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Hendrik Schmitz and Nicolas R. Ziebarth[1]

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Abstract

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, in order to foster competition among health insurance companies, German federal regulation required health insurance companies to express price differences between health plans in absolute Euro values rather than percentage point payroll tax differences. Using individual-level panel data, as well as aggregated health plan-level panel data, we find that the reform led to a sixfold increase in an individual's switching probability and a threefold demand elasticity increase.

JEL Classification: H51, I11, I18

Keywords: Health insurance; health plan switching; price competition; price elasticity; SOEP

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1 Hendrik Schmitz, University of Duisburg-Essen and RWI; Nicolas R. Ziebarth, Cornell University, DIW Berlin, and IZA Bonn. *– We would like to thank John Cawley, Damon Clark, Maria Fitzpatrick, Don Kenkel, Sam Kleiner, Jordan Matsudaira, Emily Owens, Andreas Schmid, and participants in seminars at the University of Duisburg-Essen, FU Berlin, the DIBOGS workshop in Hamburg as well as The Institute on Health Economics, Health Behaviors and Disparities at Cornell University. We take responsibility for all remaining errors in and shortcomings of the article. We also would like to thank Peter Eibich for excellent research assistance and Adam Lederer for excellence in editing this paper. The research reported in this paper is not the result of a for-pay consulting relationship. Our employers do not have a financial interest in the topic of the paper that might constitute a conflict of interest.* *– All correspondence to Hendrik Schmitz, University of Duisburg-Essen, Schuetzenbahn 70, 45117 Essen, Germany, E-Mail: hendrik.schmitz@wiwinf.uni-due.de.*

1 Introduction

Price competition is central to the idea of managed competition. Under managed competition, consumers should 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-consciousness 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 that foster price competition among insurances is a critical piece of the puzzle in figuring out how to curb health expenditure growth while improving quality of care. For any type of market-based health insurance reform, price competition among insurances and price sensitivity among consumers are both crucial.

The 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. We exploit a natural experiment that exogenously changed the framing of health plan prices in Germany. By means of laboratory experiments, various studies show that the framing of decisions matters (cf. Tversky and Kahnemann (1981)). Few studies do 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 is limited evidence on some sort of price framing. After summarizing the "patchy evidence" that comes from experimental research and consumer surveys, Wallace and Huck (2010) implement five pricing strategies in a coherent experimental setting in order to study consumer decision making. Bertini and Wathieu (2006) also offer a concise introduction of how the framing of prices affects 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 scant, literature on behavioral economics and health care (cf. Frank (2004); Liebman and Zeckhauser (2008)).

Given its enormous relevance, it is not surprising that the empirical (health) economics literature on price competition and consumer price sensitivity of health plan choice is large. The great majority of the existing evidence comes from the United States. In terms of health care spending, the US health care market is the most important one in the world. At the same time, it is among the most fragmented and, presumably, least regulated systems in the industrialized world. The 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, enrollees 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, the quality of care differs widely across plans and settings. To a large extent, 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"–factors that lower consumer price sensitivity.

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 over time, 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 managed 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. Cebul et al. (2011) find that, in the US health insurance market, search frictions are substantial and increase insurance premiums. These issues do not exist in Germany. Plan switching comes with much lower costs since there are no provider networks in Germany and choice of hospitals and doctors does not depend on the health insurance provider. Moreover, there is no employer health insurance and insurance companies offer a substantially homogenous product.

Principally 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 or Gaynor and Town (2011) 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 rich literature that models whole health insurance markets structurally has emerged (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 provide demand elasticity estimates of health plan choice. In summary, it comes as no surprise that elasticity estimates vary tremendously and that reviewing literature finds no consensus on this point.

This paper advances the literature on price competition, price framing, and consumer price sensitivity in the health care market in several respects. We study the German health insurance market, which has distinct features that allow us to shut down multiple channels that might have potentially confounded previous estimates: Germany has a universal health insurance system. 90 percent of the population is insured under a public 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 basically do 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 are 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 single 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 almost identical health plans and only compete on the basis of price.

We make use of this unique institutional setting, long-running individual-level panel data, and aggregated health plan-level panel data to study the effects of a unique natural experiment: At the beginning of 2009, the German legislature 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 percentage points of the gross wage and paid through payroll deductions. To foster price competition between insurers, the reform equalized and froze the contribution rates deducted from the payroll for all health plans and forced sickness funds to express price deviations in absolute Euro values.

We exploit price variation across sickness funds over a time span of more than ten 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, price differentials were expressed in relative terms with respect to the gross wage and deducted from the payroll. Pre-reform, we estimate that an increase of the monthly premium by 10 Euros increased the individual-level probability to switch to another sickness fund by 0.9 percentage points or 16 percent, given a baseline yearly switching probability of 5.6 percent. Changing the incremental price framing to absolute Euro values doubled the baseline probability that an individual would switch health insurance plans to more than 11 percent. The price elasticity of switching health plans—expressing the change in percent that a consumer will switch health plans after a price increase by 1 percent—increased by the factor 6 from 2.5 to 14. Aggregated panel data from five of the largest German sickness funds confirms this finding. This study also confirms earlier findings and shows that price sensitivity varies across customer characteristics: the young, the mentally strong, the non-smokers and non-obese are more price sensitive than the rest of the population. Moreover, risk averse individuals are less price sensitive.

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 is the main empirical section and provides information on the individual-level panel dataset that we use. Section 5 provides complementary evidence from aggregated health plan level data. Section 4 concludes.

2 Previous Literature on Health Plan Switching

As previously noted, the large majority of the literature on health plan choices and premium elasticities studies the US employer group market. First, 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 concerned with the welfare implications of adverse selection. Einav et al. (2010) study how inefficient pricing in insurance markets with selection results in welfare loss. They use individual level data from a US employer in 2004 and variation in health plan premiums to estimate the demand for insurance. The authors find that an annual price increase of $100 decreases the probablity that a given health plan is selected by 11 percent. Handel (2011), using data from from a large US employer between 2004 and 2009, estimates a structural choice model that incorporates switching costs. He finds low demand elasticity estimates. Lustig (2011) combines data from multiple sources to structurally model the Medicare+Choice market (Medicare Part C) under adverse selection and imperfect competition. He finds that a monthly price increase of $10 reduces the market share of a plan by 6.4 percent. Starc (2011) uses administrative market 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-sponsored 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 respect to changes in market shares. Market shares in the US employer setting, however, are typically defined as within-firm market shares. 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 selected 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 from five employers in Minneapolis and estimate that a $7 out-of-pocket monthly price increase decreases a plan's market share by 0.112 percentage 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 (starting 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 enrollment decreased by between 0.3 and 0.6 percent in 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 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 enrollees it if increases monthly contributions by $10. Using 2002-2005 data from an US employer and a Baysian approach, 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 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 every out-of-pocket premium increase by 1 percent, i.e., an coverage elasticity of -1. The "out-of-pocket premium take-up elasticities" found in the literature are consistently estimated to be very low. The elasticities range between -0.014 and -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 changed 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 increases 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 equalization scheme.

In addition to the literature that 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 also draws some attention. Abaluck and Gruber (2011) document that the 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 that the young and healthy are more price sensitive than the old and sick. This finding is in line with the phenomenon of status-quo bias, i.e., the observation that the price sensitivity depends on the enrollment length in a health plan due to loss aversion (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 is also studied in search models (cf. Bolhaar et al. (2009)). Frank and Lamiraud (2009) and Ortiz (2011) do not use search models but study switching behavior in a health care market that is similar to the German one: In Switzerland, homogenous health plans—albeit less generous than in Germany—mainly compete on a price basis under universal coverage. Still switching rates are, as in Germany, low. Frank and Lamiraud (2009) provide evidence that an increase in the number of choices reduces the individuals' willingness to switch health plans, even if price dispersion is persistent and substantial. On average, Swiss residents can choose from 50 different health plans. About 20 percent switched their health plans from 2009 to 2010. According to laboratory evidence, an increase in health plan choice increases participants' decision making time and decreases the quality of their choice (Schram and Sonnemans, 2011).

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 uninsured individuals practically do not exist. This paper focuses on 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 PHI. Non-working spouses and dependent children are covered at no cost by PHI family insurance. Special regulations apply to specific groups, like students and the unemployed with most PHI-insured.

High-income earners who exceed the income threshold, as well as self-employed individuals, have the right to choose between 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 to PHI. Hence, opting out of the public scheme can be seen as a lifetime decision.

Everyone covered under PHI is subject to a generous universal benefit package, which is determined at the federal level and codified in the Social Code Book V (*Sozialgesetzbuch V, SGB V*). Coinsurance rates are prohibited in PHI and thus, apart from copayments which are fixed at the federal level, health services are fully covered. PHI is one pillar of the German social security system (German Ministry of Health, 2011).

The compulsorily insured cannot choose their degree of coverage. Moreover, the benefit packages are determined at the federal level and are, therefore, almost the same among all insurance companies. Nevertheless, employees can choose between about 150 different health insurances, called “sickness funds.” Each sickness fund offers one standard health plan, which is why, henceforth, we use the terms “health insurance,” “sickness fund,” and “health plan” as interchangeably.

The 150 sickness funds mainly compete on pricing. For compulsorily insured members, since cost-sharing is fixed at the federal level, price competition works through differences in monthly sickness fund premiums. In PHI, premiums are not risk-related and only depend on income. Sickness funds are not-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.

3.2 Characterization of the Industry, Premiums, and Price Framing

The roots of this social insurance system go back to Otto von Bismarck. Under his leadership, Germany was the first country in the world that implemented a mandatory health insurance system for some population subgroups in 1883.[1] Traditionally, employees were allocated to sickness funds—based on their occupation or industry—and had no right to switch funds.

In 1996, switching sickness funds became a legal right. To avoid cream-skimming on the insurer side, a risk equalization scheme was implemented in 1994. At the beginning it was only based on the factors age, gender, and disability status, but was developed further in the years since. Funds with an insurance pool of good risks must contribute to a risk equalization fund that pays out money to sickness funds with pools of bad risks. As of 2011, the risk equalization scheme also equalizes differences in the risk pool according to 80 different diagnoses. To sum up, in Germany, as compared to international standards, selection issues and cream-skimming are a minor problem as the precision of the risk equalization scheme is increasing.

Given that health plan coverage, cost-sharing, access to care, and quality of care do not differ across health plans, policymakers had high hopes that competition among plans would intensify after switching became a legal right. It did, as the large decrease in the number of sickness funds demonstrates. In 1995, there were 916 funds. In 2011 the number had dropped to 150 The number was exclusively reduced through mergers, primarily between smaller funds. However, despite substantial price dispersion in a market with homogenous

[1] *Gesetz betreffend die Krankenversicherung der Arbeiter (KGV)*, passed May 29, 1883.

health plans, switching rates remained fairly low and did not increase over time. According to our dataset, in 1999, only 7 percent of all respondents switched health plans. In 2007, the figure was only 4.5 percent.

