In absolute or relative terms? How framing prices affects the consumer price sensitivity of health plan choice

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Abstract

Exploiting a unique natural experiment in Germany, this paper provides field evidence on a.) how price framing affects consumers' decision to switch health insurance plans and b.) how the price elasticity of demand for health insurance can be influenced by policymakers through simple regulatory efforts. In 2009, to foster competition among health insurance companies, German federal regulation required health insurances to express price differences across health plans in absolute Euro values rather than percentage point payroll tax differences. Using individual-level panel data as well as administrative aggregate data, we find that the reform has led to an eightfold increase in the individual switching probability.

Keywords: Health insurance, Price competition, Price elasticity, SOEP

JEL classification: H51; I11; I18

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1 Introduction

Price competition is central to the idea of managed competition. According to managed competition, consumers would be provided with standardized benefit packages as well as transparent and extensive information about quality of care, along with an array of different health plans to choose from. In theory, health insurances would then face incentives to improve the quality of care, cut costs and thus compete solely on the basis of health care quality and prices. A necessary condition for this model to work in practice is cost-consiousness among consumers and a sufficiently large price elasticity of demand for health plan choices. In other words, switching costs across health plans need to be sufficiently low and price sensitivity among consumers sufficiently large.

The question of how to design health insurance markets to foster price competion among insurances is also a key to the answer of how to curb health expenditure growth while improving quality of care. For any type of market-based health insurance reform, price competion among insurances and price senstitivity among consumers are crucial concepts.

Given this enourmous relevance, it certainly does not surprise that the literature consists of a large amount of empirical studies on this topic. The great majority of the existing evidence comes from the US. In terms of health care spending, the US health care market is the most important one worldwide. At the same time, it is the most fragmented and presumably least regulated one. The great majority of the US population is enrolled in a health care plan that is offered by one of the more than 1,200 private health insurance companies. Even when insurance coverage is predominately funded through taxes, enrolles are often covered by private health insurance plans. In total, thousands of different health plans exist, each offering a different benefit package and a different combination of deductibles, copayments, and stop-loss limits. Moreover, health insurance companies negotiate provider reimbursement rates separately and hence quality of care differs largely accross plans and settings. To a large extend, especially in the US, quality of care is not observable by consumers. This information asymmetry makes health plan quality an experience good and results in health plan choice persistence and "status quo bias."

Two additional distinct features of the US health care system presumably lower premium elasticities: limited choice of plans and higher switching costs due to provider network changes induced by switching. More than 50 percent of all working age Americans obtain health insurance coverage through their employers (National Center for Health Statistics,, 2011). In the first stage, employers select health plans and offer them to their employees. In a second stage, employees choose health plans. Although health plan choice has increased in the last decades, more than 80 percent of all firms that offer

health insurance only offer one type of plan—the great majority of employees can only choose from a menu of manged care plans (The Kaiser Family Foundation, 2011). Managed care plans, however, restrict provider access to a predetermined provider network. This means that health plan switching often entails provider switching, which boosts health plan switching costs.

Mainly due to data limitations, the great majority of research on the effect of price changes on switching behavior focuses on the US employer group market, makes use of firm data from a single employer, and identifies elasticity estimates based on within employer premium variation (see Section 2 for a comprehensive overview). Given the lack of comprehensive consistent data, the "reduced form literature" on this topic is relatively sparse. On the other hand, a quite rich literature that models whole health insurance markets structurally has emerged in recent years (see Section 2). However, the structural strand of the literature mainly focuses on modeling welfare implications of adverse selection. As a "by-product", these studies often also provides demand elasticity estimates of health plan choice. In summary, it comes at no surprise that elasticity estimates vary tremendously and that the literature reveals no definite consensus on this point.

This paper advances the literature on price competition, price framing, and consumer price sensitivity in the health care market in various respects. We study the German health insurance market which has distinct features that allow us to shut down various channels that might have potentially confounded previous estimates: Germany has a universal health insurance system. 90 percent of the population is insured under a pubic health insurance system, which is, however, not a single payer system. More than 150 health insurance companies ("sickness funds") compete against each other and are regulated by German Social law. Benefit packages are highly standardized and do basically not differ across sickness funds. Cost-sharing is almost not existent; the modest copayment rates are heavily regulated and are identical across health plans. By international standards, there exist no barriers in access to care. Choice of providers is free and not restricted. Reimbursement rates in the inpatient and outpatient sector are centrally determined and not by negotiations between insurance companies and providers. Guaranteed issue exists and insurance premiums are income-dependent in form of contribution rates. Consequently it is fair to say that 150 sickness funds offer 150 identical health plans and only compete on the basis of prices.

We make use of this unique institutional setting, long-running individual level panel data and aggregate administrative data to study the effects of a unique "natural" experiment: Effective 2009, the German legislator implemented a reform that exogenously changed the price framing of premium differentials between sickness funds. Before the reform, prices for health insurance plans were expressed in per-

centage points of the gross wage and paid as payroll deductions. To foster price competition between insurers, the reform equalized and freezed the contribution rates to be deducted from the payroll for all health plans and forced sickness funds to express price deviations in absolute Euro values and bill them separately.

We exploit price variation across sickness funds and over a time span of nine years to show that changing the price framing from relative to absolute terms substantially increased consumer switching probabilities and price competition in the market. Under the old regime, when price differentials were expressed in relative to the gross wages and deducted from the payroll, we estimate that an increase of the monthly premium by 10 Euros increased the individual level probability to switch to another sickness fund by 1 percentage points. Changing the incremental price framing to absolute Euro values and separate billing has to led to a eightfold increase in this switching probability. The implied price elasticity of demand for health plans increased from X to X. Aggregate administrative data on the sickness fund level confirms this finding. This study also confirms earlier findings and shows that price sensitivity varies across customer characteristics: the young, healthy and, surprisingly, the risk averse are more price sensitive than the rest of the population.

One key feature of this article is to show that price framing has a substantial impact on price competition and price sensitivity in the health care market. By means of laboratory experiments, various studies have shown that the framing of decisions matters (cf. Tversky and Kahnemann (1981)). Fewer studies have done so using real-world settings (cf. DellaVigna (2009)). Chetty et al. (2009) demonstrate in a field experiment that price framing of commodity taxes affects demand. Wallace and Huck (2010) provide a comprehensive literature review on the impact of price frames on consumer decision making and conclude that there was limited evidence on some sort of price framing. After summarizing the "patchy evidence" which would come from experimental research and consumer surveys, Wallace and Huck (2010) implement five pricing strategies in a coherent experimental setting to study consumer decision making. Bertini and Wathieu (2006) also offer a concise introduction of how the framing of prices affect the perceived value of goods. The study that is closest in spirit to ours is Hastings and Tejeda-Ashton (2008). In an experiment conducted in Mexico, they use a sample of financially illiterate to show that presenting fees in pesos instead of annual percentage rates induces changes in choice behavior in a hypothetical investment setting. To our knowledge, this is the first study in a real world setting that shows how consumer behavior in the health care market is causally affected by price framing. Hence, this paper contributes to the growing, but still scanty, literature on behavioral economics and health care (cf. Frank (2004); Liebman and Zeckhauser (2008)).

The next section reviews the health economics literature on price elasticities and switching behaviors. Section 3 outlines the institutional details of the German health care market. Section 4 provides first results from aggregated administrative data while Section 5 provides information on the individual level data. Section 6 presents results on the effect of add-on premia on the switching behavior. Section 7 estimates price effects before and after the reform and Section 8 concludes.

2 Previous Literature on Health Plan Switching

As mentioned, the large majority of the literature on health plan choices and premium elasticities studies the US employer group market. First of all, we briefly survey the structural estimation literature on this topic. It models whole (health) insurance markets and provides some premium elasticity estimates of health plan choices. However, premium elasticities are not the focus of this literature since it is mainly interested in the welfare implications of adverse selection. Einav et al. (2010) study how inefficient pricing in insurance markets with selection result in welfare loss. They use individual level data from an US employer in 2004 and variation in health plan premiums to estimate the demand for insurance. The authors find that an annual price increase by $100 decreases the probablitiy that a health plan is selected by 11 percent. Handel (2011) uses data from from a large US employer and the years 2004-2009 and estimates a structural choice model that incorporate switching costs and result in low demand elasticity estimates. Joshua (2011) combines data from multipe sources to structurally model the Medicare+Choice market (Medicare Part C) under adverse selection and imperfect competition. He finds that a monthly price increase by $10 reduces the market share of a plan by 6.4 percent. Starc (2011) uses administrative markt level data to model the Medigap market. She finds that elasticities are correlated with claims and that an annual premium increase of $100 leads to a decrease in the market share of a plan by 7.5 percent. Using data from an intermediary covering 11 small to mid-sized employers for the years 2004-2005, Bundorf et al. (2008) calculate that a $100 increase in the annual enrollee contribution results in health plan market share losses of between 7 to 9 percent.

