gerardi et al. 2013, Lusardi and Mitchell 2014, Ponce et al. 2017 or Beshears et al. 2018). Financial distress is thus self-reinforcing as it undermines people's capacity for long-term planning and decision-making (see, e.g., Mullainathan and Shafir, 2013).

[2] If individuals face self-control problems, potentially magnified by poverty (Banerjee and Mullainathan, 2010; Haushofer and Fehr, 2014; Bernheim et al., 2015; Carvalho et al., 2016), a large (relative to household income) lump sum cash payment may cause adverse long-term outcomes for recipients compared to in-kind transfers. In such a context, an in-kind provision might instead act as a hard commitment device (see, e.g., Bryan et al., 2010, for an overview), which can be optimal for recipients, especially if they are naive about their self-control problems (O'Donoghue and Rabin, 1999).

[3] The most common rationale for in-kind transfer schemes is to encourage recipients to consume a particular good or service (and to prevent the "misuse" of cash according to some public notion of appropriate spending).

insurance system in Switzerland in 2014. The individual premium subsidies constitute the second biggest means-tested transfer program in the country (after social assistance); in all, CHF 4.7 billion were paid out in 2018, benefiting roughly 26% of the resident population. In 2014, the premium load after subsidies amounted to 12% of the disposable income of the average subsidized household (B,S,S., 2015).[4] As an example, for a family with two children and a gross household income of CHF 70,000 (roughly at the 25% percentile of income distribution), the average yearly subsidy across all cantons is about CHF 3,800 (thus about 5% of gross income). Net of subsidies, the remaining premiums for this household make up 14% of its disposable net income (Ecoplan, 2018).

The reform affected only a limited number of jurisdictions, providing us with a quasi-experimental setting. The primary motivation for the reform was reducing arrears with payments that in a significant number of cases led to personal bankruptcies. In 2018, health insurers initiated unsuccessful debt collection proceedings against approximately 200,000 individuals, and the resulting loss certificates for outstanding premiums amounted to about CHF 400 million (Federal Office of Public Health, 2020). The cantons, i.e., the states of the Swiss Confederation, subsequently assume responsibility and cover by law 85% of these loss certificates. A popular argument against cash subsidies was that people would divert them to short-term consumption so that they were no longer available for paying premium bills due later in the year, suggesting limited willpower and/or financial planning skills upon exposure to a tempting temporary positive liquidity shock. Up to 2014, Swiss cantons were free to organize the subsidy scheme, and the payment modalities in particular, within federal regulations. Prior to the reform, some cantons thus provided recipients with a yearly one-time lump sum cash payment, while others remitted it to the beneficiaries' health insurers. The health insurers in turn reduced the premium bills by the amount of the transfer.[5] There are four cantons that changed their system to in-kind transfers in 2014, but kept all other features, like the application process, constant. We can compare the changes in payment performance in these cantons with the changes in three other cantons that experienced no changes in their transfer system in 2014, and thus serving as control cantons. The setting thus offers the possibility of a difference-in-differences (DID) design.

Our data on individual payment performance are from one of the biggest health insurance providers in Switzerland, offering us access to detailed accounting data (about 27 million bills) regarding arrears in premium payments. We focus on two outcomes related to an individual bill that indicate payment problems. First, whether the insurer sent

[4]The federal guideline specifies that a household's mandatory health insurance premiums should not exceed 8% of its *taxable* income.

[5]This process is similar to that in the exchanges of the Affordable Care Act in the United States (although in the ACA, individuals can also elect to pay the full premium first and receive a tax rebate later).

a payment reminder to customers, which occurs roughly a month after the due date of the bill. Second, initiation of the debt collection process (typically after the bill remains unpaid for three months), which leads to an entry in a central government registry and may have substantial long-term impacts in future access to rental housing or credit[6]. Regarding the individual transfers, health insurance providers did not know which of their customers received premium subsidies under the cash transfer scheme. In order to be able to compare recipients before and after the reform, we use the detailed individual level data and adopt a machine learning approach in which we predict recipients of premium subsidies. Imputing the subsidy status for all years in this consistent manner not only allows us to compare recipients in the DID between treated and untreated cantons, but also to adopt a DID within treatment cantons, with non-recipients acting as an additional control group. Finally, we also combine the two strategies in a triple-differences design.

We find that the two different payment modalities lead to substantially different outcomes regarding individuals' financial distress. The change from cash to in-kind transfers results in a 20% reduction in the probability that a payment reminder is sent out for the premium bill of a subsidized individual. In the case of debt collection, which indicates severe financial problems, the switch to in-kind payments decreases its likelihood among subsidy recipients by 16%. In a supplementary analysis, we do not find any negative (or positive) effects of the reform on the payment performance for coinsurance payments for medical services, i.e. expenditures not specifically targeted by the means-tested transfers. Finding no negative side-effects of the reduced flexibility (as individuals no longer receive cash) in this domain could be taken as an indication that recipients likewise do not have more difficulty paying other regularly occurring household expenses than before the reform. This suggests that the provision of health insurance transfers in-kind reduces financial distress among recipients overall, and not only with regard to health insurance premiums, compared with equally sized cash transfers.

Our study complements existing evidence regarding the impact of payment modality (see, e.g., Cunha, 2014; Hidrobo et al., 2014, 2016), disbursement patterns (see, e.g., Foley, 2011; Carr and Packham, 2018) and labeling (see, e.g., Kooreman, 2000; Beatty et al., 2014) of means-tested benefits on diet, other household expenditures, health, domestic violence, and other forms of crime in subsidized households. It emphasizes financial distress as an important additional outcome variable and suggests limited financial planning capacity as a key moderating factor in the effectiveness of alternative payment modalities. Interestingly, little seems to be known about whether beneficiaries themselves prefer cash over in-kind transfers. Information on the preferences of subsidized individuals is particularly absent for economically advanced countries but refer to developing countries, such

[6]See `https://www.ch.ch/en/debts-what-effects/` for further information on the debt collection process in Switzerland.

as the study by Hirvonen and Hoddinott (in press). They provide empirical evidence from a food assistance program in Ethiopia showing that, given the choice, recipients tend to choose in-kind provision over equally sized cash transfers (potentially for the reason that the former can serve as a commitment device). Another stream of related research studies the consequences of subsidized health *services* in comparison with those of cash transfers. Lieber and Lockwood (2019), for example, show that within Medicare Home Care in the United States, in-kind transfers lead to over-consumption among beneficiaries, but improve targeting compared to cash-like transfer payments. Related to our study, Kaufmann et al. (2017) present evidence from the same premium subsidy scheme in Switzerland and find that recipients are more likely to choose health insurance plans with a low deductible if they receive their benefits in-kind rather than in cash. This aspect is taken into account in the control strategy of our analysis.

The remainder of the paper is structured as follows. In Section 2, we describe the health insurance system in Switzerland, the premium subsidy scheme and the harmonization of its payment scheme to in-kind in 2014. We explain our empirical strategy in Section 3, before discussing our data and the machine learning approach for predicting recipients of cash transfers in Section 4. Finally, we present the results of our empirical analyses in Section 5, with Section 6 providing concluding remarks.

2 Institutional background

2.1 Health insurance in Switzerland

Similarly to the Netherlands, Germany, and the US marketplaces in the ACA, the Swiss health insurance system is organized according to principles of regulated competition.[7] Health plans and health providers compete on price and quality, while regulation ensures individual affordability of health plans and risk solidarity. Health insurance is compulsory, but consumers can freely choose among approximately 50 private insurers (open enrollment). The standard health plan includes free physician choice, an individual deductible of CHF 300 and a co-insurance rate of 10% up to the stop-loss amount of CHF 700.[8] To ensure risk solidarity, health plans have to charge community-rated premiums per region and age category (children aged $0-18$, young adults aged $19-25$, and adults). Consumers can choose a higher deductible and health plans with managed care features. The voluntary deductible ranges from CHF 500 to $2,500$; managed care options include telemedicine,

[7] The following general description draws heavily on Schmid et al. (2018)

[8] For children, the individual deductible is zero and the stop-loss amount is CHF 350. If a family has more than two children, the children's cumulative stop-loss amount is CHF 700.

preferred provider, and health maintenance organization health plans.[9] Choosing a voluntary deductible and/or a managed care option leads to a premium reduction. However, the premium reduction is subject to strong regulations ensuring risk solidarity between individuals with low and high risk. Finally, it is important to note that each health plan has to offer the same coverage in terms of physician services, hospital services, prescription drugs and so on. Health insurers *must not* extend the coverage of the basic health insurance plans, but they are allowed to sell supplementary health insurance plans that cover services not included in the basic coverage (e.g. dental services).

In order to ensure health plan affordability, low-income individuals and families receive means-tested premium subsidies from their canton of residence (Kaufmann et al., 2017). While the premium subsidies are based on federal law and are partially financed by the federal government, cantons have considerable leeway regarding the design of the subsidies. This is reflected in different dimensions: First, there are differences in the income threshold determining subsidy eligibility, whereby the subsidy decreases either linearly or step-wise as income rises (see Gerritzen et al., 2014, for further details). Second, the family structure, in particular marital status and the number of children, is taken into account differently. While some cantons, for instance, shift the income threshold upwards to account for family size, other cantons directly set higher subsidies per child as family size increases. Third, there is considerable variation in the cantonal reference premiums due to large differences in healthcare expenditures across cantons. The reference premium corresponds to an average premium (of the standard health plan) and is used to determine the maximum subsidy amount.[10] Altogether, these differences primarily affect the number of subsidy beneficiaries and the subsidy per beneficiary.

2.2 Payment modalities of health insurance premium subsidies

Up to 2014, cantons were allowed to decide on a further dimension of the premium subsidy payment system. They determined the *recipient* of the payment. The subsidy could be either paid into the beneficiary's bank account or to his or her insurer.[11] In the former case, the health insurance invoiced the full premium amount without even knowing which individuals received a subsidy. We refer to this payment modality as *cash transfer*. In the latter case, the health insurance provider deducted the subsidy amount from the premium, i.e., the provider invoiced a reduced premium bill. We refer to this payment system as

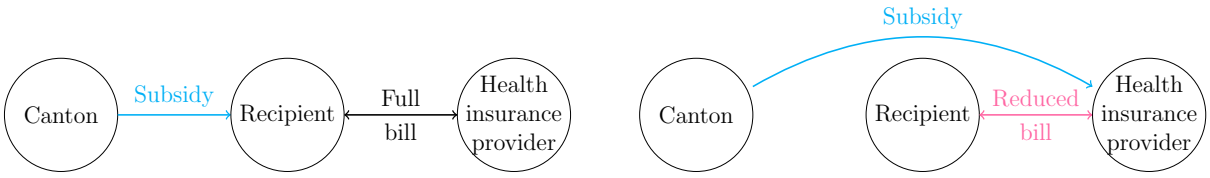
[9] The voluntary deductible for children ranges from CHF 100 to 600; children can also choose managed care health plans.

[10] Health insurance subsidies are thus price-linked similarly to subsidies in Medicare Part D and ACA exchanges (see, for example, Jaffe and Shepard, 2017).

[11] The main reason for allowing cash transfers in 1996, when the scheme started, was the lack of an adequate digital infrastructure for the exchange of recipient information between cantons and health insurance companies in many cantons at the time.

in-kind premium reduction. Graphically, we show the two systems below in Figure 1.

FIGURE 1 – Comparison of transfer payment systems



(a) Cash transfer (b) In-kind premium reductions

2.3 Payment harmonization of 2014

In the summer of 2007, the Social Security and Health Committees of the Swiss parliament passed a motion requesting the Federal Council to add an amendment to the next change in the national Health Insurance Law that would require cantons to pay out premium subsidies only in-kind. The committee members proposing the motion argued that cash payments tempted recipients to spend the benefits for purposes other than health insurance premiums.[12] However, essentially no empirical evidence existed to support (or refute) this (probably) most common justification of in-kind transfers in the political discourse. The harmonization to in-kind was backed by all parties across the political spectrum and passed unanimously in March 2010.

The amended Health Insurance Law went into effect on January 1, 2012 and the nine cantons that made use of cash transfers were given until January 1, 2014 to adapt their systems to transferring the subsidy directly to health insurance companies. The deadline became the actual reform date in all the affected cantons. Further revisions to the Health Insurance Law had no separate impact on the cantons depending on their payment system but were effective nationwide. Moreover, the other modifications applied from 2012 onward. It is thus most unlikely that they would confound any of our findings for the payment harmonization of 2014.

