Change and Choice of Nursing Home Quality and Health Insurance:

Three Essays in Applied Health Economics

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Preface

The work outlined in this dissertation was carried out at the Duesseldorf Institute of Competition Economics (DICE) and the CINCH Health Economics Research Center in Essen. The thesis has strongly benefited from discussions with professors and colleagues, as well as presentations at various national and international conferences. I am grateful to my co-authors and to all who supported and improved my work. Further, I want to thank my colleagues at DICE and CINCH for establishing a great work environment. Financial support by the Federal Ministry of Education and Research (BMBF) is gratefully acknowledged.

In particular, I want to thank my supervisor, Annika Herr, for her constant support, her patience and helpful remarks. I also owe a lot to my second supervisor, John P. Haisken-DeNew, for giving me the opportunity to start as a research assistant in the first place, and most of all, for his trust and support, even from the other side of the world. It means a lot to me that you accompanied me throughout all my theses, not only as a supervisor, but also as a dear friend. Thank you.

Also, thanks to my closest friends. You supported me in so many ways. Thank you for always believing in me and enriching my life.
This thesis is dedicated to my parents, who have always been there for me and supported me in whatever I chose to do. Thank you for everything.

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Chapter 1

Introduction

The latest figures of health care expenditures (HCE) in Germany, which are published by the Federal Health Monitoring[1], amount to €314.9 billion, and thus, 11.2% of the total GDP. Compared to other countries in the world, Figure 1.1 shows that Germany belongs to the countries which has one of the highest health care expenditures (as percentage of GDP) next to the United States, Canada and Japan. Also, compared to European countries, Germany and its direct neighbors[2] are the countries with the highest HCE (as percentage of GDP).

As these numbers are steadily increasing, the health care system is confronted with two major challenges: cost containment on the one hand, but on the other hand also the provision of and access to a good health care system to every citizen, at the same time. One essential concern is the demographic change, which incorporates both challenges and thus, makes it difficult to solve them both simultaneously. The Federal Institute for Population Research predicts an increase of elderly in need of care by 35% within the next 15 years[3]. As society is ag-

[1] https://www.gbe-bund.de/oowa921-install/servlet/oowa/aw92/dboowasys921.xwdevkit/xwd_init?gbe.isgbetol/xs_start_neu/&p_aid=3&p_aid=71415237&nummer=522&p_sprache=D&p_indsp=99999999&p_aid=90936265

[2] France, Switzerland, Austria, Denmark, the Netherlands, and Belgium

[3] http://www.bib-demografie.de/DE/Aktuelles/Grafik_des_Monats/Archiv/2015/2015_06_pflegebeduerftige.html?nn=5818828

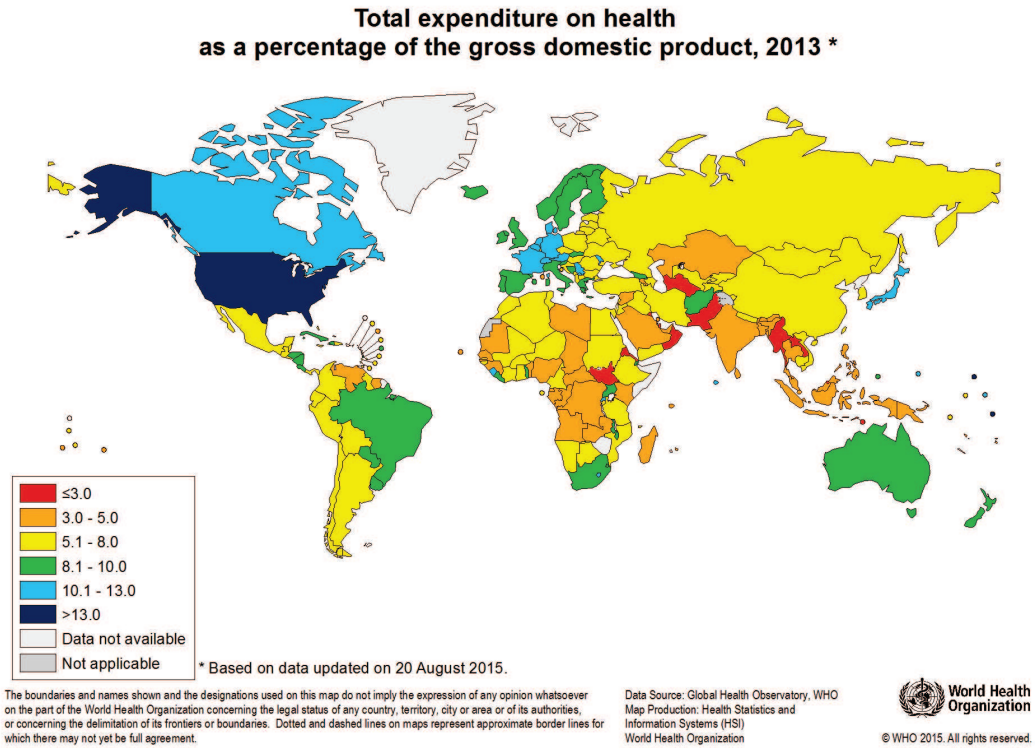


Figure 1.1: HCE as percentage of GDP, 2013

ing, more and more individuals are and will be not only in need of health care, but also in need of nursing care. The multifaceted issue of nursing care provision is subject to many political debates as it affects other markets, such as the labor market, as well: providing informal care requires a decrease of labor supply at the expense of foregone earnings, and therefore poses a burden for the caregiver, both, financially and mentally, due to foregone earnings and also because of the constant confrontation with the deteriorating health status of close family members. It may also constitute a substantial burden if working hours are not reduced and care-giving comes on top of one's full-time job (Hassink and van den Berg, 2011; Meng, 2013; Heger, 2014; Schmitz and Westphal, 2015). If informal care is not feasible and one's financial status allows it to make use of care facilities, nursing homes then become of increasing importance. Health care expenditures for inpatient nursing care amounts to €27.6 billion per year and

is steadily increasing[4]. In Germany, around 2.6 million people are in need of care. 29% of them are accommodated in nursing facilities, whereas 71% (1.86 million individuals) receive care at home[5]. Informal home care is either provided by family members and other reference persons, respectively, or partly by outpatient care services. The decision on the choice of nursing home depends on many factors, such as location, distance to relatives, but most importantly: on its quality. As German nursing homes have made headlines due to poor treatment or even violence against the elderly, the nursing homes are regularly visited and evaluated non-pre-announced since 2009 by the Medical Review Board of the German Statutory Health Insurance (MRB) – an organization responsible for advisory and appraisal services in health care. The effect of quality disclosure on nursing home performance has been subject to research studies predominantly in the U.S. (see Clement et al., 2012; He and Konetzka, 2014; Lu, 2012; Mukamel et al., 2008; Park et al., 2011; Park and Werner, 2011; Werner et al., 2010). The case for Germany will be examined in **Chapter 2** of this thesis, where the effect of public reporting of care quality on nursing home performance is analyzed.

Not only the nursing care market becomes of growing relevance, but also – and closely linked to it – the health insurance market, which constitutes the second part of this thesis. The German health insurance system is characterized by being obligatory for every citizen and by its distinctive two-tier system: both, public and private health insurance coexist on the market and are two self-contained schemes[6]. Around 87% of the population is covered by the statutory health insurance (SHI), and roughly 11% by the private health insurance[7] (PHI). The small percentage that is not insured consists of prisoners, cross-border commuters or

[4]https://www.gbe-bund.de/oowa921-install/servlet/oowa/aw92/WS0100/_XWD_FORMPROC

[5](German Federal Statistical Office, 2013).

[6]Detailed information on the German health insurance system are available at www.krankenkassen.de.

[7]Including civil servants that are beneficiaries (*Beihilfeempfänger*)

soldiers[8]. In order to be eligible for the PHI as a regular employee, a specific income threshold needs to be exceeded. One exception are self-employed individuals, who may choose between the two systems, regardless of their income. Further, given the risk-rated premium calculation, low health-risks tend to opt out of the public system, whereas high-risks would rather stay in the SHI as the premium does not depend on individual health risk, but on one's gross labor income.
However, as member of the public system, it is possible to purchase *additional* private health insurance, for which there are no eligibility restrictions. These could be, for instance, supplementary dental coverage, coverage abroad, or single-room occupation and treatment by head physician in case of hospitalization.

Several health care reforms and laws have been passed within the past decades and the most relevant ones (for this thesis) concerning the insurance system are briefly described in the following: (1) the "Health Care Structure Reform Act"[9] ensured free choice of insurance companies within each system since January 1st 1996 and therefore aimed at fostering competition between the providers. (2) The "Competition Re-Enforcement-Act"[10] stipulated – among other things – that the financing of the public health insurance is covered by the introduction of the so-called Health Fund. Additionally, a uniform contribution rate of 15.5%[11] of gross labor income is now regulated by law. All public insurance companies transfer their returns to the Health Fund, which is administered by the Federal Social Insurance Authority (*Bundesversicherungsamt*) and depending on the characteristics of their respective clients, insurance companies receive a lump sum to

[8] They are covered by the so-called *Heilfürsorge*.
[9] *Gesundheitsstrukturgesetz*, enforced on December 21st 1992.
[10] *GKV-Wettbewerbsstärkungsgesetz*, launched on April 1st 2007.
[11] From 2011 until the end of 2014, in addition to the general contribution rate of 14.6% of assessable income, which is borne by employer and employee to an equal share, the insurees were charged an special contribution of 0.9%. As from 2015, the general contribution rate is reduced to 14.6%and the special contribution was abated. The employer still bears 7.3%, whereas the insured individuals are now charged 7.3% + an additional contribution that is fixed by the respective insurance companies and varies between zero to 1.3%.

cover their expenses plus or minus some age-/gender-/morbidity-based bonus or reduction. Thus, a monthly risk-adjusted re-allocation takes place and the insurance companies receive payments from the Health Funds according to the calculated amounts. This is supposed to cover the standardized expenditures of each insured member and further ensures some level of fairness among the insurance companies, such that companies with a high share of costly insurants are reimbursed and inequality regarding the financial burden is offset. Hence, all companies have equal conditions to operate efficiently. For the private health insurance, the reform entailed that old-age provision can be transferred to another company if a switch takes place. Hence, before 2009, a switch from one PHI to another was very unlikely to happen, as one would incur a substantial monetary loss by doing so. Further, the private system now offers a so-called basic tariff, for which there is an obligation to contract (if the necessary conditions for being privately insured are fulfilled), and which does not take individual risk into account for the premium calculation, but only age and gender. The benefit package is comparable to the public insurance and the premium must not exceed the maximum contribution of the public system (which currently amounts to €639 per month[12]).

The two just mentioned health care reforms and the thereby induced law changes are relevant for this thesis insofar as due to the free choice of insurance companies, individuals have the possibility to compare providers and select one that fits their preferences best. This decision making process can be rated as an investment into one's health (care). Therefore, even though the newly chosen insurance company does not significantly differ in qualitative terms – which is the case after a switch from one SHI to another – it can still be that one's health perception changes, because of the preceding investigations, comparisons, and acquisition of information on the new insurance company. Hence, an improved health percep-

[12] www.bmg.bund.de

tion after a switch of insurance companies could mirror the "magic of the new". The two-tier scheme of the German health insurance system is subject to many political debates and also to many research studies. Quality differences between public and private insurance and the resulting effects on health and medical care utilization have been discussed intensively so far (see Hullegie and Klein, 2010; Jürges, 2009; Lüngen et al., 2008; Riphahn et al., 2003). The determinants of opting out of the public system have been analyzed by Bünnings and Tauchmann (2015). The effect of a switch, however, has not previously been examined. Whether or not a relationship between switching health insurance and health perception exists will be analyzed in **Chapter 3**.

The peculiarity of the insurance system that allows all publicly insured individuals to purchase supplementary private insurance will be given a closer look in **Chapter 4**, where the demand for additional health insurance after the experience of a health shock is investigated.