Note that the estimates from all these studies refer to market share changes in response to absolute premium price changes faced by the individual ("out-of-pocket semi-elasticities"). However, in case of employer-sponsed health insurance, employees usually pay only a share of the total premium. The share paid by the employee varies by plan type and firm characteristics and ranges from 0 percent to more than 50 percent (The Kaiser Family Foundation, 2011). Remember that, in the first stage, employers pre-select the choice of health plans offered to employees—a choice that is likely to

depend on price variation in the entire premium. It is also noteworthy that these studies report the premium elasticities with repect to changes in market shares. Market shares in the US employer setting, however, are typically defined as within-firm market shares. Please also note that baseline employee contributions and market-shares differ across settings which hampers the comparability of these estimates. Moreover, the within-firm choice set only reflects a very restricted choice set determined by the employer and neglects that employees have the option to buy insurance coverage on the individual market. Despite tax subsidies for employer-sponsored health insurance, this might be an attractive option for young healthy employees who would need to pay a high share of the premium out-of-pocket or who work in an industry with high group rates.

We now survey selectivly studies in the reduced form strand of the literature. While older studies were limited to cross-sectional analyses, Dowd and Feldman (1994) use health plan level panel data of five employers in Minneapolis and estimate that a $7 out-of-pocket monthly price increase decreases a plan's market share by 0.112 percentag points (Demand elasticity: -7.9). Buchmueller and Feldstein (1997) study the switching behavior of 75,000 University of California (UC) employees after a change UC's contribution policy. In response to a $10 increase in employee premiums (from zero), the individual level baseline switching probability increased by the factor five to 25 percent. Cutler and Reber (1998) use a sample of Harvard employees to estimate demand elasticities of -0.3 and -0.6, i.e., they find that plan enrollement decreased by between 0.3 and 0.6 percent as a response to a 1 percent increase in plan prices paid by Harvard employees ("out-of-pocket premium elasticity"). Royalty and Solomon (1999) use Stanford employees and distinguish between "insurer-perspective" elasticities, which refers to changes in total premium prices, and "employee-perspective" elasticities, which refer to changes in "out-of-pocket" premium changes. The probability that employees chose a specific health plan decreased by 0.5 to 0.8 percent for every 1 percent increase in employees' plan price. Taking into account that employers contribute a substantial share of the premium substantially inflates elasticities to -1 up to -3.5 ("insurer-perspective elasticity"). In another study using UC employees, Strombom et al. (2002) calculate "insurer perspective own-price elasticities" of health plans and find that a monthly premium increase of $5 decreases the plans market share by between 1.2 and 3.7 percent. Atherly et al. (2004) study the Medicare+Choice market and calculate out-of pocket premium elasticities of -0.134 and insurer perspective elasticities of -4.6. Buchmueller (2006) focus on a sample of retirees above 60 and calculates out-of-pocket premium elasticities of between -0.2 and -0.3, implying that a health plan would loose 4 to 8 percent of its enrolles it if increases monthly employee contributions by $10. Using 2002 -2005 data from an US employer and a Baysian ap-

proach, Carlin and Town (2009) estimate various "plan-specific" and "cross-plan premium elasticities" ranging from -0.01 to -0.41, meaning that a 1 percent price increase results in a market share decrease by between 0.01 and 0.4 percent. Chan and Gruber (2010b) study plan choice price sensitivity among low-income employees in the Massachusetts' Commonwealth Care program. A $10 out-of-pocket premium increase reduces the probability that a health plan is chosen by 8 to 16 percent resulting in an out-of pocket premium elasticities of -0.7. In Chan and Gruber (2010a), the authors study heterogeneity in price sensitivity in more detail.

Instead of switching plans as a response to premium changes, employees in the US market may decide to drop or take-up (employer-sponsored) coverage. Cutler and Reber (1998) find that the probability of dropping coverage increased by 1 percent for an out-of-pocket premium increase by 1 percent, i.e., an coverage elasticity of -1. The "out-ot-pocket premium take up elasticities" found in the literature are estimated consistently to be very low. The range goes from -0.014 to -0.09, implying that a decrease in employees' out-of-pocket premium contribution by 10 percent increases take-up rates by between 0.14 and 0.9 percent (Chernew et al., 1997; Blumberg Linda J., 2002; Cutler and Garber, 2003; Gruber and Washington, 2005; Jacobs, 2009).

The non-US literature on premium elasticities and consumer switching behavior is extremely sparse. Using data from all sickness funds in the Netherlands, Schut and Hassink (2002) study the effects of a managed competition-based health insurance reform and find out-of-pocket premium elasticities with respect to the market share of -0.3 for compulsory insurance. Discussing differences to the US market comprehensively, the authors conclude that price sensitivity in the US would be much higher due to lower search costs and higher switching experience. Subsequent studies confirm these low elasticity estimates for the Netherlands (Schut et al., 2003; Dijk et al., 2008). Using aggregated administrative data, Schut et al. (2003) study how price elasticity has changed over time after the introduction of free sickness fund choice in Germany in 1996. They estimate that the market share elasticity of a one percentage point increase in the income-dependent contribution rates increased over time to -4.8 in 1999/2000. Using an unbalanced panel of all German sickness funds between January 2001 and April 2004, Tamm et al. (2007) estimate the short-run premium elasticity to be about -1, i.e., an increase in the contribution rate by 1 percentage points would lower the market share by 1 percent. Using the same dataset as this study, the SOEP, Andersen and Schwarze (1998, 1999) as well as Andersen et al. (2002, 2007) estimate the determinants of switching behavior and analyze socio-economic characteristics of switchers. Schwarze and Andersen (2001) estimate that the individual-level probability to switch health plans increase from 5 to 9 percent if average contribution rates increase by 1 percent. Nuscheler and Knaus (2005) also take advantage of the SOEP to study adverse

selection in the German health insurance market. They find that good health increases the probability to switch funds significantly and discuss implications for the German risk compensation scheme.

In addition to the literature the focuses on price effects, some US studies measure the impact of quality information on switching behavior (Beaulieu, 2002; Abraham et al., 2006). The market for Medicare Part D has also drawn some attention. Abaluck and Gruber (2011) document that elderlies' health plan choices are not consistent with optimization under full information. Other studies came to similar conclusions (Heiss et al., 2006, 2007, 2009). There is also a consensus in the literature about the fact that the young and healthly are more price sensitive than the old and sick. The applied to the existence of quo bias exists, i.e., the obervation that price sensitivity depends on the enrollment length in a health plan (cf. Royalty and Solomon (1999); Strombom et al. (2002); Nuscheler and Knaus (2005); Becker and Zweifel (2008); Dijk et al. (2008)). Insurance search and switching behavior has also been incorporated in search models (cf. Bolhaar et al. (2009)).

3 Institutional background

3.1 The German Health Insurance System

The German health insurance system is actually comprised of two independent health insurance systems that exist side by side: a public one and a private one. Germany has universal health care coverage and uninsuranced individuals do practically not exist. This paper focuses on the Public Health Insurance (PHI) which covers about 90 percent of the German population. Employees whose gross income from salary is below a defined income threshold (in 2011: € 49,500 per year) are compulsorily insured under the PHI. Non-working spouses and dependent children are covered at no cost by the PHI family insurance. Special regulations apply to particular groups such as students and the unemployed, but most of these are PHI-insured.

High-income earners who exceed that threshold as well as self-employed people have the right to choose between the PHI and private health insurance. Once an optionally insured person (a high-income earner, self-employed person, or civil servant) opts out of the PHI system, it is practically impossible to switch back. Hence, opting out of the public scheme can be seen as a lifetime decision.