3 Empirical strategy

3.1 Treatment and control cantons

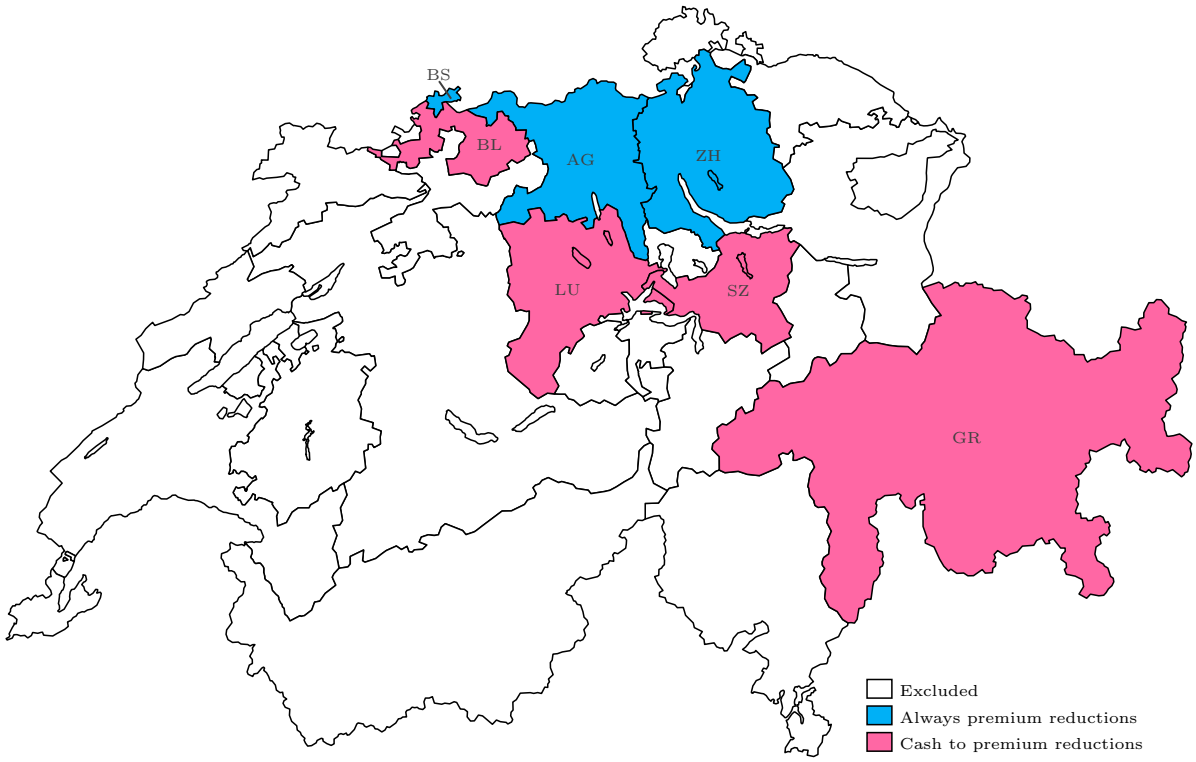
The simultaneous switch of some Swiss cantons from paying out subsidies in cash to subsidizing individuals' premiums in-kind on January 1, 2014, with other cantons maintaining the latter system, offers an ideal setting that can be studied as a quasi-experiment. It

[12] `https://www.parlament.ch/de/ratsbetrieb/amtliches-bulletin/amtliches-bulletin-die-verhandlungen?SubjectId=11790` (in German).

allows us to measure the causal effect of one over the other transfer system on the financial situation of recipients.

Specifically, four of the nine reform cantons only changed the payment modalities and thus qualify for our analysis. The other five cantons opted to adjust further modalities in their premium subsidies, such as eligibility rules and benefit amount calculation criteria.The cantons included in the treatment group are displayed in Figure 2 in red. These are the cantons of Lucerne (LU), Schwyz (SZ), Basel-Landschaft (BL), and Grisons (GR), with roughly 400,000, 160,000, 280,000, and 190,000 inhabitants, respectively, at the time of the reform.

FIGURE 2 – Overview of payment system harmonization



Three of the 17 cantons already employing in-kind transfers for their premium subsidy schemes in 2014 qualify for the control group; the other 14 cantons had to be excluded. First, since all cantons changing from cash to in-kind payment belong to the German-speaking part of Switzerland and payment behavior is quite different in the majority of French- and Italian-speaking cantons, we did not include these latter cantons in our control group. Second, since cantons quite often make minor tweaks and adjustments to their premium subsidy schemes, we also excluded all the cantons that did so during the time period under study (2012 to 2015). The three remaining cantons (marked blue in Figure 2 are Zurich (ZH), Basel-City (BS), and Aargau (AG), with respective populations of about 1.5 million, 200,000, and 670,000 at the time of the reform.

3.2 Estimation approaches

With this setting, we can follow a difference-in-differences (DID) approach to estimate the average treatment effect of the reform on the financial distress of the treated. We simply compare the outcomes for recipients in cantons that switch from cash to in-kind transfers (*tr.cant.=1*) before and after the reform with those of recipients in cantons that have always used in-kind premium reductions (*tr.cant.=0*), i.e.,

$$\rho_{recipients} = \{E[Y|tr.\ cant. = 1,\ post = 1] - E[Y|tr.\ cant. = 1,\ post = 0]\} \\ - \{E[Y|tr.\ cant. = 0,\ post = 1] - E[Y|tr.\ cant. = 0,\ post = 0]\}.$$

Since the untreated cantons have not changed any aspects of their premium subsidy schemes, any potential developments that affected the entire population of recipients in the two groups of cantons (for example, a general improvement in economic conditions for low-income individuals) will therefore be canceled out.

Other trends that occur only within the group of treated cantons, such as separate paths of economic growth, however, could still lead to spurious findings of a reform effect. To avoid our results being driven by such canton-specific factors, we employ an additional identification strategy. We consider non-recipients as another category of individuals unaffected by the payment harmonization for the control group. Contrasting an outcome for payment problems for recipients (*rec.=1*) with that for non-recipients (*rec.=0*) in treated cantons takes into account any developments affecting the payment behavior in general within the group of cantons switching from cash to in-kind. Our second estimation approach thus takes the following form:

$$\rho_{reform\ cantons} = \{E[Y|rec. = 1,\ post = 1] - E[Y|rec. = 1,\ post = 0]\} \\ - \{E[Y|rec. = 0,\ post = 1] - E[Y|rec. = 0,\ post = 0]\}.$$

Finally, we combine the first and second approaches to estimate difference-in-differences-in-differences, or triple differences (TD). This provides us with an extensive control strategy, as we account for both national trends among subsidy recipients, as well as broader cantonal trends in the group of treated cantons. Using TD also considers any changes before and after the reform between recipients and non-recipients in control cantons. Therefore, we also control for potential situations in which the development among recipients in these control cantons actually represents an improvement or deterioration in

payment behavior relative to non-recipients in the same cantons. We estimate TD with

$$\begin{aligned}\rho_{td} = (\{&E[Y|tr.\ cant. = 1,\ rec. = 1,\ post = 1] - E[Y|tr.\ canton = 1,\ rec. = 1,\ post = 0]\} \\ &- \{E[Y|tr.\ cant. = 0,\ rec. = 1,\ post = 1] - E[Y|tr.\ canton = 0,\ rec. = 1,\ post = 0]\}) \\ &- (\{E[Y|tr.\ cant. = 1,\ rec. = 0,\ post = 1] - E[Y|tr.\ canton = 1,\ rec. = 0,\ post = 0]\} \\ &- \{E[Y|tr.\ cant. = 0,\ rec. = 0,\ post = 1] - E[Y|tr.\ canton = 0,\ rec. = 0,\ post = 0]\}).\end{aligned}$$

Any finding in TD thus likely arises due to the switch from cash payments to in-kind premium reductions.

Lastly, as a check of whether the results for the subgroup of subsidy recipients correspond to the changes in payment behavior of the entire population, we also adopt a simple DID design in which we compare all individuals in treated cantons with all individuals in control cantons. Since the coefficients of the OLS estimator for the entire population scale linearly with the share of the treated population and since about 25% of individuals receive premium subsidies, these estimates should be roughly a quarter of the size of the coefficients for recipients (if the outcomes of other groups do not indeed change over time).

We estimate ρ with ordinary least squares. Given our outcome variable measure whether there is a payment problem associated with a particular bill, this is in effect a linear probability model. Since our data allows us to construct a panel for the individuals over the entire time they were under contract with the health insurer, we always include individual fixed-effects. This ensures an effective control for time-invariant personal characteristics relevant to payment behavior. As we describe later, we limit our sample to individuals who never move between cantons during our observation period.[13] In later specifications, we also always replace the standard DID indicator of whether an observation occurs after the reform with year-month specific effects (for example, for February 2013, or for August 2015) to flexibly control for general variation in payment behavior in each observed month. In the the final, most extensive specifications, we additionally include individual and household level characteristics that can vary over time and are thus not picked up by the included individual fixed-effects. The individual level characteristics capture accident coverage, lowest deductible, highest deductible, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental health insurances, ln(monthly supplemental health insurance premiums), ln(income estimation). For the household level, we consider household size, number of children in the household, number of young adults in the household, type of household, ln(mean of income within the household), ln(highest income in the household), whether all members of the household

[13]This means that the typical DID binary variable indicating whether an individual lives in a treated canton, providing the coefficient for the pre-reform difference between treated and control cantons, cannot be estimated.

are Swiss citizens, whether no member of the household is a Swiss citizen.

4 Data

4.1 Individual level information

We have access to the accounting records of the CSS Group, one of the largest Swiss health insurers, for the years 2012 to 2016 with an annual average of roughly 1.2 million individuals enrolled in compulsory health plans. Our data comprises all individuals who lived at least one day in one of the following seven cantons: Aargau (AG), Basel-Landschaft (BL), Basel-City (BS), Grisons (GR), Lucerne (LU), Schwyz (SZ), and Zurich (ZH). For each individual, we have information on the date of birth, gender, language, citizenship status, civil status and family size. Regarding individual health plans, we observe the insurer within the CSS Group (CSS, INTRAS, Arcosana, or sanagate), the chosen deductible level and plan type in terms of managed care, accident coverage, and the premium. In addition, we have information on the preferred payment method (payment slip, direct debiting procedure, or electronic billing), payment periodicity (monthly, biannually, or annually), and we know whether bills are paid by the insured person or by a third party (e.g. their parents). We also have individual information on the number of supplementary health insurance plans and the total premium paid for these plans. Changes of health plan or personal details are observed on a daily basis. Finally, the data comprises an income indicator ranging from very low income (strictly greater than 0) to very high income (2).

Regarding the subsidized premiums, we observe for each recipient the monthly and annual amount, and the subsidy period. For the cash subsidies, however, we observe neither who the individual recipients are, nor the transfers in the relevant cantons before 2014. We therefore impute this recipient status (see 4.3 for further details).

For the individuals' payments, we have very detailed information on each invoice. We observe the invoice type (e.g. health plan premium, co-payment bill), the billing amount, the billing date, and the receipt of payment. In other words, we can calculate the payment duration. We also know whether the individual received a reminder or a payment request and the final status of the bill (e.g. paid, debt collection, default, and so on).

4.2 Insurance bills sample compilation

Our initial data set consists of all the 27.15 million billing entries that accrued between January 1, 2012 and December 31, 2016 for the 586,574 CSS mandatory health insurance clients residing in one of the seven cantons. As individual premium bills can have multiple entries (for example, partial payments, internal accounting offsets and so on), we first aggregate the information for each single bill ID. Thus, we end up with the total amount

due, the number of days elapsing until settlement, and the highest level of payment collection steps taken associated with each particular bill. Next, since the most frequent contractually available billing frequency is monthly, we limit each client to at most one "bill observation" in each month in the instances in which multiple distinct billing processes were initiated for an individual within a single calendar month. In almost all of these cases, there was a clear "principal" premium bill issued, with a markedly higher amount due, next to smaller "auxiliary" bills. To avoid picking up noise by measuring payment problems for small amounts likely due to processing or communication errors between clients and the health insurance company, we only use the payment collection steps taken for the bill with the highest amount due in a single calendar month.

Next, we use the information on all mandatory health insurance contracts in the seven cantons during our observation period to create a monthly panel for all individual clients for every month they were under contract with CSS.[14] From this basis, we remove all clients who changed canton between 2012 and 2016 to prevent problems arising from their exposure to different premium subsidy systems (about 50,000 individuals). Furthermore, we only retain individuals in our sample who had a mandatory health insurance contract with CSS for at least a full year before and after the reform in 2014 (this removes another roughly 150,000 individuals). To this client-month panel, we add the monthly client-bill information described above. As roughly 15% of individuals choose billing intervals other than monthly ones, we get, overall, an unbalanced panel structure, in which we observe monthly payers more frequently than other individuals. After further removing clients with missing information for the individual and household level variables, highly unusual billing patterns or an atypical number of contract modifications (approximately 20,000 individuals), we end up with roughly 16.8 million observations of distinct health insurance premium bills from 362,808 individual clients.

Due to the lack of information on premium subsidy recipients under the cash transfer system, we choose to predict this status using a machine learning approach as explained below. In order to achieve strict separation between the observations we use to train the algorithms and those we use in our actual analysis, we remove a random subset of 50% of year-client observations for learning purposes and subsequently use only the remaining half for our analysis. While we employ all three observation years after the reform for the prediction of recipient status, problems with data quality regarding the information on the premium bills themselves in the final months of 2016 force us to discard this last year in our final sample.