3.2.1 Calculation and Price Framing of Premiums: Pre-Reform

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 deducted from employees' paychecks. For example, the average contribution rate 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 transferred by the employer to the sickness fund chosen by the employee. In addition, the employer contributed the same amount.[2].

[Insert Table 1 about here]

Before 2009, each sickness fund directly and independently collected employees' and employers' contributions and was allowed to set the insurance premium, i.e., the contribution rate as a share of an employee's gross wage. In 2008, contribution rates varied between 12.7 and 17.4 percent of the gross wage (see column (1) of Table 1). Applied to the average gross wage in that year, column (2) of Table 1 demonstrates that the average employees could have saved up to €60 per month by switching from the most expensive to the least expensive health plan. As column (5) shows, not all of the plans in the upper and lower tail of the premium distribution operated nationally. Even if one only takes nationally available plans into account, the average employee could still have saved up to €40 by switching. Table 1 also illustrates the market concentration process. By the end of 2011, half of the ten sickness funds displayed had merged with other sickness funds.

Before 2009, when an employee wanted to switch their health plan, they 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

[2]Effective July 1, 2005, the strict equal sharing of contributions was altered. After that date, the employee's share was increased slightly and 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* from December 15, 2004)

18 months. However, if sickness funds planned to increase 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 then had an extraordinary right to cancel the contract and switch funds within two months.

3.2.2 Explanations for Large Price Differences Across Homogenous Health Plans: Pre-Reform

Table 1 reveals wide price differences between sickness funds in 2008. In a market with very similar products, this phenomenon needs explanation. The most important reason goes back to historical legacy. As mentioned above, before 1996, switching sickness funds was not possible in Germany. Hence, some 1,500 funds with very different risk pools existed. A large number of funds consisted of employees from a single company. Depending on the industry and occupation this resulted in a good or bad risk pool of the insurance companies. Moreover, the insured had different incomes. Think of a bank with many well educated high earner employees who formed the bank's sickness fund members. Likewise, other funds with, say, minors, had a much worse risk pool and income situation. Since contributions were income related, a higher average income resulted, ceteris paribus, in a lower contribution rate to finance the same health care expenses of the insured.

Until 1996, contribution rates varied widely. In order to allow a fair competition between sickness funds and to protect sickness funds with high contribution rates due to a bad risk pool, a risk equalization scheme was introduced along with the freedom to choose a sickness fund. Switching health insurance companies remained a fairly rare event after the introduction of the free sickness fund choice. Therefore, historical price differences remained.

Cebul et al. (2011) show that the law of one price does not hold in frictional insurance markets. Besides frictions, "status quo bias" could be another mechanism explaining low switching rates. Tversky and Kahnemann (1981)'s theory of loss aversion suggests that humans have a tendency to exaggerate the disadvantages of exiting the current state, while understating the potential gains of an alternative state. This might especially be true when it comes to such an important issue like one's own health. A third explanation for low switching rates would be brand loyalty. Brand loyalty is a common phenomenon in other product markets.

The main objective of this paper is to analyze yet another explanation for the low switching rates—one that also policymakers had in mind when they implemented the reform that we study in this paper: price framing. As explained above, before 2009 price differences across plans were expressed as relative percentage point contribution rate differences. To calculate the exact insurance premium that an employee had to pay, they needed to know (*i*) their exact monthly gross wage; (*ii*) information about the current contribution ceiling; (*iii*) the exact contribution rate that her insurer charged; and (*iv*) how the employee's share of the total contribution rate was calculated. On the other hand, (online) calculators to compare price differences were widely known and available.

Apart from historical reasons, two further reasons might have also led to contribution rate differences observed in the market. The first are differences in efficiency of the sickness funds, meaning differences in administrative costs. In terms of intra-company process efficiency, larger health insurers certainly have advantages over smaller ones, are able to exploit economies of scale, and thus can operate more efficiently. This is the main driving force behind the mergers of small funds. The density of the branch network of the insurance company affects health plan price differences to certain amount. The less expensive health plans, by contrast, minimize their administrative costs by operating largely on an online internet basis or through call centers. Administrative costs amount to only 5 percent of sickness fund expenditures, but vary among funds and might lead to differences in prices.

Second, to differentiate their product, health plans can offer some additional benefits. Since the standard (and mandatory) benefit package is already very generous, these additional benefits are very limited and comprised of few health care services such as immunizations for tropical diseases or specific prevention screenings. These extra benefits only make up 5 percent of the benefit package, while 95 percent are fixed. Like administrative costs, these differences result only in very small expenditure differences between funds but may also lead to variations in prices. Most importantly, the adding of small extra benefits to differentiate the product did not change due to the reform. Hence, it should not be a threat to our estimates. If anything, more expensive health plans might have stressed the existence of extra benefits after the reform even more. For this case, we would underestimate the pure framing effect.

3.2.3 Calculation and Price Framing of Premiums: Post-Reform

In 2007, the German legislature implemented a law to foster competition among sickness funds in the German PHI System. The core idea was to change the price framing in the PHI system. Policymakers wanted to emphasize and visualize price differences across funds more clearly and accurately in order to encourage sickness fund switching and, hence, competition among funds.

Effective January 2009, a new law equalized and froze the contribution rates to 15.5 percent for all funds. By law, sickness funds are now forced to charge an "add-on premium" in form of an absolute monthly Euro amount in case that expenses cannot be covered by the revenues generated from the fixed and equalized contribution rate. On the other hand, well managed and financially sound sickness funds can directly reimburse their members a monthly Euro amount. In other words: the law requires sickness funds to express price differences not in relative terms with respect to employees' gross wages, but instead 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. Table 2 gives an overview of all sickness funds that charged add-on premiums or reimbursed premiums since 2009. Column (2) indicates the date of introduction and column (3) the abolishment in the event that the funds changed their policy in the meantime.

At the beginning sickness funds were reluctant to charge add-on premiums. Having no experience with such a change in price framing, no one wanted to be the first mover to charge an add-on premium. The first sickness fund to charge an add-on premium was the *Joint BKK Cologne*, a small sickness fund with just 30,000 enrollees and a market share of only 0.04 percent. It charged a premium of €8 per month. Twelve 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 nationwide health plan market share of 8.6 percent, and the *Kaufmännische Krankenkasse (KKH)* with 1.9 million insured people and a market share of 2.7 percent. In 2011, four more sickness funds followed, charging add-on premiums to their members.

As seen in column (1) of Table 2, add-on premiums range between €6.50 and €15 per month. The majority of funds charge €8, i.e., €96 per year.[3]

[Insert Table 2 about here]

As of December 2011, 10.5 million Germans are enrolled in health plans that charge an add-on premium. This represents 15 percent of all PHI insured.[4] DAK and KKH enrollees alone account for 75 percent of the total number. As explained in more detail in the next section, the main identifying variation in our individual-level dataset comes from employees enrolled in sickness funds that are noted in bold in Table 2. They account for 95 percent of all enrollees who were enrolled in health plans with an add-on premium 2010. In other words: out the total of 17 health plans that have ever charged an add-on premium, since allowed to do so under the new law, six health plans account for about 95 percent of all enrollees. We can identify them in our micro-data.

[3]Most sickness funds charge €8 per month for the following reason. Until 2011, funds were only allowed to charge add-on premiums up to a maximum of 1 percent of the gross labor income of each insured. This rule was meant to protect low income earners from an excessive premium burden. In theory, funds were obliged to check each insured's income to make sure that the 1 percent cap was not exceeded. To avoid this huge administrative effort, policymakers allowed to charge premiums up to €8 per month without the need of an income-test. This policy was slightly altered in 2011 to allow the possibility of charging unlimited amounts of add-on premiums and a transfer payment from the government to low income earners. However, this change is beyond the scope of this paper since we only use data up to and including the year 2010.

[4]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 and in Table 1 and 2 refer to the total number of enrollees. In 2011, the DAK had 4.5 million members (market share: 8.8 percent) and the KKH had 1.3 million members (market share: 2.5 percent). Given that the ratio between members and total enrollees is about 0.75, about 8 million PHI sickness fund member are currently charged an add-on premium. DAK and KKH members alone make up 65 percent of the total number affected.

As seen in Panel B of Table 2, seven financially very sound sickness funds currently reimburse their members between €2.50 (*BKK A.T.U.*) and €10 (*BKK Würth*) per month. However, the average German is unfamiliar with the existence of these seven relatively small sickness funds, some of which only have a couple of thousand enrollees. All enrollees in these seven health plans account for only 0.63 percent of all PHI enrollees. This demonstrates that reimbursing premiums is quantitatively of no importance. Given that the underlying trend in premium growth is strictly positive, it will not be of much relevance in the future either. Most of these small sickness funds that reimburse premiums only operate locally with few branch offices, a very basic service infrastructure, and few employees. Only three out of the seven reimbursing funds operate nationwide

Cancelation periods and minimum contract periods have not been changed by the reform analyzed here. Sickness funds are required to give notice at least one month before the introduction or increase of an add-on premium. After such an announcement, independent of the enrollment length, sickness fund members have an extraordinary right to cancel the contract and switch funds within two months. Moreover, all individuals are free to choose almost any of the 150 sickness funds, which are obliged by law to accept them without any risk assessment, i.e., there is no experience rating but guaranteed issue exists.

4 Evidence from Long-Runnig Individual-Level Panel Data

In this section the empirical analysis is presented. Here, we rely on rich individual-level panel data from the German Socio-Economic Panel Study (SOEP). The SOEP is a large and representative household panel dataset that started in 1984 in West Germany and was extended to include East Germany in June 1990. Since 1984 several refreshment samples and innovation samples have been drawn. In 2010, more than 11,000 households comprising of 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. 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.[5]

[5]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, as well as the Panelwhiz Plugins used here are available upon request. Any data or computational errors in this paper are our own. Haisken-DeNew and Hahn (2010) describe PanelWhiz in detail.

4.1 Sample Selection and Variable Definitions

4.1.1 Sample Selection

Starting with the 1999 wave, the SOEP asks information about 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. Out of the total of about 150 sickness funds, we are able to unambiguously assign respondents to 41 of the largest sickness funds or health plans.[6] Together, these sickness funds have a market share of more than 80 percent and cover about 50 million Germans. Most importantly, as indicated in bold in Table 2, among these identifiable funds are six funds that introduced an add-on premium after the implementation of the price framing health reform. Among these funds are two of the largest German sickness funds, DAK and KKH, which together cover more than 6 million people, about 10 percent of all PHI insurees. In total, the six sickness funds that we can unambiguously identify accumulate a market share of 95 percent relative the total market share of all funds that charge add-on premiums.

We can also assign respondents to two funds that reimbursed their members. However, as inferred from Table 2, charging add-on premiums was quantitatively practically irrelevant. Currently, all nine reimbursing sickness funds only cover 0.63 percent of all German PHI enrollees. In our SOEP data, the two identifiable reimbursing funds only translate into about 30 respondents per year.