This thesis is structured as follows: **Chapter 2**, entitled **"Nursing Home Report Cards and Quality of Care in Germany"** (joint work with Annika Herr and Hendrik Schmitz) analyzes the German nursing home market, and more specifically, investigates the effect of quality disclosure on nursing home quality. Due to the demographic change and the ageing society, nursing homes are of more and more importance and relevance. In order to increase transparency of nursing home quality and to provide a more efficient allocation among the growing number of elderly in need of care, German nursing homes are evaluated unannounced on a regular basis by the MRB since 2009. In total, 82 criteria, which are published as school grades (ranging from 1-very good to 5-very bad) are available online in standardized report cards and include different aspects of interest, e.g. quality of care, service quality, special offers, or subjective indicators. Using the publicly available data, we end up with a sample of more than 3,000 nursing homes including information on two waves. The aim is to investigate whether a quality

improvement from the first to the second evaluation is present. Further, not only the disclosed average care grades are analyzed, since they may not reliably measure true quality of care, as these average grades could be easily manipulated by only improving non-relevant aspects (such as room decoration). By extracting relevant information from the 82 criteria that represent true care quality, we aim at identifying whether care quality and outcome quality, respectively, have improved after public reporting. Results suggest that nursing homes indeed react to the evaluation and achieve significantly better results at the second evaluation compared to the first. Not only the average grades significantly improved, but also the self-constructed care- and outcome quality measures. Hence, public provision of information on nursing home quality does have a significantly positive impact on their performance.

Chapter 3 contains the research project **"Change is Good (?) - The Effect of Switching Health Insurance on Subjective Health"** (joint work with Jan Kleibrink) and examines the German health insurance market. It analyzes the effects of an health insurance switch on perceived health of individuals. As the German health insurance market is divided into two different schemes, the public and the private system, this empirical study also takes this special feature into account by disentangling two kinds of switches: (1) a switch from one public insurance company to another one, and (2) a switch from the public (SHI) to the private (PHI) system. The aim of this paper is, first, to analyze the short-run effect of an insurance *switch* on individual health, instead of investigating the effects of the respective insurance *status* as previous literature has done so far (see Hullegie and Klein (2010)). Second, in addition to the "switch-effect", the "system-effect" is investigated, that is to say, the health effects due to system differences between public and private insurance. Ongoing debates criticize quality differences in the treatment of publicly vs. privately insurance individuals. Therefore, this paper sheds light on whether these quality differences are already existent in the short-

and medium-run, and also whether an effect due to the switch itself has to be taken into account in order to prevent a potential overestimation of system differences. Applying regression-adjusted Propensity Score Matching based on data from the German Socioeconomic Panel (GSOEP), the question whether the act of switching could affect one's subjective health status, the within-system switch is analyzed by matching SHI-to-SHI-switchers to publicly insured never-switchers. Using the switch as treatment variable, in a second step, various health indicators are regressed on leads and lags of the treatment and further controls within the framework of a distributed lag model. Furthermore, the system-effect is investigated by matching within-system switchers to between-system-switchers with the switch from SHI to PHI being the treatment and analogously applying a distributed lag model. Results show that the contemporary effects are significant for the within-system switch, whereas the health effects of a between-system switch show up at a later point in time. However, long-run effects of a switch are not present. Health effects can then be attributed to system differences, which emerge after the benefits of the private system have been made use of for a longer period of time.

Chapter 4, entitled **"Because Change Happens – the Effect of Health Shocks on Supplementary Health Insurance Demand"** also examines the German insurance market and focuses on the determinants of supplementary health insurance demand. In particular, the effects of health shocks on the demand for additional private insurance are investigated. Moreover, emotional and physical shocks are disentangled. The reason for this is because the impact of a physical shock is more direct and may therefore be easier to grasp, whereas the effect of an emotional shock on insurance demand appears more subtle as it is more of an indirect effect, and has not been given much notice within the context of health insurance demand yet. Therefore, the focus of this paper is on emotional shocks. The channel through which the demand is affected could be the increasing awareness of

potential future health risks and accordingly, the increasing willingness to insure oneself and to enjoy a high(er) quality treatment in case of a health incidence. Once again, the distinctive characteristics of the German health insurance system play an important role. As already discussed above, the public and the private system are two separate schemes. In this case, however, the only connecting link is referred to, namely the possibility to purchase supplementary private health insurance as member of the public system without having to fulfill the criteria which are necessary to become eligible for the conventional private system. OLS Fixed Effects and Discrete Time Hazard Models are applied to investigate the research question using data of the German SOEP, waves 2000-2013. Results give first insights to the existence of a relationship between health shocks and supplementary health insurance demand. More specifically, emotional health shocks play an important role and should therefore not be neglected.

Chapter 5 of this thesis concludes, discusses potential caveats, and gives a brief outlook.

Chapter 2

Nursing Home Report Cards and Quality of Care in Germany*

2.1 Introduction

In this paper we analyze the effect of mandatory quality disclosure on outcome quality in the German nursing home market. After a series of public scandals regarding very bad quality in some German nursing homes (Tscharnke, 2009), health insurance providers and nursing home-owners took joint action to improve the transparency of nursing home quality. Following the "care transparency agreement (CTA)," started in 2009, German nursing homes are evaluated unannouncedly on a regular basis according to a standardized list of criteria. Since then, the quality information has been published online in report cards and can be easily accessed on central websites.

Theoretically, the public provision of quality information should serve as an incentive for the quality improvement of nursing home providers. While, typically,

*This Chapter is based on joint work with Annika Herr and Hendrik Schmitz.
We thank Florian Heiß, Ulrich Heimeshoff, and Christian Pfarr, as well as participants of the DICE brown-bag seminar 2014, the CINCH Academy 2014 and the DIBOGS workshop in Fürth 2014 for valuable comments. Financial support from the BMBF (Förderkennzeichen 01EH1102A) is gratefully acknowledged.

there is an information asymmetry between providers and consumers on the true quality of care, public report cards reduce these asymmetries, giving consumers a higher bargaining and decision making power (Arrow, 1963).

It has been empirically shown that public reporting increases quality in industries which deal with information asymmetries such as food labeling (Nielsen, 2006) or law schools (Stake, 2006). Regarding health care, some US and an Italian study find that public reporting leads to a quality improvement in hospitals (Laschober et al., 2007; Pham et al., 2006; Dziuban et al., 1994; Renzi et al., 2012). This has been shown also for German hospitals (Busse et al., 2009; Filistrucchi and Ozbugday, 2012). Cutler et al. (2004) argue that for evaluating the quality development of the hospital market, one potential problem could be the inaccuracy of data: better outcomes after quality information may also be due to the physicians' selection of healthier patients. Thus, the question arises as to whether more information is always better (Dranove et al., 2003).

Turning to the nursing care market in the US, selected quality measures improved at least for subgroups of nursing homes following the introduction of the obligatory disclosure policy in 2002 (Lu, 2012; Park and Werner, 2011; Mukamel et al., 2008; Grabowski and Town, 2011). The policy was introduced by the Nursing Home Quality Initiative (NHQI) in order to facilitate the search for an appropriate nursing home for consumers, as the US disclosure policy was not viewed as being sufficiently consumer-friendly (Stevenson, 2006; Kane and Kane, 2001). Werner et al. (2009b), who look at post-acute care, find that two out of three measures improve after public reporting. Along these lines, Werner et al. (2012) show that public reporting leads to improvements both in quality and in consumers choosing better-performing nursing homes. However, some sorting mechanism could also be a consequence of public reporting: Werner et al. (2011) show that high-risk patients tend to choose nursing homes that have achieved better results, whereas low-risk individuals rather choose low-scoring nursing homes.

Several channels might lead to quality improvements: First, individuals may choose better-performing nursing homes ("voting-by-feet"). The increased competition may lead to better quality (Werner et al., 2012). Grabowski and Town (2011) show that quality only increases in those nursing homes facing competitive pressure. However, a recent study on English nursing homes finds that competition reduces prices and consequently quality (Forder and Allan, 2014).

Second, nursing homes may learn about their relative rank in terms of quality compared to others and may thus feel the need to improve. Third, better nursing homes may be able to attract more investors or to negotiate higher prices with the nursing care funds that may, again, increase quality. However, other mechanisms may be at work, too. Reported quality might improve due to "teaching to the test" effects. Since nursing homes know the questions, they can prepare to score in exactly these aspects. Lu (2012) shows that unobserved quality measures may not improve, which gives rise to the "multitasking theory." If resources are scarce and mainly put into the reported quality outcomes, less resources are left for the unobserved quality. Analogously, Werner et al. (2009a) provide some evidence for the improvement of reported quality, whereas they, too, state that the effect on unreported measures is rather unclear. Lastly, in the US, the construction that residents only enter the quality measures in NHC after a minimum length of stay leads to a higher number of re-hospitalizations of high-risk individuals before that threshold (Konetzka et al., 2013). Furthermore, He and Konetzka (2014) show that more profitable Medicare and private-pay admissions increase while Medicaid admissions decrease in high-quality nursing homes with capacity constraints after public reporting. Public reporting may thus lead to selection. In Germany, prices do not vary by payer or person, only by need of care.

Quality increases also affect positively the financial performance of the improving nursing homes, independent of the former level (Park et al., 2011). Looking at

prices, Clement et al. (2012) find price and quality increases after NHC for low-quality nursing homes only.

In 2009, the Five-Star-Rating-System was introduced in the US and – similar to the German CTA – aims at higher transparency and facilitation of the decision making process of potential residents. Three aspects are included in the rating: health inspections, staffing, and quality measures. However, the rating system has been under debate recently, since only the health inspections are performed by the government, whereas the other two are reported by the nursing homes themselves.[1] This may lead to an overvaluation, as the self-indicated reports are not audited by an external institution. In contrast to the US system, the evaluation process of the German disclosure policy is carried out by an independent institution.

Literature on nursing home quality in Germany is rather scarce. Some studies have examined the relationship between nursing home prices and quality (Mennicken, 2013; Reichert and Stroka, 2014) or have investigated the differences in prices across federal states (Mennicken et al., 2014). Schmitz and Stroka (2014) show that consumers choose nursing homes by distance and price but not significantly by reported quality using the first wave of transparency reports. The effect of public reporting on nursing home quality in Germany has not been analyzed yet.

We use a sample of more than 3,000 German nursing homes which had been evaluated at least twice between 2009 and 2013. In analyzing the change in quality we focus on only two to six of the 64 quality indicators in the report cards – the two that measure outcome quality and four more that are assumed to capture the "risk factors" shown below. The remaining ones mainly measure processes and

[1] Compare for a discussion, for example, New York Times, Oct. 2014, http://www.nytimes.com/2014/10/07/business/medicare-alters-its-nursing-home-rating-system.html?_r=1 or http://www.medicare.gov/NursingHomeCompare/About/Ratings.html for more detailed information.

services and are arguably uninformative about quality. Nevertheless, we also analyze the effect of public reporting on the officially reported average grades. We find that nursing homes indeed perform significantly better in the second wave than in the first.

This paper contributes to the literature in the following ways: it is the first study that measures the impact of higher transparency on the quality of German nursing homes and hereby exploits the panel structure of the German quality reports for the first time. In contrast to other studies, our constructed quality measures are mainly objective, do not depend on supply-side or demand-side characteristics, and are based on evaluations by an external institution (see discussion in Dranove et al., 2003 or Cutler et al., 2004).

This paper is organized as follows: Section 2.2 provides some information on the institutional background of the German nursing care market, the introduction of the report cards and the measurement of the quality of care. Section 2.3 presents the data used. Section 2.4 analyzes changes in quality due to the report cards. Section 2.5 concludes.

2.2 Institutional background and quality assessments

To ensure that all those in need can afford long-term care, the German long-term care insurance is obligatory and directly linked to the health insurance system, implying that almost everybody is covered by long-term care insurance (around 90 percent in the public and 10 percent in the private system). Formal care is partly financed by the health plan and partly out-of-pocket. Depending on the care level of an individual – which is based on the individual's care needs and is officially divided into three categories (I, II, III) – health plans cover between €1,023 (care level I) to €1,550 (care level III) per month. The remaining amount is borne by the individual herself (or family members). For example, for the exem-

plary home in Figure 2.1 residents have to pay an additional €1,252 (care level I) or €1,845 (care level III) per month on top of the health plan's coverage of €1,023 or €1,550, respectively, plus for any possible further special services or wishes.