Table 1 presents the resulting final number of premium (and medical co-pay) bills and individuals in our analysis. The individuals for whom we have information on medical

[14] Mandatory health insurance contracts usually run for a full year from January to December, but for various reasons (e.g. change in accident coverage, canton of residence, or military service) individuals can have multiple different contracts over the course of a year.

TABLE 1 – Descriptive statistics for outcome variables

	Premium bills		Medical bills	
	At least reminder	Debt collection	At least reminder	Debt collection
Mean	6.28%	1.95%	5.64%	1.29%
Bills	6,793,005		711,211	
Individuals	336,582		148,458	

Note: Mean refers to the share of bills that receive at least a payment reminder or entered debt collection, respectively, out of all premium and medical bills, respectively, over the entire time period we analyze. Among all individuals, 23.6% (15.5%) have received at least one payment reminder and 5.2% (2.7%) entered debt collection at least once for premium bills (medical bills).

bills form a subset of those whose premium bills we study (since many never require such services during the observation period).

4.3 Classification of subsidy recipient status

Cantonal governments paying out cash transfers prior to the harmonization did not inform health insurance providers as to which of their customers receive premium subsidies. We are thus only able to directly identify recipient status (and corresponding subsidy amounts) for all years in cantons belonging to the control group. For the cantons that switched to in-kind transfers in 2014, identification is only possible after the reform took place. Obviously, this presents a challenge to our empirical strategy, which relies on comparing recipients from treated and untreated cantons, as well as recipients with non-recipients within cantons. Therefore, the correct classification of the subsidy status of all individuals in our data over the entire time becomes a crucial step before we can begin our actual analysis of the effect of cash versus in-kind transfers on the financial distress of recipients.

Such a classification is possible, though, due to the large number of clients and the scope of information in our data. It allows us to recreate the cantonal premium subsidy eligibility rules closely enough to predict the status for every individual in each year.[15] Given the highly non-linear eligibility formulas, simple linear probability models using OLS to estimate the propensity to receive subsidies are not sufficient. The corresponding

[15]One alternative would be to simply hold the recipient status in 2014 (the first year we know it in all cantons) of each individual constant for every year. However, this approach is fraught with several issues that likely result in biased findings. First, recipient status varies quite substantially within individuals over the years we observe. By keeping the recipient status fixed in this way, only 75% of actual recipients would be correctly classified in 2012, just two years removed from the reform. Second, and more importantly, this approach leads by design to a 100% prediction accuracy in 2014. This is problematic, as it implies that prediction accuracy improves in a highly discontinuous manner that aligns exactly with the reform. It also results in the prediction accuracy being higher in general after the reform (see figure D5 in the appendix). We would thus have difficulties in separating how much of the outcome in our subsequent analysis can be attributed to the payment system and how much arose due to the distortions introduced by different pre- and post-reform levels in prediction accuracy.

predictions are too inexact[16], so that our results are biased significantly towards zero, most likely due to the high share of non-recipients (for whom the reform has no effect) being wrongly classified as recipients. For this reason, we opt to employ several machine learning algorithms that are better suited to dealing with the complex non-linearities in eligibility determination.

4.4 Machine learning protocol

For our main analysis, we determine a predicted recipient status for *each* individual in the data set in *each* year, i.e. even when the actual status is known. We adopt this strategy in order to prevent any bias in the estimated treatment effect of the reform that would arise just because the status is fully accurate over the full duration of the sample in the control group but only after the reform in the treatment group. We proceed in nine steps[17]:

First, we separate the observations we use to train the prediction models from those on which we conduct our analysis afterwards. Our large data set enables us to randomly split our data in half, into a "learning set" and an "analysis set" and still have enough observations to conduct both tasks.

Second, we only use data from after the reform in 2014 for creating the prediction models for all cantons (i.e., also for those that always applied in-kind transfers) and all years. This ensures that information from the same years is used to tune the algorithms and to evaluate their performance for the cantons in the treatment and control groups. If treated otherwise, differences in the quality of the predictions at the reform date (with more accurate predictions for the cantons in the control group before the reform, observed over the whole period, than for those in the treatment group) might bias the results of the main analysis.

Third, we randomly separate the data in the "learning set" into a training (80%) and a validation set (20%). These steps leave us with about 500,000 observations to train our prediction models with.

Fourth, since each canton sets eligibility rules individually and income level thresholds differ substantially between cantons, we also create cantonal subsets of both the training and validation samples. Specifically, we take advantage of the large number of observations in the complete training sample as well as the opportunity to recreate the cantonal eligibility formulas by training all of our models once on the full set and once for each canton separately.[18] We will explain how we combine these models into a single propensity

[16]Figure D4 in the appendix provides an example of using the same prediction procedure as in our eventual machine learning approach, but instead relying on OLS. It shows that only about 45% of the individuals predicted to be recipients actually receive subsidies.

[17]Figure D1 in the Appendix provides an overview of the machine learning protocol in graphical form.

[18]For some cantons we have to rely on a rather small number of observations (e.g., in one canton, fewer than 10,000 observations are available to train our models). Partially resorting back to the larger sample

to be a subsidy recipient below.

Fifth, in all our models, we use the individual and household characteristics outlined earlier and, based on them, also construct additional features to arrive at 50 variables (listed in Figure D3 in the Appendix). We feed them into our machine learning algorithms to detect premium subsidy recipients.

Sixth, as ensembles of multiple models often perform better than a single, highly tuned algorithm (see, e.g., Mullainathan and Spiess, 2017), we use three different types of machine learning algorithms, *gradient boosted trees*, *random forests*, and *artificial neural networks* for each of the 8 training samples (the 7 cantonal sets and the full set).

Seventh, after tuning the hyperparameters for each algorithm and subset[19], we apply all six resulting models to corresponding cantonal data in the "analysis" set and end up with the six corresponding probabilities of receiving subsidies for each individual in each year of our sample.

Eighth, in order to obtain a single propensity that can be translated into a binary indicator, we run a simple logit model for each canton (again using only observations from 2014 onward) with the actual recipient status as the dependent variable and the six probabilities as the explanatory variables. The resulting coefficients are then adjusted (to add up to one) in order to get the optimal weights for each model in each canton. By multiplying each propensity by its corresponding weight and then summing up, we arrive at a single probability for each individual, which we call the ensemble prediction.

Ninth, we determine the threshold likelihood above which an individual is classified as a subsidy recipient based on a data-driven approach. Specifically, we choose for each canton the value which maximizes the harmonic mean of precision and recall (also known as the F_1 score).[20] Once again, we only use observations made after all cantons had adopted in-kind transfers.

Overall, these nine steps provide us with a prediction for the subsidy recipient status of each individual in every year we observe him or her in our data set.

4.5 Performance of the status classification

Out of sample (in the analysis set after 2014), we correctly classify 84% of individuals as recipients or non-recipients in each respective year (accuracy) with our machine learning approach. When individuals indeed receive premium subsidies in the respective year, we

helps to achieve better predictions for these cases.

[19]Calculations were performed at sciCORE (`http://scicore.unibas.ch/`) scientific computing center at University of Basel.

[20]Alternatively, we could have chosen the cut-off point in such a way that the predicted share matches the share of actual recipients in our data in each year. However, as this share is not known for the cash transfer system, we would have had to extrapolate the share of recipients for each year, using official statistics for all insured individuals within a canton.

identify them as doing so in 71% of cases (sensitivity); for non-recipients this rate is 87% (specificity). Precision (how many individuals classified as recipients indeed receive subsidies) is 61%. This means that the pool of predicted recipients consists to an extent of over one third of individuals who have not actually enjoyed reduced health insurance premiums in the year in question. Any estimated treatment effect is thus likely a lower bound.[21] Additional information on how well our predictions perform over time in treated and control cantons can be found in Figure D2 in the Appendix. We see some improvements in prediction quality after the reform relative to before in the cantons always applying in-kind transfers (for which it is possible to pursue this evaluation). Compared to the alternative approaches, as well as compared to the absolute levels, they are rather small in relative terms, however. Given that we estimate the propensity to receive subsidies in exactly the same way for both groups of cantons, there is little reason for why any upticks we observe in the control cantons should be unique to this group. Any possible effects arising from different levels of prediction accuracy before and after the reform should therefore cancel out in our various difference-in-differences approaches.

5 Results

We discuss the results of our main analysis in three subsections. First, we provide graphic evidence depicting the mean outcomes of our dependent variables for financial distress on a monthly basis over time for recipients across reform and control cantons as well as for recipients and non-recipients within the group of reform cantons. Second, we present the results from the corresponding DID and TD estimates. Third, we show and discuss the possible side effects of the reform on the settlement of medical bills.

5.1 Graphic evidence for financial distress

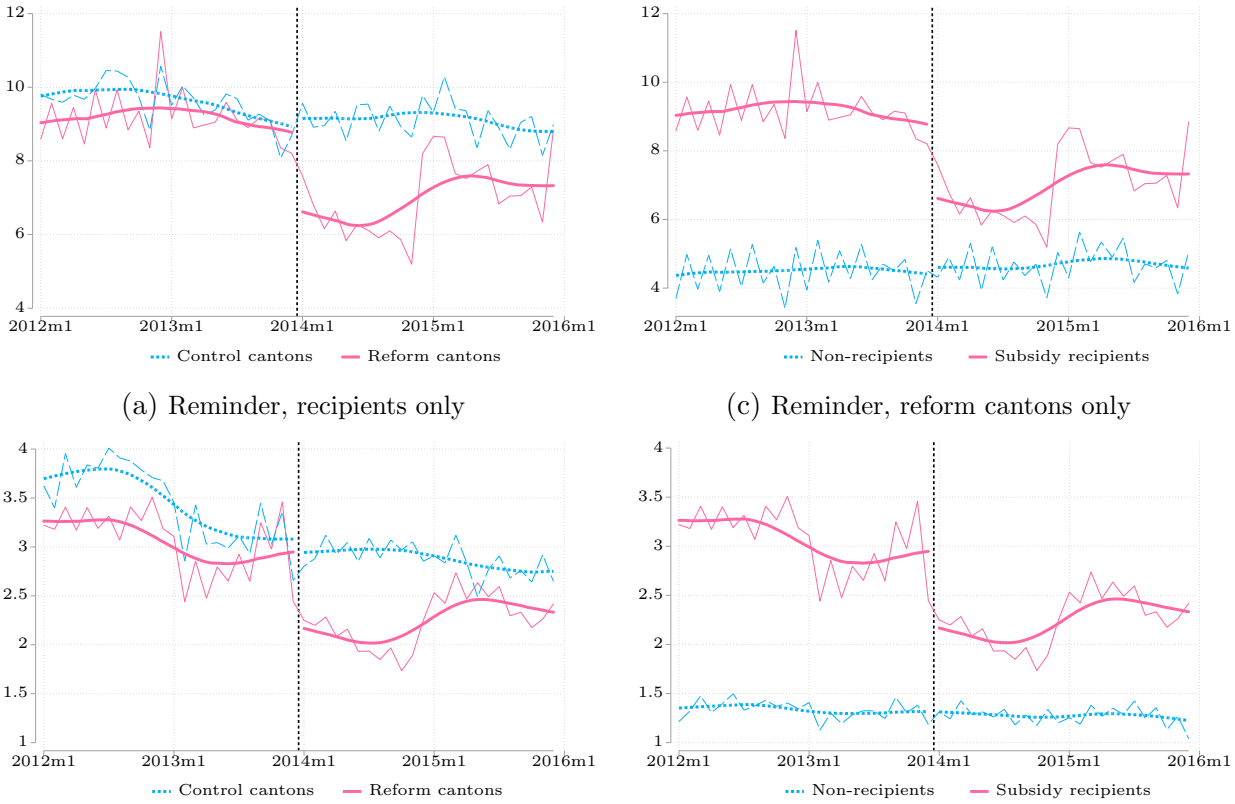
In Figure 3, we present the raw probability, aggregated over each month between January 2012 and December 2015, for a given bill that the recipient will receive at least a payment reminder or enter debt collection, respectively. The upper two panels display the results for payment reminders, while the bottom two show results for debt collection. On the left-hand side, we compare subsidy recipients[22] in cantons that changed from cash to in-

[21] Such an attenuation bias is also suggested when we apply the exact same classification process as in our machine learning approach, but rely on an OLS approach (though, of course, combining predictions from only two models instead of six). A linear probability model performs substantially worse (73% accuracy, 68% sensitivity, 74% specificity, and 43% precision) in correctly predicting subsidy recipient status. Especially because the OLS approach classifies many more non-recipients as recipients, the effects of the reform become much smaller if we use the OLS predictions compared to the results we obtain with our much more accurate machine learning predictions (see Tables D1 to D3 in the Appendix).

[22] In the following, the status of subsidy recipient (or non-recipient) always refers to the classification based on our machine learning procedure, unless otherwise noted.

kind transfer on January 1, 2014 with recipients in cantons that always applied in-kind transfers. The right-hand side only considers the cantons affected by the payment reform and compares subsidy recipients against non-recipients within these four cantons.[23]

FIGURE 3 – Switch from cash transfers to in-kind premium subsidies and payment behavior



(a) Reminder, recipients only

(c) Reminder, reform cantons only

(b) Debt collection, recipients only

(d) Debt collection, reform cantons only

Note: For all individuals, subsidy recipient status is determined based on the classification procedure outlined in Section 4.3.