Our empirical analysis focuses on sickness fund *members*, not the total of enrollees; the latter would also include family members insured at no cost under PHI family insurance. More precisely, we focus on "paying" members since they have to carry premium increases and make the decision to switch health plans. We define paying sickness fund members as all those who are gainfully employed, earn more than €800 gross per month, and pay the full PHI health insurance premium.[7] In addition, we disregard those insured under the second tier of the German health care system–the private health insurance. We end up with a sample of 51,291 person-year observations from 11,813 different individuals.

4.1.2 Definition of Dependent Variable and Explanation of the Analyses in Part A and B

Our dependent variable indicates whether a sickness fund member switched to another sickness fund between two interviews, which are usually carried out in the first five months of a year. This binary dependent variable is called *Switch* and measures whether a respondent

[6] We cannot assign individuals to very small sickness funds. This is because respondents only state the major funds in the questionnaire. All small funds are summarized by "other" in the questionnaire.

[7] This excludes all those insured under PHI family insurance, the unemployed for some of whom social security pays 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. Individuals with a wage of less than €800 per month do not have to pay the full health insurance contribution.

cancelled her sickness fund membership since the last interview and switched to another sickness funds in the course of the year. As an example, a value of 1 in the year 2010 implies than the insured switched sickness funds between the interviews in 2009 and 2010. Appendix A1 shows that 5.6 percent of all person-year observations entail switches, i.e., we observe 2,982 health plans switches over all years and across all sickness funds.

In total, in this part of the paper, we carry out two different analyses. Part A, as described in more detail in Section 4.2.1, solely evaluates whether being enrolled in a health plan that introduced an add-on premium increased the switching probability among these enrollees—relative to before the reform and relative to the change in switching behavior over time for the unaffected. We distinguish between one group of insurees that was charged add-on premia after the reform, a second group of insurees that was reimbursed a part of the standardized premiums, and a third (control) group that was neither charged add-on premia nor reimbursed money. This model in Part A is a difference-in-differences (DID) analysis.

Part B, as detailed in Section 4.2.2, introduces regressors that represent health plan premium changes in Euro values. The main objective of this second model is to exploit exogenous price variation across sickness funds *and* years—post- *and* pre-reform. The idea is to compare the impact of price increases on switching behavior—before and after the regulatory change in the requirement of how to frame price differences between health plans. We also calculate pre- and post-reform price responsiveness for specific subsamples.

4.1.3 Regressors Measuring Pre- and Post-Reform Price Changes in Part A and B

As previously mentioned, in Part A of the empirical analysis, we solely intend to measure the effect of charging add-on premiums and reimbursing premiums on the post-reform switching probability. To this end, we define a variable named *AddOn*. *AddOn* is one for respondents who actually were charged an add-on premium, i.e., for all respondents who were insured under one of the six add-on premium charging health plans in post-reform years (see bold health plans in Table 2). Equivalently defined is the dummy *Reimb*, which is one for respondents who actually were reimbursed premiums, i.e., for the respondents who were insured under one of the two reimbursing health plans in post-reform years as indicated in bold in Table 2.[8] However, since only 0.63 percent of the German population is enrolled in a health plan that reimburses premiums, we cannot obtain meaningful estimates with the just 30 SOEP respondents in reimbursing plans in post-reform years. Consequently, we only use *Reimb* in one single specification.

In Part B of the empirical analysis, we measure the exact price effect on switching behavior both pre- and post-reform. For this purpose, in a first step, we perform extensive

[8]As Table 2 illustrates, the seven distinct add-on premium charging and reimbursing sickness funds that are identifiable in the SOEP data introduced their policies in different post-reform years and months. Since we have information about the exact interview date, this generates some additional variation across time, not just across funds.

research at the sickness fund level and collect contribution rates on a monthly basis for all 41 sickness funds in our sample between 2000 and 2010. As seen in Table 1, in 2008—the last pre-reform year—contribution rates varied from 12.7 to 17.4 percent of an individual's gross wages.

According to the day of the interview and the sickness fund, in a first step, we precisely assign the individuals their contribution rates. For reasons discussed in more detail in Section 4.2.2, we focus on the effect of premium *increases* on switching behavior. More precisely, we would like to measure the switching effect of *potential* premium increases. This means, the potential premium increase assuming that the individual remains enrolled in the health plan between t_0 and t_1. For this purpose, in a second step, we take half the total contribution rate in t_1, i.e., the employee's premium share in t_1, and multiply it with the gross wage (in 2009 values) of the individual in t_0 up to the contribution ceiling of year t_0.[9] We fix labor income to t_0 in order to be able to fully ascribe premium increases to contribution rate increases and not to confuse it with other influence factors such as a wage raise after a promotion. From 2009, for employees in add-on premium charging or reimbursing funds, we add the according add-on premium or subtract the according monthly reimbursement. Then we subtract the health plan premium in t_0 from the premium in t_1. As a result, we obtain the monthly insurance premium increase in Euros and call this variable *PremiumIncreaseEuro*. Dividing this variable by the monthly premium in t_0 provides us with the relative increase *PremiumIncreasePercent*. We also generate a rougher measure of premium increases, just a dummy that indicates whether the individual would face a premium increase between t_0 and t_1 in case of a no-switch. This variable is called *PremiumIncreaseDummy*.

For example, assume we were interested in the year 2006 (2010). The *PremiumIncreaseEuro*-regressor for 2006 (2010) would indicate the change in the probability that a respondent switched health plans between 2005 (2009) and 2006 (2010)—due to a monthly health plan premium increase of €1, which was triggered by an increase in the health plan contribution rate (the introduction of an add-on premium).

4.1.4 Other Socio-Economic Covariates

In addition to the variables described above, we make use of a rich set of socio-economic background variables to correct for observable differences between respondents and to analyze heterogeneity in switching behavior and reform effects. All variable names and defini-

[9] We disregard the employers' share for various 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. Even if the full incidence of health insurance premiums was on the employees, they would typically make the decision to switch health plans based on their share alone. Second, unlike 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 plan.

tions, means, standard deviations, minimum and maximum values, as well as the number of person-year observations for each variable are shown in Appendix A1.

A first group of covariates includes demographics. The standard variables such as *Age*, *Female*, *Married* and *Children under 16* are included. A potentially very interesting variable included 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.

A second group of covariates includes educational and labor market characteristics. We use various binary variables that measure educational status according to the International Standard Classification of Education (ISCED). As for labor market activities, we make use of the dummies *Full-time employed* and *Part-time employed*. In addition, we generate a measure of the logarithm of equalized household income of an individual and adjust it by the household composition.[10] 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 two binary variables and call them *SAH excellent* [best health category] and *SAH good* [second best health category]. *Degree disability* measures whether individuals are officially certified as disabled, and if yes, to which degree (from 0 to 100 percent). *Doctor visits* gives us the doctor visits in the last quarter and *Hospital visits* the number of hospital stays in the calendar year prior to the interview.

In addition, we routinely control for common time shocks by employing year dummies. We also take account of persistent differences in switching behavior across the 16 German federal states by incorporating state dummies into our models. All variables listed so far contain 51,291 observations and represent our main set of covariates. We use these covariates throughout our empirical analyses to adjust the sample composition.

We also take advantage of the rich SOEP dataset and use measures that were not surveyed in every year but every other year. Using the information from every other year, we impute values for the years in which this information was not surveyed.[11] This applies to the following variables that are solely used to characterize health plan switchers and investigate heterogeneity in reform 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 starting in 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 (Burkhauser and Cawley, 2008).

[10] Income equalization is carried out by dividing household income by the square-root of all household members.

[11] Imputation is carried out by linear interpolation of each individual's even year values to odd years.

All time-varying variables described here measure the actual information as indicated by the respondent at the time of the interview. To make sure that this information is exogenous to the switching decision, we use it at time t_0 together with the dependent variable that indicates health plan switching between t_0 and t_1.

4.2 Part A: Assessing the Effect of Being Charged an Add-On Premium on Switching Behavior

4.2.1 Econometric Model

To asses the impact of being charged an add-on premium on the switching probability, we estimate the following probit model:

$$\begin{aligned} Prob[Switch_{it} = 1] = \Phi(&\beta_0 + \beta_1 AddOn_{it} + \beta_2 AddOn_{it} \times postreform_t \\ &+ \gamma X_{it} + \phi_t + \sigma_{fs} + \epsilon_{it}) \end{aligned} \tag{1}$$

where $Switch_{it}$ indicates whether individual i switched health plans between $t-1$ and t. $AddOn_{it}$ indicates the group of respondents whose sickness funds charged an add-on premium in post-reform years. $postreform_t$ indicates the post-reform time period. The vector X_{it} includes the set of standard socio-economic control variables as discussed in Section 4.1.4 and displayed in Appendix A1. ϕ_t represents a vector of time dummies and σ_{fs} nets out permanent differences across the 16 German federal states. ϵ_{it} represents the error term and $\Phi(.)$ stands for the cumulative distribution function for the standard normal distribution. This is a DID model. Consequently, to obtain the effect of the add-on premium on switching behavior we calculate the "treatment-effect" as shown by Puhani (2011) for probit models [12]

4.2.2 Identification of Causal Effects and Results

The identification of causal effects in DID models mainly rests upon the assumption of a common time trend between the group that was affected by the reform and a control group that was not. This assumption should hold conditional on all available covariates.

Figure 1 plots the unconditional time trend of our dependent variable for Part A of the empirical analysis. As can be seen, both trends show fairly parallel developments over time. Moreover, we observe an abrupt jump in the individual switching probabilities for those

[12] Puhani (2011) shows that the advice of Ai and Norton (2004) to compute the discrete double difference is not relevant in nonlinear models when the interest lies in the estimation of a treatment effect in a difference-in-differences model. Throughout the paper, we calculate and display the marginal effects as proposed by Puhani (2011).

respondents who were charged add-on premiums in post-reform years, whereas the switching probabilities for sickness fund members without add-on premiums are stable over time. This points towards a strong impact of charging add-on premia on health plan switching behavior.

[Insert Figure 1 about here]

Anticipation effects or lock-in effects might be a small 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 period rules do not apply during this window. However, as seen in Figure 1, for 2009 and 2008 as compared to 2007, we observe a decrease in the switching probability among those who were eventually charged an add-on premium. However, since we have enough long-running micro panel data at hand, we can simply drop the potentially contaminated years 2008 and 2009 from our analysis (see below).

It is important to note that only these two pre-reform years are potentially contaminated by higher consumer uncertainty about future events. In general, uncertainty about future premium changes did *not* change over the course of the reform. In general, at the beginning of each year, there is certainty about price differences in the current year, t_0. In the course of the year, some health plans also announce price changes for t_1. Anticipating price changes more than one year in advance is quite difficult, if not impossible. However, recall that there there is no official enrollment period, that the legal contract period is 18 months, but that plan members have a extraordinary right to cancel contracts and switch plans in case of premium increases. These regulations did *not* change after the reform.

