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Falling ill raises the health insurer's administration bill

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ABSTRACT

In many countries, governments use payment systems to compensate health insurers more for enrollees with higher expected costs. However, little empirical research has examined whether these payment systems should also include health insurers' administrative costs. We provide two sources of evidence that health insurers with a more morbid population have higher administrative costs. First, we show at the customer level a causal relationship between individual morbidity and individual administrative contacts with the insurer, using the weekly evolution of the number of individual customer contacts (calls, emails, in-person visits etc.) of a large Swiss health insurer. Using a difference-in-differences design, we find that the onset of a chronic illness causes on average a persistent increase of about 40% in individuals' contacts with the health insurer. Second, we provide evidence that this relationship also holds for total administrative costs at the insurer level. We study twenty years of Swiss health insurance market data and find a positive elasticity of around 1, indicating that, all else equal, an insurer with a more morbid population, equal to 1% more health care spending, faces about 1% higher administrative costs.

1. Introduction

In health insurance, the premium an insurer charges to the customer contains the expected amount of medical care expenditures and the loading fee, including administrative costs, to cover the costs of supplying health insurance. A global overview of high-income countries shows that administrative costs for health insurers are on average about 4.2% of total insurance costs for social security schemes and about three times higher for private health insurance schemes (Mathauer and Nicolle, 2011). While there is now extensive empirical literature showing that (expected) medical care expenditures vary greatly across customers, there is, as far as we know, no empirical literature to what extent administrative health insurance costs vary among individuals. The main reason is that administrative costs are often only available at the insurer level making it difficult to break costs down to a single customer.

Administration in health insurance contains many activities and the extent depends on the country's health system. Several activities target groups of customers and are difficult to break down to the individual customer level, such as marketing, registering, plan-design, accounting, infrastructure costs, purchasing care, utilization reviews etc. However, other activities can be assigned to individual customers, such as billing, claims processing, providing information to customers and administrative processes targeted to special customers (such as customers who do not pay their premium or receive income-related subsidies). Many of these administrative activities are likely to be more costly for a more morbid customer population. Yet, data on these activities are usually unavailable to researchers as businesses choose to keep these data private.

Knowledge about variation in individual administrative costs is important for many reasons. Administrative costs are a central element in many theoretical models with adverse selection in competitive insurance markets. For instance, in the standard textbook example of competitive insurance markets, coverage for all individuals is considered to be efficient (Arrow, 1963). However, including administrative costs to the model will change this outcome, and this change will even be more pronounced in the case of heterogeneous administrative costs, i.e., where individual administrative costs are positively related to individual medical costs. This is even more problematic if administrative costs

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disproportionally increase for certain conditions (chronic vs. acute) or due to other variables (e.g., low health literacy). The existence of variation in administrative costs has also implications for policy. In regulated health insurance markets with community rating, adjusted health plan payments are needed to mitigate incentives for risk selection. These markets exist, for example, in the US (Marketplaces under the Affordable Care Act, Medicare Advantage) as well as in many European countries, such as in Germany, Switzerland, and the Netherlands. In principle, these payments should recognize any difference in costs among individuals, including administrative costs. In publicly organized health insurance systems, the government often delegates the organization of health care to regional bodies or contracts with private insurers as in Medicaid Managed Care. The payment these bodies receive should ideally not only depend on expected medical costs but also on expected administrative costs. Finally, knowledge about variation in individual administrative costs can be valuable for insurers who want to improve their efficiency in administration.

The literature that studies the effect on the administrative costs of providing health insurance is limited. Well-known is the fact that the administrative costs vary strongly by the type of health insurance system (Cutler and Ly, 2011; Hagenaars et al., 2018; Kahn et al., 2005; Mathauer and Nicolle, 2011; Phelps, 2018; Woolhandler et al., 2003). Within a particular insurance system, it is shown that loading fees are subject to economies of scale and vary by group size (Karaca-Mandic et al., 2011; Phelps, 2018). Others have shown that (the efficiency of) administrative costs depend on how insurance companies are organized (Jiwani et al., 2014; Tseng et al., 2018). These papers usually rely on aggregate-level or survey data. Only recently, Dunn et al. (2021) used detailed micro-level data to show inefficiencies in billing between insurers and providers in the US. They estimate large costs of billing that vary substantially across insurance markets. While these studies analyze the administrative activities between health care providers and insurers, there are, as far as we know, no empirical studies that relate administrative activities between the insurers and individual customers. Generally, there might be many reasons why administrative activities might differ across individuals. For example, individuals may differ in their level of education or empowerment (Buehler and Maas, 2018), the degree of satisfaction (Blodgett et al., 1995; Kim et al., 2010), or whether or not defaulting plays a role (Douven et al., 2019; Van Ginneken and Rice, 2015). We believe, however, that in health insurance illness is the most straightforward characteristic to start with. Variation in predicted morbidity is considerable in health care, and having an illness is also likely to increase the chance that a health insurer has to act on behalf of its customer. Moreover, a consumer's illness is easily identifiable by insurers and thus a potential instrument for risk selection.

We provide two pieces of evidence whether a more morbid population causes higher administrative costs for an insurer. The first is a difference-in-differences design where we exploit the exogenous event of a customer becoming chronically ill. We show that this event causes a substantial and persistent increase in customer contacts for an insurer, and thus, ceteris paribus, causes higher administrative costs. For policy purposes, it might also be interesting to obtain insights on a more general association, namely to what extent population morbidity of an insurer affects total administrative insurer costs. Therefore, we use a two-way fixed-effects design, using data of total administrative costs of all insurers in the Swiss market over a period of twenty years. We find that total administrative costs are strongly positively correlated with population morbidity. A limitation of the fixed effects model is, e.g., that it does not control for insurer activities that are unrelated to population morbidity and that vary over time.