The graphic evidence in Figure 3 clearly indicates an effect of the reform on payment behavior for health insurance premiums.[24] According to panel (a), before the reform, the likelihood of cash-transfer recipients receiving at least a payment reminder was on average about 9%, which immediately drops to around 7%, on average, once the same benefits are provided in-kind. Based on the averages for the two years before and after the reform, the difference of 2.19 percentage points represents a reduction in payment difficulties of roughly a quarter for the population affected by the reform. It is noteworthy that, pre-reform, the fractions of payment reminders among recipients in control and treated cantons

[23]The same raw probabilities for all individuals in control and treated cantons are displayed in Figure C1 in the Appendix.

[24]Recipients of premium subsidies in cantons that always used in-kind provision generally had more problems with paying their premium bills than did recipients in cantons with cash transfers, both before and after the reform. This might be due to the three control cantons having larger urban population centers, which are associated with higher levels of financial difficulties in general.

seem to follow a common trend, even unconditionally, which is a crucial requirement for our DID strategy later. Furthermore, and as expected, since there was no change for recipients in control cantons, which always applied in-kind payments, we observe virtually no change in the probability of receiving at least a reminder. This provides some assurance that the substantial improvement regarding moderate financial problems in the treated cantons is not due to some nation-wide trend or a potential concurrent change in the billing process by the health insurer (which the company also assures us did not happen).

For severe financial distress, measured by the initiation of debt collection proceedings, we observe in panel (b) a pattern similar to that for payment reminders. Debt collection proceedings (which start roughly three months after the due date of the premium bill) are substantially less likely to be initiated for subsidy recipients in treated cantons after the 2014 reform than before. No analogous reduction occurs for recipients in the control cantons. Under the cash regime, recipients had a probability of about 3%, on average, of each bill entering debt collection, while after the switch to in-kind transfers this mean probability decreases to roughly 2.2%. The corresponding 0.8 percentage-point decline suggests an improvement in severe financial problems of about 25%. However, this figure overestimates the effect of the reform on debt collection, as there was a similar decrease in its likelihood across all cantons from 2012 to 2013. Since the movement over time prior to the reform occurred in parallel in both the control and treated cantons, it will eventually be correctly captured in the DID approach below.

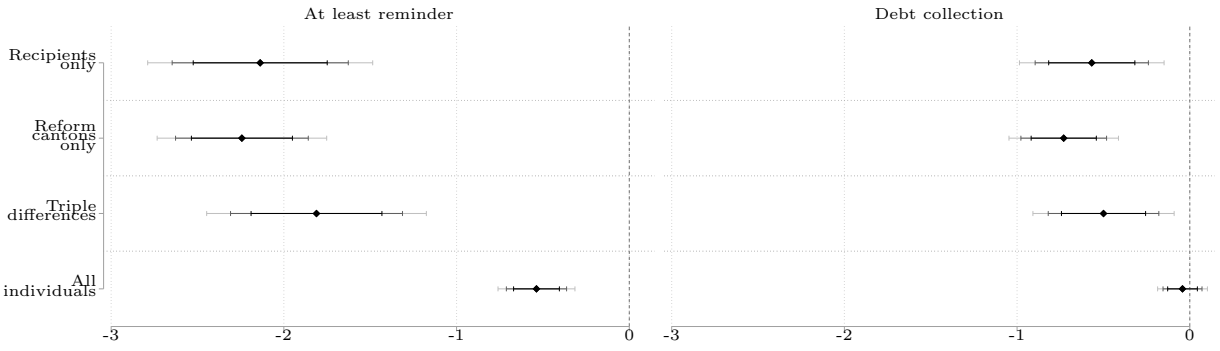
In panels (c) and (d), we also compare the development for recipients before and after the reform with that for non-recipients in cantons that changed payment modalities from cash to in-kind. This comparison should reveal whether there has been a general shift within the treated cantons that has led to the reduction in financial difficulties observed in panels (a) and (b). There seems to have been no general shift. Instead, and as expected, the likelihood for non-recipients of receiving a payment reminder and of experiencing debt collection proceedings does not change with the reform.[25] In contrast, for recipients, we observe a substantially lower fraction of bills ending up with a reminder or the initiation of debt collection.

[25]This observation can also serve as an indirect validation of our machine learning procedure. As we train our models for all the cantons only on the post-reform period, it would have been possible for a structural break in prediction accuracy and outcomes to occur that is synchronous with the reform. In fact, the alternative classification of holding recipient status constant at the status observed in 2014 for all the years in our analysis would indeed introduce a substantial discontinuity in prediction accuracy. Tables D7 to D9 in the Appendix show that the corresponding results are much less stable over the different control groups. This becomes particularly pronounced in the design comparing recipients and non-recipients in treatment cantons only, as here there is no longer a group of other cantons where a similarly large shift in the quality of the classification occurred.

5.2 Estimation results for insurance bills

We formally estimate the treatment effect of the switch from cash transfers to reduced insurance premiums on the financial distress of the treated subsidy recipients within DID and TD analyses. Figure 4 displays the corresponding coefficients of the most extensive specifications for the treatment effect for the three strategies using different control groups to compare subsidy recipients in treated cantons.[26] We present the 95%, 99%, and 99.9% confidence intervals of each coefficient as black, gray, and light gray lines. The effect of payment system reform on the payment behavior of recipients is statistically significant at the 0.1% level for all the control strategies. The size of the estimated effect across the three specifications is similar to what we observe in the graphic analysis above. The reform substantially reduces both mild and severe financial problems of subsidy recipients.

FIGURE 4 – Treatment effect of payment reform on the payment problems of the treated subsidy recipients



Note: Diamonds represent the beta coefficient of the relevant difference-in-differences (or triple differences, respectively) interaction terms. Among subsidy recipients in treated cantons before the reform, the probability of any given bill receiving at least a payment reminder is 9.19%, and 3.04% of entering into debt collection. All results include individual and specific months fixed-effects. Individual and household-level controls include accident coverage, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, time of month the bill was received, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. All standard errors are clustered on the individual level. Black, gray and light gray lines correspond to the 95%, 99% and 99.9% confidence intervals.

Specifically, the first two rows show that the probability of each bill receiving at least a payment reminder is reduced by 2.14 percentage points (when comparing recipients in treated cantons with those in the control cantons) or 2.24 percentage points (when comparing recipients with non-recipients in treated cantons), respectively. These are the DID results with individual fixed-effects, year-month fixed-effects and various time-variant in-

[26]The full regression results for each estimation are presented in Tables C1 to C4 in the Appendix. Including year-month effects (instead of a single post-reform dummy as in standard DID) as well as numerous time-varying individual and household-level controls leads to virtually no change in the estimated coefficients of interest compared to the baseline with only individual fixed-effects.

dividual and household level controls. In row three, we combine the two approaches based on DID into a TD analysis. The development in payment behavior after the reform relative to before among recipients in treated cantons is compared to the development among recipients in control cantons and non-recipients in both treated and control cantons. With this comprehensive control strategy a decrease of 1.81 percentage points in the probability of getting at least a payment reminder is estimated. As the likelihood of a payment reminder was 9.19% among recipients in the treated cantons before the reform, this likelihood is reduced by 23.3%, 24.4%, or 19.7%, respectively, according to the three estimations.[27]

For severe financial problems, i.e, entering debt collection, the estimated effect of the reform amounts to a reduction by 0.57 percentage points (when comparing recipients in treated cantons with those in control cantons) or 0.73 percentage points (when comparing recipients with non-recipients in treated cantons). These effect sizes are somewhat smaller than those observed in the graphic analysis. Based on the TD, a reduction of 0.50 percentage points is estimated. Compared to the 3.04% probability of each bill entering debt collection among recipients in treated cantons before the reform, the reductions amount to 18.8%, 24.0% and 16.4% lower likelihoods, respectively.

In the last row of Figure 4, we compare payment behavior for premium bills of all individuals (regardless of recipient status) in treated cantons with that of all individuals in control cantons. These estimations offer a cross-check of the results that rely on the classification of subsidy recipient status. We find that among all individuals the probability of receiving at least a reminder for a particular bill decreases by 0.54 percentage points relative to pre-reform and control cantons. Due to the properties of the OLS estimator, we can linearly scale the size of the coefficient to approximate the treatment effect on the treated. By multiplying the coefficient by four (as the share of recipients in treated cantons is, on average, about 25%), we get an expected effect on the treated of about 2.2 percentage points. This effect size lies within the confidence intervals of the different control approaches shown in rows one to three.[28] For the likelihood of debt collection proceedings, quadrupling the estimated coefficient of -0.05 percentage points (not statistically different from zero at the 95% level) over all individuals yields an extrapolated treatment effect on those treated of about -0.2 percentage points. This effect size is fairly wide of the 0.5 percentage-point reduction we find with the refined control strategies;

[27]The TD estimate is slightly smaller than those based on DID. This smaller effect size likely arises because non-recipients in control cantons are less likely to pay their premium bills on time in the years after the reform (while for recipients in the control cantons no substantial change in payment behavior after, compared to before, the reform is observed (as expected)). This results in an apparent relative decrease in financial problems among recipients in control cantons, which, in turn, lowers the effect of the reform on recipients in treated cantons in the TD estimation.

[28]This result can also be taken as an indication that our machine-learning approach to predict recipients was successful and any potential biases introduced thereby are not an alternative explanation for our results.

however, it still falls within the lower end of the confidence bands.

5.3 Estimation results for medical co-pay bills

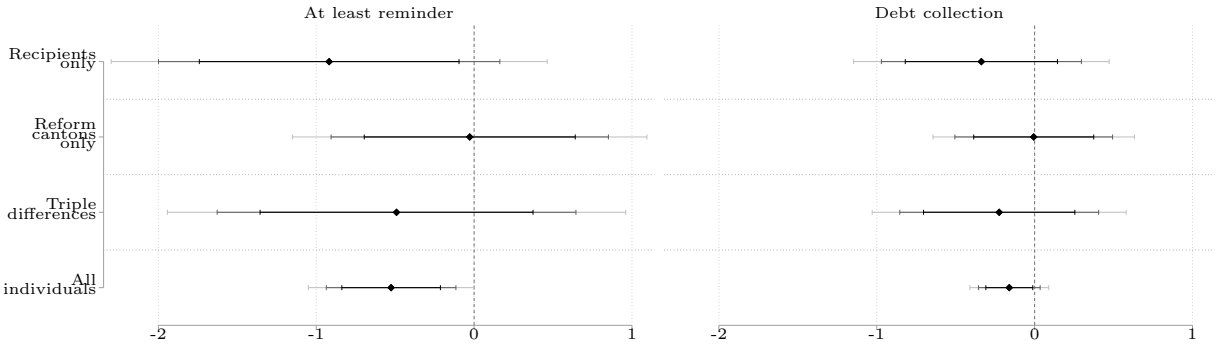
In traditional economic reasoning, cash transfers are attractive due to the flexibility they offer recipients. In the case of an income or expenditure shock, means are optimally allocated so that the overall mental and financial costs of delaying the settlement of some bills but not others is minimal. Accordingly, the observed payment behavior for the particular category of insurance bills under the cash regime was optimal, and providing the in-kind subsidy in the form of a reduced insurance premium restricts optimization and may well lead to more financial distress, albeit in other areas. We address this argument that is relevant from a welfare perspective in two ways. First, we provide some arguments that put the importance of paying insurance bills and the specific indicators of financial distress in perspective. Second, we empirically assess potential side-effects and analyze payment behavior for largely unexpected expenditures.

According to law, insurers are not allowed to limit insurance coverage or terminate contracts for basic coverage if customers do not pay their premium bills on time. However, as long as outstanding premiums are not fully paid, individuals are not allowed to change their health insurance provider and thus cannot benefit from less expensive alternatives. Moreover, some cantons also limit individuals' access to medical care (and serve basic medical needs only) once health insurers initiate debt collection against delinquent clients. Independently of any implications for medical care, entering debt collection might have severe consequences more broadly and is thus not chosen lightly. In particular, landlords regularly ask for a current extract from the debt register to screen out financially distressed applicants. We thus consider entering debt collection to be an indicator of general financial problems and not just a reflection of domain-specific payment behavior or a consequence of short-term liquidity management.

We explore this interpretation based on an empirical test for potential unintended consequences in payment behavior in another spending category. Specifically, we can study the same people's payment behavior for co-pays for medical services. These include all expenses for hospital treatments, purchases at pharmacies and in some cases doctor visits (particularly in physician networks). The medical service provider first sends the invoice to the health insurance company, which in turn bills their clients for the full amount until the yearly deductible is reached. The average medical co-pay bill in our data amounts to CHF 96. Bills for co-pays are always sent on a separate invoice to customers and, thus, there is no administrative connection between billing for premiums and co-pays. There is no subsidy scheme for medical co-pays, so payment system reform did not affect this area in any way. Importantly, health insurers are by law not allowed to use the premium subsidy to offset any co-pay bills. Otherwise, the billing and payment

collection process is identical to those for bills for health insurance premiums. For data quality reasons we had to limit our analysis of medical co-pays to the years 2013 and 2014, i.e. one year before and after the reform.