Ideally, in DID models, individuals in the treatment and control group should be as similar as possible. Parametric models use the covariate distribution of the unaffected group to make out-of-sample predictions. Appendix A2 show the covariate means for the two groups separately and evaluates their difference by means of the scale-free normalized difference (Imbens and Wooldridge, 2009). The means of almost all covariates are very similar 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 the two groups and is thus unlikely to lead to sensitive results. In other words: those employees who were covered under a health plan that charged an add-on premium in post-reform years do not significantly differ from those employees who were covered under a health plan that did not charge add-on premiums.

The results for Part A are in Table 3.[13] $AddOn \times postreform$ indicates how the switching probability changed because of the charging of an add-on premium in post-reform years.

[13]The results are robust to using sample weights and weighted regressions.

The first column excludes any additional socio-economic control variables and yields a highly significant add-on premium effect of +0.061 percentage points. It is basically the regression part equivalent to what we see in Figure 1. Related to the 4 percent average baseline switching probability for the treatment group (see Appendix A2), this translates into a add-on premium-related increase in the switching probability by 150 percent. The baseline probability to switch more than doubled for insurees who were charged add-on premiums. This effect is very robust to the inclusion of additional covariates as column (2) demonstrates.

[Insert Table 3 about here]

Column (3) includes $Reimb{\times}postreform$. $Reimb{\times}postreform$ is one for post-reform years and individuals who were reimbursed parts of their premium. Remember that these individuals have no extraordinary right to cancel the contract and are bound to their 18 months enrollment period. Moreover, since here the unit of observation is the individual, we do not observe an increase in plan enrollment. Most importantly, as discussed in Section 4.2.2 and can be inferred from Table 2, the phenomenon of premia reimbursement is quantitatively negligible. In our data, we only observe about 30 individuals per year who have a one for their *Reimb*-Variable. Consequently, it is not surprising that the estimate for *Reimb* shows large standard errors, almost twice as large as the point estimate, and are not at all useful. Therefore, in Part B below, we exclusively focus on the much more relevant effect of premium increases on health plan switching.

Column (4) of Table 3 tests whether the results depend on the inclusion of the years 2008 and 2009 that do not show parallel trends. We do not find evidence for this since excluding these two years from our data yields a highly significant 6.0 percentage point increase that is almost identical to out baseline estimate in column (1). Column (5) checks whether the results are sensitive to functional form assumptions and runs an OLS model. The estimated add-on premium effect is slightly, but not dramatically, larger than the baseline estimate in column (1). It is highly significant.

4.3 Part B: Assessing the Price Effect of Premium Increases on Switching Behavior: Pre- and Post-Reform

4.3.1 Econometric Model

To assess the impact of premium increases and the change in the framing of premium increases on the switching probability, we estimate the following probit model:

$$Prob[Switch_{it} = 1] = \Phi(\beta_0 + \beta_1 PremiumIncrease_{it} \times prereform_t \\ + \beta_2 PremiumIncrease_{it} \times postreform_t \\ + \gamma X_{it} + \phi_t + \sigma_{fs} + \epsilon_{it}) \quad (2)$$

where $Switch_{it}$, X_{it}, ϕ_t, σ_{fs}, ϵ_{st}, and $\Phi(.)$ are defined as above. The variable $prereform_t$ takes on the value one in years before the reform and zero afterwards, while the opposite holds for $postreform_t$.[14] Here, $PremiumIncrease_{it}$ stands representative for three different price regressors that we subsequently employ, depending on the model specification:

(i) A dummy variable that identifies individuals whose health plan premiums increased between $t-1$ and t (*PremiumIncreaseDummy*).

(ii) A variable that measures the premium increase in Euro between $t-1$ and t (*PremiumIncreaseEuro*).

(iii) A variable that measures the premium increase in percent between $t-1$ and t, relative to the premium in $t-1$. (*PremiumIncreasePercent*)

PremiumIncreaseEuro and *PremiumIncreasePercent* always refer to increases in the monthly "out-of-pocket" health insurance premium, i.e., changes in the employee share of the premium. For example, employing *PremiumIncreaseEuro*× *prereform* as regressor of interest allows us to calculate the effect of an increase in the monthly health plan premium by €1 expressed in relative terms (also labeled *[relative]* in the regression tables). To measure the effect due to an increase expressed in absolute terms, we use *PremiumIncreaseEuro*× *postreform* (also labeled *[absolute]*).

In Part B of the analysis we focus solely on the health plan switching effects that are triggered by *increases* in health plan premiums for the following reasons: First, we would like to stress the outstanding importance of health plan premium increases, both for researchers and policymakers. Almost all industrialized countries have seen staggering increases health care expenditures and health care premiums. In Germany, the average contribution rate increased from 12.6 percent in 1990 to 15.5 percent in 2011 (German Federal Statistical Office, 2011). In the US, despite a substantial increase in cost-sharing, monthly "out-of-pocket" health plan premiums for single coverage more than doubled from $27 in 1999 to $75 in 2010 (The Kaiser Family Foundation, 2011). Existing studies for Germany project significant future increases in health care expenditures and, hence, health plan premiums mainly due to rising incomes, population aging, advances in medical technology, and system inefficiencies (cf. Postler (2003)).

[14]This specification yields exactly the same results as including $PremiumIncrease_{it}$ and $PremiumIncrease_{it} \times postreform_t$ as the first two regressors but facilitates the interpretation of the regression results later.

A second reason goes back to the institutional setup, since insurees only have an extraordinary right to cancel health insurance contracts and switch health plans immediately in case of premium increases.

A final reason to focus on premium increases is the empirical irrelevance of premium decreases. For the whole of Germany, enrollees in health plans with premium reimbursement currently account only 0.63 percent of all PHI enrollees. Consequently, in post-reform years, in the SOEP data, we only observe about 30 respondents who saw premium decreases—far too few to obtain precise estimates as we see in the results section for Part A below.

4.3.2 Identification of Causal Effects and Results

Identification of Causal Effects

In the empirical models illustrated by equation 2, our core source of identifying variation is the health plan premium variation across the 41 sickness funds over more than 10 years. As discussed in Section 3.2, health plan premiums are autonomously set at the health plan level by the sickness funds. The largest German health plans have a market share of about 10 percent and 10 million enrollees. Hence, it is plausible to assume that health plan premium changes on the health plan level are strictly exogenous to the individual. In Part B, our identifying variation comes from 41 (sickness funds) $\times$ 11,813 different individuals observed over various years. However, not every individual experienced premium increases in every year.

[Insert Table 4 about here]

This is illustrated in Table 4. For example, in 2002, 79.95 percent of the 4,379 individuals in our sample faced an average increase in their monthly health plan premiums by €4.72 (€56.64 per year) or 4.7 percent. Table 4 illustrates that premium increases occur in annual waves due to health care cost shocks triggered by consumption or provider reimbursement. There is a lot of variation in the share of respondents who were affected by premium increases. However, the bandwidth of the average premium increase is quite small and ranges between 1.7 and 5.3 percent of the individuals' income. The most important thing to remember is that the premium variation across health plans and years is exogenous from the perspective of the individual, and it unambiguously and comprehensively affects every individual identified in our data.

A crucial issue in most studies trying to evaluate policy reforms is selection into or out of the policy intervention. We are in the fortunate position to exploit a unique institutional setting that addresses selection issues quite convincingly. The reason is that compulsorily insured sickness fund members must be insured under the PHI system. We can identify the small fraction of voluntarily insured PHI members and exclude them in the robustness checks. This is the only group that could have opted-out of PHI in response to the reform. However, opting-out of the PHI system is essentially a lifetime decision.

Keep in mind that sickness funds had almost no possibility to respond to the reform. Important PHI health plan parameters such as the benefit package, the cost-sharing amount, and provider reimbursement rates are centrally determined and are 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.

It may have been that those sickness funds which 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 loyalty. Moreover, although switching is in principle relatively easy, switching costs occur (see discussion in Section 3.2.2). We found no evidence of a systematic anti-switching campaign. We would underestimate the price effects on switching behavior if that was nevertheless the case.

Switching health plans in the German PHI does not entail switching of primary care physicians, specialists, or hospitals. There is no selective contracting in the German health care system, meaning that all insured are free to enter any German hospital and to see any doctor they want to see. In a nutshell, the provider network does not change when individuals switch health insurances, which implies lower switching costs as compared to other countries such as the US.

Baseline Results

Table 5 presents our baseline results and reads as follows: Each column represents one regression model as in equation (2). In the first row, we make use of dummies that indicate whether an insuree would carry a premium increase between t_0 and t_1 if they did not switch health plans. *PremiumIncreaseDummy*$\times$*prereform* indicates the average marginal effect for pre-reform years, i.e., from 2000-2009, when prices were expressed in percentage point payroll differences. We see that in pre-reform years, the baseline probability to switch health plans increased by 1.8 percentage points from 5.6 percent (Appendix A1) in case of an average premium increase. However, as displayed in the second row – *PremiumIncrease-Dummy*$\times$*postreform* – in post-reform years, when the framing of price differences was exogenously changed to absolute Euro values, the switching probability doubled after a premium increase. Both effects are significant at the 1 percent level.

[Insert Table 5 about here]

Column (2) is built on the same principle. However, now we make use of the more precise measure *PremiumIncreaseEuro*, which represents monthly premium increases in €100. In pre-reform years, a monthly premium increase by €10 increased the switching probability by 0.9 percentage points from 5.6 to 6.5 percent, or by 16 percent. The legislative requirement to express price differences in absolute Euro values rather than percentage point payroll tax differences boosted that probability to a staggering 150 percent, by the factor 6 and more than doubled that baseline probability to switch. Note that this finding is in line with the finding from Table 3.

Finally, in column (3), we find that a premium increase of 10 percent increased the baseline switching probability from 5.6 to 7 percent, or 25 percent, in pre-reform years. This translates into a pre-reform switching elasticity of 2.5: a premium increase by 1 percent increased the individual-level switching probability by 2.5 percent. Simple regulatory effort that changed the price framing of premium differences across health plans more than doubled the baseline switching probability from 5.6 to 13.6 percent as a reaction to a 10 percent premium increase. The implied switching elasticity shoot by the factor 6 from 2.5 to 14. All regressors of interest in Table 5 are significant at the 1 percent level.

Robustness Checks

Robustness checks for our preferred specification (*PremiumIncreaseEuro*) are shown in Table 6. In column (1) we restrict the sample to those PHI members that are compulsorily insured within the public health insurance system. In other words, we identify and exclude the subsample that could have selected themselves out of the treatment and opted-out of the public system in reaction to the reform. We observe that both point estimates, for the pre- and post-reform price sensitivity, are significant and fall into the same confidence intervals as the baseline estimates in column (2) of Table 5.