First, we study whether customer contacts increase when customers become chronically ill. We have access to very detailed data of administrative activities from a large Swiss health insurer which can be targeted to the customer level, namely customer contacts, e.g., by phone, email, or in-person visit. This allows us to perform a causal analysis in which we show that the number of customer contacts, and thus administrative costs, increases when customers become chronically ill. Using private information from the Swiss insurer we estimate that handling these customer contacts covers about 10–20% of total administrative insurance costs for this insurer. We find that through the onset of a chronic illness customers have on average about 40% more administrative contacts with their insurer compared to customers not being chronically ill. The effect is mainly driven by contacts that are related to the health of the customer. We find no heterogeneity in the effect between men and women, nor between older and younger ages.

Second, we estimate how population morbidity affects total administrative costs of an insurer. To obtain such an estimate, we collected a twenty year-panel dataset of the entire Swiss mandatory private health insurance market. The Swiss market has advantages over other (competitive) insurance markets in that the market is more regulated and harmonized limiting the scope of administrative activities for an insurer, and that there were no large regulatory changes during the twenty-year period. Using a two-way fixed effects panel analysis, we find that an insurer who spends 1% (CHF 25 per capita) more on medical claims, due to a more morbid population, faces an increase of 1% in administrative costs (CHF 1.4 per capita). The magnitude of the effect is non-trivial, which indicates that heterogenous administrative costs are important to take into account in theoretical models and in practice, as it increases the insurer's incentives for risk selection. Our analysis is a case study for Switzerland, but Douven et al. (2022) found the relationship between administrative costs and morbidity also in health insurance markets of other countries (Germany, Netherlands, Australia, USA).

The setup of our paper is as follows. In section 2, we briefly discuss the Swiss health insurance market. In section 3, we study the relationship between morbidity and administrative contacts at the individual customer level using micro-level data of a Swiss health insurer. In section 4, we study the relationship between population morbidity and total administrative contacts using aggregated data of all health insurers in the Swiss insurance market for a twenty-year period. Section 5 discusses the results and concludes.

2. Health insurance in Switzerland

Before we start describing our analysis, we provide a summary of the Swiss health insurance system and the type of administrative costs a Swiss health insurer faces. Like many other health insurance markets, the Swiss health insurance system is based on managed competition, where private health insurance companies compete for customers on price and quality (see Schmid et al. (2018) for a more extensive description of the Swiss insurance market and McGuire and van Kleef (2018) for a comparison with other insurance markets based on managed competition). The government manages the basic benefit package which every Swiss resident must take out. There is periodic open enrollment, community-rating and a risk equalization system to ensure risk solidarity. To maintain affordability, cantons (the equivalent of states) reduce premium payments through means-tested subsidies for about a quarter of the population. Insurance contracts are not linked to employment but are on an individual basis, so spouses and children have separate contracts. Cost-sharing is implemented through a mix of a mandatory deductible and coinsurance. Customers can choose a higher deductible up to a maximum of CHF 2500. (During the study period, 1 Swiss franc (CHF) was roughly equivalent to 1 USD.)

Almost three out of four residents enroll in a gatekeeping plan. Outside such plans, Swiss patients have unrestricted access to physicians (general practitioners and specialists). Swiss provider fees are generally set by negotiations between provider associations and insurance associations. Insurers are not allowed to make a profit on the basic mandatory coverage. Any surplus needs to be allocated to the reserves. To make profits, insurers can offer voluntary supplementary insurance (e.g., dental care, more comfort and choice in a hospital) where the insurer is allowed to apply underwriting, risk-rated premiums, and coverage limitations due to pre-existing conditions.

2.1. Administration by a Swiss health insurer

While the main task of a Swiss health insurer for mandatory insurance is to collect premiums, process claims and pay out benefits, there are several other activities that add to the administrative burden. In a system of managed competition, insurers also face administrative costs related to product communication, marketing, advertising, managing internal resources and risk equalization. The idea of managing competition is that insurers manage health care which requires additional activities such as (selectively) contracting providers, designing provider payment systems, coordinating care, preforming utilization reviews and monitoring.

Total administrative costs of Swiss health insurers for basic health insurance in 2017 were about 5% of total health care expenditures, or about CHF 1.4 billion which is about CHF 166 per customer (Moneyland, 2018). Total administrative supplementary insurance costs are even larger with CHF 1.8 billion but in this paper, we consider only administrative costs related to basic health insurance. The annual reports of the Swiss health insurers report administrative expenses in very general categories like manpower, IT, office equipment, and marketing. Unlike in most other countries, which administer the premium collection through payroll taxes, insurers collect the premiums through bills usually sent monthly to the customer. Despite the cantonal subsidies, about 5% of the population cannot or refuse to pay their premium so that debt enforcement is initiated for them (FOPH, 2019). Therefore, premium collection plays a significant role in the insurer's administration (Schmid et al., 2022).

3. Administrative contacts at the individual customer level

For the individual customer level analysis, we rely on a difference-in-differences design where we use the event of a customer becoming chronically ill to measure whether this causes a change in the number of administrative contacts with the health insurer. The idea being that more customer contacts, ceteris paribus, result in higher administrative costs. Although in practice some additional contacts might be absorbed by the existing workforce. We compare the weekly number of contacts of a group of customers who became chronically ill with customers who did not. We focus on chronic illnesses because they are relatively easy to identify in our data, have a high incidence, and we expect persistent effects on administrative costs. To strengthen the rigor of our study design, we performed two additional analyses: One in which we compared the treatment group with customers with no health care expenditures. From these customers, we can derive what fraction of contacts is not health-related. In the second analysis, we compare the treatment group with customers who were registered as chronically ill one year earlier than the customers in the treatment group. The evolution of the contacts from this group reveals insights into the longer-term effects of a chronic illness on contacts.