FIGURE 5 – Treatment effect of the reform on payment problems for medical co-pays of the treated subsidy recipients



Note: Diamonds represent the beta coefficient of the relevant difference-in-differences (or triple differences, respectively) interaction terms. Among subsidy recipients in treated cantons before the reform, the probability for any given bill of at least one payment reminder being sent is 8.72%, and 2.50% of debt collection being initiated. All results include individual and specific months fixed-effects. Individual and household level controls include accident coverage, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. All standard errors are clustered on the individual level. Black, gray and light gray lines correspond to the 95%, 99% and 99.9% confidence intervals.

In Figure 5, we present the main DID and TD coefficients for the reform effect on payment behavior regarding co-pay bills of subsidy recipients. The full regression tables can be found in Tables C5 to C8 in the Appendix. In contrast to the effect on premium bill payment, we do not observe a systematic reaction in the settlement of medical co-pays. Reminders and debt collection do not become more likely among subsidy recipients after the reform (the probability before the reform thereby amounts to 8.72% of at least a reminder and 2.50% of debt collection). Rather, we observe the point estimates to be negative; however, they come with relatively large standard errors. We interpret the evidence as a null effect and an indication that no unintended consequences occurred by switching from cash to in-kind subsidy payments in this additional domain of household expenditures.

6 Conclusion

Effective redistribution is determined by much more than the amount of transfers. Not only is it difficult to reach some of those who qualify for subsidy because they have no

fixed address, no bank account or do not pay taxes, but also potential beneficiaries are required to apply. Disbursement and take-up are hands-on problems for welfare programs and indicate that the procedural aspects of means-tested transfers matter.

With our analysis, we want to underscore the importance played by procedural "details" in people's financial distress, in particular, if individuals' capacity to plan consumption and their motivation to stick to plans are limited. These individuals might best be helped if transfers simplified their financial planning and freed up mental capacities for other tasks. This aspect is inherently related to the decision as to providing subsidies in cash or in-kind.

Our empirical study exploits a quasi-natural experiment with health insurance premium subsidies in Switzerland to assess the relevance of payment modalities for recipients' payment problems. In a DID and TD setting, we estimate a substantial reduction in payment problems for treated subsidy recipients after the switch is made from cash transfers to reduced insurance premiums. Moreover, using the same setting and variation, we do not observe any unintended consequences regarding recipients' payment behavior on unsubsidized co-pays for medical services. This suggests an overall reduction in financial distress.

The discussion on an (unconditional) basic income replacing or complementing means-tested programs should consider that financial problems are not just a matter of means but also of procedures. Complementary research should further explore the potentially crucial role of these aspects for people's (economic) well-being. Transfers in cash versus in-kind are only one key aspect. Another aspect is whether the transfer comes anonymously or involves some social interaction, for example, with a social worker. If it were to play a role we should know it when we design the transfer programs for our future.

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Transfer Payment Systems and Financial Distress: Insights from Health Insurance Premium Subsidies

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Online Appendix

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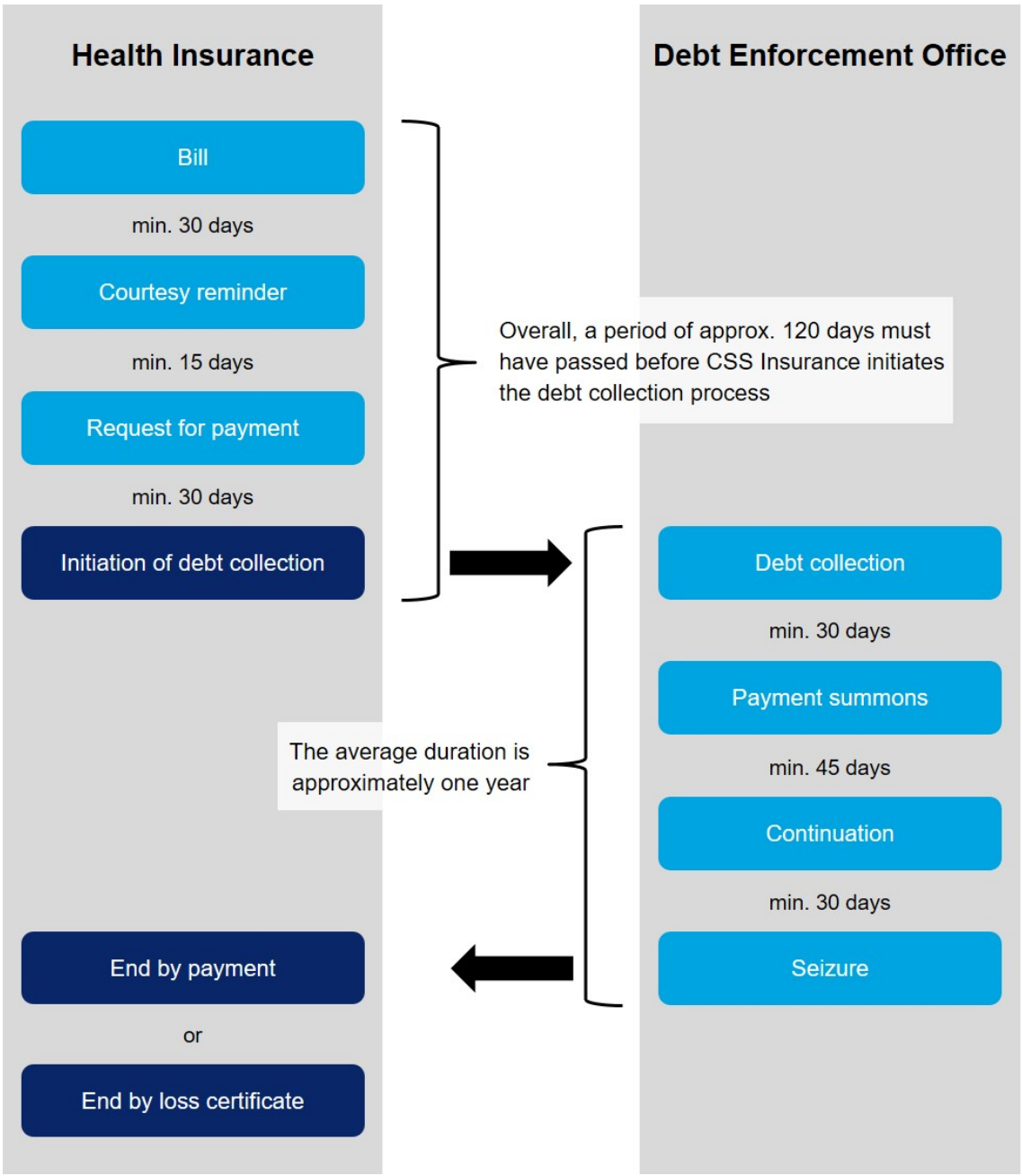
A The internal bill collection process

The insurer follows a clearly organized bill collection process that guarantees an equal treatment of all the customers. Figure A1 provides a graphical overview showing the different steps and minimal duration. However, it is important to note that the process can last up to four years. In what follows, we first explain for which bills this process applies. Afterwards, we describe the different steps of the process.

FIGURE A1 – Overview of the bill collection process



Basically, there are two bill types that are relevant in our context: Health plan premium bills and co-payment bills. Regarding the latter, it is important to note that two health provider remuneration systems co-exist (see Schmid, 2017, for details). In the *payer system* ("tiers payant"), the health care providers send their bills to the health insurance, which reimburses the providers and charges the patients for their cost share. Here, the patients owe the insurance the co-payments, that is, the health insurance debt collection process also applies to co-payment bills under the payer system. Note that about 70% of all health services bills corresponding to about 80% of the health care costs are remunerated in the payer system. In the *guarantee system* ("tiers garant"), however, the health care providers send their bills to the patients, which (have to) pay the bills themselves and forward copies to their insurance. After receiving the copy, the insurance reimburses the patient within an average of 10 days (Federal Office of Public Health, 2015). Here, the billed amount is owed the health care providers, which have to initiate the debt collection process if the patient does not pay. Consequently, we consider health plan premium bills and the *payer system* co-payment bills. These bills undergo the following process:

(a) Courtesy reminder: The header of each bill shows the issue date and the due date.[29] The difference between these two dates is always 30 days or more. If no payment is recognized before or latest on the due date, CSS Insurance mails a courtesy reminder to the customer. The courtesy reminder shows again an issue date and the *new* due date. Essentially, the reminder gives the customer (at least) an additional fifteen days to pay the billed amount. There are no further consequences if the receipt of payment is before or on the new due date.

(b) Request for payment: If the bill remains unpaid after the courtesy reminder, CSS Insurance mails a request for payment to the customer. The customer has (at least) an additional 30 days to pay the billed amount. However, the payment request includes a penalty charge of CHF 20.00; in addition, it warns the customer of further negative consequences in case the billed amount remains unpaid (e.g. the initiation of debt collection; in case of supplementary insurance plans, CSS Insurance can suspend the contract). If there is still no receipt of payment, the billed amount is

[29] In case the printed due date is a Saturday, Sunday or holiday like Ascension Day, the effective due date is the following Monday

on hold for debt collection. However, a period of approximately 120 days must have passed before CSS Insurance finally initiates debt collection.

(c) Debt collection: CSS Insurance initiates debt collection by submitting a request for enforcement to the debt enforcement office.[30] The debt enforcement office is a public institution, which is organized in each canton separately. However, debt enforcement follows a strict process that is determined by federal law. It is important to note that the request for enforcement has to be sent to the office located where the customer lives (e.g. the office in the canton of residence); in addition, debt enforcement is not free and CSS Insurance has to pay the proceedings costs in advance (the costs vary with the amount of debt). After receiving the request, the debt enforcement office issues a payment summons to the customer.

(d) Payment summons: After receiving the payment summons, the customer has three options. First, the customer accepts that he or she has to pay the amount due. In this case, the customer has 20 days from receipt of the payment summons to pay the amount of debt *and* the debt enforcement costs, which were paid by CSS Insurance in advance $\rightarrow (g)$. Second, the customer can contest the payment summons if he or she does not agree with the amount demanded. In this case, the customer has to make an official objection within 10 days after receiving the payment summons. Note that the customer does *not* have to state any reason $\rightarrow (e)$. Third, the customer does neither contest the payment summons nor pay the amount due $\rightarrow (e)$. Overall, it takes a minimum of 30 days between the debt collection request and the delivery of the payment summons. However, if the customer is inaccessible, it can take much longer.

(e) Continuation: If the customer does neither contest the payment summons nor pay the amount due, CSS asks the debt enforcement office to continue the debt enforcement proceedings $\rightarrow (f)$. However, if the customer files an objection to the payment summons, the debt enforcement is on hold. To overrule the objection and to continue the debt enforcement proceedings, CSS Insurance now has to apply to the appropriate authority, which checks whether the debt is valid. The initial authority

[30]Note that CSS Insurance initiates debt collection only four times a year. Hence, the duration from the initial billing to the initiation of debt collection is typically between 120 and 180 days.

differs between basic and supplementary health insurance. In principle, if the debt stems from basic health insurance premiums or co-payments, the initial authority is the legal department of CSS Insurance; if the debt are related to supplementary health insurance plans, the initial authority is commonly a regional court.[31] In any case, the last resort is the Federal Supreme Court of Switzerland. Once the debt is legally decided to be valid, CSS asks the debt enforcement office to continue the debt enforcement proceedings $\rightarrow (f)$.

(f) Seizure: The continuation of the debt enforcement proceedings results in the seizure of customer's assets, which also includes garnishment of wages. However, asset seizure and wage garnishment is limited, that is, it is only possible if the customer's standard of living does not fall below a certain level. If some debts still remain unpaid, CSS Insurance receives a loss certificate that shows the amount of the loss incurred. The loss certificate allows CSS Insurance to collect the debts within a period of 20 years (of course, the financial situation of the customer has to improve first).

(g) End of process: The process ends either by payment of the debt, e.g. the seized assets offset the debt, or by receiving the loss certificate.[32] If CSS Insurance receives a loss certificate for debts related to basic health insurance, the customers' canton of residence covers 85% of the amount excluding the debt enforcement costs.