In principle, there is no regulated upper limit for the price that nursing homes may charge and nursing homes are to a large extent independent. However, prices cannot be set freely but result from a bargaining process between the majority of affected sickness funds and each provider (see Schmitz and Stroka, 2014). Within a nursing home, prices do not vary across individuals other than with respect to their care level. Finally, contracts between providers of the approximately 12,000 nursing homes and residents in need of care are individually agreed on. Nursing homes are mostly run by non-profit (55%) or private (40%) institutions, while only 5% were public in 2009.

2.2.1 Quality assessment in German nursing homes

The Medical Review Board of the German Statutory Health Insurance (MRB) is responsible for monitoring quality in nursing homes, and as such serves as an external control body. Prior to 2008, the social long-term care system did not address the issue of quality reporting, as quality issues were dealt with bilaterally between the insurance and the service provider. The flaws of this approach were: that 1) unannounced quality evaluations by the MRB were not mandatory; and 2) the information was very difficult for the public to access.

Since 2008, the "care transparency agreement (CTA)" (*Pflege-Transparenzvereinbarung*)[2] has been helping individuals in need of nursing home care to make a more informed nursing home choice. Comparability of nursing homes is guaranteed because the same 64 criteria are tested in all nursing homes and reporting of the

[2]The public report cards were jointly set up by umbrella organizations of both health and long-term care insurances and owners of nursing homes.

results is standardized. The results of each evaluation are published not only in online report cards[3] but are also displayed in the nursing homes.

Nursing homes may be forced or may wish to improve their failed standards until a repeated evaluation in the near future, where the fact that the nursing home had been evaluated again will be marked on the updated report card. We drop the two homes with replaced report cards from our data. The evaluation is unannounced and undertaken by trained inspectors of the respective regional MRB. All German nursing homes were finally tested at least once by the year 2011, followed by regular updates thereafter.

2.2.2 Criteria and average grades in the report cards

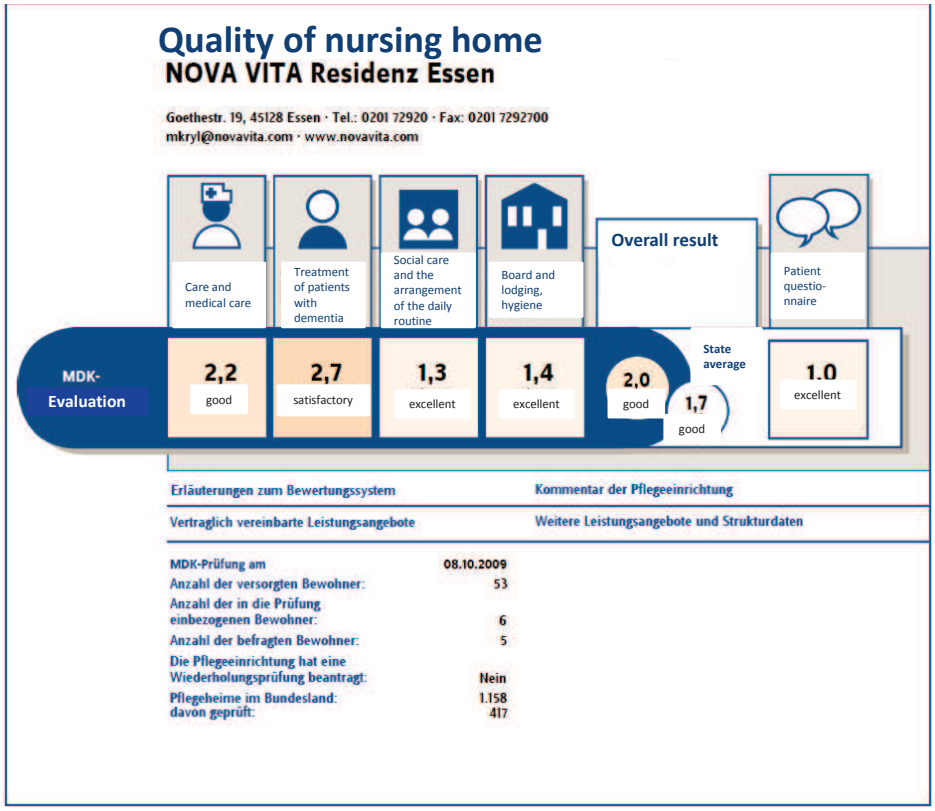
The criteria of the report cards comprise a wide range of aspects such as quality of care, handling of residents with dementia, quality of board and lodging, hygiene, as well as cultural offers. The full list of questions is reported in Table 2.5 in the Appendix. Consider, as an example, the most important criterion "Is the liquidity status of the resident appropriate?." The inspectors test on a subgroup of residents in the nursing home, say 10 people, whether this criterion is fulfilled and calculate the percentage of individuals for whom it holds true. Then, until 2014, the percentage value is translated into a grade according to the German system of school grades from 1.0 (= excellent) to 5.0 (= inadequate or failed) (see Table 2.6 in the Appendix for the mapping). The grades, not the exact percentage values, are then published. Many criteria are actually comprised by binary indicators (e.g. "Is there a systematic pain assessment?", where 1.0 stands for yes and 5.0 for no).

Since comparisons over 64 grades is rather difficult, an overall grade of the nursing home is generated by calculating an average of all single grades. Compare

[3]For instance, at www.pflegenoten.de, www.bkk-pflegefinder.de, or www.aok-pflegeheimnavigator.de.

Figure 2.1 for a showcase report card which includes the overall grade and grades of four subgroups. We use two of these grades for a comparison in our robustness checks.

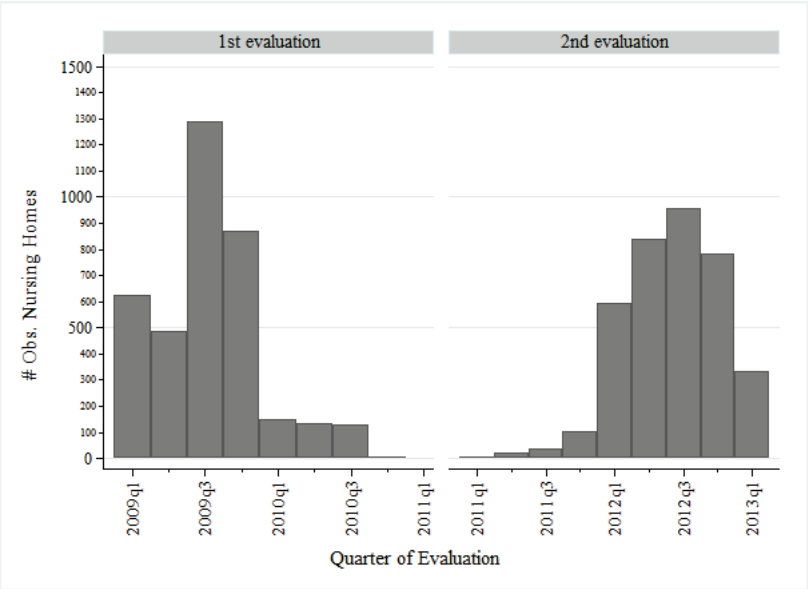
Figure 2.1: Example of a report card (first page)



Source: www.pflegenoten.de. Own translations to English. Only the first page is shown. The remaining pages include all 64 single criteria.

While there is no doubt that aggregation strongly facilitates the comparison, the aggregation method is subject to a great deal of critique among nursing scientists (see, e.g., Hasseler and Wolf-Ostermann, 2010). First, the mapping into school grades is arbitrary. It is highly disputable that fulfilling a criterion which is supposed to be standard for good quality only in, say, 75 per cent of all cases is a "good" quality (grade of 2.3, which represents a "good" in the German system). This reflects the fact that the mapping is the result of an extensive bargaining process between the MRB and the nursing home owners before the care trans-

Figure 2.2: Number of observations at quarter of evaluation



parency agreement became effective. Second, averaging all 64 grades into the overall grade is problematic. More important criteria like outcome quality measures get similar weights as arguably less decisive factors like the offer of cultural activities in the nursing home. Apart from that, there is the critique that too much process and structural quality is measured but too little outcome quality (Hasseler and Wolf-Ostermann, 2010). Thus, we are skeptical of the content of the officially aggregated grades. That being said, we are confident that the reports include a lot of information on the quality of nursing homes, which we exploit to construct grades that reflect the true quality of care. Nevertheless, we will use two of the average grades to check our results for robustness.

2.2.3 Extracting quality information from the report cards

In order to assess true quality improvement, we construct two quality indicators using single items from the reports. In defining our main quality indicator we use the only two outcome quality criteria among the 64 grades. These are the following (questions 15 and 18 in the report cards, see Table 2.5):

(i) Is the nutritional status appropriate given the conditions set by the institution?

(ii) Is the supply of fluids appropriate given the conditions set by the institution?

In addition, we acknowledge that only a grade of 1.0 (excellent) implies that the criterion is fulfilled for all residents, truly reflecting a good quality of care. Therefore, we define binary indicators q_j for criterion j equaling one if and only if the criterion is fulfilled for all tested residents (grade 1.0) and zero if the grade is worse, meaning that it is not fulfilled for at least some residents:

$$q_k = \begin{cases} 1 & \text{if grade}_j = 1.0 \\ 0 & \text{if grade}_j > 1.0 \end{cases}$$

We then define the quality indicator as

$$\textit{Outcome quality} = \frac{1}{2}\sum_{j=1}^{2} q_j \qquad j = 1,2 \tag{2.1}$$

Among all grades we consider *Nutritional and liquid status* as most important for the quality of care in a nursing home. Moreover, we argue that these are not easily manipulated in the short run for the mere purpose of an evaluation. We thereby address the potential issue that nursing homes might rather improve simple or cheap aspects which are, however, irrelevant for care quality, to increase the grade average.

In addition, we define a second indicator, measuring general quality of care. For this we follow the definition of Hasseler and Wolf-Ostermann (2010) and only use six of the seven "risk criteria" instead of the full number of available grades to define an aggregate measure of quality of care in a nursing home.[4] According

[4]These are criteria 15, 18, 20, 22, 27, 29 (order changed here). Criterium 11 is not considered here due to a high number of missing values (around two-thirds). Note that 15 and 18 are the two outcome quality indicators also previously used.

to Hasseler and Wolf-Ostermann (2010), risk criteria are "factors that, when left unattended, affect the health and quality of life of individuals independent of the affliction." (own translation of their originally German definition).[5] We thus add to the two outcome criteria:

(i) Are systematic pain assessments conducted?
(ii) Are individual risks and resources of residents with incontinence or a bladder catheter assessed?
(iii) Is the individual risk of contracture collected?
(iv) Do measures restricting the individual freedom require consent?

We thus use a second indicator spanning all six risk criteria, defined as

$$\textit{Care quality} = \frac{1}{6}\sum_{k=1}^{6} q_k \qquad k = 1, \ldots, 6 \tag{2.2}$$

which is the share of ones among all six criteria and called *Care quality*.[6]

While we do believe in the content of *Care quality*, it might be problematic as some of the indicators could be quickly improved without actually improving the true quality. Hence, *Outcome quality* is the preferred measure of quality. In a robustness check, we also run our analysis on the two official grades *MRB care quality* and *MRB overall quality*. The former is an average across the 35 criteria grouped in "Nursing and medical care" whereas the latter is the overall average across all 64 criteria, of which 40% are binary indicators. They are both reported on the first page of the report.

[5] The care transparency agreement of December 17, 2008 scheduled a scientific evaluation of the report cards. An advisory board mainly composed of nursing and health scientists lead by Martina Hasseler and Karin Wolf-Ostermann was in charge of critically evaluating the report cards and making suggestions for improvement in future years. We follow some of their arguments published in the final report (Hasseler and Wolf-Ostermann, 2010).