Everyone covered under the PHI is subject to a generous universal benefit package, which is determined at the federal level and codified in the Social Code Book V (SGB V). Coinsurance rates are prohibited in the PHI and thus, apart from copayments which are fixed at the federal level, health services are fully covered. The PHI is one pillar of

the German social security system (German Ministry of Health, 2011). Although the PHI is a compulsory health insurance system and benefit packages as well as provider reimbursement are determined at the federal level by Social law, employees can choose between about 150 different health insurances, called "sickness funds" (German Ministry of Health, 2011).[1] The 150 sickness funds mainly compete on the price level. For compulsorily insured members, since cost-sharing is fixed at the federal level, price competition works through differences in monthly sickness fund premiums. In the PHI, premiums are not risk-related and only depend on income. Sickness funds are non-for-profit organizations meaning that, in the medium-run, revenues must equal expenses. There exists guaranteed issue and free choice of providers. Reimbursement of providers is also determined centrally and does not vary across sickness funds, only across regions.

3.2 Calculation and Price Framing of Sickness Fund Premiums (Contribution Rates) Before and After the Reform

The PHI is primarily financed by mandatory payroll deductions that are not risk-related but income-dependent. For people with gainful employment, these contributions are split equally between employer and employee up to a contribution ceiling (2011: €44,550 per year).

The health policy reform that we evaluate in this paper became effective January 1, 2009. Prior to that reform, sickness fund premiums ("contributions") were solely expressed as a share of the gross wage. This mandatory payroll tax was automatically dedecuted from employees' paychecks. For example, the average payroll tax in 2002 amounted to 14 percent of the gross wage and was (by law) equally split between employers and employees (German Ministry of Health, 2011). The average gross wage in that year was €2,386 (German Social Code Book VI, Annex I). This means that, on average, 0.07×€2,386=€167 per month were deducted directly from employees' paychecks and transfered by the employer to the sickness fund chosen by the employee. In addition, the employer paid the same amount.[2]

Before 2009, each sickness fund directly and independently collected employees' and employers' contributions. To avoid adverse and risk selection, a risk equalizing scheme—based on the factors age, gender and disability status—equalized varying

[1] Traditionally, employees were allocated to sickness funds—based on their occupation or industry—and had no right to switch funds. In 1996, switching funds became a legal right.

[2] Effective July 1 2005, the strict equal sharing of contributions has been given up. Since then employees' share was slightly raised, they are now charged $[0.9 + 0.5 \times (cr - 0.9)]$ percent of their gross wage where cr denotes the overall contribution rate. In the example above, this would amount to an employee share of 7.45 percent and an employer share of 6.55 percent of the gross wage (cf. Gesetz zur Anpassung der Finanzierung von Zahnersatz vom 15. Dezember 2004).

risk profiles across funds. Funds with an insurance pool of good risks had to contribute to a risk equalization fund which paid out money for sickness funds with a pool of bad risks.

Before 2009, each sickness fund was allowed to set the insurance premium, i.e., the contribution rate as a share of employees' gross wage, autonomously and independently. Consequently, in 2002, contribution rates varied from 12.7 to 14.9 percent of the gross wage (Quelle). Applied to the average gross wage, this means that employees could save some to €25 per month through switching from the most expensive to the cheapest sickness fund. Since each sickness fund essentially only offers one standardized health plan for compulsorily insured, switching health plans is equivalent to switching sickness funds.

Before 2009, when an employee wanted to switch her health plan, she had to give cancelation notice in written form. The cancelation period was two months from the end of the month in which cancelation notice was given. The minimum contract period was 18 months. However, if sickness funds were planning to raise contribution rates, they were required to give notice to their insurees in written form at least one month in advance. Independent of the enrollment length, sickness fund members had then an extraordinary right to cancel the contract and switch funds within two months. Switching funds has always been relatively easy; the easiest way is to fill out an online application form. Almost always, the paperwork—including cancelation notice—is then completed by the enrollee's new fund.

In 2007, the German legislator implemented a law to foster competition among sickness funds in the German Public Health Insurance System. The core idea was to change the price framing in the PHI system. Policymaker wanted to emphasize and visualize price differences across funds more clearly and accurately to enhance sickness fund switching and hence competition among funds. The new law equalized and froze the contribution rates to 15.5 percent for all funds. Since January 2009, by law, sickness funds are forced to charge an "add-on premium" in form of an absolute monthly Euro amount in case that expenses can not be covered by the revenues generated from the fixed contribution rate. On the other hand, well managed and financially sound sickness funds can directly reimburse their members money every month. In other words, the law required sickness funds to express price differences no longer in relative terms with respect to employees' gross wages but in absolute Euro values. Moreover, sickness funds now have to bill (or reimburse) such add-on premiums separately, while the 15.5 percent general contribution is still deducted from the payroll.

At the beginning, sickness funds were extremely reluctant to charge add-on premiums. Having no experience with such a change in price framing, no one wanted to be the first mover and charge an add-on premium. The first sickness fund that moved

ahead and charged an add-on premium of €8 per month was the *Gemeinsame Betriebskrankenkasse Köln*, a small sickness fund with just 42,000 enrollees. Five sickness funds followed in 2010, among them two of the largest German funds: the third largest sickness fund at that time, the Deutsche Angestellten Krankenkasse (DAK), with 6 million insured people and a market share of 8.5 percent, and the KKH-Allianz with 1.9 million insured people and a market share of 2.7 percent. The DAK introduced the add-on premium effective February 1, 2010 and the KKH-Allianz introduced it effective March 1, 2010. In 2011, four more sickness funds followed and charged add-on premiums to their members. It is estimated that in 2011, around 10 million sickness fund members—or 20 percent of all PHI members—are charged an add-on premium.[3] Add-on premiums vary between €6.50 and €15 per month. The majority of funds charge €8, i.e., €96 per year.[4] On the other hand, in 2011, four financially very sound sickness funds reimburse their members between €30 (BKK A.T.U.) and €72 (G&V BKK) per year. However, the average German is unfamiliar with the existence of these four relatively small sickness funds who have between 1,100 (G&V BKK) and 240,000 (hkk) members. Most of these small sickness funds only operate locally with few branch offices, a very basic service infrastructure, and few employees.

Cancelation periods and mininum contract periods have not been changed by the new law. Sickness funds are required to give notice at least one month before the introduction or increase of an add-on premium. In that case, independent of the enrollment length, sickness fund members have an extraordinary right to cancel the contract and switch funds within two months.

4 Aggregated Data

To get a first impression of the switching behavior due to the introduction of add-on premia we collected aggregated data on the level of the sickness fund. By law, sickness funds are obliged to accurately measure their number of enrolles and members and provide the *German Ministry of Health (BMG)* with these data in regular time inter-

[3]To be precise, we need to distinguish between sickness fund "members", i.e., those who are charged the premium and who make the decision whether to switch a fund or not, and "enrollees." The latter refers to the total number of insured people and also includes insured family members. The figures above refer to the total number of enrollees. In 2009, the DAK had 1.4 million members (market share: 1.7 percent) and the KKH-Allianz had 4.6 million members (market share: 9.1 percent). It is estimated that around 10 million members are charged an add-on premium, i.e., DAK and KKH-Allianz members make up 50 percent of the total number affected.

[4]Most sickness funds charge €8 per month since sickness funds are not required to consider the income level up to a monthly add-on premium of €8. As a general rule, add-on premiums can be charged up to 1 percent of a member's income up to the contribution ceiling of €44,550 per year, i.e., 0.01×€44,500=€445.50 per year or €37.13 per month is the upper limit for people with an annual gross wage of at least €44,550. Up to €8 per month, an income-independent flat add-on premium can be charged by sickness funds.

vals. However, the BMG only publishes data on whole generic sickness funds groups as described above, i.e., data on the number of insured in all AOKs, IKKs, BKKs, LKKs *et cetera*.