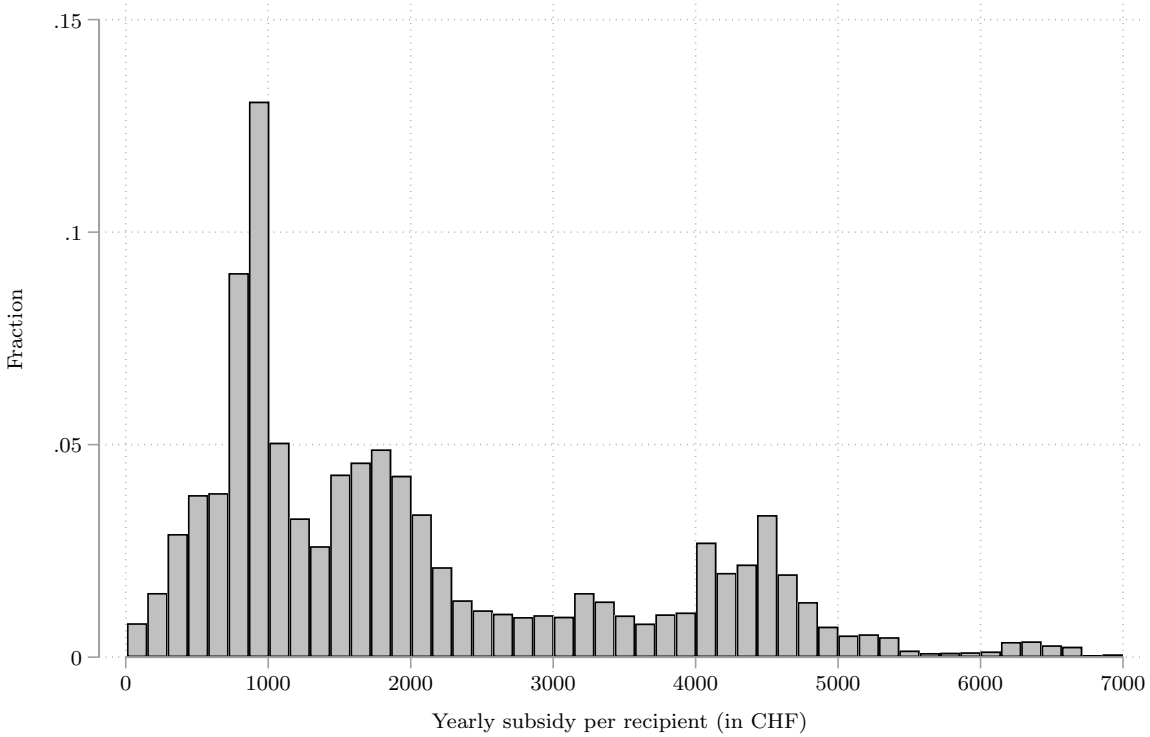
[31] Note that CSS Insurance also has the possibility to terminate or suspend supplementary health insurance plans if the corresponding premiums or co-payments are not paid. In other words, not paying these debts implies a loss in coverage.

[32] Note that the process can also end by writing off a bad debt. However, this is only possible for debts related to supplementary health insurance plans as the insurers are obliged to collect all debts related to mandatory health insurance plans.

B Distribution of yearly premium subsidies

In our sample, the median yearly subsidy per recipients amounts to CHF 1,578. While there is a large fraction of recipients with annual subsidies between CHF 1,000 and CHF 2,000, a non-negligible fraction receives up to CHF 5,000 per year. Figure B1 provides a corresponding histogram. There are, however, also large differences in the average yearly premium between cantons (from CHF 4,600 in Grisons to CHF 7,200 in Basel-City).

FIGURE B1 – Distribution of yearly premium subsidy per recipient

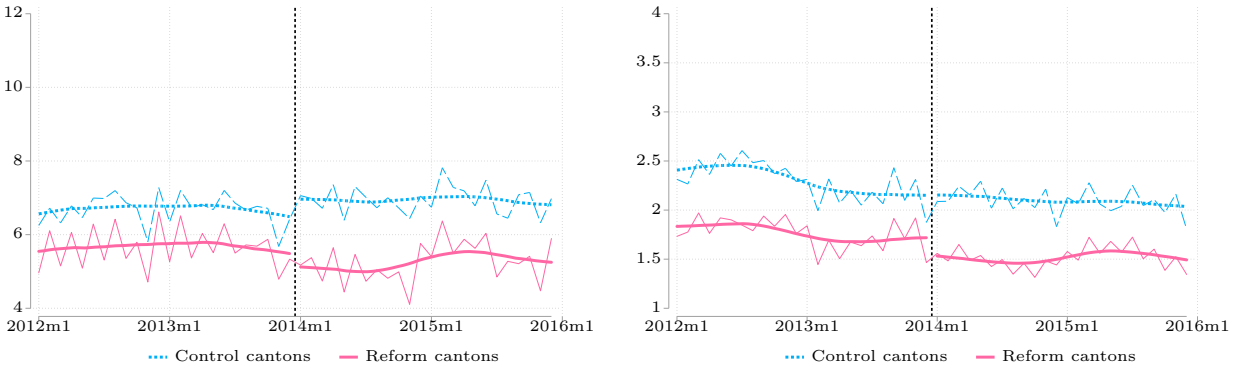


Note: Multiple persons in a household can receive subsidies. Here, we show the subsidy on a per person basis. The data is covering recipients from all the seven cantons in the years after the payment reform.

C Complete results and robustness checks

C.1 Premium bills

FIGURE C1 – Switch from cash transfers to in-kind premium subsides and payment behavior



(a) Reminder, all individuals

(b) Debt collection, all individuals

TABLE C1 – Effect of the payment reform on payment problems (all individuals)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.08			-0.20***		
	(0.05)			(0.03)		
Reform canton × post	-0.55***	-0.55***	-0.54***	-0.06	-0.05	-0.04
	(0.07)	(0.07)	(0.07)	(0.04)	(0.04)	(0.04)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	6.79M	6.79M	6.79M	6.79M	6.79M	6.79M
R^2	0.54	0.54	0.55	0.64	0.64	0.64

Note: Among individuals in treated cantons before the reform, the baseline probability for any given bill to receive at least a payment reminder is 5.70%, and 1.75% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 329,483 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table C2 – Effect of the payment reform on payment problems (predicted subsidy recipients only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	-0.15			-0.30***		
	(0.12)			(0.08)		
Reform canton × post	-2.13***	-2.12***	-2.14***	-0.57***	-0.57***	-0.57***
	(0.20)	(0.20)	(0.20)	(0.13)	(0.13)	(0.13)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	1.92M	1.92M	1.92M	1.92M	1.92M	1.92M
R^2	0.54	0.54	0.54	0.61	0.61	0.61

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 9.19%, and 3.04% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 99,319 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table C3 – Effect of the payment reform on payment problems (reform cantons only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	0.54**	0.55***	0.63***	0.17	0.17	0.21
	(0.16)	(0.16)	(0.16)	(0.11)	(0.11)	(0.11)
Post-reform	0.07			-0.09**		
	(0.05)			(0.03)		
Recipient × post	-2.17***	-2.16***	-2.24***	-0.71***	-0.70***	-0.73***
	(0.15)	(0.15)	(0.15)	(0.10)	(0.10)	(0.10)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	2.81M	2.81M	2.81M	2.81M	2.81M	2.81M
R^2	0.56	0.56	0.56	0.64	0.64	0.64

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 9.19%, and 3.04% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 135,947 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table C4 – Effect of the payment reform on payment problems (triple differences)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	-0.10	-0.11	-0.12	0.10	0.09	0.07
	(0.15)	(0.15)	(0.15)	(0.10)	(0.10)	(0.10)
Post-reform	0.20***			-0.13***		
	(0.05)			(0.03)		
Recipient × reform canton	0.64**	0.65**	0.77***	0.08	0.08	0.16
	(0.22)	(0.22)	(0.22)	(0.15)	(0.15)	(0.15)
Reform canton × recipient	-0.38**	-0.38**	-0.44***	-0.22**	-0.22**	-0.23**
	(0.12)	(0.12)	(0.12)	(0.08)	(0.08)	(0.08)
Reform canton × post	-0.13*	-0.13	-0.12	0.05	0.05	0.07
	(0.07)	(0.07)	(0.06)	(0.04)	(0.04)	(0.04)
Recipient × reform canton × post	-1.79***	-1.79***	-1.81***	-0.49***	-0.49***	-0.50***
	(0.19)	(0.19)	(0.19)	(0.12)	(0.12)	(0.12)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	6.79M	6.79M	6.79M	6.79M	6.79M	6.79M
R^2	0.54	0.54	0.55	0.64	0.64	0.64

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 9.19%, and 3.04% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 329,483 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

C.2 Medical bills

TABLE C5 – Effect of the payment reform on payment problems for medical co-pays (all individuals)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.58***			0.11*		
	(0.11)			(0.05)		
Reform canton × post	-0.53***	-0.54***	-0.53***	-0.17*	-0.17*	-0.16*
	(0.16)	(0.16)	(0.16)	(0.08)	(0.08)	(0.08)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.68M	0.68M	0.68M	0.68M	0.68M	0.68M
R^2	0.41	0.41	0.41	0.60	0.61	0.61

Note: Among individuals in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 5.31%, and 1.06% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, household type, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 120,202 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE C6 – Effect of the payment reform on payment problems for medical co-pays (predicted subsidy recipients only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.96***			0.32*		
	(0.26)			(0.15)		
Reform canton × post	-0.92*	-0.94*	-0.92*	-0.37	-0.37	-0.34
	(0.42)	(0.42)	(0.42)	(0.25)	(0.25)	(0.25)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.19M	0.19M	0.19M	0.19M	0.19M	0.19M
R^2	0.44	0.44	0.44	0.60	0.60	0.60

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 8.72%, and 2.50% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 35,794 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table C7 – Effect of the payment reform on payment problems for medical co-pays (reform cantons only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	-0.37	-0.40	-0.33	-0.19	-0.20	-0.18
	(0.47)	(0.47)	(0.47)	(0.22)	(0.22)	(0.23)
Post-reform	0.06			-0.05		
	(0.13)			(0.05)		
Recipient × post	-0.01	-0.02	-0.03	-0.01	-0.02	-0.01
	(0.34)	(0.34)	(0.34)	(0.19)	(0.19)	(0.19)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.30M	0.30M	0.30M	0.30M	0.30M	0.30M
R^2	0.40	0.40	0.40	0.58	0.58	0.58

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 8.72%, and 2.50% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 52,074 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. S

Table C8 – Effect of the payment reform on payment problems for medical co-pays (triple differences)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	-0.50	-0.50	-0.51	-0.12	-0.12	-0.11
	(0.42)	(0.42)	(0.42)	(0.24)	(0.24)	(0.24)
Post-reform	0.44***			0.04		
	(0.11)			(0.05)		
Recipient × reform canton	0.14	0.10	0.17	-0.07	-0.08	-0.06
	(0.63)	(0.63)	(0.63)	(0.33)	(0.33)	(0.33)
Reform canton × recipient	0.46	0.46	0.47	0.23	0.23	0.22
	(0.28)	(0.28)	(0.28)	(0.15)	(0.15)	(0.15)
Reform canton × post	-0.38*	-0.39*	-0.37*	-0.09	-0.09	-0.09
	(0.17)	(0.17)	(0.17)	(0.07)	(0.07)	(0.07)
Recipient × reform canton × post	-0.47	-0.47	-0.49	-0.24	-0.24	-0.22
	(0.44)	(0.44)	(0.44)	(0.24)	(0.24)	(0.24)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.68M	0.68M	0.68M	0.68M	0.68M	0.68M
R^2	0.41	0.41	0.41	0.60	0.61	0.61

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 8.72%, and 2.50% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 120,202 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