We have access to a unique proprietary customer service database from the largest Swiss health insurer covering about every sixth Swiss resident. The database includes every customer contact for three consecutive years from 2017 to 2019. Every contact is linked to a customer. Most contacts are initiated by the customer (88%) or by a family member or relative on behalf of the customer (6%). Providers initiate 4% of the contacts on behalf of a customer, while the remaining 2% are initiated by public authorities (see Table A1 in appendix A). Note that contacts are never initiated by the insurer. There are many different channels to contact the insurer (see Table A2 in appendix A). The most important channels are phone calls (48%), in person visits at an agency (17%), emails (14%) and scanned documents (9%). Customers contact their insurer for various reasons (see Table A3 in appendix A). In fact, the insurer registers 88 different categories of contact reasons, ranging from complex questions about benefits and coverage (24%), premium payment (7%), or guidance on plan changes (12%) to simple ones as updating personal information (residential address, bank account) (10%) or ordering personalized labels to submit a claim (3%). Also, a provider may contact the insurer to ask about the customer's coverage or about a claim. As a major limitation of the data, the insurer does not and most often cannot distinguish whether a contact pertains to the mandatory or the supplementary part of insurance. However, around 80% of the customers have supplementary insurance and it covers less than 10% of total health care expenditures (BfS, 2018).

We also have access to the customer database of the insurer including information on gender, age, and health care expenditures from basic coverage. Since the insurer lacks information on diagnoses, we use the registration in a pharmaceutical cost group (PCG) as an indicator for the event of becoming chronically ill (Lamers and van Vliet, 2004). A similar method is used in the Netherlands (van Kleef et al., 2018), in some US states for Medicaid Managed Care payments (Courtot et al., 2013) as well as since 2018 in the Marketplaces to supplement diagnosis data (CMS, 2016). Individuals are registered in a PCG if they receive a prespecified set and quantity of drugs. To identify a drug, regardless of whether it is brand or generic, the active pharmaceutical ingredient is used. The identification is based on the Anatomical Therapeutic Chemical classification issued by the WHO (www.whocc.no/atc, accessed on August 17, 2022), which are similar to the National Drug Codes (NDC). The registration for a PCG starts for a customer on the day the individual fills the prescription of the prespecified set of drugs. The insurer classifies 26 PCGs, with depression, asthma, diabetes, and cardiovascular disease among the most prevalent ones. In order to rule out acute events, most PCGs need multiple prescriptions to trigger a PCG registration. A PCG is not a disease management program or anything a customer can choose to enroll into. In fact, both customers and employees handling the customer's request do not know whether a customer is registered in a PCG. PCGs are only used for risk adjustment purposes and only a limited number of employees have access to this information. PCG registrations occur frequently, and we can identify the exact date of a registration, which allows us to measure the average number of weekly administrative contacts for the treatment group with precision. Because our analysis is retrospective and all data were anonymized, Swiss law waives the requirement of informed consent and ethical approval for this study.

For our analysis, we constructed a balanced three-year panel of customers who we observe in our dataset for 36 consecutive months, i.e., over the available years from 2017 to 2019. A balanced panel has the advantage that the number of customers remains constant over time which allows to use the number of customers as the base in most calculations. As a disadvantage, we lose approximately 18% of the customers who joined or left the insurer during these three years due to birth, death, immigration, emigration, or entering from or exiting to another insurer.

To construct the *treatment group*, we first selected all customers who were registered into a PCG in 2018 for the first time in our sample. First, we coded the week in which they were registered into a PCG as week '0' and set the day of registration in the middle of week '0'. This approach allows us to group all chronically ill customers and study the total number of contacts in the weeks before and after the event. Another advantage is that we smooth seasonality effects as all weeks in 2018 are centered at week 0, and we smooth daily effects as all days in a week are placed in the middle of week '0'. Next, we define a control group and conduct two additional analyses by selecting customers with the following characteristics.

- *Control group*: Customers who were never registered into a PCG in 2017–2019.
- *Group* 1: Customers with zero health care expenditures in 2017–2019.
- *Group* 2: Customers who were registered into a PCG in week '–52'.

The *control group* is comparable with customers in the *treatment group*, except that these customers do not receive the treatment.

Therefore, this group is the ideal control group for the counterfactual situation what would have happened to customers in the treatment group in absence of the treatment. The rationale for selecting *group* 1 is to obtain an idea about the number of administrative customer contacts that are unrelated to being or falling ill. For customers in *group* 2 the registration into a PCG occurs one year earlier which allows to follow up the evolution of administrative contacts up to two years after registration into a PCG. It allows us to gain more insight whether the treatment effects are temporary or permanent.

For our analyses, we constructed *control group* and *group* 1 in a similar way as the *treatment group*. We randomly assigned customers to a 'placebo PCG registration day' in 2018. The number of customers we assigned to a certain week in 2018 are proportional to the number of customers in the *treatment group* who were registered into a PCG in that week (according to Figure A2 in the appendix). For *group* 2, we constructed the 'placebo PCG registration day' in 2018 by adding 365 days to the PCG registration date in 2017. Subsequently, we counted for all three groups the number of administrative customer contacts per week in the same way as for the *treatment group*.

3.1. Results

The three-year panel includes roughly 1.07 million customers (about 13% of the Swiss population). On average, these customers (or their representatives) initiate about 40,000 administrative contacts per week. Fig. 1 shows the weekly frequency of customer contacts with the insurer in 2018. The y-axis refers to the weekly number of contacts divided by the total number of customers. For example, in week 2, we have a frequency of 3.2%, which corresponds to about 34,000 administrative contacts (i.e. 3.2% times the total number of customers). Note that some customers might have more than one contact per week. There is some structural weekly variation which can be related to holidays or insurer activities. At the end of the year, for example, insurers announce their plan premiums for the upcoming year and customers must decide on plan changes for the next year by the end of November, which results in many customer contacts.