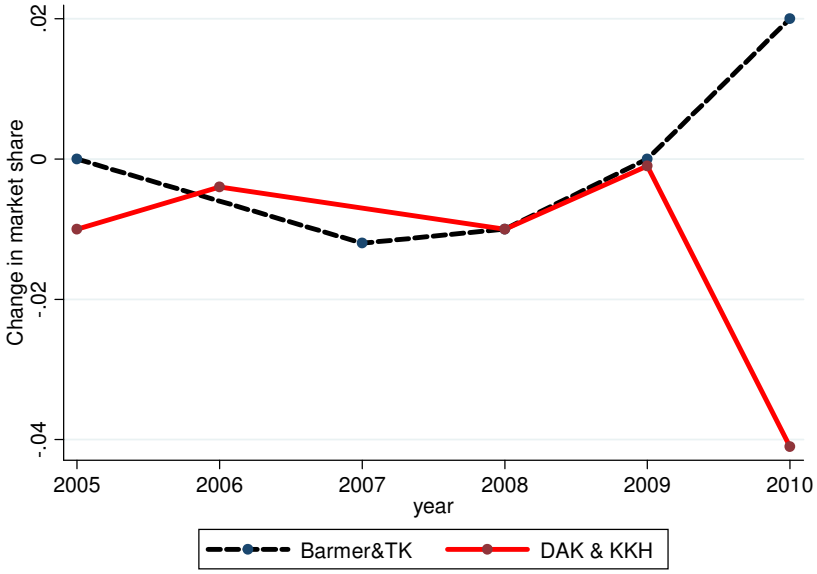
The DAK and the KKH are the only large sickness funds with a substantial market share that charge add-on-premiums. In 2010, they had 4.5 (DAK) and 1.3 (KKH) million enrollees. Boths funds belong to the group of *Ersatzkassen*.[5] Therefore, we collected aggregated membership data on the two other large German *Ersatzkassen* with a substantial market share: the *BARMER Ersatzkasse* and the *Techniker Krankenkasse (TK)*. In 2010, the BARMER sickness fund had 5.3 million members (market share: 10.3 percent) and the TK had 4.6 million members (market share: 8.9 percent). The BARMER and the TK are the largest German sickness funds. We surveyed all annual reports of these four large German Ersatzkassen from 2005-2010 and collected the average number of members for each fund and year. Dividing the number of sickness fund members for each fund and given year by the total number of sickness funds members in the year—the latter figure is released by the BMG—we obtained the market share for each of these four sickness funds over the time period from 2005-2010.

Thus, in total, we obtain aggregated data from 2005 to 2010 for four of the largest German sickness funds. Two of these funds charged an add-on premium and two of them did not. Together, these four sickness funds represent more than 15 million sickness fund members and have a market share of more than 30 percent.[6] Figure 1 presents the changes in market shares of these funds between 2005 and 2010. While until 2009, before add-on premia were introduced, changes in market share were fairly small, the two sickness funds that charged add-on premia experienced a strong drop by about 4 per cent. Likewise, the two other large funds benefited and increased their shares.

[5]The term *Ersatzkasse ("Alternative Fund")* ist a historic legacy. In 1883, the first Chancelor of the German Empire, Otto von Bismarck, introduced the first public health insurance system in the world in Germany. All compulsorily insured citizen were assigned to newly founded sickness funds according to their occupation, e.g., craftsmen were assigned to *Innungskrankenkassen (IKK)*. However, on a voluntary basis, sickness funds already existed before that time in Germany. As an alternative to the newly founded funds, employees were allowed to choose one of those already existing older sickness funds (if accountable for the employees' occupation). Hence, at the beginning, funds that already existed prior to 1883 were called "assistance funds" (*Hilfskassen*); in 1914, they were renamed to "alternative funds" (*Ersatzkassen*). At around 1900, about 1,500 *Ersatzkassen* existed; in 2011, only 6 remained.

[6]In total, they represent more the 21 million enrollees, dependents insured under family insurance included.

Figure 1: Development of Market Shares over Time



5 Long-Runnig Individual Level Panel Data: The German Socio-Economic Panel Study (SOEP)

The main data source that we rely on is the German Socio-economic Panel Study (SOEP). The SOEP is a large and representative household panel dataset which started in 1984 in West Germany and was extended to include East Germany in June 1990. In the past 20 years, various refreshment samples and innovation samples were drawn. In addition, in specific years, specific population subgroups were oversampled (e.g. immigrants in 1984 & 1994/1995 and high-income earners in 2002). In 2010, more than 11,000 households with more than 22,000 individuals participated in the survey.

The SOEP core questionnaire includes a wide array of questions on well-being, labor market activities, and health. Most of these questions are surveyed annually. Some topics, e.g., health behavior such as smoking or alcohol consumption, are surveyed every other year. In addition, the SOEP includes batteries of questions on specific themes that are surveyed in more or less regular longer time intervals; e.g., the fields "social security" and "assets" were surveyed in 2002 and 2007. More information on the SOEP can be found in Wagner et al. (2007). For our empirical analysis, we make use of the waves 1999-2010.[7]

[7]The data used in this paper were extracted using the Add-On package PanelWhiz v2.0 (Nov 2007) for Stata. PanelWhiz was written by Dr. John P. Haisken-DeNew (john@panelwhiz.eu). The PanelWhiz generated DO file to retrieve the SOEP data used here and any Panelwhiz Plugins are available upon request. Any data or computational errors in this paper are our own. Haisken-DeNew and Hahn (2006) describe PanelWhiz in detail.

Dependent Variable and Sample Selection

As of 1999, the SOEP includes information on each respondent's health insurance status and sickness fund membership. Moreover, individuals indicate whether or not they changed their sickness fund in the previous year. In the questionnaire, to indicate their sickness fund memebership, respondents can choose between eleven options. Among these options are the largest German sickness funds. However, the existence of about 150 different sickness funds makes it necessary to group some of the smaller funds according to historical concepts (see Table 1 for the eleven options displayed in the questionnaire). Information on the sickness fund group and the federal state the insured lives in allows us to unambiguously assign some 80 per cent of all respondents their health insurance provider.[8] The remaining 20 per cent are insured with more than 100 typically very small providers. We disregard this group since we do not have full information on their provider.

Our analysis focuses on the "paying" sickness fund members. We define paying sickness fund members as all those who are gainfully employed, earn more than €400 gross per month, and pay the full PHI health insurance premium.[9] As mentioned above, we also have to disregard those insured who cannot be unambiguously assigned a sickness fund, i.e., respondents who indicated "BKK" or "Other sicknes fund" in the questionnaire. Moreover, we disregard those insured under the second tier of the German Health Care System–the private health insurace. We end up with a sample of 50,911 person-year observations from 13,187 different individuals.

Our dependent variable indicates whether a sickness fund member switched to another sickness fund beween two interviews, which are usually conducted in the first three months of a year. This binary dependent variable is defined in an antipacitory manner. It measures whether a respondent will cancel her current sickness fund memberhship and switch to another sickness funds until the next interview in the upcoming year. As an example, a value of 1 in the year 1999 implies than the insured will switch sickness funds until the next interview in 2000. As mentioned, in the analyses, we use all waves from 1999 to 2010. Consequently, the most recent wave of 2010 is only used to construct the dependent variable for the year 2009. We call this switching

[8]This is because two of the groups of funds which can be indicated, the AOK and the IKK do not operate on the national market like most of the large funds but have independent companies in each of the 16 German federal states. The catchment areas of these funds do not overlap because the funds are open only to individuals living in the federal state the sickness fund is located in. Thus, knowing that a respondent's health insurance provider is an AOK or an IKK together with information on the federal state they live in allows us to exactly determine the insurance fund also in this case.

[9]This excludes all under PHI familiy insurance, the unemployed for whom social security pays 100 percent of the health insurance premium, full-time students who just pay an income-independent flat premium (2011: €76,41 per month) or who are insured under their parents' family insurance, pensioners as well as special population groups such as draft soldiers or low-income earners with a wage of less than €400 per month.

indicator *Switch*. Appendix A shows that 5.8 percent of all person-year observations entail switches, i.e., we observe 3,707 health plans switches over all years and across all sickness funds.

We carry out two different analyses in the following two Sections. Part A (Section 6) performs a difference-in-differences analysis on the effect of add-on premia on the likelihood to switch health plans. To this end we define a treatment and a control group. The treatment group comprises all individuals who were exposed to an add-on premium in 2010. Part B (Section 7) compares the effects of both the health insurance premium and changes in the premium on the switching behavior. Emphasis is put on the difference of the price elasticity before and after the reform in 2009. The relevant variables are defined below.