D Prediction of subsidy recipient status

D.1 Machine learning procedures

FIGURE D1 – Process for classifying the premium subsidy status

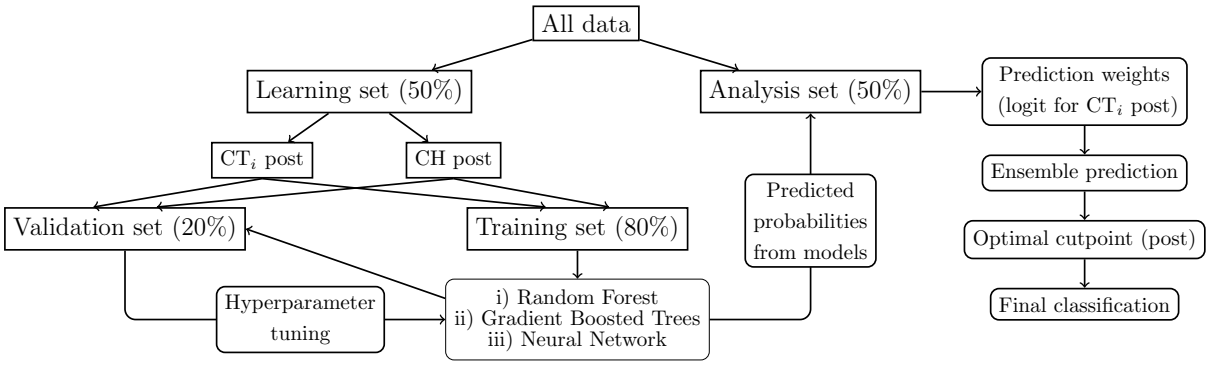
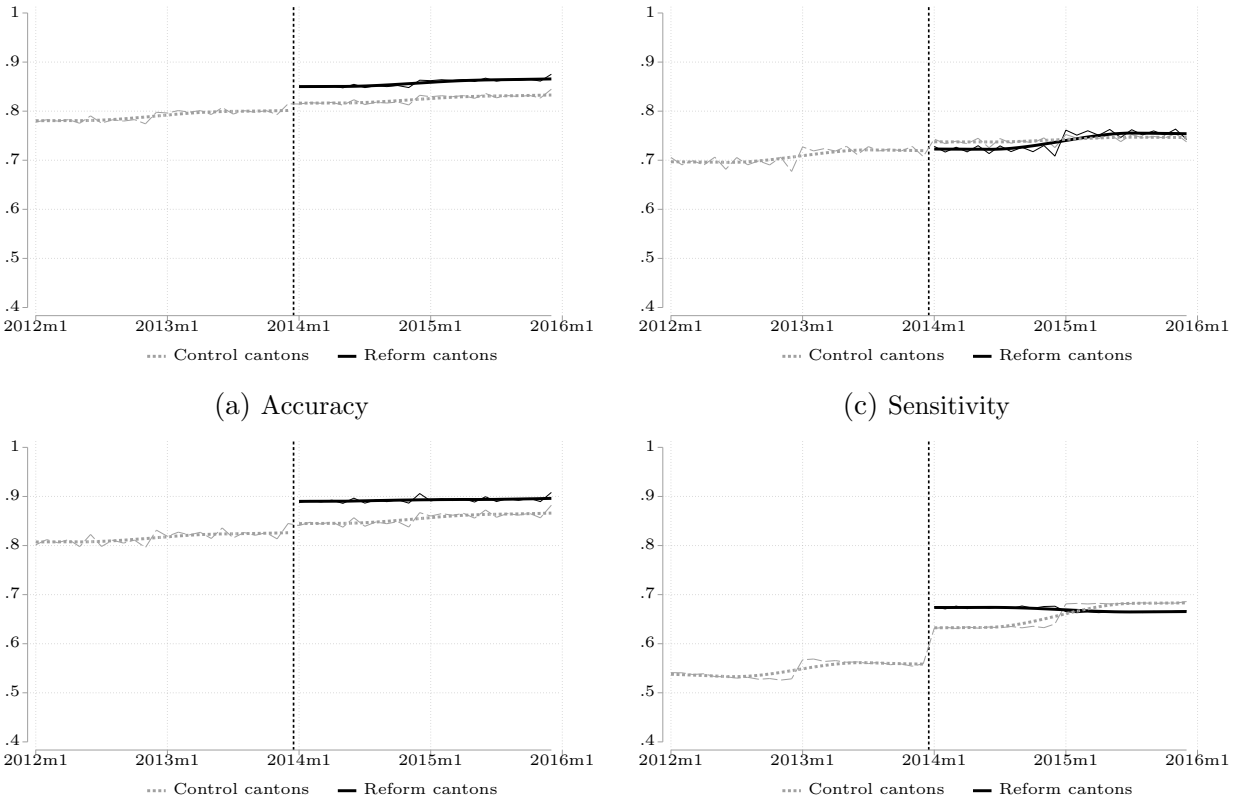


FIGURE D2 – Subsidy recipient status: Classification performance of machine learning approach



(a) Accuracy

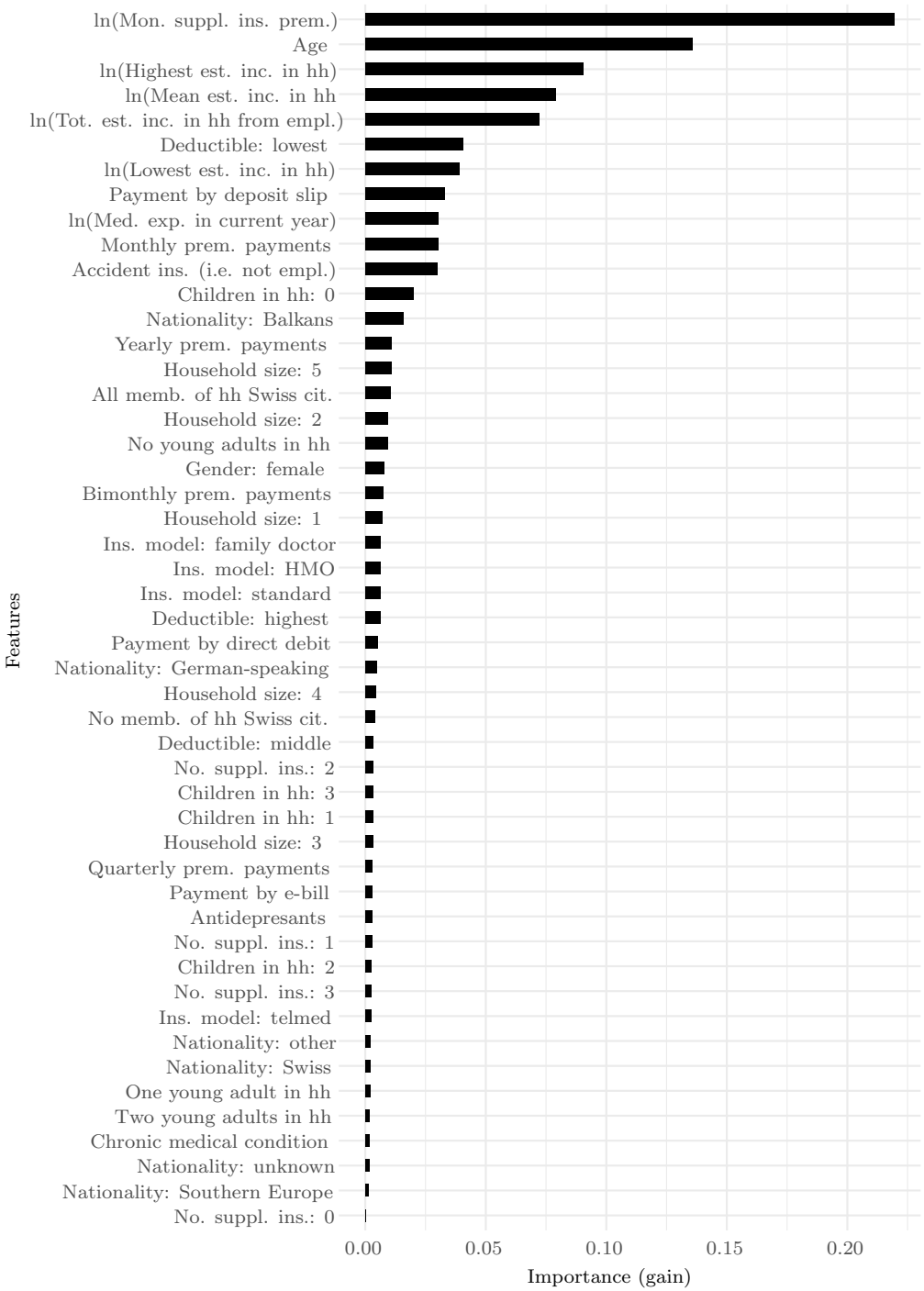
(c) Sensitivity

(b) Specificity

(d) Precision

Note: All measures refer to the out-of-sample classification performance among observations in the "analysis set" (which were never used for training the classification algorithms). Performance in reform cantons prior to the reform in 2014 cannot be evaluated, as we know the actual recipient status of any individuals living in these cantons only after the switch to in-kind provision. As explained in Sections 4.3-4.5 in the main text, the classification procedure is exactly the same for both groups of cantons. It is therefore unlikely that the relative classification performance between reform and control cantons is substantially different before the reform than after the reform.

FIGURE D3 – Example of the relative feature importance for the classification of the subsidy recipient status

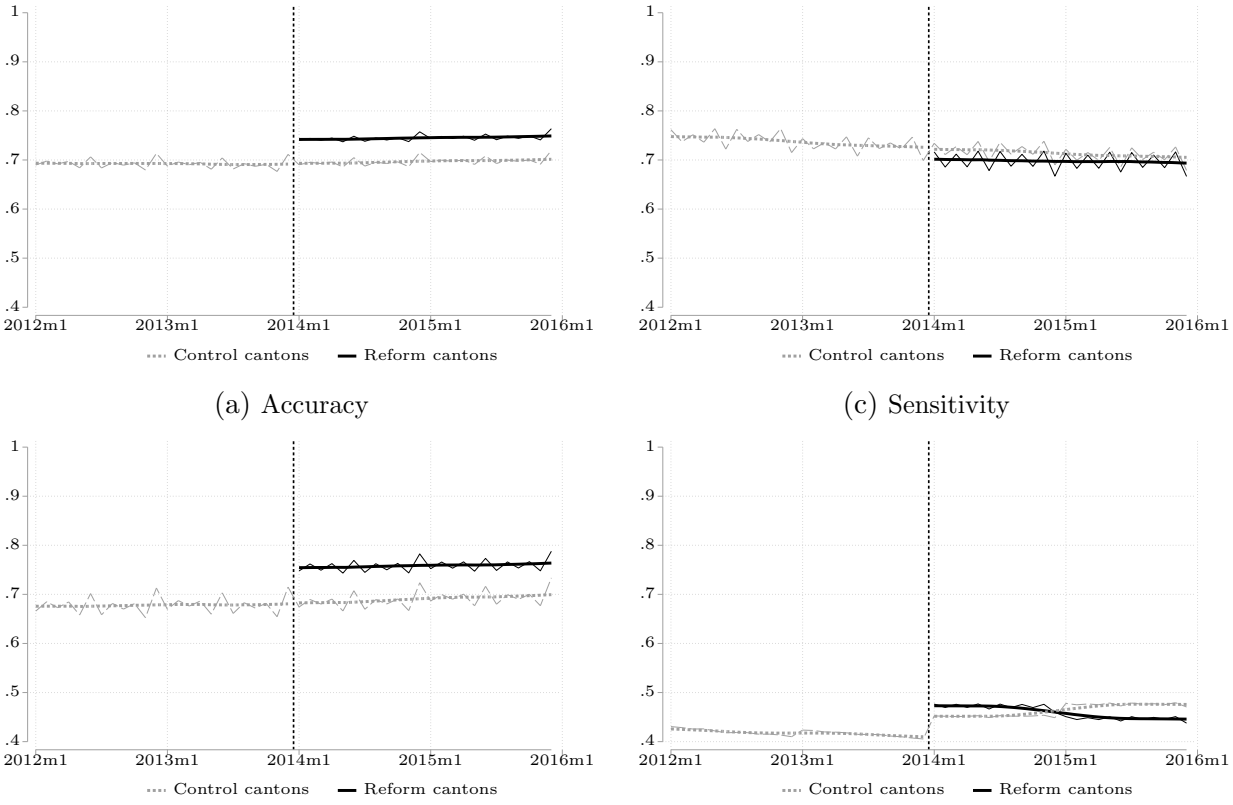


Note: Relative gain in prediction accuracy of each feature used in predicting recipient status. The example is for the gradient boosted trees model for all the cantons combined after the reform. Abbreviations of the ten most important variables: ln(Mon. suppl. ins. prem.) is the natural logarithm of monthly supplemental insurance premiums, ln(Highest est. inc. in hh) is the natural logarithm of the highest estimated income of any member within a household, ln(Mean est. inc. in hh) is the natural logarithm of the average estimated income of all members within a household, ln(Tot. est. inc. in hh from empl.) is the natural logarithm of the sum of the income estimates of all members within a household if they are working (no accident coverage from CSS), ln(Lowest est. inc. in hh) is the natural logarithm of the lowest estimated income of any member within a household, ln(Med. exp. in current year) is the natural logarithm of the total medical expenses in the current year.

D.2 Alternative approaches for the classification of the subsidy recipient status

D.2.1 Linear probability model

FIGURE D4 – Subsidy recipient status: Classification performance of linear probability model



(a) Accuracy

(c) Sensitivity

(b) Specificity

(d) Precision

Note: All measures refer to the out-of-sample classification performance among observations in the "analysis set" (which were never used for the OLS estimations). Performance in reform cantons prior to the reform in 2014 cannot be evaluated, as we know the actual recipient status of any individuals living in these cantons only after the switch to in-kind provision. As explained in Sections 4.3-4.5 in the main text, the classification procedure is exactly the same for both groups of cantons. It is therefore unlikely that the relative classification performance between reform and control cantons is substantially different before the reform than after the reform.