Figure A1 in the appendix shows a U-shaped pattern for the number of customer contacts per age category. At the age of 19–40, women contact their health insurer more often than men, which typically coincides with the child-bearing period. For the other age categories, there is a large similarity between men and women.

Fig. 2 shows the correlation which we show in this paper to be causal: Customers with higher health care expenditures contact the health insurer more often. Fig. 2 also reveals that even customers without health care expenditures can have a substantial number of contacts with the insurer. This is our rationale for sampling *group* 1 to control for contacts that are unrelated to morbidity.

In 2018, about 31,000 or 2.9% of all customers were registered in a PCG for the first time. Every week the health insurer registers on average a PCG for the first time for about 0.06% of the population. Figure A2 in Appendix A shows that the weekly pattern is relatively stable although there is some variation, for example fewer PCGs are registered during the summer holidays (weeks 29–34).

The upper part of Table 1 shows customer characteristics of the treatment and control group, the two other groups and the total panel. All groups have a sufficient number of individuals. The *control group* is the largest group and contains about two thirds of the population of the total panel. The gender distribution is around 50%. Only in *group* 1, the group with no health care expenditures, almost three-quarters of the customers are male which is related to the fact that many young women use some health care, e.g. maternity benefits or annual check-ups. As expected, the average health care expenditures are highest for the *treatment group* and *group* 2. Chronically ill customers are only included in the *treatment group* and *group* 2, albeit customers in the latter group are registered into a PCG one year earlier. As expected, customers in the *treatment group* and *group* 2 contacted the insurer most often in the year 2018, with on average 2.71 and 2.59 contacts per year, respectively.

We visualize the causal relationship in Fig. 3. The figure shows the administrative contacts of customers in the *treatment group* and the three other groups. Each dot in Fig. 3 represents the average contact frequency per week for that group. The four solid lines are constructed using a locally estimated scatterplot smoother. The shaded areas around the lines represent the 95% confidence intervals, which are quite thin due to the large number of observations in each group. Fig. 3 shows that the frequency of administrative contacts of customers is lowest for *group* 1 at around 2%. For the *control group*, we observe a higher frequency ranging from 2.8% to 3.6%. The slightly increasing lines for the *control group* and *group* 1 are related to an exogenous increase in contacts, which we generally observe in our dataset. This increase could be related to the increasing complexity of health insurance, the increase in easiness to contact health insurers, the fact that customers become more empowered over time or other factors. For *group* 2, we observe a quite stable pattern ranging between 5.9% and 4.7%. Since the customers in this group became chronically ill one year before week '0', their number of contacts is significantly larger than for the *control group* and *group* 1.

Although the different patterns of the control group and the other two groups may already indicate a positive causal relationship between morbidity and administrative contacts, the plausibility of a causal

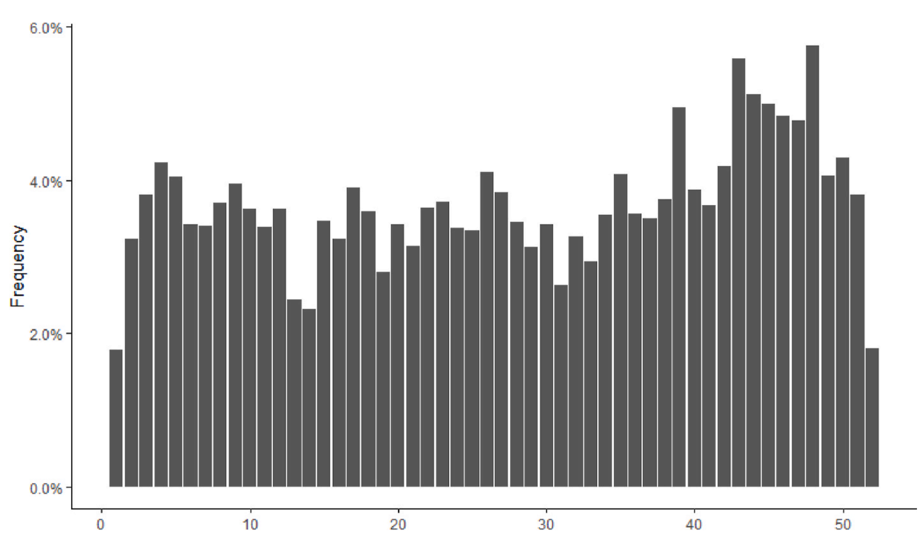

Fig. 1. Weekly frequency of customer contacts, *Notes*: Fig. 1 shows weekly numbers of administrative contacts in 2018 in relation to the total number of customers.