[6] In order to avoid potential selection bias due to missing values, *Care quality* is redefined, as question 29 has also missing values (1,999 observations). If question 29 was not applicable in that nursing home, care quality is measured using five criteria only ($\frac{0}{5}; \ldots; \frac{5}{5}$). These outcomes are then mapped on the $\frac{0}{6}; \ldots; \frac{6}{6}$ scale to the closest neighbouring value.

2.3 Data and descriptive statistics

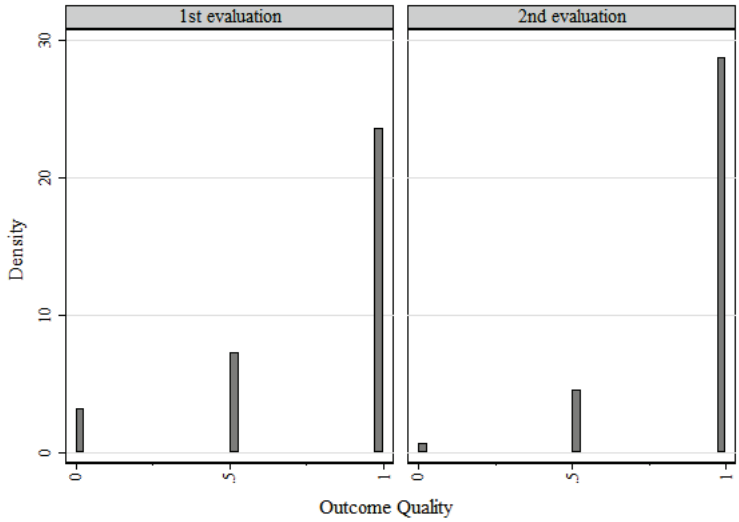
The unit of observation is the nursing home. We merge two data sets: the report cards of German nursing homes and regional information at county level. The report cards are available online for all nursing homes in Germany[7], which amount to about 12,000. However, for the first wave, we only have access to a random sample of roughly 5,000 nursing homes. We exclude nursing homes only providing short-term and out-patient care and care for children and disabled individuals. We also exclude nursing homes that are specialized in only treating residents suffering from dementia. Various special homes such as care for residents with apallic conditions, multiple sclerosis, or stroke residents are also dropped. Finally, we exclude nursing homes with less than 10 residents. Thus, we only focus on general long-term care. As we want to exploit the panel structure, we only include homes that were observed in both waves. In total, we end up with 6,176 nursing home-year observations, 3,088 observations for each wave . The nursing homes have been evaluated at different points in time: 2,769 in 2009 and 319 in 2010 in the first wave, 135 in 2011, 2,670 in 2012, and 283 in 2013 in the second wave (see Figure 2.2).

Table 2.1 reports the descriptive statistics of the two quality measures in the first and the second wave separately. In both cases it can be seen that nursing homes have improved over time. In the first evaluation, only 70 percent of the nursing homes manage to fulfil both, the provision with sufficient nutrition and with liquids, of all selected inhabitants. Care quality can also be considered as moderate in the first evaluation, as roughly 58 percent of the six relevant criteria are fulfilled (around 3.5 criteria), and only 361 out of a total of 3,088 nursing homes fulfil all care quality criteria (not shown in the table). In the second wave, the nursing homes achieve better results across all criteria: outcome quality increases to 91

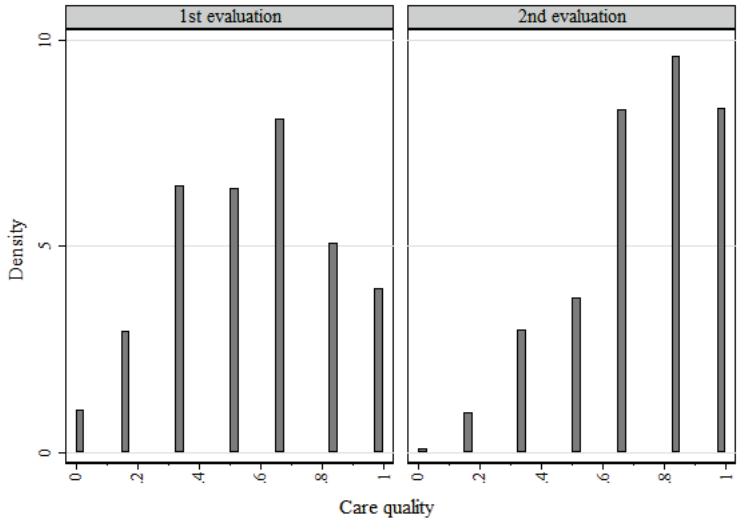
[7]For instance at www.pflegenoten.de, www.bkk-pflegefinder.de, or www.aok-pflegeheimnavigator.de

Figure 2.3: Average quality by wave

Outcome quality



Care quality



percent and the number of nursing homes which fulfil all six care quality criteria more than doubles to 756. On average, nursing homes now fulfil 73 percent of the care criteria, which is equivalent to meeting around 4.5 of the six requirements.

Socio-economic control variables measured at the county level are taken from the Federal Office for Building and Regional Planning (INKAR) for the years 2009

Table 2.1: Descriptives: quality measures

Variable	Mean		Std. Dev.	Min.	Max.
1st evaluation	Outcome quality	0.799	0.328	0	1
	Care quality	0.572	0.264	0	1
	MRB: Care quality	4.036	0.843	1	5
	MRB: Overall quality	4.278	0.689	1.1	5
	N		3,088		
2nd evaluation	Outcome quality	0.912	0.217	0	1
	Care quality	0.732	0.228	0	1
	MRB: Care quality	4.581	0.507	1.2	5
	MRB: Overall quality	4.784	0.288	1.9	5
	N		3,088		

Balanced panel of nursing homes evaluated in 2009/2010 (first eval.) and 2011-2013 (second eval.). MRB quality measures are the officially reported average grades used for robustness checks. Outcome quality $\in (0, \frac{1}{2}, 1)$, Care quality $\in (0, \frac{1}{6}, \ldots, 1)$. MRB quality transformed: 1 (failed) to 5 (excellent).

Table 2.2: Descriptive statistics: Regional characteristics at county level

Variable	Mean	Std. Dev.	Min.	Max.
Household income [in 1,000 EUR]	1.51	0.199	1.082	2.45
Share informal care recipients per ppl in need	0.457	0.064	0.275	0.692
Pension Payment (m) [in 1,000 EUR]	1.047	0.08	0.829	1.332
Pension Payment (f) [in 1,000 EUR]	0.558	0.1	0.37	0.796
Share of county defined as rural	0.205	0.251	0	1
N		6,176		

Regional characteristics at county level. Years 2009 (first wave) and 2011 (second wave). Monetary values deflated to 2009 prices.

and 2011 (2011 is the latest year available) which we match to the first wave and the second wave, respectively. Descriptive statistics in Table 2.2 show that in our sample, on average, net household income amounts to roughly €1,531 per month. Furthermore, population and nursing-care specific factors are included, such as the number of physicians per 10,000 inhabitants, the ratio of benefit recipients in informal care to people in need of care, and the amount of the average pension payment per month. The average pension payment per month of men (€1,047) is almost twice as high as the women's pensions (€558). Finally, the percentage of a particular county defined as rural is also included in our main regressions.

2.4 Quality responses to the transparency reform

2.4.1 Estimation strategy

We postulate that the transparency reform, especially public reporting, has a positive impact on the suppliers' behavior, incentivizing them to put more effort into improving quality. Thus, in our empirical analysis, we are mostly interested in the change in quality measures between the first and the second wave of published report cards. As the transparency reform is applied to all German nursing homes, the analysis is essentially a before-and-after comparison. We assume that the first evaluation measures the baseline quality that would have also been prevalent – but not measured and published – without the report cards. Reactions to the publications should be visible in the second evaluation. We estimate the following linear model:

$$quality_{it} = \beta_0 + \beta_1 2^{nd}\text{evaluation}_{it} + X_{it}\delta + \lambda_{FE_i} + \varepsilon_{it} \tag{2.3}$$

where $quality_{it}$ is either *Outcome quality* or *Care quality*. The main explanatory variable of interest is 2^{nd} *evaluation* which is a dummy variable equalling one in the second wave and zero in the first. β_1 measures the change in quality between

both waves. X_{it} is a vector containing the information on county level shown in Table 2.2 and λ_{FE_i} captures unobserved fixed effects of the 16 federal states. These are important since quality levels and prices vary by federal states. Standard errors are clustered on nursing home level.

To identify the effects of the reform on quality, we need two main assumptions.

(i) Without public reporting, the nursing homes would not have changed their quality.

(ii) The indicator $quality_{it}$ indeed measures the quality of nursing homes. That is, changes in the outcome variable reflect true quality changes.

2.4.2 Results

Table 2.3 reports the regression results. At the second evaluation, nursing homes have, on average, improved their outcome quality (sufficient provision with liquids and nutrition) by 0.104. This is equivalent to the case where 10.4 percent of all nursing homes did not satisfy the sufficient nutritional and liquid requirements during the first evaluation and changed this in the meantime. The number of nursing homes not achieving any of the two criteria shrinks from 292 to 65, while the number of best graders improves by 500 nursing homes to 2608 out of the 3088.

Regarding care quality, the transparency reform led to an improvement by 14.2 percentage points, which is equal to almost one additionally fulfilled criterion out of six per nursing home (since $1/6 = 0.167$). Nursing homes seem to have improved in several aspects, as the number of those fulfilling none of the six criteria decreased from 94 to merely nine in the course of the transparency reform, whereas the number of nursing homes fulfilling five out of six criteria increased from 461 (1st evaluation) to 873 (2nd evaluation).

Table 2.3: Effect of second evaluation on two measures of care quality

	(1) Outcome quality	(2) Care quality
2nd evaluation	0.104***	0.142***
	(0.008)	(0.007)
Household income [in 1,000 EUR]	-0.003	-0.006
	(0.030)	(0.025)
Share informal care recipients per ppl in need	0.043	0.293***
	(0.088)	(0.077)
Pension Payment (m) [in 1,000 EUR]	-0.109	-0.230***
	(0.074)	(0.063)
Pension Payment (f) [in 1,000 EUR]	-0.086	0.001
	(0.105)	(0.090)
Share of county defined as rural	-0.002	-0.058***
	(0.023)	(0.021)
Constant	0.976***	0.683***
	(0.098)	(0.081)
Federal States FE	Yes	Yes
N	6,176	6,176
R^2	0.09	0.24
F	27.42	102.61

Significance levels: * 0.1 ** 0.05 *** 0.01. Standard errors clustered on nursing home level. Outcome quality $\in (0, \frac{1}{2}, 1)$, Care quality $\in (0, \frac{1}{6}, \ldots, 1)$

The regional characteristics do not explain much of the variation in nursing home quality. A higher care quality can be found in counties with a higher share of benefit receivers, with lower pension payments for men given the household income and in more urban counties.

Summing up, both grades show a significant improvement between both waves. Hence, nursing homes react to the once-experienced unannounced evaluation by offering better quality. Certainly, it is not clear whether the effect stems from some kind of "teaching to the test" phenomenon, such that nursing homes only improve in exactly those criteria which they know will be checked (Lu, 2012). However, we argue that even if this were the case, this would still be an improvement in very important quality criteria (six risk factors and in particular the nutritional and liquid status of residents) and, therefore, beneficial to residents. Public reporting, therefore, may serve as an instrument in order to steer care providers toward investing in better quality, as they do react to the public provision of quality information.

2.4.3 Robustness checks

Although the official average grades do not measure outcome quality and suffer from severe shortcomings, we can show that they also improve across nursing homes over time (compare Table 2.4). Both, the reported average care quality and the average overall quality have improved by around 0.5 points (half a grade) from the first to the second evaluation.

Table 2.4: Effect of second evaluation on MRB average grades

	(1) MRB Care quality	(2) MRB Overall q.
2nd evaluation	0.507***	0.481***
	(0.019)	(0.015)
Household income [in 1,000 EUR]	-0.002	-0.038
	(0.076)	(0.060)
Share informal care recipients per ppl in need	0.676***	0.364**
	(0.238)	(0.177)
Pension Payment (m) [in 1,000 EUR]	-0.648***	-0.462***
	(0.185)	(0.143)
Pension Payment (f) [in 1,000 EUR]	0.405	0.354*
	(0.269)	(0.204)
Share of county defined as rural	-0.209***	-0.144***
	(0.063)	(0.046)
Constant	4.178***	4.412***
	(0.255)	(0.193)
Federal States FE	Yes	Yes
N	6,176	6,176
R^2	0.26	0.31
F	109.91	119.06

Significance levels: * p<0.1 ** p<0.05 *** p<0.01. Standard errors clustered on nursing home level. MRB grades range from 1 (failed) to 5 (excellent).