[Insert Table 6 about here]

In column (2), we only consider the years 2007 to 2010. This exercise also provides evidence whether serial correlation in case of long time horizons is a threat to our estimates because of underestimated standard errors. The size, sign, and significance of the coefficients are fully in line with our baseline estimates. Column (3) also tests whether the potential underestimation of standard errors is a threat to our results. It clusters standard errors at the health plan$\times$year level ($41\times11=451$ cluster).

In column (4), we exclude the pre-reform years 2008 and 2009. The pre-reform price sensitivity is larger once we exclude the pre-reform years 2008 and 2009. Now a monthly premium increase by €10 would increase the switching probability by two percentage points. This might be a hint to uncertainty in the two years before the reform became effective. The price effect in 2008 and 2009 was very low since, due to increased uncertainty, insurees did not switch until the reform fully phased in in 2010.

Characterization of Health Plan Switchers

Although the main objective of this paper is to estimate price (framing) effects on health plan switching, it is worth looking at the significant socio-economic correlates of switchers in Table 7. In doing so we employ an extended set of covariates in the analysis. Since some of these are only available as of 2002, this analysis is based on a smaller sample of only 36,111 observations. We basically drop the years 1999-2001 but still have plenty of pre-reform years left.

In line with earlier studies, we see that older people are less likely to switch, which could suggest that the length of plan enrollment is an important determinant of switching behavior. We already discussed potential explanations for this finding, such as brand loyalty and the status-quo hypothesis. Besides decision overload, one of the main barriers to health plan switching is certainly switching costs. Cancellation notice has to be given in written form and employees need to sign-up for a new health plan. The internet facilitates switching substantially, but older people are still especially reluctant to use the internet.

Looking at labor market characteristics, we find evidence that being full-time employed, having a higher income and, again surprisingly, being less well educated is positively correlated with the switching probability.

[Insert Table 7 about here]

Finally, the lower bottom panel of Table 7 makes use of rich socio-economic background information from the SOEP. We replicate the well-established finding that healthier people are more likely to switch. Controlling for severall health measures jointly, subjective self-assessed health (SAH) does not seem to have a significant effect. However, we find significant correlations with the degree of disability and the number of outpatient doctor visits. Also, we find that mentally healthy people are more likely to switch but find no such relationship for physically strong people. Obese people and smokers are less likely to switch.

Who Reacts Strongest to a Change in Price Framing?

Now we would like to know: How can we characterize the people who react to premium increases and whose price elasticity exactly increased due to the change in price framing? The answer is given by Table 8. The setup of Table 8 is similar to the one of Table 6. Each column represents one probit regression model similar to the one in equation 2. The only difference is that we interact the covariates as indicated in the column header additionally with the regressors of interest in order to analyze reform heterogeneity.

[Insert Table 8 about here]

In column (1) we are interested in the stratifying covariate *age 41-64*, which is a dummy and splits the sample in to people younger than 41 and older than 41.[15] The first two rows indicate how middle-age insurees reacted to price changes pre-reform. The price effect can be directly compared to the effect in the second row where we interact *PremiumIncreaseEuro* with [1-(*age 41-64*)]. The next two rows do exactly the same but for post-reform years. The findings show that only the younger generation was price responsive in strict statistical terms, both pre- and post-reform.

In column (2), we stratify the sample by the median household income. A price increase of €10 per month weighs more for the poorer half of the sample—both relative to their income and relative to their baseline premium, which is also lower due to the income-dependence of the premiums (see Section 3.1). Moreover, lower income classes have lower (monetary) opportunity costs and thus lower switching costs. Consequently, it might now be surprising that the price sensitivity of the poorer half was already, pre-reform, much higher than the price sensitivity of the richer half of the sample. The implied price elasticities were 4.2 vs. 2.8. Pre-reform, a 1 percent price increase increased switching probabilities for the poor by 4.2 percent; but for the rich only by 2.8 percent. The poorer half also benefited the most from the change in price framing and the higher price transparency. They heavily reacted and switched health plans more often when price differences were visualized in absolute Euro values.

Column (3) shows that the price effects for the risk-loving are higher than for the risk-averse. The same holds for those in better physical and mental health shape (columns (4) and (5)). Although all of the point estimates for smokers vs. non-smokers are statistically significant we cannot say that smokers react differently to price changes than non-smokers since the confidence intervals overlap. Further, obesity does not seem to be a driving force.

5 Evidence From Aggregate Health Plan Level Panel Data

This section provides complementary empirical evidence on the price framing effect, supporting our main empirical analysis in Section 4. Although the data that we rely on is—in contrast to SOEP data—not representative, has few observations, and the results and findings of this exercise can only be generalized to the universe of the five health plans that we look at, it has two main advantages. First, we make use of aggregated sickness fund panel data. By law, sickness funds are obliged to accurately measure their number of enrollees and members and provide the *German Ministry of Health (Bundesministerium für Gesundheit, BMG)* with these data at regular time intervals. Second, we able able to evaluate the

[15] Note that, since retirees are excluded, elderly in this sample are up to 64 years old.

price framing effects from a different perspective. In Section 4, we took an individual-level perspective. Here, our unit of observation is the health plan and the net annual change of health plan members. As such, we are able to compare our estimation results to a variety of existing findings in the literature.

5.1 Sample Selection

The *DAK* and the *KKH* are the largest two sickness funds that charge add-on-premiums. In 2010, they had 4.5 (*DAK*) and 1.3 (*KKH*) million enrollees. 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 2002-2010 and collected the average number of members for each fund and year. In addition, we collected membership data for the largest sickness fund that reimbursed insurees. The *hkk*, however, had on average only 130,000 members between 2002 and 2010 is thus relatively small as compared to the other four sickness funds.

Thus, in total, we obtain aggregated data from 2002 to 2010 for five of the largest German sickness funds. Two of these funds charged an add-on premium of € 8 per month, one fund reimbursed their members € 5 per month, and two neither charged add-on premiums nor reimbursed money. Together these five sickness funds represent more than 15 million sickness fund members and have a nationwide health plan market share of more than 30 percent.[16]

The number of members varies between 0.12 and 5.6 million across funds and years. In 2008, the year before the contribution rates were equalized and frozen by the legislature, the five funds charged contributions that varied between 14.1 and 15.4 percent. Related to the average gross wage, these contribution rate differences translated into annual price differences for employees of up to € 16.60 per month (€ 200 per year). Our identifying variation in the aggregated data comes from health plan price differences across five funds $\times$ eight years. Given the institutional setup and the size of the sickness funds—and thus health plan members—health plan premiums in given years are plausibly exogenous from the perspective of the insured individual.

[16]In total, the five sickness funds represent more the 21 million enrollees, dependents insured under family insurance included.

5.2 Model Specification

We run the following models to assess the impact of price changes on changes in health plan enrollment and health plan market shares. Moreover, as such, we can estimate "out-of-pocket (semi-)elasticities" as well as "insurer-perspective (semi-)elasticities" and compare them with previous finding in the literature on demand elasticities (see Section 2 for more details).

The first model, run with aggregated data by means of OLS, is

$$\begin{aligned}\Delta M_{s,t} = \beta_0 + \beta_1 PremiumRelative_{st} + \beta_2 AddOn_{st} \times postreform_t \\ + \beta_3 Reimb_{st} \times postreform_t + \beta_4 NoChange_s + \phi_t + \epsilon_{st}\end{aligned} \tag{3}$$

where $\Delta M_{s,t} = M_{s,t} - M_{s,t-1}/M_{s,t-1}$, depending on the model, measures either

(i) the change in members of sickness fund s between t_0 and t_1 in percent, or

(ii) the change in the market share of sickness fund s between t_0 and t_1 in percent.

$PremiumRelative_{st}$ stands for the sickness fund specific payroll tax rate ("contributions rate") of sickness fund s at time t. This variable can also be interpreted as the "full" (or "insurer-perspective") health insurance premium since it includes employee and employer shares. It measures the pre-reform price effect of health plan premiums on membership and market share changes. The *AddOn*×*postreform*-dummy measures the effect of the "out-of-pocket"-add-on premium on health plan enrollment and market share development. It has a one for the two add-on premium charging funds in post-reform years. In contrast, *Reimb*×*postreform* is one for the reimbursing fund in post-reform years. $NoChange_s$ has a one for the two remaining funds that did neither charge add-on premiums nor reimbursed their members. ϕ_t is a vector that includes year dummies and ϵ_{st} is the error term.

The second model that we run is

$$\begin{aligned}\Delta M_{s,t} = \beta_0 + \beta_1 PremiumEuro_{st} + \beta_2 PremiumEuro_{st} \times postreform_t \\ + \beta_3 NoChange_s + \phi_t + \epsilon_{st}\end{aligned} \tag{4}$$

where $\Delta M_{s,t}$, $NoChange_s$, ϕ_t, and ϵ_{st} are defined as above. The main difference with equation (3) is that we calculate the employees' health plan premiums in Euro for every sickness fund s at time t ($PremiumEuro_{st}$) by multiplying half of the contribution rate with the average employee gross wage (see Section 3.2 for more details). This variable can also be interpreted as the "out-of-pocket" health insurance premium. β_1 measures the pre-reform effect of an annual increase in premiums by €100 and $\beta_1 + \beta_2$ the post-reform effect.

The summary statistic for the aggregated data is presented in Appendix B. On average over all years, the five funds had 3.1 million members but lost 0.2 percent of them per year. On average, they charged a contribution rate of 14.58 percent. The employee share of this income-dependent health plan premium amounted to an average of €2,355 per year or €196.25 per month (in 2009 values). The average market share over all funds and years was 6.1 percent, which decreased, however, by an annual rate of 0.1 percent.

5.3 Results

Table 9 provides the estimation results from the aggregated sickness fund panel data and the regression models as discussed above. The first two columns use the change in sickness fund members as dependent variable. An increase in the sickness fund-specific payroll tax rate ("contribution rate"= *PremiumRelative*) by 1 percentage point led on average to a decrease in health plan enrollment by 4.1 percent. This estimate is in line with Schut et al. (2003), who use similar data, but an earlier time period, for the universe of all German health plans. They estimate the membership elasticity with respect to contribution rates to be -4.8. A health plan price increase by 1 percentage point of the contribution rate represents an absolute price increase by about €300 per year. Applied to the average full annual premium over all years—€4,500—this translates into a price increase by 6.67 percent. Hence, the implied full—or "insurer-perspective"—demand elasticity with respect to health plan enrollment is -0.6.

Now consider column (2), where the variable *PremiumEuro* indicates that a €100 annual out-of-pocket health plan premium increase leads to a decrease in plan enrollment by 2.6 percent. Related to the average annual out-of-pocket premium (see Appendix B), €100 represent a price increase by 4.2 percent.[17] This finding that a 1 percent price increase in out-of-pocket insurance premiums decreases plan enrollment by 0.6 percent is— despite all institutional differences—perfectly in line with the US studies (Cutler and Reber, 1998; Buchmueller, 2006).