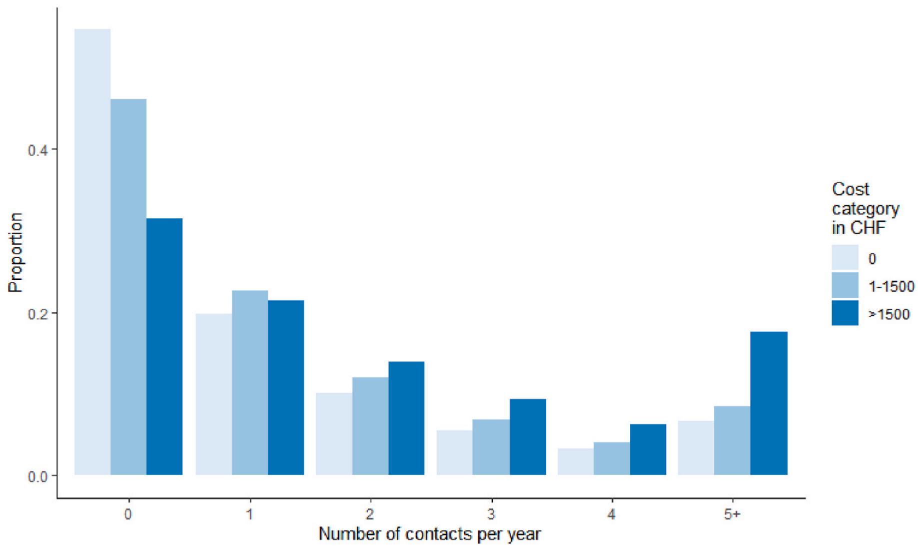

Fig. 2. Number of contacts for different cost categories, *Notes*: Fig. 2 shows on the x-axis six categories, each representing the number of administrative contacts of a customer in 2018. The y-axis shows the proportion of people in one of the six categories for three different expenditure categories. The light-blue category represents all customers with no health care costs, the grey-blue category represents all customers with positive health care costs but lower than CHF 1500, and the dark-blue category represents all customers with health care costs above CHF 1500.

Table 1
Some characteristics of the different groups.

	Treatment group	*Control group*	*Group* 1	*Group* 2	3-year panel
	Registered in a PCG in week '0'	Never registered in a PCG	No health care costs	Registered in a PCG in week '-52	
Number of individuals	36,552	713,372	53,423	39,785	1,072,282
Male (share)	0.44	0.50	0.72	0.44	0.48
Average age (in years)	51.58 (21.65)	35.99 (20.91)	41.99 (16.39)	50.97 (21.16)	43.77 (23.44)
Average health care expenditures in basic coverage in 2018 (in CHF)	9019 (15,231)	1447 (4373)	0 (0)	7150 (12,410)	3881 (9451)
Start of PCG in 2018	1	0	0	0	0.029
Start of PCG in 2017	0	0	0	1	0.032
Average number of contacts per customer in 2018	2.71 (3.96)	1.68 (2.83)	1.07 (2.10)	2.59 (4.04)	1.92 (3.17)
Average weekly frequency of contacting a health insurer (%)					
During week '–51' to week '–26'	3.69 (0.13)	2.85 (0.06)	1.89 (0.09)	5.20 (0.28)	
During week '–25' to week '–1'	4.58 (0.69)	3.12 (0.07)	2.01 (0.10)	4.92 (0.13)	
During week '0' to week '51'	5.71 (0.45)	3.41 (0.12)	2.20 (0.13)	4.97 (0.17)	
Treatment effect (DiD)		1.46 [20.6]			

Notes: Standard deviations in parentheses. Treatment effects are calculated by the following diff-in-diff calculation: ['*Treatment group*' ('week 0–51') – '*Treatment group*' ('week −51 to −26')] – ['*Control group*' ('week 0–51') – '*Control group*' ('week −51 to −26')]. Z-values, between squared brackets, are computed by assuming independency. 1 CHF equates to about 1 US dollar.

relationship is enhanced by the pattern of the *treatment group*. We observe that the number of customer contacts peaks at the time of the PCG registration in week '0', with a frequency of 8%. The reason for this peak is that in week '0' all customers face a change in their drug prescriptions as they are for the first time registered in a PCG. We observe lower but increasing numbers in the weeks before the event. Becoming chronically ill is not a sudden exogenous event as customers may already have developed health problems before they are registered as chronically ill. In fact, a customer may already have drug prescriptions before the prespecified set of drug prescriptions for a PCG is filled. Therefore, the frequencies already start to increase as the PCG registration day becomes closer. In the weeks after the PCG registration, the administrative contacts remain relatively high but decline slowly and almost converge to the line of *group* 2. The decline in frequencies after week '0' is similar to the decline in frequencies in *group* 2 during week '–50' to '–25', as the actual PCG registration day of those is at week '–52'. This also explains why the trend of *group* 2 differs from *group* 1 and the *control group*. The treatment period, i.e. the onset of the illness, clearly starts before the date of the PCG registration but it remains unclear when exactly. We chose to define the pre-treatment period as weeks '–51' to '–26', where the *treatment group* evolves quite parallel to the *control group* and *group* 1. The likely reason that customers in the *treatment group* have higher contact frequencies during the pre-treatment period than customers in the *control group* and *group* 1 is that they already have higher health care expenditures before their chronic illness is diagnosed. As the post-treatment period, we use the weeks after the PCG registration (week 0 to week 51).

We believe that the graphic representation in Fig. 3 provides compelling evidence for the existence of a causal relationship with non-trivial effects, which was the main goal of our research. The fact that customer contacts increase for chronically ill persons is likely to be a general finding that will hold for many insurance markets. Since the precise size of the effect is likely to depend on the characteristics of the insurance market and of the insurer, we are only interested in obtaining a rough idea of the size of the effect. Therefore, we perform a simple difference-in-differences calculation using the average frequencies in the lower panel of Table 1 resulting in an effect of (5.71–3.41) – (3.69–2.85) = 1.46% points. Note that the effect is strongly statistically significant due to the small standard errors (see Table 1, lower panel). In relative terms, we find that the onset of a chronic illness causes on average a structural increase in administrative contacts with the insurer of about 40% (1.46%/3.69%). Note that using a regression-based