2.5 Conclusion

This study analyzes the effects of a reform to increase transparency in health care: the mandatory evaluation by an external institution and publication of these report cards for German nursing homes. We use a random sample of more than 3,000 German nursing homes evaluated twice between 2009 and 2013. Our results show that the higher transparency indeed has a positive impact on the reported quality of nursing homes. The evaluated nursing homes, on average, increased their performance by a little less than one out of six selected grade units from the first to the second evaluation.

This can be seen as a positive effect of the transparency reform. However, it remains unclear whether this is just a "teaching to the test" effect or not. We argue that, even if this were the case, it is an indication of the reform's success as improvements in the two outcome quality indicators are certainly beneficial for the residents. This holds as long as nursing homes do not shift resources away from other important but not tested outcomes.

Similar to the US, the evaluation process is subject to current debates, as the average grades could be misleading due to a potential overvaluation. However, the reasons for the debates in the two countries differ. While the Five Star Rating suffers from self-reporting, the German averages may hide specific quality issues. The most important single indicators are reported but hard to identify in the report cards and individuals looking for suitable nursing homes may focus on the easy to interpret overall grade. Moreover, the chosen increments of each grade, which reflect the result of a bargaining process between insurance companies and nursing homes, are too good, on average. This issue has been approached lately: Since 2014, the raw data is reported (e.g. 8 out of 10 observed residents fulfill the respective criterion) instead of potentially misleading school grades.

However, still, several adjustments need to be made. We argue that the vast majority of indicators cannot be used to measure quality – only seven indicators can. Note, however, that we do not make any statement about the current *level* of the quality in German nursing homes, only on *changes*.

Therefore, the report cards should be strongly revised to include many more outcome quality indicators and indicators of quality of life of the residents. The results of this study allow us to infer that such a reform would most likely lead to quality improvements in the German nursing home sector.

2.A Appendix

Table 2.5: Full list of report card questions

Area 1: Nursing and medical care	
[1]	Is an active communication with a physician comprehensible if required?
[2]	Does the application of the nursing treatments correspond to the physician's orders?
[3]	Does the supply of medicines correspond to the physician's orders?
[4]	Is the use of medicines appropriate?
[5]	Are compression stockings put on properly?
[6]	Is the individual pressure sore risk being assessed?
[7]	Are pressure ulcer prevention measures being applied?
[8]	Are place and time at which the chronic wound/pressure ulcer occurred verifiable?
[9]	Is a differentiated documentation in case of chronic wounds or pressure ulcer being carried out (in terms of actuality, verifiability of development, size, position, depth)?
[10]	Are the applied measures to treat chronic wounds or pressure ulcer based on state-of-the-art knowledge?
[11]	Are documents regarding the treatment of chronic wounds or bedsores analyzed and, if necessary, the measures adjusted?
[12]	Do residents with chronic pains receive the prescribed medication?
[13]	Are individual nutritional resources and risks documented?
[14]	Are necessary measures taken in case of restrictions regarding independent supply of food?
[15]	Is the nutritional status appropriate given the conditions set by the institution?
[16]	Are individual resources and risks regarding the supply of fluids documented?
[17]	Are necessary measures taken in case of restrictions regarding independent supply of fluids?
[18]	Is the supply of fluids appropriate given the conditions set by the institution?
[19]	Is the sense of taste of residents with feeding tubes being stimulated?
[20]	Are systematic pain assessments conducted?
[21]	Does the nursing home cooperate closely with the treating physician?
[22]	Are individual risks and resources of residents with incontinence or a bladder catheter assessed?
[23]	Are necessary measures for residents with incontinence or a bladder catheter taken?
[24]	Is the individual risk of falling assessed?
[25]	Are fall incidents being documented?
[26]	Are necessary prophylaxes against fall incidents taken?
[27]	Is the individual risk of contracture collected?
[28]	Are necessary contracture prophylaxes taken?
[29]	Do measures restricting the individual freedom require consent?
[30]	Is the necessity of freedom restricting measures checked regularly?
[31]	Are individual needs and habits of the residents regarding personal hygiene taken into account and being carried out accordingly?
[32]	Are individual needs and habits of the residents regarding oral and dental hygiene taken into account and being carried out accordingly?

Continued on next page

Table 2.5 – Continued

[33] Is nursing care usually being carried out by the same nurse?
[34] Are workers regularly trained regarding First Aid and emergency measures?
[35] Do written procedural instructions regarding First Aid and emergency measures exist?

Area 2: Care of residents suffering dementia

[36] Is the biography of residents suffering dementia taken into account and being considered when planning daily activities?
[37] Are accompanying and caring persons of residents suffering dementia incorporated into the nursing and caring process?
[38] Is self-determinantion of residents suffering dementia taken into account in the nursing and caring process?
[39] Is well-being of residents suffering dementia determined and documented, and appropriate measures for improvement deducted from that information?
[40] Do suitable exercise and recreational areas for particular target groups exist (at night time also) ?
[41] Do secured recreational areas outside exist?
[42] Do identification facilitating arrangements regarding design of surroundings exist in rooms and recreation rooms?
[43] Are individual guidance measures, e.g. photographs, used?
[44] Are residents suffering dementia offered adequate activities, e.g. regarding exercise, communication, or perception?
[45] Are residents suffering dementia offered suitable food?

Area 3: Social care and the arrangement of the daily routine

[46] As part of social care, is group counseling available?
[47] As part of social care, is individual counseling available?
[48] Does the nursing home have annual celebrations?
[49] Are there activities together with the local community?
[50] Are there measures to promote contact with relatives?
[51] Are the social care measures justified by the residents' composition and needs?
[52] Is assistance or information provided to familiarize new residents with the nursing facility (e.g., contact person, support during the orientation, assessment interviews after six weeks)?
[53] Is the orientation phase systematically evaluated?
[54] Are there guidelines with respect to the provision of terminal care?
[55] Does the nursing facility have a system for managing complaints?

Area 4: Accommodation, provision, household management, and hygiene

[56] Are residents allowed to decorate and design their rooms with their own furniture, personal effects, and memorabilia?
[57] Do residents have a say in the design and decoration of the communal areas?
[58] Does the facility give a good overall impression in terms of cleanliness and hygiene? For example, does it appear clean? Is it in order? Are there unpleasant odors?
[59] Within a specified time slot, are residents free to choose when to eat?

Continued on next page

Table 2.5 – Continued

[60]	Is appropriate food provided for people with special dietary requirements (e.g., residents with diabetes)?
[61]	Is the food plan made available to the residents in a legible format?
[62]	Is the presentation of food and drinks tailored to the needs of each individual resident? For example, to facilitate eating and digestion, some residents require food to be precut into smaller pieces or pureed.
[63]	Are the portions tailored to the preferences of the residents?
[64]	Are the food and drinks for the residents provided in a pleasant environment and relaxing atmosphere?

Note: Outcome and risk criteria highlighted.

Table 2.6: Mapping of grades

Category	Grade	Percentage range	Category	Grade	Percentage range
	1.0	97.4 - 100.0		3.5	57.6 - 58.9
excellent	1.1	94.8 - 97.3		3.6	56.2 - 57.5
quality	1.2	92.2 - 94.7		3.7	54.8 - 56.1
(sehr	1.3	89.6 - 92.1	poor	3.8	53.4 - 54.7
gut)	1.4	87.0 - 89.5	quality	3.9	52.0 - 53.3
				4.0	50.6 - 51.9
	1.5	85.6 - 86.9		4.1	49.2 - 50.5
	1.6	84.2 - 85.5		4.2	47.8 - 49.1
	1.7	82.8 - 84.1		4.3	46.4 - 47.7
good	1.8	81.4 - 82.7		4.4	45.0 - 46.3
quality	1.9	80.0 - 81.3			
	2.0	78.6 - 79.9		4.5	43.6 - 44.9
	2.1	77.2 - 78.5		4.6	42.2 - 43.5
	2.2	75.8 - 77.1	failed	4.7	40.8 - 42.1
	2.3	74.4 - 75.7		4.8	39.4 - 40.7
	2.4	73.0 - 74.3		4.9	38.0 - 39.3
				5.0	0.0 - 37.9
	2.5	71.6 - 72.9			
	2.6	70.2 - 71.5			
	2.7	68.8 - 70.1			
	2.8	67.4 - 68.7			
fair	2.9	66.0 - 67.3			
quality	3.0	64.6 - 65.9			
	3.1	63.2 - 64.5			
	3.2	61.8 - 63.1			
	3.3	60.4 - 61.7			
	3.4	59.0 - 60.3			

Source: Pflege-Transparenzvereinbarung, Appendix 2. http://www.vdek.com/vertragspartner/Pflegeversicherung/grundlagen/transparenzvereinbarung.html. Own translation into English.

Chapter 3

Change is Good (?) - The Effect of Switching Health Insurance on Subjective Health*

3.1 Introduction

The key feature that differentiates the German health insurance market from those of many other European countries is its two-tier system[1]. Having health insurance is compulsory in Germany and everyone is by default covered by the statutory health insurance (SHI). The SHI is strongly regulated politically. The premium is fixed to a certain percentage of the insurants' labor income and the catalog of benefits is politically determined. Hence, there are no considerable quality or price differences between SHI companies. Under certain conditions including a high income, being self-employed or being a civil servant, however, it is possible to opt out of this system and sign a contract within the private health insurance system (PHI). The two systems differ in several dimensions, the most

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[1]The two-tier system allows the coexistence of the public and the private system on the health insurance market, where one scheme serves as a substitute for the other with respect to full coverage. This system also prevails in Belgium and the Netherlands (see http://www.ess-europe.de/karte.htm).

notable ones being premium calculation, reimbursement system, availability of family insurance, coverage, and doctors' compensation. Whether one or the other system is more attractive for insurants depends on his/her personal characteristics. As doctors' compensation is more beneficial for private health insurants, this system is said to offer better health care quality. At the same time, unlike the community-rated SHI premiums, PHI premiums are risk-rated. This makes it less attractive for high risks, as they have to face high premiums. Therefore, the coexistence of both statutory and private health insurance gives rise to issues like moral hazard or selection problems because of information asymmetries due to individual risk heterogeneity, quality differences and differences between benefit packages between the systems (Cutler et al., 2008; Einav et al., 2011; Finkelstein and McGarry, 2006; Pauly, 1974; Keane and Stavrunova, 2011; Olivella and Vera-Hernández, 2013; Yilma et al., 2012).

The existing literature on the health effects of insurance choice mainly focuses on these aspects. Analyses are based on the long-term effects of being in either statutory health insurance or private health insurance. Furthermore, existing studies investigate the effect of *holding* one insurance type or the other and its effect on health outcomes, and do not take the effect of *changing* insurance types into account. The effect of health insurance on various health outcomes as well as on medical care utilization are thoroughly investigated (Anderson et al., 2012; Card et al., 2008; Dave and Kaestner, 2009; Hullegie and Klein, 2010; Jones et al., 2006; Jürges, 2009; Kriwy and Mielck, 2006).

Using data of the German Socio-Economic Panel (GSOEP), Hullegie and Klein (2010) show that privately insured individuals have a significantly lower health care utilization (measured by the number of doctor visits), but a better self-assessed health. Applying the same data-set, Riphahn et al. (2003) find no relationship between insurance type and number of doctor visits, whereas Pohlmeier and Ulrich

(1995) and Jürges (2009), estimating a negative binomial hurdle model, argue that PHI patients tend to have a lower probability to consult a doctor in the first place.