[17]Note that in the German institutional setting, the "out-of-pocket" demand elasticity is identical to the "insurer-perspective" demand elasticity (see Section 2), since employees pay 50 percent of the full premium and, hence, carry 50 percent of any price change.

[Insert Table 9 about here]

Before turning to the effect of the change in price framing, we look at the price effect on the change in market shares, as indicated in columns (3) and (4) of Table 9. The results are almost identical to the ones presented in columns (1) and (2): A €100 annual out-of-pocket premium increase decreases a sickness fund's—and hence health plan's—market share by 2.6 percent; this demand semi-elasticity is a little bit lower than the estimates from the US (see Section 2). However, the majority of these studies are structural in nature, define market shares more narrowly[18], and focus on specific population subsamples (Dowd and Feldman, 1994; Bundorf et al., 2008; Einav et al., 2010; Lustig, 2011; Starc, 2011; Abaluck and Gruber, 2011). The implied demand elasticity with respect to the market share is identical to the one derived from columns (1) and (2) and is -0.6. It is sightly larger, but in line with, those obtained by Schut and Hassink (2002); Carlin and Town (2009) as well as Handel (2011).

Now we come to the core theme of this paper and look at whether, and if so, how, the exogenous change in the framing of price differences across health plans affected consumer price sensitivity. The second row of Table 9 indicates whether the introduction of add-on-premiums triggered a significant increase in health plan price sensitivity. The dummy variable $AddOn \times postreform$ identifies those sickness funds with add-on premiums in post-reform years, i.e., for DAK and KKH in 2010. As inferred from columns (1) and (3), the introduction of such an add-on premium led to decreasing numbers of members and decreasing market share, falling to 6.5 percent. This translates into an elasticity of -1.8, which is three times as large as the -0.6 pre-reform elasticity derived from row (1).

The dummy variable $Reimb \times postreform$ yields the effect of a post-reform reimbursement of €5 per month on enrollment and market share and is +2.3 percent. Interestingly, the implied elasticity is only half as large as for the premium-increase case and -0.9. This finding is in line with prospect theory and the concept of loss aversion (Kahneman and Tversky, 1979).[19]

Returning to columns (2) and (4) of Table 9. The pre-reform effects of an annual increase in out-of-pocket premiums by €100 have already been discussed. Adding the coefficients for *PremiumEuro* and $PremiumEuro \times postreform$ gives us the post-reform effect of an out-of-pocket premium increase by €100 on plan enrollment and plan market share. We find an effect of -6.9 percent, translating into an demand price elasticity of -1.6, which is consistent with the finding above. Again, as compared to the -0.6 demand elasticity that we find for

[18]Note that in this setting, the market share is defined as health plan enrollment as a share of the (German) universe of health plan enrollment.

[19]z An alternative explanation refers to the institutional setting and the fact that premium increases trigger an extraordinary right to cancel the contract and switch health plan, whereas this is not the case for premium decreases (see Section 3).

pre-reform years, this represents a reform-induced increase in consumer price sensitivity by almost the factor 3.

We summarize the following from our models using aggregated data: (*i*) all findings are plausible and in line with the diverse literature on this topic; (*ii*) the price elasticity for absolute premium increases is twice as large as the elasticity for absolute premium decreases; and, most importantly, (*iii*) the policy reform that exogenously changed the price framing for price differences across health plans increased the out-of-pocket demand price elasticity by the factor 3 to -1.6.

6 Conclusion

This paper provides empirical evidence from a natural experiment showing how price framing affects consumer health plan choice. We rely on a unique institutional setting in which 150 health plans predominately compete on price levels and in which health plan coverage, cost-sharing, and provider reimbursement are fixed at the federal level. Germany's public health insurance system offers a free choice of providers and, thus, has no health plan specific provider networks.

The reform studied regulates how health plan prices are displayed. Policymakers wanted to make price differences between health plans more transparent and express them more clearly to customers in order to foster competition between insurance companies. Before the reform, health plan prices were expressed in form of a mandatory payroll tax rate. Each of the 150 health plans set their payroll tax rate autonomously and independently. In other words: price differences between health plans were expressed in percentage point payroll tax rate differences. Health plans were basically identical, employees were allowed to freely choose their health plan, and the pre-reform maximum price differences amounted up to €60 per month. Nevertheless, switching rates were fairly low. At that time, a monthly "out-of-pocket" premium increase by €10 increase the baseline switching probability by 0.9 percentage points or 16 percent.

A simple federal reform equalized and froze the health plan payroll tax rate across all health plans. The law required health insurers to report the difference to this standardized federal-level health plan price in absolute Euro values. Using rich individual-level SOEP panel data covering more than 10 years, we show that changing the framing of price differences to absolute Euro values boosted the increase in the switching probability triggered by a premium increase by a factor of 6. It doubled the baseline probability to switch health plans.

We complement this individual-level panel data analysis, which is representative for 80 percent of the German population, with aggregated data from five of the largest German health plans. The five health plans have a collective market share of 30 percent. While we take the individual-level perspective when using SOEP panel data, in this case we take the health plan perspective. The pre-reform demand elasticity was about -0.6, i.e., an increase in health plan premiums by 1 percent decreased health plan enrollment and health plan market shares by about 0.6 percent. Changing the framing of price differences across health plans increased this elasticity almost by the factor 3 to -1.6.

A simple back-of-the envelope calculation illustrates the reform-associated increase in consumer welfare: The reform made price labeling more transparent and, thus, doubled the switching rates among those 10 million Germans who now pay more than that standard price as set by the legislature. Under the assumption that switchers save on average €10 per month, this translates into savings of €5 million per month for this group. To the extent that individuals switch to more efficient sickness funds, these savings could be interpreted as efficiency gains that directly increase gross consumer welfare. In the future, due to rising health expenditures, more health plans will charge add-on premiums, competition will further intensify, and more consumers will switch health plans. Under the assumption that the total population switching rate would double to 10 percent, and individuals switch to plans who work more efficiently, consumer savings would increase to €300 million annually.

To the best of our knowledge, this is the first paper providing non-experimental evidence on how findings from behavioral economics translate to real world consumer health plan choice. It also illustrates how insights from behavioral economics can be used to improve the design of health care markets. Our findings are of general importance and certainly not specific to Germany. Experiments show that non-rational behavioral phenomena are not country-specific. Applied to other countries, the results of this study would suggest that, whenever possible, health plan prices should be expressed in absolute monetary values.

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Figure 1: Individual-Level Data: Development of Switching Probability over Time in Percent

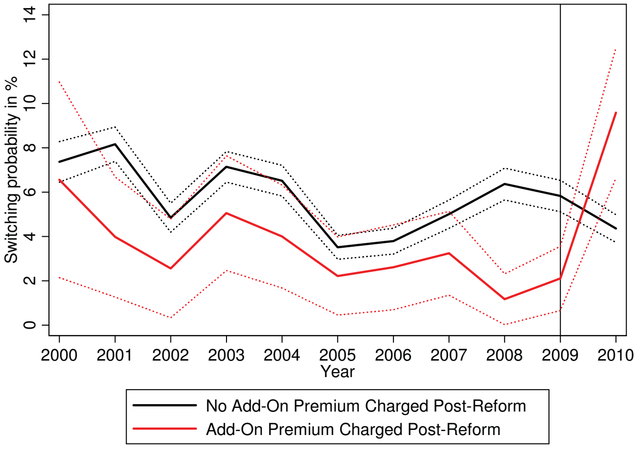

Table 1: Selected Sickness Funds (=Health Plans) and Maximum Price Differences: 2008

Name of Sickness Fund	Contribution Rate	Employee Share of Premium	#Enrollees	Market Share	Plan Operates
City BKK	17.4%	€233.51	207,000	0.29%	15/16 federal states
AOK Saarland	16.7%	€224.58	230,000	0.23%	1/16 federal state
AOK Mecklenburg-West Pomerania	16.7%	€224.58	487,995	0.69%	1/16 federal state
AOK Berlin	16.7%	€224.58	712,000	1.01%	1/16 federal state
Joint BKK Cologne	16.6%	€223.30	40,000	0.06%	16/16 federal states
BKK BMV	16.6%	€223.30	70,657	0.10%	16/16 federal states
...	...	...	...	...	
...	...	...	...	...	
...	...	...	...	...	
BIG direct healthy	13.4%	€182.47	338,000	0.48%	16/16 federal states
BKK of the Thuringia Energy Supply	13.3%	€181.19	12,100	0.02%	2/16 federal states
IKK Thuringia	13.2%	€179.92	230,000	0.33%	3/16 federal states
IKK South-West Direct	13.2%	€179.92	500,000	0.71%	3/16 federal states
BKK MEM	13.1%	€178.64	2,100	0.00%	1/16 federal states
IKK Saxony	12.7%	€173.54	690,000	0.98%	3/16 federal states

Sources: National Association of Statutory Health Insurance Funds, Annual Reports of the Sickness Funds, information by sickness funds. The employee "out-of-pocket"- premium (column 2) is calculated according to the average monthly gross wage in 2008, which was €2,552 (German Statutory Pension Insurance, 2011). Column (3) displays the number of enrollees, i.e., the family members insured under PHI family insurance are included. Column (4) divides the total number of enrollees in a specific sickness fund (column (3)) by the total number of PHI insured in Germany in 2008, which was 70,244 million (German Federal Statistical Office, 2011). Column (5) shows that not all plans operate nationwide. The City BKK was the first German sickness fund in history to go bankrupt and was closed on July 1, 2011. AOK Mecklenburg-West Pomerania and AOK Berlin merged to the new AOK North-East on January 1, 2011. Joint BKK Cologne merged with the bhplus BKK on January 1, 2011. BKK BMV merged with the Schwenninger BKK on January 1, 2009. IKK Thuringia and IKK Sachsen merged, forming IKK Classic on January 1, 2010.