Part A: Definition of Treatment and Control Group

As discussed in Section 3.2, to this date, 10 sickness funds charge paying members add-on premiums between €78 and €180 per year. Four sickness funds reimburse their paying members between €30 and €72 per year. Around 135 sickness funds do neither charge add-on premiums nor reimburse their paying members. SOEP data unambiguously identifies 45 of the 150 sickness funds. However, as Table 1 shows, the 45 identifiable sickness funds cover 80 percent of all PHI members, which sum up to about 50 million. Hence, we can use rich individual level-panel data for 10 years that is representative of 40 million German sickness fund members.[10] From early 2010, two of the largest German sickness funds charged an add-on premium to their paying members: the DAK and the KKH. Both can be identified in our data. They account for more than 10 percent of all PHI members. Moreover, the 6 million members of these two funds account for about 50 percent of all PHI members who were charged an add-on premium. The DAK introduced the add-on-premium in February 2010, while the KKH charges add-on premia since March 2010. Individuals surveyed after March (in case of DAK) and April (in case of KKH) are the treatment group when we analyze the effect of add-on premia on the switching probability.[11] The variable *Treat* is 1 for this group and 0 for everyone else. Appendix A shows, that 5.2 percent of our sample belong to the treatment group.

[10] Given the sample selection described above, we effectively use panel data that represent about XX million Germans in 2010.

[11] Hence, there are individuals insured by the DAK or the KKH who were surveyed in 2010 but are not in the treatment group. These are those who were interviewed in the first 3 (4 in case of the KKH) months in 2010 when add-on premia had not been introduced yet.

Table 1: Identification of sickness funds in SOEP data and definition of treatment and control groups

	(Generic groups of) sickness funds	# of funds in 2009	Identifiable?	Identifiable in comb. with federal state?	Market-share 2009
a.)	**Add-on premium (treatment group)**				
1	DAK	1	yes		9.43
2	KKH	1	yes		3.25
b.)	**No add-on premium (control group)**				
3	AOK	15	no	yes	30.57
4	Barmer	1	yes		10.66
5	TKK	1	yes		11.48
6	IKK	15	no	yes	8.17
7	GEK	1	yes		2.35
8	Knappschaft	1	yes		2.59
9	LKK	9	no	yes	0.61
c.)	**Not identifieable**				
10	BKK	155	no	no	18.18
11	Other	18	no	no	2.70

Source: SOEP v27

Part B: Covariates Measuring Individual Health Plan Prices

To estimate price effects on switching probabilities before and after the reform, we performed an extensive research at the sickness fund level and collected contribution rates detailed to a daily level for all 45 sickness funds in our sample over a time span of 11 years. According to the day of the interview we assigned the individuals in our data their exact contribution rates. The total contribution rate range goes from 11.7 to 15.5 (percent of the gross wage). We call this variable *Contribution*.

In a second step, we take half this total contribution rate, i.e., the employee's share, and multiply it with the inflated–in 2009 values–gross wage of the respondent in the year of the interview up to the contribution ceiling of that year.[12] From 2009, we add the add-on premium. As a result, we obtain the monthly insurance premium that employees pay for their PHI health insurance coverage. We call this variable *Premium*.

In a third step, using contribution rates of the employees' sickness fund in t_1 and the gross wage of the individuals in t_0, we calculate the *potential* premium increase for individuals in Euro, given that they do not switch health plans. We fix labor income in t_0 to be able to fully attain premium increases to contribution rate increases and not to confuse it with other influence factors such as a wage raise after promotion. We call this variable *PremiumIncrease*.

In a final step, we generate a variable *PremiumIncreasePercent* by dividing *PremiumIncrease* through *Premium*. This measure yields the potential premium increase in percent of the current premium in case of not switching health plans.

Table 2 reports average premium increases between 1999 and 2009 and should be read as follows. For example, in 2002, 56.3 per cent of the 6,665 individuals in our sample were insured with a provider that raised the contribution rate until the next interview in 2003. The average increase of the contribution rate was 0.52 percentage points. This amounted to an average increase in the employee share of the insurance contribution by 5.63 Euro for those individuals faced with an increase. For a single individual a 5 Euro increase per month would result from an income of 2000 Euro and an insurance rate increase by 0.5 percentage points. Given that the upper amount is capped by the social insurance contribution ceiling and that many individuals earn less than 2000 Euro per month, an average of 5.63 Euro increase per month is rea-

[12] We disregard the employer's share in our analysis for two reasons. First, we assume that the incidence of the employers' share is indeed on the employers and not on the employees. This is not necessarily the case. However, there is no empirical evidence on the incidence of social insurance contributions in Germany. Moreover, employees typically believe that they only pay the employee share as health insurance premium. That is, even if the true incidence of health insurance contributions was on the employees, they would typically make the decision to switch sickness funds based on their share alone. Second, unless in the US, in Germany, employers do not preselect insurance plans for employees in any way. Employees are completely free in choosing their health insurance.

Table 2: Premium increase

Year	Observations	In funds with premium increase in %	ø-premium increase in %-points (if increase)	ø-premium increase in Euro (if increase)
1999	4,793	0.1	0.45	2.04
2000	7,869	11.0	0.57	3.16
2001	6,771	76.6	0.65	3.82
2002	6,665	56.3	0.52	5.63
2003	5,843	0.0	-	-
2004	5,469	0.3	0.20	2.42
2005	5,162	1.4	0.47	6.42
2006	5,422	89.4	0.81	8.71
2007	5,367	3.0	0.38	4.70
2008	5,109	97.3	1.54	16.12
2009	5,451	8.6	-	8.00

sonable. Typically, until 2007, either the majority of insurance funds increased their contribution rate (by different amounts, though), or almost no fund, an exception being the year 2002. The introduction of the "Gesundheitsfonds" lead to a mandatory increase in the contribution rate for almost all sickness funds.[13] Since 2009, premium increases that imply an extraordinary termination right are not expressed in terms of contribution rates but absolute values.

Other Socio-Economic Covariates

In addition to the variables described above, we make use of a rich set of socio-economic background variables to adjust for differences in the the sample composition between treatment and control group and to analyze heterogeneity in switching behavior and treatment effects (price elasticities, respectively). All variable names and definitions, means, standard deviations, mininum and maximum values as well as the number of person-year observations for each variable are shown in Appendix A.

A first group of covariates includes demographics. The standard variables such as *Age*, *Female*, *Married* or *Children under 16* are included. In addition, we make use of a dummy for West Germany, called *West*. A second group of covariates includes educational and labor market characteristics. We use various binary variables that measure the total years of education. As for labor market activities, we make use of the dummies *Full-time employed*, *Part-time employed*, and *Self-employed*. In addition,

[13]Note that the increase was not due to the introduction of the "Gesundheitsfonds" as such but due to a sharp increase in health care expenditures in the year 2009. What was mandatory, however, was the fixed contribution rate by the government.

we generate a measure of the logarithm of household income of an individual and adjust it by the household composition (OECD equivalence scale). We call this variable *Ln Equiv. HH-Income*.

A third group of covariates measures health and health care consumption. We collapse the five categorial self-assessed health (SAH) measure into three binary variables and call them *SAH very good* [best health categorie], *SAH good* [second health categories], *SAH satisfactory* [third best health categorie]. Bad and very bad self-rated heatl are the reference group. *Degree disability* measures whether individuals are officially certified as disabled, and if yes, to which degree (from 0 to 100%). *Doctor visits* gives us the doctor visits in the last quarter and *Hospital visits* the number of hospital stays in the calender year prior to the interview. All variables listed so far contain 50,911observations and represent our main set of covariates. We use these covariates routinely throughout our empirical analyses to adjust the sample composition.

However, we take advantage of the rich SOEP dataset and also use measures that were not surveyed in every year. The following variables are primarily used to characterize health plan switchers and investigate heterogeneity in treatment effects: In addition to the subjective health measure SAH, we rely on a generic and quasi-objective health measure that has been surveyed every other year since 2002–the continuous SF12 with its two components for physical (*pcs*) and mental health (*mcs*). We also have a measure called *Smoker*, which measures the current smoking status of respondents. 37 percent of our sample smokes. Slightly more than 50 percent of our sample is considered *overweight* and almost 15 percent of the sample are *obese* according to conventional BMI cut-offs. A potentially extremely interesting variable to stratify on is *Degree risk taking*. It measures individual risk attitudes on a scale from 0 to 10; the mean lies around 4.5 in our sample.

6 Effect of Add-on Premium on Switching Probability

To asses the effect of add-on premia on the likelihood to switch sickness funds, we estimate the following difference-in-differences model by means of a Linear Probability Model (LPM):

$$Switch_{it} = \beta_0 + \beta_1 Treat_{it} + \beta_2 2009_{it} + \beta_3 Treat_{it} \times 2009_{it} + \gamma X_{it} + \epsilon_{it}$$

where $Switch_{it}$ indicates whether the individual switched health plans between t_0 and t_1, $Treat_{it}$ is the treatment indicator, and 2009_{it} is a dummy variable indicating the post treatment year. The vector X_{it} includes all other control variables as discussed in Section 5 and displayed in Appendix A. β_3 captures the reform effect.