Regarding switching behavior in general, Laske-Aldershof et al. (2004) compare the consumer mobility within the statutory health insurance system in five countries (Germany, the Netherlands, Switzerland, Belgium and Israel) and investigate the differences in switching behavior and its determinants in the context of optimizing the "socially desirable level of consumer mobility". Dormont et al. (2009) address the issue that the willingness to switch insurances is rather low in Switzerland, even if price differences are present, a finding that can be explained by differences in individual health risks. This also plays an important role in the analysis of switching from SHI to PHI in Germany (Bünnings and Tauchmann, 2015). The authors' explanation for the observed consumer inertia is that individuals refrain from changing providers, if they rate their health poorly. Thus, individuals have the concern that insurance companies offer unreasonably expensive contracts upon their application, because they are considered as "bad risks".

Another key aspect in explaining insurance choice and switching behavior are differences across benefit packages and premiums. Various studies look at the relationship between consumer price sensitivity and switching behavior (within the statutory health insurance scheme), however, the results are ambiguous and also differ across countries (Buchmueller and Feldstein, 1997; Eibich et al., 2012; Gress et al., 2002; Schut et al., 2003; Strombom et al., 2002). Further studies investigate the quality differences between the public and private health insurance which result in, e.g., shorter waiting times, higher compensation for doctors, and therefore, more extensive treatments for privately insured patients (Lüngen et al., 2008; Jürges, 2009; Walendzik et al., 2008).

So far, literature looks at the effects of health insurance on health, or on the determinants of individual switching behavior and the relationship between price and

insurance choice. However, the effect of the switching process itself on health outcomes has not been analyzed yet (to the best of our knowledge). Thus, it could be that an individual's utility increases just by the action or the anticipation of switching, as it can be considered as investing efforts (searching time, decision making) and money (purchase more services) respectively, with the aim of improving one's health (insurance) situation. Also, switching insurance in order to obtain *less* coverage could also improve one's subjective health (satisfaction). It implies that, for individuals with very low health risks, the premium is most likely to be lower and hence, monetary benefits are gained and the benefit package is sensed to be more suitable and appropriate. However, it may also be that the newly chosen insurance company offers *more* services to the same price. In any case, changing insurance may induce psychological effects on individuals in the short-run, resulting in a better perceived health[2].

Therefore, this paper focuses on the process of switching health insurance and its short-run effect on subjective health indicators. In order to disentangle possible channels driving health outcomes between insurants from different companies and systems, both kinds of insurance switches are analyzed. More precisely, the switch of insurance companies *within* the public system and the switch from public to private, thus, *between* the systems are taken into account. The reason for disentangling within- and between-system switches is the following: since the catalog of benefits is politically fixed and therefore almost identical for insurance companies of the public system, quality differences between companies within the market are negligible. Hence, by comparing health outcomes of SHI-switchers and SHI-neverswitchers, the "switch-effect" is supposed to be reflected. On the other hand, by analyzing the effect of a between-system switch on health outcomes, the "system-effect" is referred to, which incorporates the better fit of the new contract to the individual's needs. Comparing switchers within the SHI

[2]This goes along the lines of the theory of decision making and psychological expected utility (see Caplin and Leahy, 2001; Edwards, 1954; Payne, 1976; Sheridan et al., 1975; Simon, 1959).

to switchers from SHI to PHI makes it feasible to "difference out" the switch-effect (as both types of switchers are compared to each other), and to filter the "system-effect". Two factors should be considered when using the term "system effect": first, as only the short- and medium-term effects are analyzed, the potentially perceived quality difference between the public and the private system are assumed to be of non-clinical nature (such as the feeling of being more privileged, which may be evoked by shorter waiting times, for instance). Second, the possibility to choose a contract that fits best according to one's health and risk situation also leads to an increase of utility, independent of whether the new contract has more or less features covered. Hence, the effect also incorporates the impact on health due to the possibility of customizing one's insurance contract according to one's needs.

Therefore, our study aims at and contributes by (1) identifying the effects of an insurance switch on individual health outcomes, (2) analyzing the effect closely around the time of the switch in order to obtain insights regarding anticipative and short-term effects, and (3) disentangling the health effects due to system differences and better fitting contracts from psychological health effects arising from the switch of insurance itself.

The paper is structured as follows: Section 3.2 gives an overview of the German insurance market and the main characteristics of statutory and private health insurance, followed by a short description of the hypotheses postulated in this study in Section 3.3. Subsequent to the empirical strategy which is provided in Section 3.4, data (Section 3.5), results and robustness checks (Section 3.6) are presented. Section 3.7 concludes.

3.2 Institutional Background

3.2.1 The German Health Insurance System

In Germany, enrollment in health insurance is compulsory and individuals are either covered by statutory health insurance or – if eligible – may opt out of this system to buy private health insurance. The majority (about 90%) of Germany's population is covered by statutory health insurance (German Federal Statistical Office, 2012), as only civil servants, self-employed, and high-income individuals are free to choose between the systems. Within the SHI, differences between companies are rather small. The catalog of benefits is regulated by law and therefore, more than 90% of the benefits covered are identical between companies. In the PHI, individuals may choose the content of their benefit package corresponding to their health care needs. Hence, healthier individuals with a low amount of medical care utilization may select into PHI (if eligible). However, it could also be the case that unhealthy eligible individuals rather stay in the public system due to the excessive need of medical care, since they would be charged a very high premium in the private system due to the risk-rating. Still, as a member of the PHI, better treatments by physicians (e.g., shorter waiting times, more extensive treatment procedures) are shown to be existent (Lüngen et al., 2008). The content of the basic PHI tariff is comparable to the benefit package of the SHI, however, it is possible to add customized services, depending on individual preferences of coverage[3].

The key differences between the two systems, which may have an impact on individuals' and doctors' behavior and incentives are depicted in Table 3.1 below[4].

[3]For instance, additional coverage regarding dental treatment (e.g., inlays, bridges or crowns) could be added, or additional inpatient services (e.g. hospital treatments by the head physician, or single/double-room occupancy), or specific outpatient services (e.g., coverage of costs for eyeglasses or hearing aids).

[4]www.pkv.de/themen/krankenversicherung
www.gkv-spitzenverband.de/krankenversicherung/krankenversicherung_grundprinzipien/grundprinzipien.jsp

In contrast to the SHI, PHI premiums are risk-rated on the individual level. Furthermore, individuals can choose from a large number of different contract options, including various amounts of co-payments or deductibles – a characteristic that does not exist in the SHI. Also, doctors' compensation varies considerably under the two different schemes. For PHI insurants, doctors' compensation is much higher than for SHI insurants. This leads to differences concerning the quality of care as more treatments are prescribed for PHI patients and waiting times are shorter (Lüngen et al., 2008)[6].

Eligibility to opt out of SHI is possible only under some restrictive circumstances. Generally, self-employed and civil servants are allowed to opt out of the SHI to sign a contract with a PHI company. Furthermore, employees may opt for PHI coverage, if – and only if – the individual's gross income exceeds a specific threshold, which is regulated and adjusted annually. The thresholds for the years 2000 - 2013 are shown in Table 3.6 in the Appendix. Thus, for instance, if one's income in year 2014 exceeds €52.200, one becomes eligible to purchase PHI.
Under most circumstances, the decision to opt out of the SHI is a life-long decision. It is only possible to switch back from the PHI if the eligibility criteria are not met any longer. For insurants above the age of 55, switching back to the SHI is not possible at all. Hence, switching back from the PHI to the SHI is a rare

Table 3.1: Main differences between SHI and PHI

	SHI	**PHI**
Premium Calculation	Community-Rated, Income-Related	Individual, Risk-Based
Enrollment Policies	Obligation to Contract	No Obligation to Contract[5]
Reimbursement System	In-Kind Provision	In-Cash Provision
Family Insurance	Yes	No
Coverage	Universal	Individual
Doctors' Compensation	Lower	Higher

[5]Except for the basic plan.
[6]Quality differences in the treatment of PHI and SHI insurants are subject to a heated and ongoing public and political debate concerning fairness issues in the German health care system.

case that is only observed under special circumstances. This case is therefore not regarded throughout the paper.

The next section will give a short overview of the main idea and the hypotheses of this study.

3.3 Hypotheses

Insurance choice can be expected to have subjective health effects over different channels. To derive hypotheses concerning the direction and strength of effects, we differentiate between switch- and system effects.

3.3.1 Switch Effects

A switch of insurance companies, regardless of within or between systems, is assumed to entail positive health effects due to the change to a more suitable contract that fits one's preferences to a higher extent, no matter if the new contract offers less or more coverage. Especially in the short-run, effects on the psychological level are more likely to show up due to the self-initiated change[7]. Insurants will rather not change their health insurance on a whim but after a decision-making process. When, at the end of this process, they decide to switch their insurers, they must expect to enjoy a coverage at least as good as the one before their change. Hence, they might feel better about their health and/or are more satisfied because of the switch to a better and/or more suitable insurance coverage. This effect is expected to arise not only after the switch, but possibly also shortly before the switch, due to the anticipation of the new and better (fitting) coverage[8]. By analyzing the within-system switch, the existence of this "switch-

[7]See Chadi and Hetschko (2014), who investigated the effect of a job change on job satisfaction.
[8]See Caplin and Leahy (2001), who suggest that once a decision on a (positive) event is made, one's utility is affected before the event takes place due to anticipatory feelings as individuals enjoy thinking about a positive happening in the future.

effect" is regarded to. Significant quality differences are not likely to arise within the public system, as the benefit package is legally determined and only a small and negligible fraction of company-specific benefits exists[9]. Note that we do not analyze the switch within the private system, but only within the public system, because until 2009, it was not possible to transfer the already built up old age provisions from one PHI to another. Hence, a PHI-to-PHI-switch was unlikely to happen, since one would have encountered a great monetary loss by switching.

3.3.2 System Effects

System- and quality-effects are more likely to arise in case of a between-system switch, since the content of coverage and the premia significantly differ. Note that for this analysis, "system- and quality-effects" refer to the potential preferential treatment of PHI members by health care providers, in terms of shorter waiting times, for instance. Hence, the terms relate to a better status that is associated with being privately insured, which then potentially leads to a higher perceived health. Also, it is supposed to reflect the "better fit" of the content of the new insurance contract to one's preferences, regardless of whether more or less services are covered.

It is assumed that physical health effects will rather show up in the longer run, i.e. after the individual has experienced the "upgrade" to a higher quality system on the one hand, and on the other hand potentially after taking in the benefits of a more customized contract[10]. Differences between SHI and PHI insurants and the resulting health differences have been empirically investigated and found before (e.g., Hullegie and Klein, 2010). However, none of the previous studies take the switching process into account. Therefore, in order to filter system effects from

[9] These do not include core medical treatments but rather additional benefits, for instance, including the coverage of fitness programs or alternative medicine. Hence, it can be assumed to make a difference on the psychological level in the short-run, as physical effects would rather show up in the longer-run, if these fitness programs, for instance, are made use of.

[10] See Lüngen et al. (2008); Jürges (2009), and Walendzik et al. (2008) for the analysis of quality differences between the public and the private system.

switching effects, switchers within the system and switchers between the systems are matched and compared to each other. The reason for this approach is to consider individuals with the same openness and willingness to change, hence, a similar probability to initiate a switch, whether it is a between- or within-system switch. Further, by matching inner-system switchers to between-system switchers with respect to relevant socioeconomic characteristics and prior health status, the issue that PHI holders are generally significantly different from SHI policy holders is taken into account.

3.4 Empirical Strategy

The aim of this analysis is to investigate the effect of switching health insurance on individual health. Further, health effects due to the switch and health effects due to system differences are to be disentangled.

Switch Effects

The first part of the analysis investigates the effects that come from the act of switching alone by including only SHI insured individuals. In a first step, the probability to switch within the system conditional on several control variables is estimated by applying a probit model. These control variables include – in addition to standard regressors[11] – the willingness to take risks, insurance premium of last year/last insurer, and lagged health outcome variables. SHI-insured never-switchers are matched to SHI-insured switchers within the framework of Propensity Score Matching using the Epanechnikov kernel[12] with a bandwidth of 0.02[13] in order to obtain the "switch-effect", since individuals receive the same

[11] Including last year's gross labor income, an indicator for full-time employment, gender, age, marital status, an indicator for having children living in the household, years of education, an indicator for living in East Germany.
[12] See Heckman et al. (1997, 1998) for introductory information on kernel-based matching.
[13] A bandwidth of 0.04 is later implemented as a robustness check.