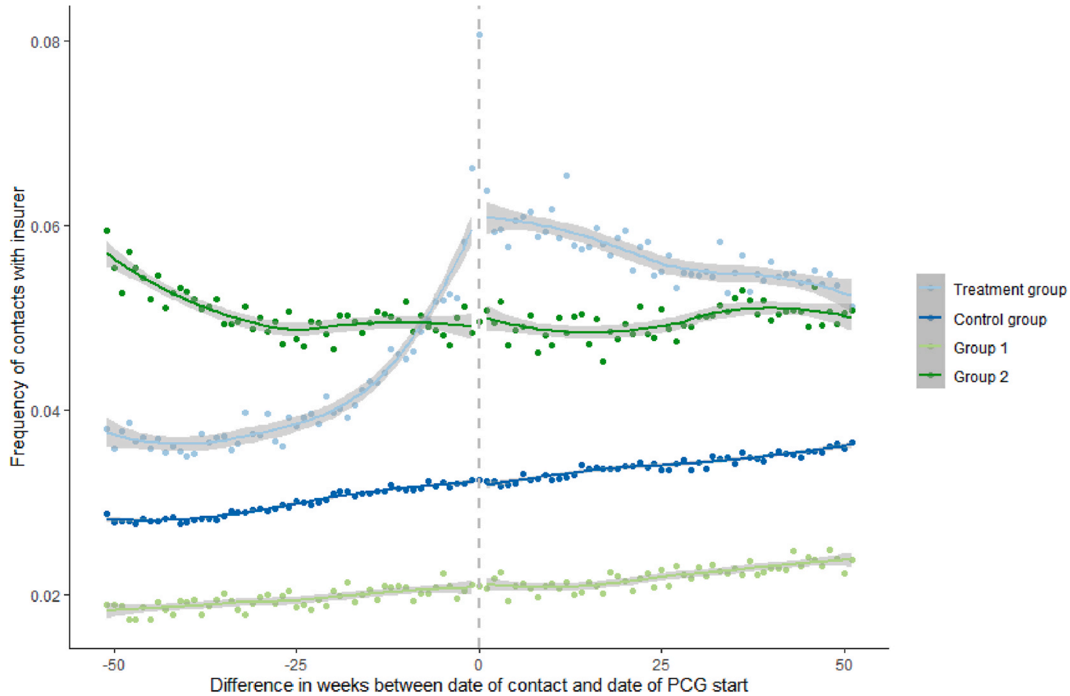

Fig. 3. Administrative customer contacts for treatment and control groups, *Notes*: Zero on the x-axis corresponds to the PCG registration day for the treatment group and the 'placebo PCG registration day' for the control and two other groups. Every dot represents the number of contacts per week divided by the group size. The lines are constructed using a locally estimated scatterplot smoother and the shaded areas around the lines represent 95% confidence intervals.

difference-in-differences model would not change the effect in an important way, as we have only age and sex as control variables and our heterogeneity analysis in Appendix B does not show differences among these.

3.2. Subsample analysis

Until now, we have looked at all contacts, independent of the reason for the contact. To show that the increase in contacts is mainly health-related, we selected a subsample of contacts that are most likely related to health issues of a customer, such as contacts with requests or questions about benefits or claims. Of the 88 categories the insurer registers, we selected 19, which cover about 30% of all contacts. Two thirds of all the selected contacts fall into one category: *Managing a general benefit-related request*. The remaining categories are mainly requests for specific subtypes of benefits (e.g., outpatient, inpatient, pharmacy). In Appendix B, we constructed Figure B1, similar to Fig. 3, for this subsample and calculated the effects in Table B1. We find an average structural increase in administrative contacts with the insurer of about 70%, which confirms our premise that the increase in contacts is caused by a deterioration in health. In our main result, we use all contacts and not only health-related ones because the categorization by the insurer might be incomplete. Some categories might see an increase in contacts with the onset of a chronic disease that the insurer does not anticipate.

As another subsample, we selected contacts that were originated by the provider on behalf of the customer. The advantage of this subsample is that we are certain that these contacts are health-related as providers initiate the contact with the health insurer. This selection covers about 4% of all contacts. Again, with an average structural increase in administrative contacts with the insurer of about 120% we find again strong evidence for a causal relationship (See Figure B2 and Table B1 in Appendix B).

4. Total administrative costs at the insurer level

Our previous analyses provide compelling evidence that insurers with a healthier population have fewer administrative costs that are related to customer contacts. However, it is unclear whether this causal effect is also substantial for total administrative costs at the insurer level. On the one hand, one could argue that the effect should be relatively small. Most administrative costs of insurers are mainly fixed costs, such as wages for personnel and capital costs for buildings, and these costs are likely to be independent of the morbidity of the insurer population. On the other hand, one could argue that the effects of morbidity are also considerable at the insurer level. An insurer with a more morbid population has not only more customer contacts but might also have more provider contacts, such as more activities related to (mistakes in) provider billing (Gottlieb et al., 2018), managed care, utilization review and bargaining on price and quality, etc. To carry out these activities, an insurer will require more personnel and capital costs, and thus higher administrative costs.

Measuring a causal effect at the insurer level is challenging as it requires, at the minimum, sufficient administrative insurance data and a plausible identification strategy. We collected data from all Swiss health insurers over a twenty-year period, from 2000 to 2019, with an annual average of 66 insurers in the market. The data are publicly available and provided by the Swiss regulator including information on total administrative costs, total health care spending, population size, and risk-adjustment payments. Risk-adjustment payments compensate or punish an insurer for (estimated) morbidity differences across enrolees to prevent selection activities by insurers (see for a recent overview McGuire and van Kleef, 2018).