Table D1 – Effect of the payment reform on payment problems (predicted subsidy recipients with linear probability model only

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.07			-0.34***		
	(0.10)			(0.06)		
Reform canton × post	-1.36***	-1.36***	-1.40***	-0.32**	-0.32**	-0.32**
	(0.15)	(0.15)	(0.15)	(0.10)	(0.10)	(0.10)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	2.64M	2.64M	2.64M	2.64M	2.64M	2.64M
R^2	0.56	0.56	0.56	0.65	0.65	0.65

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 9.64%, and 3.61% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 125,220 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D2 – Effect of the payment reform on payment problems (reform cantons with linear probability model only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	0.76***	0.78***	1.04***	0.37**	0.36**	0.52***
	(0.19)	(0.19)	(0.20)	(0.12)	(0.12)	(0.12)
Post-reform	-0.04			-0.05*		
	(0.04)			(0.02)		
Recipient × post	-1.25***	-1.24***	-1.41***	-0.61***	-0.60***	-0.67***
	(0.12)	(0.12)	(0.12)	(0.08)	(0.08)	(0.08)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	2.81M	2.81M	2.81M	2.81M	2.81M	2.81M
R^2	0.56	0.56	0.56	0.64	0.64	0.64

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 9.64%, and 3.61% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 135,947 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D3 – Effect of the payment reform on payment problems (triple differences with linear probability mode)l

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	-0.08	-0.07	0.09	0.39**	0.38**	0.43***
	(0.18)	(0.18)	(0.18)	(0.12)	(0.12)	(0.12)
Post-reform	0.08			-0.09**		
	(0.05)			(0.03)		
Recipient × reform canton	0.84**	0.85**	0.95***	-0.02	-0.03	0.11
	(0.26)	(0.26)	(0.26)	(0.17)	(0.17)	(0.17)
Reform canton × recipient	-0.01	-0.00	-0.15	-0.27***	-0.27***	-0.33***
	(0.11)	(0.11)	(0.11)	(0.07)	(0.07)	(0.07)
Reform canton × post	-0.12	-0.12	-0.10	0.04	0.04	0.05
	(0.06)	(0.06)	(0.06)	(0.04)	(0.04)	(0.04)
Recipient × reform canton × post	-1.24***	-1.24***	-1.27***	-0.34**	-0.34**	-0.35**
	(0.16)	(0.16)	(0.16)	(0.11)	(0.11)	(0.11)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	6.79M	6.79M	6.79M	6.79M	6.79M	6.79M
R^2	0.54	0.54	0.55	0.64	0.64	0.64

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 9.64%, and 3.61% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 329,483 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D4 – Effect of the payment reform on payment problems for medical co-pays (predicted subsidy recipients with linear probability model only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.83***			0.09		
	(0.21)			(0.12)		
Reform canton × post	-0.84*	-0.86*	-0.84*	-0.18	-0.18	-0.15
	(0.34)	(0.34)	(0.34)	(0.19)	(0.19)	(0.19)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.25M	0.25M	0.25M	0.25M	0.25M	0.25M
R^2	0.45	0.45	0.45	0.62	0.62	0.62

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 6.30%, and 1.87% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 47,039 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D5 – Effect of the payment reform on payment problems for medical co-pays (reform cantons with linear probability model only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	0.42	0.35	0.51	0.46	0.45	0.51
	(0.66)	(0.66)	(0.68)	(0.29)	(0.29)	(0.31)
Post-reform	0.12			-0.04		
	(0.12)			(0.04)		
Recipient × post	-0.21	-0.23	-0.28	-0.08	-0.08	-0.09
	(0.29)	(0.29)	(0.29)	(0.15)	(0.15)	(0.16)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.30M	0.30M	0.30M	0.30M	0.30M	0.30M
R^2	0.40	0.40	0.40	0.58	0.58	0.58

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 6.30%, and 1.87% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 52,074 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

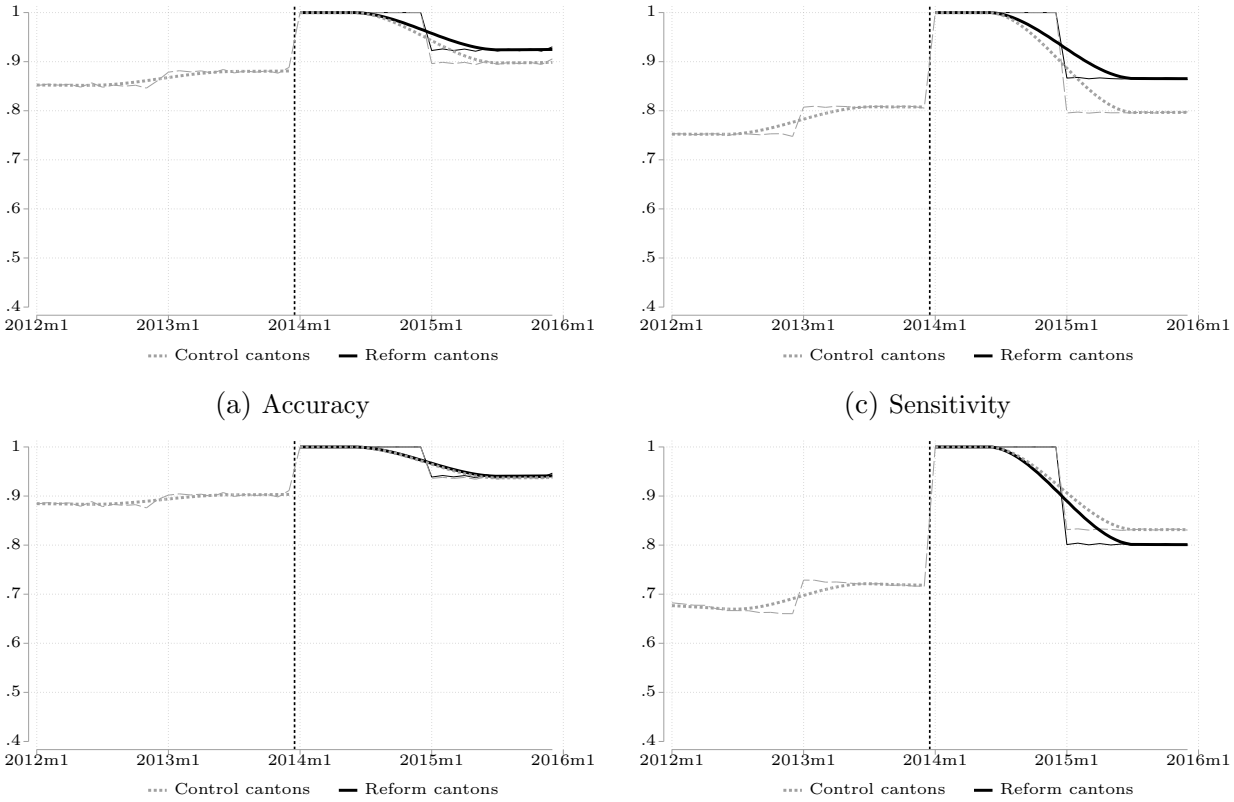
Table D6 – Effect of the payment reform on payment problems for medical co-pays (triple differences with linear probability model)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Recipient (predicted)	-1.37*	-1.40*	-1.32*	-0.26	-0.26	-0.16
	(0.59)	(0.59)	(0.61)	(0.29)	(0.29)	(0.30)
Post-reform	0.43***			0.12**		
	(0.12)			(0.04)		
Recipient × reform canton	1.78*	1.76*	1.88*	0.72	0.71	0.75
	(0.89)	(0.89)	(0.90)	(0.41)	(0.41)	(0.42)
Reform canton × recipient	0.40	0.40	0.39	-0.03	-0.02	-0.05
	(0.24)	(0.24)	(0.24)	(0.13)	(0.13)	(0.13)
Reform canton × post	-0.31	-0.32	-0.30	-0.16**	-0.16**	-0.15*
	(0.17)	(0.17)	(0.17)	(0.06)	(0.06)	(0.06)
Recipient × reform canton × post	-0.61	-0.62	-0.64	-0.06	-0.06	-0.05
	(0.38)	(0.38)	(0.38)	(0.20)	(0.20)	(0.20)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.68M	0.68M	0.68M	0.68M	0.68M	0.68M
R^2	0.41	0.41	0.41	0.60	0.61	0.61

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 6.30%, and 1.87% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 120,202 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

D.2.2 Recipient status in 2014 held constant in every year

FIGURE D5 – Subsidy recipient status: Classification performance when holding recipient status in 2014 constant



(a) Accuracy

(c) Sensitivity

(b) Specificity

(d) Precision

Note: All measures refer to the classification performance among observations in the "analysis set". Performance in reform cantons prior to the reform in 2014 cannot be evaluated, as we know the actual recipient status of any individuals living in these cantons only after the switch to in-kind provision. As explained in Sections 4.3-4.5 in the main text, the classification procedure is exactly the same for both groups of cantons. However, holding the recipient status in 2014 constant for all four years results in perfect classification in 2014 for all cantons. It is therefore likely that the relative classification performance between reform and control cantons is substantially different before the reform than after the reform.

Table D7 – Effect of the payment reform on payment problems (predicted subsidy recipients with 2014 status held constant only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	-0.89***			-0.52***		
	(0.12)			(0.07)		
Reform canton × post	-1.99***	-1.97***	-1.95***	-0.42***	-0.42***	-0.40***
	(0.18)	(0.18)	(0.18)	(0.11)	(0.11)	(0.11)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	1.72M	1.72M	1.72M	1.72M	1.72M	1.72M
R^2	0.48	0.49	0.49	0.51	0.51	0.51

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 8.22%, and 2.29% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 77,231 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D8 – Effect of the payment reform on payment problems (reform cantons with 2014 recipient status held constant only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.27***			-0.05		
	(0.05)			(0.03)		
Recipient × post	-3.14***	-3.14***	-3.19***	-0.90***	-0.89***	-0.91***
	(0.15)	(0.14)	(0.14)	(0.09)	(0.09)	(0.09)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	2.81M	2.81M	2.81M	2.81M	2.81M	2.81M
R^2	0.56	0.56	0.56	0.64	0.64	0.64

Note: .Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 8.22%, and 2.29% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 135,947 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table D9 – Effect of payment reform on payment problems (triple differences with 2014 recipient status held constant

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.44***			-0.09**		
	(0.05)			(0.03)		
Reform canton × recipient	-1.33***	-1.32***	-1.36***	-0.44***	-0.43***	-0.45***
	(0.13)	(0.13)	(0.13)	(0.08)	(0.08)	(0.08)
Reform canton × post	-0.17*	-0.17*	-0.15*	0.03	0.04	0.05
	(0.07)	(0.07)	(0.07)	(0.05)	(0.05)	(0.05)
Recipient × reform canton × post	-1.82***	-1.82***	-1.84***	-0.46***	-0.46***	-0.46***
	(0.19)	(0.19)	(0.19)	(0.12)	(0.12)	(0.12)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	6.79M	6.79M	6.79M	6.79M	6.79M	6.79M
R^2	0.54	0.54	0.55	0.64	0.64	0.64

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given bill to receive at least a payment reminder is 8.22%, and 2.29% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, issue of bill early or late in month, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 329,483 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D10 – Effect of the payment reform on payment problems for medical co-pays (predicted subsidy recipients with 2014 status held constant only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.85***			0.23		
	(0.24)			(0.12)		
Reform canton × post	-0.94*	-0.97**	-0.98**	-0.37	-0.37	-0.37
	(0.37)	(0.37)	(0.37)	(0.20)	(0.20)	(0.20)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.18M	0.18M	0.18M	0.18M	0.18M	0.18M
R^2	0.42	0.42	0.42	0.58	0.58	0.58

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 6.07%, and 1.60% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 31,660 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D11 – Effect of the payment reform on payment problems for medical co-pays (reform cantons with with 2014 recipient status held constant only)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.10			-0.03		
	(0.13)			(0.05)		
Recipient × post	-0.20	-0.21	-0.21	-0.11	-0.11	-0.10
	(0.31)	(0.31)	(0.31)	(0.16)	(0.16)	(0.16)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.30M	0.30M	0.30M	0.30M	0.30M	0.30M
R^2	0.40	0.40	0.40	0.58	0.58	0.58

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 6.07%, and 1.60% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 52,074 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D12 – Effect of the payment reform on payment problems for medical co-pays (triple differences with with 2014 recipient status held constant)

	At least payment reminder			Entered debt collection		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-reform	0.47***			0.07		
	(0.12)			(0.05)		
Recipient × post	0.37	0.37	0.37	0.16	0.16	0.16
	(0.27)	(0.27)	(0.27)	(0.14)	(0.13)	(0.14)
Reform canton × post	-0.38*	-0.39*	-0.37*	-0.10	-0.10	-0.09
	(0.17)	(0.17)	(0.17)	(0.08)	(0.08)	(0.08)
Recipient × reform canton × post	-0.57	-0.57	-0.58	-0.27	-0.27	-0.26
	(0.41)	(0.41)	(0.41)	(0.21)	(0.21)	(0.21)
Individual fixed-effects	✓	✓	✓	✓	✓	✓
Specific month fixed-effects		✓	✓		✓	✓
Ind. & hh level controls			✓			✓
Observations	0.68M	0.68M	0.68M	0.68M	0.68M	0.68M
R^2	0.41	0.41	0.41	0.60	0.61	0.61

Note: Among subsidy recipients in treated cantons before the reform, the probability for any given medical bill to receive at least a payment reminder is 6.07%, and 1.60% to enter into debt collection. Individual and household level controls include accident insurance, lowest deductible chosen, highest deductible chosen, payment rhythm, means of payment, number of supplemental insurances, natural logarithm of monthly supplemental insurance expenditures, natural logarithm of estimated income, household size, number of children in household, number of young adults in household, natural logarithm of average income in household, natural logarithm of highest income in household, whether all household members are Swiss citizens, whether no household member is a Swiss citizen. Standard errors (clustered on 120,202 individuals) in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.