(or very similar) benefits within the public system. Hence, the weighted averages of all individuals in the control group to whom this bandwidth applies is used to contruct the counterfactual outcome. The advantage of this is a lower variance, since a higher amount of information is used. A higher weight is given to those who are close to the respective treated individuals.

The average treatment effect on the treated is calculated as follows[14]:

$$\tau_{ATT} = E(\tau|D = 1) = E(Y_1|D = 1) - E(Y_0|D = 1) \tag{3.1}$$

where τ_{ATT} is defined as the difference between expected outcomes with and without treatment for individuals that were treated. The ATT in this case is given by the difference of the health outcomes for SHI-switchers with and without a switch. Y_1 therefore stands for the health outcome after a switch and Y_0 is the health outcome without a switch (the unobservable counterfactual), and D denotes the treatment status. In order to rule out selection bias, identifying assumptions regarding unconfoundedness and overlap need to be fulfilled, such that equation 3.2 below holds:

$$E(Y_0|D = 1) - E(Y_0|D = 0) = 0 \tag{3.2}$$

This means that for the control group (never-switchers) the expected health outcome is the same in any case. For the ATT to be identified, the unconfoundedness assumption $Y_0 \perp\!\!\!\perp D|X$, meaning that health outcomes for never-switchers are independent of treatment assignment given the explanatory variables denoted by X, which are also not affected by treatment, needs to hold. Additionally, the overlap assumption $P(D = 1|X) < 1$, which states that the probability to be treated conditional on X is not perfectly predictable (common support), must hold as well. In the next step, in order to assess the dynamic effects of the treatment

[14]See, for instance, Heckman et al. (1999); Roy (1951); Rubin (1974).

(within-system-switch) on various health outcomes (self-assessed health, satisfaction with own health, worries about own health), a distributed lag model is estimated, which includes leads and lags of the treatment to capture subjective health effects that might arise due to anticipation of treatment and also potential follow-up effects (see Amemiya and Fuller, 1967; Ashenfelter, 1978; Ashenfelter and Card, 1985). Further, the kernel weights that were estimated in the first step are implemented on the covariates (see Smith and Todd, 2005). This additionally accounts for the panel structure of the data and the fact that each observation serves as a single unit.

$$\text{HEALTH}_{i,j=0} = \alpha_0 + \sum_{j=-1}^{3} \beta_j \text{TREATEDW}_{ij} + \boldsymbol{\gamma X} + \epsilon_{ij} \tag{3.3}$$

where *HEALTH* stands for one of the three health outcomes. $TREATEDW_{ij}$ denotes the treatment status of individual i, and the subscript *j=-1,0,1,2,3* stands for the leads and lags of the treatment variable. Hence, β_j report the effect on health if the treatment occurred j periods before/afterwards. More specifically, β_{-1} captures the anticipatory effect, which reports the health outcome in the *current* period if the switch occurs in the *next* period. β_0 reflects the contemporary effect. β_1, β_2, and β_3 stand for the health effects 1/2/3 years after the switch. Hence, not only right after the switch ($j = 0$) there are some effects to be expected, but also anticipative effects could arise before that ($j < 0$) due to the searching and comparing process, and also several years after the switch took place ($j > 0$). $\boldsymbol{X}$ is a vector containing the remaining control variables and ϵ is the error term. The kernel weights $\mathbf{W}$ are implemented on the explanatory variables, such that $\hat{\boldsymbol{\beta}} = (\boldsymbol{X'WX})^{-1}\boldsymbol{X'y}$. This two-step approach is referred to as regression-adjusted matching. The reason to combine propensity score matching with a parametric regression model is that the effect of the treatment on the outcome will be correctly estimated if *either* the propensity score model *or* the outcome regression model is correctly specified, given that there are no unmeasured

confounders (Bang and Robins, 2005; Kreif et al., 2013; Robins et al., 1994, 1995, 2007; Van der Laan and Robins, 2003). Selection bias decreases and efficiency increases compared to applying only one of the two methods (Hill and Reiter, 2006; Ho et al., 2007). Standard errors are clustered on the individual level to take into account the panel structure of the data (see Schmitz and Westphal, 2015).

System Effects

The second part of the analysis focuses on the between-system switch and the identification of system and quality differences between the systems, respectively. In this case, within-system switchers are matched to between-system switchers, since the willingness to switch should be existent in both groups. The difference between the treatment group (between-system-switchers) and the control group (within-system switchers) should only be the insurance type they switch to. Hence, both groups are supposed to be comparable in the sense that they both have a similar "switching-mentality" (additional to further characteristics). Analogously to the analysis of the switch-effects, the probability to switch between the systems conditional on the beforementioned covariates is estimated by a probit model, and within-system-switchers (control group) are matched to between-system-switchers (treatment group) within the framework of Propensity Score Matching. The Epanechnikov kernel with a bandwidth of 0.02 is implemented as matching algorithm. The calculated weights are assigned to the relevant control variables. The distributed lag model is estimated in the second step, where, again, various health outcomes are regressed on leads and lags of the treatment (between-system-switch) and relevant controls. In this case, the main estimation model looks as follows:

$$\text{HEALTH}_{i,j=0} = \delta_0 + \sum_{j=-1}^{3} \rho_j \text{TREATEDB}_{ij} + \boldsymbol{\mu X} + \nu_{ij} \tag{3.4}$$

where $TREATEDB_{ij}$ indicates whether a between-system-switch has occurred or not. The coefficients denoted by ρ_j, where $j = -1, 0, 1, 2, 3$, report the anticipatory/contemporary/follow-up health effects of a switch from the public to the private system. The next Section provides detailed information on the data used for this study.

3.5 Data

The data source used for our analysis is the German Socioeconomic Panel[15], waves 2001 - 2012[16]. Unemployed individuals and those below 24 and above 55 years of age are excluded from the analysis, since younger individuals could be covered by family insurance in the SHI, and those older than 55 years can either be objected to returning to the SHI or could already be in retirement and therefore have to be insured by the SHI if they receive a public pension. For the analysis of the between-system switch, civil servants and self-employed are also excluded in order to make sure that the only way to opt out of SHI is determined by income, which also improves the matching process[17].

The health outcomes of interest are (1) health worries[18], (2) self-assessed health[19], and (3) satisfaction with health[20]. As standard control variables, we include gross labor income, gender, age, marital status, an indicator for having children living in the household, years of education, being full-time employed (as opposed to

[15]Data are extracted using PanelWhiz (Haisken-DeNew and Hahn, 2010).
[16]Due to the legislative alignment regarding the income thresholds ("Gesetz zur Rechtsangleichung in der gesetzlichen Krankenversicherung"), year 2001 constitutes the starting period of the analysis, because before January 1st 2001, Germany did not have a uniform income threshold for East and West Germany.
[17]In the main analyses, self-employed individuals are excluded, since they have the possibility to opt out of the SHI in any case, regardless of income. Therefore, as a robustness check, the estimations are done for the subsample of self-employed only.
[18]"How concerned are you with your health? [Very concerned / Somewhat concerned / Not concerned at all]".
[19]"How would you describe your current health? [1 Very bad - 5 Very good]".
[20]"How satisfied are you with your health? [1 Completely dissatisfied - 5 Completely satisfied]".

part-time employed), personal willingness to take risks[21], and an indicator for living in East Germany. Further, lagged dependent variables are taken into account in order to reduce potential bias due to selection issues, if individuals switch for specific health reasons, for instance. For matching purposes, an indicator of having experienced a hospital stay one period before the switch is also included as an objective health measure in the first step. However, the indicator for hospital stay(s) is not used as outcome variable, because the focus of this paper is on subjective health outcomes, since only a short time frame is being analyzed. For the within-system switch, the premium of the last insurance company is also accounted for, as it can be assumed that a higher premium has a positive impact on one's switching decision.

Tables 3.2 and 3.3 depict the descriptive statistics for the analysis of within- and between-system switches, including information on the matching quality. The number of observations is clearly lower for the between-system analysis and amounts to roughly 7,000 compared to about 25,000 observations for the within-system analysis. The reason for that may be that there are not so many individuals who are eligible for the PHI in the first place, and also because civil servants, self-employed and those who already hold a PHI contract where a switch is not visible in the data are excluded from the analysis.
Regarding the quality of the two matching processes, it can be seen that the control variables before the matching significantly differ between treatment and control group, whereas after the matching, the differences are small and insignificant. This is true for both types of switching. Further, the standardized bias is reduced substantially after matching.

The three health outcome variables (Self-assessed Health, Health Satisfaction, No Health Worries) are all coded such that "the higher, the better". It can be seen that the health of within-switchers is slightly lower than the health of between-

[21] "Would you describe yourself as someone who tries to avoid risks (risk-averse) or as someone who is willing to take risks (risk-prone)? (0 risk averse - 10 risk-prone)".

switchers. This may be due to several reasons: first, as premium calculation is risk-rated in the PHI, it is clear that very unhealthy individuals would have to pay a high premium and would therefore rather not choose the private system. Second, the income restriction for the between-switch analysis (explained below) leads to a sample that consists of higher income earners than in the sample of the within-system analysis, where only outliers are excluded.

Regarding the assignment to the respective treatment group, 25% (6,466) of all individuals have switched from one SHI to another, whereas 15% (1,045) switch from SHI to PHI[22]. Gross labor income is cleared from outliers: for the within-analysis, the lowest 10% are dropped and the minimum monthly individual gross income amounts to 417€, whereas for the between-system analysis, we further restricted the sample to those who are close to the income threshold[23] in order to be eligible for the PHI. The minimum monthly income then amounts to 2,337€ with a mean of 3,716€, which is higher than the mean for the within-system switchers (2,531€). The willingness to take risks is similar for both samples. The share of male individuals differs by more than 20%-points between the two samples, which seems plausible when considering the income and the share of full-time employed for both groups: those with a higher income, and hence, those who are eligible for the PHI, most likely have a full-time job. In general, statistics show that primarily men are employed full-time, especially if children are still living in the household[24].

Table 3.7 in the Appendix shows the probit results regarding the impact of the explanatory variables on being in the treatment group of the within-system-switch (column (1)) and the between-system-switch (column (2)), respectively. As ex-

[22]It should be noted that for the later regression, a switch will be coded such that it takes the value 1 only once for each person directly after the 1st switch and is coded as 0 afterwards. Therefore, these percentages accordingly reduce to 4% (874 individuals) and 2% (117 individuals), respectively.

[23]Gross income is at most 1,500€ below the threshold.

[24]See for example http://ec.europa.eu/eurostat/statistics-explained/index.php/Employment_statistics

pected, gross labor income has a positive and significant effect on a switch from SHI to PHI, whereas it does not play a role in the switch from one SHI to another. Further, the willingness to take risks is only significant for the within-switchers. This may be due to the fact that in this case, switchers are compared to non-switchers, whereas in the between-system-switch, SHI-switchers are in the control group, hence, both, the treatment and the control group consist of switchers who should have a similar risk behavior. Men have a significantly lower likelihood to switch to a new public insurance company, and the probability to switch decreases with age. Married individuals are less likely to switch from one SHI to another, and individuals with children still living in the household are less likely to switch from SHI to PHI. The latter can be explained by the fact that in the private system family members are not covered, so it would be more costly to be in the PHI when having children. Interestingly, years of education has a significant and negative effect on the within-system-switch, but a positive effect on the between-system switch. The outcome of the latter is more intuitive, since higher educated individuals are likely to have a higher income as well, and therefore are more likely to be eligible for the private system and also more prone to switch. Living in East Germany also reduces the probability to switch from the public to the private system. Moreover, full-time employment positively affects switching behavior in the public system and does not have a significant impact on a switch to the private system, as premium calculation is income-related in the former case and risk-rated in the latter. Regarding the premium itself (which is only included in the within-system switch), the probit results show that a higher premium of the last insurance company increases the probability to switch to another SHI company. The next Section discusses the results of the main models.