Table 2: Overview of Sickness Funds With Add-On Premiums And Reimbursement

Name of Sickness Fund	Monthly Amount /Month	Introduced	Abolished	#Enrollees	Market Share (2010)	Contribution Rate (2008)	Plan Operates
A: Funds with Add-On Premium							
BKK Hoesch	€ 15.00	01/01/2011	-	99,415	0.14%	15.80%	10/16 federal states
City BKK	**€ 15.00**	**04/01/2010**	**07/01/2010**	**168,000**	**0.24%**	**17.40%**	**16/16 federal state**
BKK of the Healing Professions	€ 10.00	01/01/2011	-	185,000	0.26%	16.20%	16/16 federal state
BKK Westphalian-Lippe	**€ 12.00**	**02/01/2010**	**09/30/2010**	**27,355**	**0.04%**	**15.70%**	**16/16 federal state**
DAK	**€ 8.00**	**02/01/2010**	**03/31/2012**	**6,049,941**	**8.64%**	**15.40%**	**16/16 federal states**
KKH-Allianz	**€ 8.00**	**03/01/2010**	**03/01/2012**	**1,900,057**	**2.71%**	**14.80%**	**16/16 federal states**
German BKK	**€ 8.00**	**02/01/2010**	**-**	**916,765**	**1.31%**	**15.10%**	**16/16 federal states**
BKK Health	**€ 8.00**	**02/01/2010**	**03/31/2012**	**1,200,000**	**1.71%**	**14.90%**	**6/16 federal states**
BKK Phoenix	€ 8.00	01/01/2010	-	10,663	0.02%	16.30%	16/16 federal states
Novitas BKK	€ 8.00	07/01/2010	12/31/2010	450,000	0.64%	15.40%	16/16 federal states
Esso BKK	€ 8.00	04/01/2010	12/31/2010	26,000	0.04%	14.50%	16/16 federal states
BKK Publik	€ 8.00	01/01/2011	-	6,849	0.01%	15.50%	3/16 federal states
BKK Axel Springer	€ 8.00	01/01/2010	03/31/2012	12,142	0.02%	16.50%	only Axel Springer employees
BKK Merck	€ 8.00	04/01/2010	-	28,000	0.04%	14.30%	only Merck employees
e.on BKK	€ 8.00	03/01/2010	06/30/2011	8,900	0.01%	14.50%	only e.on employees
BKK advita	€ 6.50	07/01/2011	-	43,000	0.06%	15.70%	16/16 federal states
Joint BKK Cologne	1% of wage	09/01/2009	12/31/2010	29,414	0.04%	16.60%	16/16 federal states
Total				*11,161,501*	*15.93%*		
Total 12/2011				*10,451,832*	*14.92%*		
B: Funds with Reimbursement							
BKK A.T.U.	€ 2.50	01/01/2011	-	100,223	0.14%	14.40%	16/16 federal states
hkk	**€ 5.00**	**01/01/2009**	**-**	**325,511**	**0.46%**	**14.10%**	**16/16 federal states**
BKK Economics and Finance	€ 5.00	01/01/2011	-	10,000	0.01%	14.40%	12/16 federal states
BKK PWC	€ 5.00	01/01/2011	-	17,091	0.02%	14.10%	only PWC employees
BKK ALP Plus	**€ 5.83**	**07/01/2009**	**03/30/2010**	**107,773**	**0.15%**	**14.80%**	**16/16 federal states**
G+V BKK	€ 6.00	10/01/2009	-	1,000	0.00%	12.20%	2/16 federal states
IKK South-West	€ 8.33	01/01/2009	01/01/2010	680,000	0.97%	13.80%	3/16 federal states
BKK Groz-Beckert	€ 8.33	01/01/2009	-	6,280	0.01%	13.10%	only Groz-Beckert employees
BKK Würth	€ 10.00	01/01/2009	-	12,432	0.01%	13.50%	only Adolf Würth employees
Total				*1,260,310*	*1.77%*		
Total 12/2011				*472,537*	*0.63%*		

Sources: German Federal (Social) Insurance Office, National Association of Statutory Health Insurance Funds, Annual Reports of the Sickness Funds, information by sickness funds. We can identify and accurately assign SOEP respondents to the sickness funds listed in bold. Column (4) displays the number of enrollees, i.e., the family members insured under PHI family insurance are included. Column (5) divides the total number of enrollees in a specific sickness fund (column (3)) by the total number of PHI insured in Germany in 2010, which was 70,011 million (German Federal Statistical Office, 2011). Column (6) shows that not all plans operate nationwide. The City BKK was the first German sickness fund in history that went bankrupt and was closed on July 1, 2011. The BKK of the Healing Professions closes January 1, 2012. The DAK, BKK Health, and BKK Axel-Springer merges January 1, 2012, and will constitute the new DAK-Gesundheit. BKK Westphalian-Lippe merged on October 1, 2010 with BKK Local. The Joint BKK Cologne merged on January 1, 2011 with the mhplus BKK. The exact reimbursement amount of the BKK Würth has not been determined yet.

Table 3: Add-on and Reimbursement Effect on Switching Behavior

	Baseline	Full set of covariates	With reimb.	Without 2008 and 2009	OLS
	(1)	(2)	(3)	(4)	(5)
AddOn×postreform	0.061***	0.064***	0.067***	0.060***	0.080***
	(0.014)	(0.016)	(0.016)	(0.016)	(0.015)
Reimb×postreform			0.016		
			(0.025)		
Socio-economic controls	no	yes	yes	yes	yes
Federal state dummies	no	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes
Add-on dummy	yes	yes	yes	yes	yes
Observations	51,291	51,291	51,257	41,938	51,291

$*p < 0.1, **p < 0.05, ***p < 0.01$; standard errors in parentheses are clustered at the individual level. Each column represents one type of difference-in-differences model as illustrated by equation 1. The dependent variable in all columns is $Switch_{it}$ and indicates whether individual i switched health plans between $t-1$ and t. $AddOn_{it}$ is one for respondents whose sickness funds charged an add-on premium in post-reform years and zero else. $Reimb_{it}$ is one for respondents whose sickness funds reimbursed premiums in post-reform years and zero else. Each model, except for column (5), is a probit model. The "treatment"-effects of the probit models are calculated according to Puhani (2011). Column (1) is the baseline estimate and the regression version of Figure 1. Column (2) includes the full set of covariates (see Appendix A1). Column (3) additionally measures the effect of reimbursement of health plan switching. Column (4) excludes the years 2008 and 2009. Column (5) runs an OLS model.

Table 4: Premium Increase Effect on Switching Probability: Identifying Variation

Year	Respondents	Share of respondents with premium increase (in %)	ø conditional premium increase in Euro	ø conditional premium increase in % of income
2000	3,257	0.03	1.65	2.10
2001	5,016	10.21	3.65	4.00
2002	4,379	79.95	4.72	4.67
2003	5,597	55.90	6.13	3.60
2004	5,169	0.00	-	-
2005	4,767	0.50	2.70	1.69
2006	4,408	1.68	6.63	3.49
2007	4,851	90.02	9.55	5.32
2008	4,786	4.18	6.76	3.35
2009	4,567	88.81	8.33	4.91
2010	4,494	8.59	8.00	5.06

Table 5: Premium Increase Effect on Switching Behavior: Pre- and Post-Reform

	(1)		(2)		(3)	
PremiumIncreaseDummy×prereform *[relative]*	0.018∗∗∗	(0.004)				
PremiumIncreaseDummy×postreform *[absolute]*	0.046∗∗∗	(0.010)				
PremiumIncreaseEuro×prereform *(divided by 100), [relative]*			0.090∗∗∗	(0.027)		
PremiumIncreaseEuro×postreform *(divided by 100), [absolute]*			0.572∗∗∗	(0.131)		
PremiumIncreasePercent×prereform *(divided by 100), [relative]*					0.138∗∗∗	(0.045)
PremiumIncreasePercent×postreform *(divided by 100), [absolute]*					0.800∗∗∗	(0.177)
Socio-economic controls	yes		yes		yes	
Federal state dummies	yes		yes		yes	
Year dummies	yes		yes		yes	
Observations	51,291		51,291		51,291	

$*p < 0.1, **p < 0.05, ***p < 0.01$; each model is a probit model, average marginal effects are reported. Standard errors in parentheses are clustered at the individual level. Each column represents one model as illustrated by equation 2. The dependent variable in all columns is $Switch_{it}$ and indicates whether individual i switched health plans between $t-1$ and t. *PremiumIncreaseDummy* is a dummy variable that identifies individuals whose health plan premiums increased between $t-1$ and t. *PremiumIncreasePercent* is a continuous variable that measures the premium increase between $t-1$ and t in percent, relative to the premium in $t-1$. More information on the covariates is in Appendix A1.

Table 6: Robustness checks

	Only stat. insured (1)	Only 2007 to 2010 (2)	cluster health plan×year (3)	Without 2008 and 2009 (4)
PremiumIncreaseEuro×prereform	0.103***	0.064**	0.090	0.202***
(divided by 100), [relative]	(0.030)	(0.032)	(0.068)	(0.041)
PremiumIncreaseEuro×postreform	0.601***	0.542***	0.572**	0.568***
(divided by 100), [absolute]	(0.147)	(0.126)	(0.246)	(0.130)
Socio-economic controls	yes	yes	yes	yes
Federal state dummies	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes
Observations	42,584	18,698	51,291	41,938

$*p < 0.1, **p < 0.05, ***p < 0.01$; each model is a probit model, average marginal effects are reported. Standard errors in parentheses are clustered at the individual level, except for column (3). Each column represents one model as illustrated by equation 2. The dependent variable in all columns is $Switch_{it}$ and indicates whether individual i switched health plans between $t-1$ and t. $PremiumIncreaseEuro$ is a continuous variable that measures the premium increase in Euro between $t-1$ and t. Column (1) excludes voluntarily insured. Column (2) only includes the years 2007-2010. Column (3) clusters standard errors at the health plan×year (=11×41) level. Column (4) excludes the years of 2008 and 2009.

Table 7: Characterizing Health Plan Switchers

	Correlates of switching behavior using rich set of covariates	
PremiumIncreaseEuro×prereform *(divided by 100), [relative]*	0.077***	(0.027)
PremiumIncreaseEuro×postreform *(divided by 100), [absolute]*	0.462***	(0.150)
Demographics		
Age	-0.002***	(0.000)
Married	0.003	(0.003)
Children under 16	-0.005*	(0.003)
Female	0.012***	(0.003)
Risk loving	0.010***	(0.003)
Educational and Labor Market Characteristics		
Education inadequate (0-4 yrs)	-0.052***	(0.019)
Education general (10-14 yrs)	-0.005	(0.005)
Education A-level (14-16 yrs)	-0.016***	(0.005)
Education voc. training (15-18 yrs)	-0.013***	(0.005)
Education higher (20 yrs)	-0.013***	(0.004)
Full-time employed	0.028***	(0.009)
Individual income > mean	0.005*	(0.003)
Health and Health Care Consumption		
SAH very good	-0.001	(0.005)
SAH good	0.002	(0.003)
Degree Disability	-0.000**	(0.000)
Doctor visits	-0.001***	(0.000)
Hospital visits	0.001	(0.003)
Partly imputed		
PCS > median	-0.001	(0.003)
MCS > median	0.006**	(0.003)
Obese	-0.016***	(0.004)
Overweight	0.000	(0.003)
Smoker	-0.006**	(0.003)
Year dummies	yes	
Federal state dummies	yes	
Observations	36,111	

$*p < 0.1, **p < 0.05, ***p < 0.01$; each model is a probit model, average marginal effects are reported. Standard errors in parentheses are clustered at the individual level.