The identification of causal effects in DID models mainly rests upon the assumption of common time trends between treatment and control group in the absence of the event that should be analyzed. This assumption should hold conditional on all available covariates. Moreover, ideally, the characteristics of treamtment and control group should not differ substantially since parametric models use the covariate distribution of the controls to make out-of-sample predictions. Imbens and Rubin (2009) propose to evaluate differences in covariates for treatment and control group by the scale-free normalized difference:

$$\Delta s = \frac{\bar{s}_1 - \bar{s}_0}{\sqrt{\sigma_1^2 + \sigma_0^2}} \quad (1)$$

with $\bar{s}_1$ and $\bar{s}_o$ denoting average covariate values for the treatment and control group, respectively. σ stands for the variance. As a rule of thumb, a normalized difference exceeding 0.25 is likely to lead to sensitive results (Imbens and Wooldridge, 2009).

Using the SOEP, Table 3 shows the means of all covariates separately for treatment and control group together with the normalized difference. As can be seen, the means of almost all covariates are practically identical and almost all normalized differences are below 0.1. No value exceeds the sensitivity threshold of 0.25 as proposed by (Imbens and Wooldridge, 2009). Hence, we conclude that the covariate distribution seems to be well balanced across treatment and control group and is very unlikely to lead to sensitive results.

Proving the validity of the common time trend assumption–conditional on all covariates–is more difficult. The standard approaches are to display unconditional trends of the outcomes variable for both groups over time and to estimate models for placebo reforms. We do both. The results of the placebo regression are reassuring and presented in Table A2 in the Appendix.

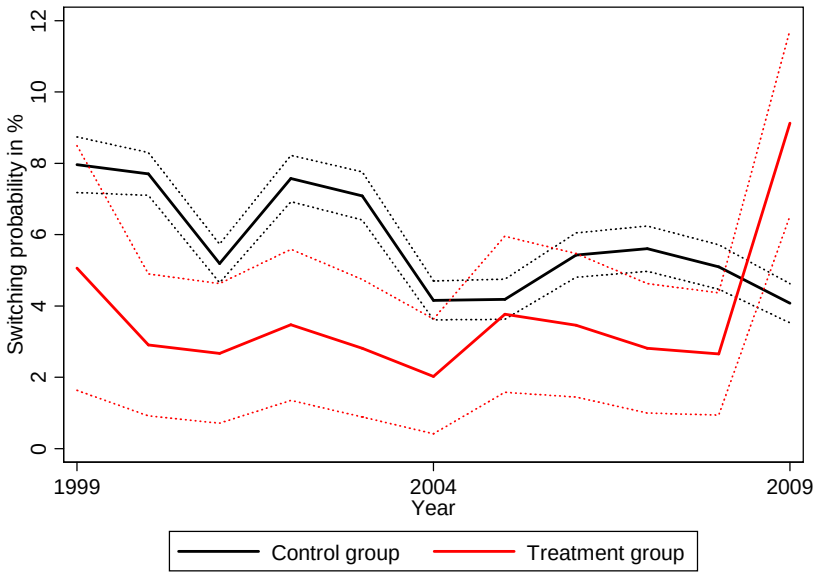
Figure 2 plots the unconditional time trend of our dependent variable. Both trends show fairly parallel developments. Moreover, we observe an abrupt jump in the individual switching probabilities for SOEP DAK and KKH sickness fund members, whereas the switching probabilities for sickness fund members without add-on premium are stable. This points towards a strong effect of add-on premia on health plan switching behavior.

The drawbacks and limitations of DiD estimation are extensively debated. A particular concern is the underestimation of OLS standard errors due to serial correlation in the case of long time horizons as well as unobserved (treatment and control) group effects (Bertrand et al., 2004; Donald and Lang, 2007; Angrist and Pischke, 2009). To pro-

Table 3: Means by treatment and control group

	Overall	Treatment group		Control group		Normalized
	Mean	Mean	Variance	Mean	Variance	difference
Switch	0.058	0.039	0.038	0.059	0.056	
Treatment-group	0.052	1	0	0	0	
Age	41.104	42.277	129.509	41.040	134.611	0.076
Married	0.613	0.608	0.238	0.613	0.237	0.008
Children under 16	0.381	0.360	0.230	0.382	0.236	0.033
Female	0.466	0.619	0.236	0.457	0.248	0.232
SAH very good	0.103	0.092	0.084	0.104	0.093	0.028
SAH good	0.479	0.470	0.249	0.479	0.250	0.013
Degree Disability	2.886	4.271	232.845	2.811	155.821	0.074
Doctor visits	1.927	2.109	9.416	1.917	10.343	0.043
Hospital visits	0.101	0.111	0.309	0.100	0.179	0.015
Ln equiv. hh-income	7.503	7.524	0.258	7.502	0.234	0.031
Educ. inadequate	0.017	0.004	0.004	0.017	0.017	0.093
Educ. general	0.128	0.082	0.075	0.130	0.113	0.111
Educ. A-level	0.062	0.077	0.071	0.061	0.057	0.045
Educ. voc. train.	0.090	0.081	0.075	0.091	0.083	0.024
Educ. higher	0.185	0.212	0.167	0.184	0.150	0.050
Full-time employed	0.731	0.661	0.224	0.735	0.195	0.113
Part-time employed	0.187	0.266	0.195	0.183	0.149	0.142
Self-employed	0.056	0.078	0.072	0.055	0.052	0.063
West	0.734	0.767	0.179	0.732	0.196	0.058
Degree Risk-Taking	4.577	4.529	3.040	4.580	3.133	0.020
Obese	0.144	0.116	0.102	0.146	0.124	0.063
Overweight	0.507	0.459	0.248	0.510	0.250	0.072
Smoker	0.373	0.371	0.233	0.374	0.234	0.004
PCS	52.099	51.919	58.933	52.110	59.148	0.018
MCS	50.070	49.316	77.735	50.116	76.294	0.064

Figure 2: Switching probabilities over time



vide evidence on whether unobserved common group errors might be a serious threat to our estimates, in robustness checks, we cluster on the sickness fund×year (45×11 = 495 clusters) level in the individual level analysis (Angrist and Pischke, 2009).

A crucial issue in most studies trying to evaluate policy reforms is, besides the absence of a control group, selection into or out of the policy intervention. As already discussed above we are in the fortunate position to exploit a unique institutional setting that adresses selection issues quite convincingly. The reason is that compulsorily insured sickness fund members must be insured under the PHI system. Moreover, parameters such as the benefits package, the cost-sharing amount, and provider reimbursement rates are centrally determined and not only out of the individuals' influence but also out the sickness funds' influence. The reform that we study was implemented at the federal level, fully enforced and applied to all 150 PHI sickness funds in Germany.

Anticipation effects or lock-in effects are no issue in this setting. As discussed in Section 3.2, sickness funds who increase health plan premiums have to give notice in written form at least one months in advance. Then, insurees have an extraordinary right to switch sickness funds within the next two months. Contract periods do no longer apply.

Discussion of the reform in the media might have had an impact on switching behavior due to rising awareness. For that purpose, we undertook research in the German Wallstreet Journal ("Handelsblatt"). The first newspaper article containing rumours about the health reform and an add-on premium was published on April 12, 2006. Within the following 5 years, i.e., until April 12, 2011, we obtain 372 article

hits when searching jointly for "add-on premium " and "sickness fund." Conducting the same search with the words "contribution rate" and "sickness fund" for the time period from April 12, 2001 until April 12, 2006 yields 299 hits. Although the form number is slightly larger, we believe that the difference is not large enough for it to trigger higher awareness *and* to influence insurees switching behavior based on the media reports. Discussions about the health care system are permanently present in the German media. Moreover, as mentioned, all sickness fund members must given notice in written form in case of premium increases. This requirement did not change in the course of the reform.