For identification, we use a panel dataset that allows us to exploit variation across insurers and across time. We start by assuming that administrative costs depend on the population size of an insurer and on mean risk-adjusted health care spending per enrolee. The latter variable reflects mean health care spending per enrolee in the total insurance market plus (minus) the mean contribution per enrolee each insurer receives from (has to pay into) the risk adjustment fund, thus being a good proxy for population morbidity at the insurer level. To derive elasticities, we assume the following Cobb-Douglas cost function:

$$ADM_{it} = A_i N_{it}^{\alpha} RAS_{it}^{\beta} \quad (1)$$

where ADM_{it} represents total administrative costs of insurer i in year t, N_{it} the population size, and RAS_{it} represents risk-adjusted health care spending per enrolee. A_i represents an insurer-specific term, for example related to organizational efficiency of an insurer. Our main interest are the elasticities α and β. For example, $\alpha < 1$ would indicate diminishing returns with respect to population size, which is related to the finding in the literature that the insurers' loading fee varies with group size (Phelps, 2018). However, we are not aware of any study that estimates β. If $\beta > 0$, then having a more morbid population would indicate higher administrative costs, the same result as we found in the previous section for customer contacts. We estimate the following (unbalanced) panel model:

$$\log ADM_{it} = A_i + \alpha \log N_{it} + \beta \log RAS_{it} + \gamma_t + \varepsilon_{it} \quad (2)$$

where we add γ_t to control for possible year effects. ε_{it} is the error term which we cluster at the insurer level. Insurer fixed effects A_i control for constant heterogeneity over time. There might exist endogeneity problems with respect to both explanatory variables. Population size N_{it} might be high *because* an insurer spends a lot on marketing activities to attract new customers. We are not able to control for this type of endogeneity, but the effects are likely to be small as marketing activities by Swiss insurers are very small in relation to total administrative costs. For example, Swiss insurers spent in 2017 about 3.8% of total administrative costs on marketing (Moneyland, 2018). Risk-adjusted health care spending is likely to be uncorrelated to an insurer's individual administrative activities or costs because risk-adjusted payments to individual insurers are based on medical claims from *all* insurers in the market. Moreover, information about (past) administrative costs is excluded from the formula for the risk-adjusted payments.

Table 2 shows some descriptive statistics of our dataset. The number of insurers declines over the twenty-year period. In 2000, there were 82 insurers, of which 40 insurers later exited the market, and 18 insurers entered the market (of which 9 insurers again exited the market). There is considerable variation in the population size, even after we exclude very small insurers with less than 1000 enrolees. Mean administrative costs per enrolee vary between CHF 14.8 and 566.9 and are on average about 6% of mean risk-adjusted health care spending per enrolee. We observe large differences in mean risk-adjusted health care spending per enrolee, ranging from CHF 354.9 to 7074.1. These large differences are mainly due to differences in population morbidity across insurers. If we divide RAS_{it} by the annual mean health care spending per enrolee in the total market, we obtain the risk-score of an insurer (Douven et al., 2022), which is shown in the last row of Table 2. A risk-score lower/larger than one indicates that an insurer has a relatively healthy/unhealthy population.

Table 3 presents the results of three estimations. In the first estimation, we use all years and insurers. In the second estimation, we use only years after 2011 because in 2012 and 2017 the regulator in Switzerland improved the risk equalization system. Before 2012, only age and sex were used as risk adjustors, while after 2011 an indicator for prior hospitalization (in 2012) and an indicator for prior drug consumption (2017) were added as risk adjustors (see Schmid et al., 2018). Thus, this change has likely improved our morbidity indicator since 2012 as well. In the third analysis, we restrict to a balanced panel by removing insurers that have entered and exited the market during the twenty-year period. This might reduce some bias because administrative costs of insurers are likely to be strongly influenced by activities related to entering or exiting the market, thereby contaminating the relationship we are measuring between morbidity and administrative costs.

The estimation results are quite robust across the different models. First of all, we find for all three estimations an elasticity for α of about 0.85 with respect to population size. In two of the three estimates, α significantly differs from one, which indicates diminishing returns to scale with respect to administrative costs. For β we find also a positive elasticity indicating a positive relationship between the morbidity of an insurer population and administrative costs. However, there seems to be more uncertainty around the β estimates, and its size depends on the model we estimate. In the first model, we use all years and insurers and find an elasticity of about 0.4, although not significant at the 5% level. In model 2 and 3, we find higher and strongly significant elasticities for β of around 1. This indicates that, all else equal, an insurer with a more morbid population, equal to 1% of health care spending, faces about 1% higher administrative costs. We prefer both model 2 and 3 over model 1, as model 2 has a better morbidity indicator and there is likely to be less bias in model 3. Therefore, we use 1 as our preferred elasticity. Based on the average values in Table 2, this result implies that a CHF 25 per capita increase in health care spending is associated with a CHF 1.4 per capita increase in administrative costs. This shows that the effects are non-trivial, for example, two times the standard deviation in health care spending per capita across insurers is about CHF 1700 which corresponds to 68 (CHF 1700/CHF 25) x CHF 1.4 = CHF 95 difference in administrative costs per capita.

To conclude, our estimation results provide evidence that also at the insurer level the population morbidity of an insurer has a non-trivial effect on administrative costs. A likely reason is that insurers with a more morbid population not only have more customer contacts, related to morbid patients, but also spend more on provider contacts, related to purchasing care activities such as billing, managed care, utilization review etc. Thus, selecting good risks might not only be profitable for an insurer in terms of medical claims, as good risks are often overcompensated by the risk equalization system (see e.g., Layton et al., 2017), but also likely on administrative costs.

Table 2
Descriptive statistics Swiss health insurers (2000–2019).

Variables	Mean	Standard Deviation	Minimum	Maximum
Number of insurers per year	66.4	13.2	50	82
Population size (N_{it})	115,300	197,477	1009	1,129,490
Administrative costs p.e. (ADM_{it}/N_{it}), in CHF.	141.9	56.6	14.8	566.9
Risk-adjusted health care spending p.e. (RAS_{it}), in CHF. in CHF.	2573.8	841.9	354.9	7074.1
Risk-score of an insurer	0.96	0.18	0.15	2.63

Note: The means are annual numbers taken over all insurers and all years. p.e. is per enrolee. We excluded observations from insurers with a population <1000. 1 Swiss franc (CHF) equates to about 1 US dollar. In the last row, we obtained the risk score by dividing RAS_{it} by mean annual health care spending of the total market (see Douven et al., 2022).