Table 8: Analyzing Reform Effect Heterogeneity

	age 41-64 (1)	> median income (2)	Risk loving (3)	> median pcs (4)	> median mcs (5)	Obese (6)	Smoker (7)
PremiumIncreaseEuro×prereform×*[column header=1]*	0.021	0.056*	0.090***	0.087***	0.057*	0.060	0.125***
(divided by 100), [relative]	(0.035)	(0.032)	(0.032)	(0.033)	(0.033)	(0.065)	(0.042)
PremiumIncreaseEuro×prereform×*[column header=0]*	0.119***	0.107***	0.061*	0.065*	0.104***	0.080***	0.054*
(divided by 100), [relative]	(0.032)	(0.036)	(0.035)	(0.035)	(0.035)	(0.028)	(0.029)
PremiumIncreaseEuro×postreform×*[column header=1]*	0.262	0.265	0.529***	0.509**	0.552***	0.370	0.511**
(divided by 100), [absolute]	(0.234)	(0.202)	(0.203)	(0.202)	(0.204)	(0.449)	(0.250)
PremiumIncreaseEuro×postreform×*[column header=0]*	0.605***	0.724***	0.391*	0.411*	0.363*	0.474***	0.438**
(divided by 100), [absolute]	(0.193)	(0.215)	(0.213)	(0.214)	(0.211)	(0.158)	(0.181)
Extended set of socio-economic controls	yes	yes	yes	yes	yes	yes	yes
Federal state dummies	yes	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes
Observations	36,111	36,111	36,111	36,111	36,111	36,111	36,111

$*p < 0.1, **p < 0.05, ***p < 0.01$; each model is a probit model, average marginal effects are reported. Standard errors in parentheses are clustered at the individual level. Each column represents one model similar to the one illustrated by equation 2. The only difference to equation 2 is that the regressor of interest, as indicated in the rows, is additionally interacted with the covariate of interest, as indicated in the column headers. As such, we test for effect heterogeneity. The dependent variable in all columns is $Switch_{it}$ and indicates whether individual i switched health plans between $t-1$ and t. $PremiumIncreaseEuro$ is a continuous variable that measures the premium increase in Euro between $t-1$ and t. Column (1) interacts the regressors of interest with a dummy variable that splits the sample into those between 18 and 40 years of age, and those between 41 and 64. Column (2) interacts the regressors of interest with a dummy variable that splits the sample at the median of the income distribution. Column (3) uses a dummy variable that splits the sample at the median of the "degree of risk taking" distribution. Column (4) uses a dummy variable that splits the sample at the median of the pcs distribution and column (5) uses mcs instead. Column (6) uses the obese and column (7) the smoker indicator as described in Appendix A1.

Table 9: Aggregated Administrative Data:
Premium and Reform Effects on Members and Market Share

	Dependent Variable: Change in Members in %		Dependent Variable: Change in Market Share in %	
	(1)	(2)	(3)	(4)
PremiumRelative	-0.0412**		-0.0413**	
[relative]	(0.0102)		(0.0102)	
AddOn×postreform	-0.0647**		-0.0645**	
[absolute]	(0.0051)		(0.0166)	
Reimb×postreform	0.0227**		0.0228**	
[absolute]	(0.0051)		(0.0051)	
PremiumEuro		-0.0262**		-0.0263**
[relative]		(0.0062)		(0.0062)
PremiumEuro×postreform		-0.0430**		-0.0428**
[absolute]		(0.014)		(0.0139)
Year Dummies	yes	yes	yes	yes
NoChange	yes	yes	yes	yes
N	40	40	40	40

* $p<0.1$, ** $p<0.05$, *** $p<0.01$; standard errors are clustered at the sickness fund level. Columns (1) and (3) represent a model as in equation 3 and columns (2) and (4) as in equation 4. All models are estimated by OLS. The dependent variable in columns (1) and (2) measures the change in members of a given sickness fund s between t_0 and t_1 in percent. The dependent variable in columns (3) and (4) measures the change in the nationwide market share of a given sickness fund s—and, given the institutional setting, as such, at the same time the change in the nationwide health plan market share (see Section 3)—between t_0 and t_1 in percent. *Premium-Relative* yield the pre-reform price effect of a change in the mandatory payroll deduction ("contribution rate") by 1 percentage point. Since this represents the employer *and* employee health plan premium, it represents also the full or "insurer-perspective" premium (see Section 2). *Addon* measures the reform effect of changing the price framing and a subsequent €8 monthly *increase* in premiums, i.e., the effect of introducing an add-on premium. *Reimb* measures the reform effect of changing the price framing and a subsequent *decrease* in premiums, i.e., the effect of a €5 monthly premium reimbursement. *PremiumEuro* measures the pre-reform employee "out-of-pocket" price effect of €100 per year, i.e., €8.30 per month. *PremiumEuro×postreform* measures the reform effect of changing the price framing and a subsequent annual €100 change in the out-of-pocket premium.

Appendix A

Table A1: Descriptive Statistics for Individual-Level SOEP Data

Variable	Description	Mean	S.D.	Min	Max	Obs.
Switch	Switches health plan between t_0 and t_1	0.056	0.231	0	1	51,291
AddOn	Member of health plan that introduces add-on premium in 2010	0.060	0.237	0	1	51,291
Regressors of Interest						
PremiumIncreaseDummy	Premium increase btw. t_0 and t_1	0.317	0.465	0	1	51,291
PremiumIncreaseEuro	Premium increase btw. t_0 and t_1 in €	2.31	4.55	0	50.59	51,291
PremiumIncreasePercent	Premium increase btw.t_0 and t_1 in %	1.48	2.68	0	20.59	51,291
Demographics						
Age	Age in years	42.487	10.744	18	64	51,291
Married	Married=1	0.651	0.477	0	1	51,291
Children under 16	Number of children under 16	0.376	0.484	0	1	51,291
Female	Female=1	0.423	0.494	0	1	51,291
Ln equiv, hh-income	Ln equivalized household income	7.341	0.409	1.753	10.801	51,291
Degree Risk-Taking (*partly imputed*)	Scale from 0-10	4.547	1.720	0	10	49,087
Educational and Labor Market Characteristics						
Educ. inadequate	ISCED-1997 classification: 1 (inadequate, 0-4 yrs.)	0.012	0.109	0	1	51,291
Educ. general	ISCED-1997 classification: 2 (general elementary, 10-14 yrs.)	0.093	0.291	0	1	51,291
Educ. A-level	ISCED-1997 classification: 4 (vocational plus A-level, 14-16 yrs.)	0.064	0.244	0	1	51,291
Educ. voc. train.	ISCED-1997 classification: 5 (higher vocational, 15-18 yrs.)	0.100	0.301	0	1	51,291
Educ. higher	ISCED-1997 classification: 6 (higher education, 20 yrs.)	0.209	0.407	0	1	51,291
Full-time employed	Full-time employed=1	0.826	0.379	0	1	51,291
Health and Health Care Consumption						
SAH excellent	Best category on 1-5 scale	0.097	0.296	0	1	51,291
SAH good	Best two categories on 1-5 scale	0.478	0.500	0	1	51,291
Degree Disability	Degree of disability in %	2.88	12.28	0	100	51,291
Doctor visits	Number of doctor visits in previous three months	1.9	3.2	0	90	51,291
Hospital visits	Number of hospital stays in previous year	0.100	0.428	0	22	51,291
Partly imputed						
Obese	BMI $>$ 30	0.146	0.353	0	1	37,545
Overweight	25 $<$ BMI $<$ 30	0.522	0.500	0	1	37,545
Smoker	Current smoker=1	0.364	0.481	0	1	50,382
PCS	SF12 Physical Health Scale (0-100)	0.520	0.077	0.092	0.735	36,522
MCS	SF12 Mental Health Scale (0-100)	0.502	0.087	0.053	0.778	36,522

Table A2: SOEP Analysis Part A: Observable Characteristics of Individuals by Reform Status

	Overall	Add-On Premium Charged Post-Reform		No Add-On Premium Charged Post-Reform		Normalized difference
	Mean	Mean	Variance	Mean	Variance	
Switch	0.06	0.04	0.04	0.06	0.05	
Treatment-group	0.06	1.00	0.00	0.00	0.00	
Demographics						
Age	42.49	43.09	113.50	42.45	115.54	0.04
Married	0.65	0.63	0.23	0.65	0.23	0.03
Children under 16	0.38	0.33	0.22	0.38	0.24	0.07
Female	0.42	0.59	0.24	0.41	0.24	0.25
Degree Risk-Taking	4.55	4.46	2.86	4.55	2.97	0.04
Educational and Labor Market Characteristics						
Educ. inadequate	0.01	0.00	0.00	0.01	0.01	0.08
Educ. general	0.09	0.06	0.05	0.10	0.09	0.10
Educ. A-level	0.06	0.08	0.07	0.06	0.06	0.04
Educ. voc. train.	0.10	0.09	0.08	0.10	0.09	0.04
Educ. higher	0.21	0.22	0.17	0.21	0.17	0.01
Full-time employed	0.83	0.74	0.19	0.83	0.14	0.16
Ln equiv. hh-income	7.34	7.41	0.19	7.34	0.17	0.12
Health and Health Care Consumption						
SAH very good	0.10	0.09	0.08	0.10	0.09	0.03
SAH good	0.48	0.46	0.25	0.48	0.25	0.02
Degree Disability	2.88	4.33	240.72	2.78	144.88	0.08
Obese	0.15	0.12	0.11	0.15	0.13	0.05
Overweight	0.52	0.49	0.25	0.52	0.25	0.05
Smoker	0.36	0.36	0.23	0.36	0.23	0.01
PCS	0.52	0.52	0.01	0.52	0.01	0.05
MCS	0.50	0.49	0.01	0.50	0.01	0.07
Doctor visits	1.90	2.08	9.51	1.89	10.21	0.04
Hospital visits	0.10	0.10	0.31	0.10	0.17	0.01

This table shows the covariate distribution separately for the two groups that we use in Part A of Section 5 in our DID analysis. The last column shows the normalized difference which has been calculated according to $\Delta s = \frac{\bar{s}_1 - \bar{s}_0}{\sqrt{\sigma_1^2 + \sigma_0^2}}$ 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).

Appendix B

Table B1: Descriptive Statistics for Aggregated Administrative Data

Variable	Mean	Std. Dev.	Min.	Max.	N
Sickness fund members	3.1073	2.0504	0.1219	5.6374	40
(in t, in million)					
Change of sickness fund members	-0.00206	0.03213	-0.06471	0.05449	40
(btw. t_0 and t_1 in %)					
Market share	0.0613	0.0404	0.02409	0.11145	40
(in t, relative to total enrollment in Germany)					
Change of market share	-0.00101	0.0311	-0.06672	0.0566	40
(btw. t_0 and t_1 in %)					
PremiumRelative	14.58	0.6292	13.05	15.4	40
(Contribution Rate = full health plan premium)					
AddOn	0.05	0.2207	0	1	40
(=1 for funds with add-on premium in post-reform years)					
Reimb	0.05	0.2207	0	1	40
(=1 for funds with reimbursement in post-reform years)					
PremiumEuro	23.55	1.22	21.09	25.88	40
(= Annual out-of-Pocket Health Plan Premium in € 100)					