Admittedly, it may have been that those sickness funds who decided to charge add-on premiums took special (marketing) measures to keep their members. For example, they could have stressed other than price factors to convince their members not to switch. Such "soft" factors might be service quality, the network of branch offices, or customer loyality. Moreover, although switching is in principle relatively easy, switching costs occur. For example, insurees are issued new ID insurance cards. Also, from the perspective of the insured, there is uncertainty about whether (and when) another new sickness fund might also decide to charge an add-on premium. Add-on premium charging sickness funds could have stressed all these factors. However, we contacted the DAK and KKH directly and found no evidence of a systematic anti-switching campaign. We would underestimate the price effects on switching behavior if that was nevertheless the case. Moreover, and most importantly, switching health plans in the German PHI does not involve switching of GPs, specialists, or hospitals. There is no selective contracting in the German health care system, meaning that all insured are free to enter each German hospital and to visit the doctor they want to. This does not change when individuals switch health insurances and implies drastically reduced switching costs as opposed to many other countries.

Table 4: DiD-Results

	(1)		(2)		(3)	
Treat x 2009 (DiD)	0.091***	(0.016)	0.091***	(0.016)	0.091***	(0.023)
Treat	−0.032***	(0.005)	−0.033***	(0.005)	−0.033***	(0.005)
Year = 2009	−0.039***	(0.005)	−0.029***	(0.006)	−0.033***	(0.006)
Age			−0.002***	(0.000)	−0.002***	(0.000)
Married			−0.000	(0.003)	0.004	(0.004)
Children under 16			−0.005*	(0.003)	−0.007**	(0.003)
Female			0.008***	(0.003)	0.010***	(0.004)
SAH very good			0.013***	(0.004)	0.001	(0.006)
SAH good			0.009***	(0.002)	0.001	(0.003)
Degree Disability			−0.000	(0.000)	−0.000	(0.000)
Doctor visits			−0.001***	(0.000)	−0.001*	(0.000)
Hospital visits			−0.003	(0.002)	−0.002	(0.003)
Ln equiv. hh-income			0.009***	(0.003)	0.006	(0.004)
Education inadequate			−0.030***	(0.007)	−0.027***	(0.010)
Education general			−0.012***	(0.003)	−0.008*	(0.005)
Education A-level			−0.007	(0.005)	−0.016***	(0.006)
Education voc. training			−0.009**	(0.004)	−0.011**	(0.005)
Education higher			−0.007**	(0.003)	−0.005	(0.004)
Full-time employed			0.015***	(0.005)	0.017**	(0.007)
Part-time employed			0.005	(0.006)	0.006	(0.007)
Self-employed			0.002	(0.008)	0.005	(0.011)
Degree Risk-Taking					0.003***	(0.001)
Obese (imputed)					−0.010**	(0.004)
Overweight (imputed)					−0.002	(0.003)
Smoker (imputed)					−0.004	(0.003)
PCS (imputed)					0.016	(0.023)
MCS (imputed)					0.034**	(0.017)
Constant	0.080***	(0.004)	0.061**	(0.026)	0.055	(0.034)
Federal state dummies	no		yes		yes	
Year dummies	yes		yes		yes	
Observations	50,911		50,911		31,533	

$*p < 0.1, **p < 0.05, ***p < 0.01$; Standard errors in parentheses, clustered by individuals. Reference categories: SAH: SAH satisfactory or worse; education: middle vocational; Labor force status: Out of the labor force.

Table 4 reports the DiD-results. Column (1) presents the regression that just includes the treatment-indicator, time-dummy and the interaction of both. The highly significant coefficient of the interaction effect indicates that the introduction of add-on-premia increased the probability to switch health insurances by 9.1 percentage points. Given that the average yearly switching probability in the sample amounts to 5.8 per cent, this is an enormous effect with a relative increase by 157 per cent. Column (2) includes the full list of covariates available in each wave as discussed above. This does not affect the results at all, reassuring that heterogeneity and switching between treatment and control-group is not an issue here. Column (3) includes even more socio-economic variables. These finally added variables are only available every other year as of 2002 (the even years). Therefore, we cannot use observations from 1999 to 2001 and need to impute these variables for the odd years. This induces a loss in the number of observations but does not change the reform effect.

Changes in switching behavior due to the reform

However, column (3) of Table 4 allows some interesting insights in characteristics of health insurance switchers, independent of add-on premia. Especially younger and more healthy individuals switch health plans. Moreover, risk taking individuals are more likely to switch. In order to test whether the effect of observable covariates on the switching behavior changed due to the reform we estimate regression models with triple interactions. As an example, to test if the effect of age changed in the course of the reform we estimate

$$\begin{aligned} Switch_{it} = \beta_0 + \beta_1 Age_{it} + \beta_2 Age_{it} \times 2009_{it} + \beta_3 2009_{it} + \beta_4 Age_{it} \times Treat_{it} \\ + \beta_5 Treat_{it} + \beta_6 Treat_{it} \times 2009_{it} + \beta_7 Age_{it} \times Treat_{it} \times 2009_{it} + \beta X_{it} + \epsilon_{it} \end{aligned} \tag{2}$$

where the vector X_{it} includes all other control variables (including year dummies) as in Table 4, column (3). We do this for several different control variables. In (1), β_1 measures the baseline effect of a variable whereas β_7 captures by how much this effect changed due to the reform. The two interesting coefficients are reported in Table 5. Note that each line represents one regression. Except for "female" the effects of all characteristic are reinforced due to the reform. For instance, increasing age by one year reduces the likelihood to switch sickness funds by 0.6 percentage points after the reform while it was only 0.2 percentage points before. The effects are typically high in economic terms but mostly not statistically significant. This is probably due to a low incidence of add-on premia in 2009 which make precise estimation of changes in the effects of characteristic due to the reform difficult.

Table 5: Changes in switching behavior

	Base line effect		Change due to reform	
	β_1		β_7	
Age	$-0.002***$	(0.000)	$-0.004**$	(0,002)
Female	$0.015***$	(0.003)	-0.039	(0.042)
SAH very good	0.001	(0.006)	0.010	(0.071)
SAH good	0.002	(0.003)	0.060	(0.040)
Degree Risk-Taking	$0.002***$	(0.001)	0.007	(0.011)
Obese (imputed)	$-0.010***$	(0.004)	-0.035	(0.053)
Overweight (imputed)	-0.001	(0.003)	-0.029	(0.038)
Smoker (imputed)	$-0.007**$	(0.003)	-0.044	(0.041)
PCS (imputed)	0.007	(0.022)	$0.487**$	(0.206)
MCS (imputed)	$0.037**$	(0.017)	0.295	(0.180)

$*p < 0.1, **p < 0.05, ***p < 0.01$; Standard errors in parentheses, clustered by individuals. Each line represents one separate regression estimating the above regression model where "Age" is replaced by the respective variable in the left column.

7 Price effects on the switching probability

We exploit SOEP panel data and analyze the effects of health plan prices and price framing on switching behavior on the individual level. In these empirical models, our core source of identifying variation is the health plan premium variation accross the 45 sickness funds over 10 years on the individual level. SOEP data unambiguously identifies the 45 largest German sickness funds which consist of 80 percent of all PHI sickness fund members. The data is representative for 40 million sickness fund members in Germany.

Health plan premiums are autonomously set at the sickness fund level by the sickness funds. Health plan prices are determined by numerous factors. In the first place, health care consumption of sickness fund members is a driving force, but also factors like administrative costs or payments to (or out of) the risk equilization scheme play a role. However, since all sickness funds are non-for-profit organizations, profit seeking can be excluded as a driving force for premium increases. The average sickness fund that is identified by our data has XXX enrollees. Hence, it is very plausible to assume that health plan premium changes on the sickness fund level are strictly exogenous to the individual.

In addition to variation in premiums across funds and over 10 years, the institutional setting determines that premiums vary at the individual level as well. Premiums are charged in form of a payroll deduction as contribution rates–relative to the employee's gross wage up to a contribution ceiling. Contribution ceilings are (exogenously) determined at the federal level and vary from year to year (2009: €44,100;

2010: €45,000; 2011: €44,550). Hence, gross wage variation across individuals and over time—in combination with changes in the contribution ceiling over time—leads to additional premium variation at the individual level. Our identifying variation thus comes from 45 (sickness funds) $\times$ 50,911 person-year observations.

We estimate three different specifications. The first includes a dummy indicating a premium increase between two waves. The interaction of with a year 2009 dummy indicates how much the effect of a premium increase has changed due to the reform.

$$\begin{aligned} Switch_{it} = \beta_0 + \beta_1 PremiumIncrease\,(Dummy)_{it} + \beta_2 2009_{it} \\ + \beta_3 PremiumIncrease\,(Dummy)_{it} \times 2009_{it} + \beta_4 X_{it} + \epsilon_{it} \end{aligned} \tag{3}$$

The second specification replaces $PremiumIncrease\,(Dummy)$ with $PremiumIncrease\,(Euro)$ and measures the premium increase in Euro. $PremiumIncrease\,(Euro)$ takes on the value 0 if there was no increase. Again, the interaction with the year 2009 allows to identify how much this effect has changed due to the reform. Finally, we use the percentage increase in the premium in the same way as the two other regressions.