5. Discussion and conclusion

In this paper, we show that insurers with a more morbid population

Table 3
Fixed-effects estimation results.

log ADM_{it}	α	β	#obs	#insurers	Model test
(1) Years 2000–2019	0.85 (0.04)	0.42 (0.35)	1354	100	F(21,99) = 76.2
(2) Years 2012–2019	0.81 (0.07)	1.15 (0.25)	425	58	F(9,57) = 39.5
(3) Balanced panel, 2000–2019	0.91 (0.06)	1.17 (0.31)	840	42	F(21,41) = 43.6

Notes: Robust standard errors in parentheses. All estimations are with insurer and year fixed effects. All computations are done in Stata 17.0 with xtreg.

have, ceteris paribus, higher administrative costs. We provide two sources of evidence. First, using data of a large Swiss health insurer we show that the number of customer contacts with an insurer increase by about 40% when a customer becomes chronically ill. Second, we provide evidence that *total* administrative costs are higher for insurers with a more morbid population. Using twenty years of Swiss health insurance market data we perform a two-way fixed effect panel analysis and find a positive elasticity of around 1, indicating that, all else equal, an insurer who spends 1% (CHF 25 per capita) more on medical claims, due to a more morbid population, faces about 1% (CHF 1.4 per capita) higher administrative costs.

The main implication of our research is that administrative costs are heterogeneous across the population. This has important consequences in theoretical models of health insurance markets as high risks become even more costly than good risks, thereby exacerbating adverse selection problems. The finding has also implications for policy. In many health care markets, insurers are subsidized by a regulator for their insurance activities. Health insurers with a more morbid population receive higher subsidies, but these subsidies are often only related to the medical costs of the population and administrative costs are often neglected. However, if administrative costs vary across customers, then insurers have an additional incentive to select good risks, and to not provide quality care for the morbid population, not only in medical care but also in customer care. Examples where these issues play a role are health care markets in Australia, Belgium, Israel, the Netherlands, and Switzerland, where subsidies related to the risk equalization system do not include administrative costs. We are aware of two countries that do take administrative costs into account in their risk equalization. In Germany, the size of the subsidy is related to the morbidity of the insurer population (Drösler et al., 2017). In the US Marketplaces, the regulator followed a similar strategy as Germany until 2018 but changed its strategy in 2018 and reduced the importance of administrative costs in the risk equalization (Douven et al., 2022).

In all countries, regulators face the problem that it is extremely difficult to estimate the importance of administrative costs. The reason is that often sufficient data about administrative costs is lacking and there is no sound identification strategy available. Of course, we face a similar problem but tried to solve this problem by first showing causality for a subset of administrative costs, i.e. customer contacts, for which a causal identification strategy was available. Next, we selected a country, Switzerland, for which there is sufficient data available and where the insurance market remained relatively stable over a twenty-year period. This allows us to estimate a two-way fixed effect model that generated reasonably robust results.

Our model is also a refinement on Karaca-Mandic et al. (2011). While they show that the loading fee of health insurers declines with population size, we show that the administrative cost component of the loading fee is likely to be responsible for this finding. Large health insurers have on average lower per capita administrative costs indicating that in a competitive insurance market they have a competitive advantage over smaller insurers. In fact, over the last twenty years, the Swiss market has significantly contracted with particularly smaller insurers leaving the market, mostly through mergers. This development towards an oligopoly might be welfare decreasing as it threatens the core concept of managed competition in health insurance whose success depends on consumer choice.

The main limitation of our study is the reliance on one insurer and one country. However, the causal relationship we find in Switzerland for one insurer is likely to hold for the majority of health insurers in the world as they have to keep contact with their customers. Obviously, the precise size of the effect may differ depending on the organizational details of the insurer and a country's health insurance system (Cutler and Ly, 2011; Hagenaars et al., 2018; Mathauer and Nicolle, 2011; Woolhandler et al., 2003). Yet, our analyses at the individual customer level can, in principle, be reproduced for any other well-organized health insurer. On the country level, Douven et al. (2022) show that the positive relationship between total administrative costs and population morbidity can be observed in four other countries as well (Australia, Germany, the Netherlands, and the US). The size of the effect on administrative costs might be larger in less regulated insurance markets, such as the US, where insurers perform more administrative activities. An example of an activity, not performed by a Swiss health insurer but that is likely correlated with population morbidity, is credentialing with physicians (granting permission to practice medicine for a particular health plan) (Cutler and Ly, 2011). A limitation of our analysis for the aggregated level is that there might be important variables that vary over time for which we do not control. For example, we show that our estimates for administrative costs become insignificant if we include insurers in our sample that entered or exited the market. The years before exiting, and after entering, a market might affect administrative activities of insurers in ways that are unrelated to population morbidity. If we had information about these activities, we could control for them. Another research idea would be to use the number of employees per insurer as dependent variable, as changes in population morbidity are likely to result in changes in the number of employees. This requires more detailed data from the insurers about their headcount.

It is important to note that there are other approaches to address the importance of administrative costs. Besides relating administrative costs to the morbidity of the insurer population, other variables may be considered as well. One such variable is whether customers are defaulting in paying their premium (or co-payment). With a mandate, insurance companies have often large departments to encourage defaulters to pay their bills. Being a defaulter may be partly related to morbidity but may also be related to other factors such as negative income shocks, becoming unemployed or facing a divorce. Education and health literacy could also be factors correlated with morbidity and administrative costs. This would be interesting research areas to explore for further study.

Author contribution

Both authors contributed equally to this manuscript.

Declaration of competing interest

None.

Data availability

Part of the data that has been used is confidential.

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Supplementary data

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