Results are reported in Table 6. Before 2009, a premium increase by the sickness fund resulted in a 1.5 percentage point higher likelihood to switch sickness funds. This was a moderate effect. After the reform, this effect jumped up by 4.4 to a 5.9 higher probability to switch funds, being a fourfold increase due to the reform. Not only the incidence of a premium increase is important for the decision to switch funds, also the amount of the increase. Therefore, column (2) compares the effect of a Euro value increase before and after the price framing changed. Before, 10 Euro more per month lead to a 1 percentage point higher likelihood to switch. This effect strongly jumped up to 8 percentage points after price increases were expressed in absolute instead of relative terms. Likewise, looking at the effect of percentage increases in the premium there is a strong difference between premium increases expressed in absolute or relative terms. Before the reform, a one percentage point increase in the premium induced a 0.1 percentage point higher likelihood to switch funds while this effect rose to about 1 percentage point afterwards. In total, all specification reveal a much stronger effect of premium increases in absolute than in relative terms.

Robustness checks

Table 7 reports the results of some robustness checks. First, we also include the voluntarily insured in the public system. This increases the sample size by some 10,000 observations. Second, we only consider the most recent years 2006 to 2009. Third, we use a balanced panel 2006 to 2009. In the lower panel of Table 7, column (4) presents

Table 6: Effects of premium increase

	(1)	(2)	(3)
Premium increase (Dummy)	0.015∗∗∗ (0.004)		
Premium increase (Dummy) x 2009	0.044∗∗∗ (0.016)		
Premium increase (Euro)		0.001∗∗∗ (0.000)	
Premium increase (Euro) x 2009		0.007∗∗∗ (0.002)	
Premium increase (Percent)			0.001∗∗∗ (0.000)
Premium increase (Percent) x 2009			0.009∗∗∗ (0.003)
Socio-economic controls	yes	yes	yes
Federal state dummies	yes	yes	yes
Year dummies	yes	yes	yes
Observations	50,911	50,911	50,911

$*p < 0.1, **p < 0.05, ***p < 0.01$; Standard errors in parentheses, clustered by individuals

results of fixed-effects regressions and column (5) reports results when standard errors are clustered by sickness fund and year. Finally, we use the variable "premium change" instead of a premium increase. This variable also takes into account decreases in the monthly insurance premium. The latter does happen in some rare cases. The results suggest that the effect of premium increases in relative terms is somewhat sensitive to the specification. Only in two out of the six robustness checks is it positive and significant. It is even negative in case of the fixed effects estimations. However, the effect of a price increase expressed in absolute terms remains highly significant in both statistical and economic senses.

8 Conclusion

To be written.

Table 7: Robustness checks

	Statutorily and voluntarily ins. (1)		Only years 2006-2009 (2)		Balanced panel 2006-2009 (3)	
Premium increase (Euro)	0.001***	(0.000)	0.001**	(0.000)	0.000	(0.000)
Premium increase (Euro) x 2009	0.006***	(0.002)	0.007***	(0.002)	0.006**	(0.002)
Socio-economic controls	yes		yes		yes	
Federal state dummies	yes		yes		yes	
Year dummies	yes		yes		yes	
Observations	60,325		17,368		9,279	
	Fixed effects (4)		Donald-Lang (5)		Improved variables (6)	
Premium increase (Euro)	−0.001*	(0.000)	0.001	(0.001)		
Premium increase (Euro) x 2009	0.010***	(0.002)	0.007***	(0.002)		
Premium change (Euro)					0.000	(0.000)
Premium change (Euro) x 2009					0.007***	(0.002)
Socio-economic controls	yes		yes		yes	
Federal state dummies	yes		yes		yes	
Year dummies	yes		yes		yes	
Observations	50,911		50,911		50,911	

$*p < 0.1, **p < 0.05, ***p < 0.01$; Standard errors in parentheses, clustered by individuals

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Appendix A

Table A1: Descriptive Statistics of all SOEP Variables

Variable	Description	Mean	S.D.	Min	Max	Obs.
Switch	Binary: Switches funds until next wave	0.058	0.234	0	1	50,911
Treatment-group	Binary: Member of fund that introduces add-on premium in 2009	0.052	0.221	0	1	50,911
Age	Age	41.104	11.594	18	83	50,911
Married	Married	0.613	0.487	0	1	50,911
Children under 16	Number of children under 16	0.381	0.486	0	1	50,911
Female	Female	0.466	0.499	0	1	50,911
SAH very good	Self-assed health very good	0.103	0.304	0	1	50,911
SAH good	Self-assed health good	0.479	0.500	0	1	50,911
Degree Disability	Degree of disability	2.886	12.645	0	100	50,911
Doctor visits	Number of doctor visits in previous three months	1.927	3.209	0	99	50,911
Hospital visits	Number of hospital stays in previous year	0.101	0.431	0	22	50,911
Ln equiv. hh-income	Ln euqivalised household income	7.503	0.485	1.753	10.801	50,911
Educ. inadequate	ISCED-1997 classification: 1 (inadequate)	0.017	0.128	0	1	50,911
Educ. general	ISCED-1997 classification: 2 (genenral elementary)	0.128	0.334	0	1	50,911
Educ. A-level	ISCED-1997 classification: 4 (vocational plus A-level)	0.062	0.241	0	1	50,911
Educ. voc. train.	ISCED-1997 classification: 5 (higher vocational)	0.090	0.287	0	1	50,911
Educ. higher	ISCED-1997 classification: 6 (higher education)	0.185	0.388	0	1	50,911
Full-time employed	Full-time employed	0.731	0.444	0	1	50,911
Part-time employed	Part-time employed	0.187	0.390	0	1	50,911
Unemployed	Unemployed	0.007	0.086	0	1	50,911
Self-employed	Self-employed	0.056	0.231	0	1	50,911
West	West Germany	0.734	0.442	0	1	50,911
Partly imputed variables						
Degree Risk-Taking	Degree of risk taking	4.577	1.769	0	10	46,585
Obese	BMI > 30	0.144	0.351	0	1	33,178
Overweight	$25 <$ BMI < 30	0.507	0.500	0	1	33,178
Smoker	Current smoker	0.373	0.484	0	1	48,290
PCS	Physical Component Summary Scale	52.099	7.690	9.208	73.776	32,298
MCS	Mental Component Summary Scale	50.070	8.741	5.324	77.774	32,298

Reference categories: SAH: SAH satisfactory or worse; education: middle vocational; Labor force status: Out of the labor force.

Appendix B: Test for parallel trends

Table A2 reports results of tests on parallel trends of treatment and control group. To this end we disregarded the post-treatment year 2009 and interacted all pre-treatment year dummies with the treatment dummy. All interaction terms are both individually and jointly insignificant. However, the interactions for 2004, 2005, and 2008 differ statistically from the 2000 interaction.

Table A2: Test for parallel trends

Add-on premium x 2000	−0.021	(0.022)
Add-on premium x 2001	0.004	(0.022)
Add-on premium x 2002	−0.004	(0.022)
Add-on premium x 2003	−0.006	(0.023)
Add-on premium x 2004	0.015	(0.020)
Add-on premium x 2005	0.015	(0.022)
Add-on premium x 2006	0.016	(0.020)
Add-on premium x 2007	0.002	(0.022)
Add-on premium x 2008	0.014	(0.021)
Add-on premium	−0.037∗	(0.019)
Year = 2000	−0.001	(0.006)
Year = 2001	−0.027∗∗∗	(0.005)
Year = 2002	0.007	(0.006)
Year = 2003	0.003	(0.006)
Year = 2004	−0.029∗∗∗	(0.006)
Year = 2005	−0.028∗∗∗	(0.006)
Year = 2006	−0.014∗∗	(0.006)
Year = 2007	−0.012∗∗	(0.006)
Year = 2008	−0.019∗∗∗	(0.006)
Observations	46,478	

$*p < 0.1, **p < 0.05, ***p < 0.01$; Standard errors in parentheses, clustered by individuals. Same covariates as in Table 4, column (2) included but not presented here.