Table 3.2: Descriptive Statistics: Matching Quality of Within-System Switch

				Control Group		Standardized Bias		t-value	
Variable	Min.	Max.	Treated	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
Log(Gross Labor Inc.)	6.03	11.51	7.63	7.65	7.64	-5.1	-1.7	-1.47	-0.37
WTTR	0	10	4.86	4.62	4.71	11.3	7	3.43	1.55
Male	0	1	0.47	0.50	0.49	-5.5	-3.7	-1.69	-0.82
Age	25	54	40.41	41.80	41.40	-17.5	-12.3	-5.47	-2.72
Married	0	1	0.64	0.65	0.65	-2.1	-2.6	-0.66	-0.56
Children in HH	0	1	0.44	0.45	0.45	-2.5	-2	-0.76	-0.44
Yrs. of Educ.	7	18	12.17	12.42	12.24	-10.7	-3	-3.14	-0.68
East Germany	0	1	0.28	0.26	0.27	5.1	2.7	1.59	0.59
Full-Time Employed	0	1	0.78	0.75	0.76	7	4.5	2.1	1
No Health Worries$_{t-1}$	1	3	2.27	2.24	2.25	5.2	3.6	1.59	0.79
SAH$_{t-1}$	1	5	3.62	3.58	3.59	4.4	3.1	1.33	0.7
Health Satisf.$_{t-1}$	1	5	7.11	6.99	7.03	6.5	4.3	1.96	0.96
Premium$_{t-1}$	13.2	15.5	15.02	14.96	15.00	13.5	4.2	3.74	0.96
Hospitalization$_{t-1}$	0	1	0.08	0.08	0.08	0.1	0	0.04	0
			N_{treat}=6,466	$N_{control}$=19,252		N_{total}=25,718			

Note: Authors' calculations based on the SOEP, waves 2001-2012. Descriptive Statistics show the matching quality of the within-system switch. Mean values of the control variables are depicted.

Table 3.3: Descriptive Statistics: Matching Quality of Between-System Switch

				Control Group		Standardized Bias		t-value	
Variable	Min.	Max.	Treated	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
Log(Gross Labor Inc.)	7.76	10.3	8.42	8.17	8.36	92.30	22.60	10.57	1.69
WTTR	0	10	5.13	4.91	5.09	10.70	2.30	1.25	0.19
Male	0	1	0.69	0.70	0.68	-2.30	1.80	-0.27	0.15
Age	25	54	39.70	41.15	40.14	-20.20	-6.10	-2.30	-0.51
Married	0	1	0.55	0.64	0.57	-19.40	-4.90	-2.33	-0.41
Children in HH	0	1	0.39	0.43	0.40	-8.70	-2.50	-1.02	-0.21
Yrs. of Educ.	7	18	15.03	13.34	14.69	60.50	12.20	7.06	1.00
East Germany	0	1	0.18	0.18	0.19	0.80	-0.30	0.09	-0.03
Full-Time Employed	0	1	0.99	0.96	0.98	14.40	3.00	1.42	0.31
No Health Worries$_{t-1}$	1	3	2.46	2.34	2.44	21.00	4.10	2.41	0.35
SAH$_{t-1}$	1	5	3.96	3.69	3.90	35.50	8.40	4.02	0.73
Health Satisf.$_{t-1}$	1	5	7.74	7.19	7.60	32.90	8.40	3.56	0.75
Hospitalization$_{t-1}$	0	1	0.05	0.06	0.05	-5.80	-1.00	-0.65	-0.09
			N_{treat}=1,045	$N_{control}$=5,961		N_{total}=7,006			

Note: Authors' calculations based on the SOEP, waves 2001-2012. Descriptive Statistics show the matching quality of the between-system switch. Mean values of the control variables are depicted.

3.6 Results

3.6.1 Within-System Switch

The results of the within-system analysis are shown in Table 3.4. For all health outcomes, the coefficients showing the contemporary effect are positive and significant. Since the variable $treatedw_{j=0}$ equals 1 for those who switched from one SHI to another at some point during the transition from t-1 to t, the contemporary effect at j=0 can be seen as the effect right after the switch. Hence, directly after switching, perceived health increases by 1.8%-points, satisfaction with health by 2.7%-points and health worries decrease by 2.8%-points ($\widehat{=}$ the likelihood of *not* having health worries increases). Interestingly, the effect of the lead variable $treatedw_{j=1}$ for self-assessed health is negative and significant, which could be seen as some kind of anticipatory effect, meaning that a switch in the future period entails a decrease of one's perceived health in the current period. Knowing that a change of insurance will occur in the near future might lead to a lower evaluation of one's present health status, since a change may go along with the hope and expectation of having better or cheaper coverage and therefore better future health. Also, on the contrary, being unsatisfied with one's current coverage increases the chance of switching, which then again enhances this health effect. Regarding the lagged treatment indicators, all coefficients are insignificant and do not seem to have an impact on health, except for the health outcome *No Health Worries*, which is positive and significant for j=-3, meaning that three periods after an inner-system switch (or later), worries about own health go down.

One's labor income is positively related to all health indicators. A higher willingness to take risks is also positively associated with one's health satisfaction. Gender, marital status, and having children living in the household do not seem to be significantly correlated with health. With increasing age, health decreases. Years of education is positively associated with health worries, meaning that the

higher the education, the less health worries. Individuals living in East Germany seem to rate their health higher than those living in West Germany. Having a full-time job decreases health outcomes compared to having a part-time job.

3.6.2 Between-System Switch

Table 3.5 reports the results of the estimations of the between-system switch, which incorporates the system- and quality-effects ("better-fit"). It can be seen that – unlike the within-system estimations – not the contemporary treatment indicators are significant, but instead the lagged treatment variable, hence, there is a positive and significant effect on self-assessed and satisfaction with health in the current period, when a switch from SHI to PHI occurred one period before. Strikingly, the anticipatory effects are positive in this case, but insignificant. Effects in the longer run, three years (or more) after the switch, are significant for satisfaction with own health and having no health worries. Hence, a switch to a private health insurance company that happened three periods ago still has a positive impact on one's health satisfaction in the current period and significantly decreases worries about own health. All in all, in can be stated that due to the system differences, health effects are noted and perceived at a later stage when certain benefits and services in the private system have been experienced. That also explains the positive effect on health satisfaction that still shows up in the long run.

Labor income in this case is even negatively related to having no health worries: the higher the income, the more worries about own health arise. Also, there are opposite outcomes for the willingness to take risks: the more risk-loving, the lower the self-assessed health. Gender, marital status and having children living in the household are not correlated with health outcomes, either. Age is also negatively related to self-assessed health and satisfaction with health. The indicator of having a full-time job does not show any impact in this case, which may be

due to the income restriction of the sample. All individuals earn a wage that is close to the compulsory insurance income threshold and therefore is relatively high. Hence, there might not be many individuals who actually do have a part-time job and earn a lot at the same time, which leads to very low variation and therefore the coefficients are all small and insignificant.

Table 3.4: Effect of a Within-System Switch on Health

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
treatedw$_{j=1}$	-0.019*	0.011	-0.004
	(0.010)	(0.017)	(0.011)
treatedw$_{j=0}$	0.018**	0.027**	0.028***
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-1}$	0.000	0.001	0.005
	(0.007)	(0.014)	(0.009)
treatedw$_{j=-2}$	0.010	0.002	0.016
	(0.007)	(0.015)	(0.010)
treatedw$_{j=-3}$	0.009	0.001	0.018*
	(0.007)	(0.014)	(0.010)
Log(Gross Labor Inc.)	0.017*	0.031*	0.026**
	(0.010)	(0.018)	(0.012)
WTTR	0.001	0.006*	0.003
	(0.002)	(0.003)	(0.002)
Male	0.015	0.027	0.017
	(0.009)	(0.018)	(0.012)
Age	-0.002***	-0.004***	-0.002***
	(0.001)	(0.001)	(0.001)
Married	0.007	-0.007	-0.004
	(0.009)	(0.017)	(0.012)
Children in HH	-0.000	-0.008	-0.008
	(0.008)	(0.016)	(0.011)
Yrs. of Education	0.001	-0.002	0.004*
	(0.002)	(0.003)	(0.002)
East Germany	0.024***	-0.029*	0.001
	(0.008)	(0.018)	(0.012)
Full-Time Job	-0.025*	-0.064***	-0.043***
	(0.013)	(0.023)	(0.015)
No Health Worries$_{t-1}$	0.043***	0.059***	0.207***
	(0.007)	(0.014)	(0.011)
SAH$_{t-1}$	0.090***	0.086***	0.012
	(0.007)	(0.014)	(0.011)
Health Satisf.$_{t-1}$	0.030***	0.097***	0.024***
	(0.003)	(0.006)	(0.005)
Hospitalization$_{t-1}$	0.011	0.028	0.001
	(0.017)	(0.032)	(0.021)
N	25718	25718	25718

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a within-system switch (*treatedw*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.5: Effect of a Between-System Switch on Health

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
$\text{treatedb}_{j=1}$	0.023	0.025	0.033
	(0.017)	(0.039)	(0.037)
$\text{treatedb}_{j=0}$	-0.017	-0.049	0.014
	(0.017)	(0.041)	(0.020)
$\text{treatedb}_{j=-1}$	0.044***	0.101***	0.046**
	(0.015)	(0.028)	(0.024)
$\text{treatedb}_{j=-2}$	-0.022	-0.022	-0.022
	(0.017)	(0.037)	(0.026)
$\text{treatedb}_{j=-3}$	0.011	0.091***	0.048*
	(0.016)	(0.032)	(0.025)
Log(Gross Labor Inc.)	0.028	0.043	-0.093**
	(0.025)	(0.062)	(0.047)
WTTR	-0.010**	-0.015	-0.004
	(0.004)	(0.009)	(0.005)
Male	0.023	0.045	0.017
	(0.019)	(0.046)	(0.024)
Age	-0.003***	-0.006**	-0.001
	(0.001)	(0.003)	(0.001)
Married	0.013	0.007	-0.012
	(0.024)	(0.047)	(0.022)
Children in HH	-0.027	-0.036	0.003
	(0.023)	(0.051)	(0.024)
Yrs. of Education	0.003	-0.008	0.003
	(0.003)	(0.008)	(0.005)
East Germany	-0.014	-0.009	-0.061**
	(0.024)	(0.066)	(0.028)
Full-Time Job	-0.008	-0.045	0.017
	(0.025)	(0.046)	(0.024)
$\text{No Health Worries}_{t-1}$	0.008	0.049	0.229***
	(0.014)	(0.034)	(0.024)
SAH_{t-1}	0.155***	0.168***	0.018
	(0.019)	(0.053)	(0.016)
$\text{Health Satisf.}_{t-1}$	0.015*	0.064***	-0.003
	(0.008)	(0.021)	(0.010)
$\text{Hospitalization}_{t-1}$	-0.073	-0.098	-0.092
	(0.050)	(0.079)	(0.061)
Constant	0.487**	0.041	1.017***
	(0.193)	(0.499)	(0.340)
N	7006	7006	7006

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** $p<0.01$; ** $p<0.5$; * $p<0.1$. Standard errors (in parentheses) clustered on individual level.

3.6.3 Sensitivity Analysis

Variation of Kernel Type and Bandwidth

In the main models, the most common kernel type and bandwidth are applied: the Epanechnikov kernel with a bandwidth of 0.02. Studies have shown that there are no serious issues regarding over- or undersmoothing present when using conventional bandwidth choice compared to optimization of bandwidth by approximation of the mean integrated squared error (Frölich, 2005). In order to make sure that results do not change, a greater bandwidth (0.04) is implemented. A comparison of results for the two different bandwidths for the within-system analysis are shown in Table 3.8. Analogously, for the between-system analysis, results are presented in Table 3.14. The coefficients of the leads and lags of the treatment indicators do not vary and remain robust in terms of signs, magnitude and significance.

Further, instead of implementing an Epanechnikov kernel, a biweight kernel is used, which also belongs to one of the most commonly used kernel types. Tables 3.9 and 3.15 show that varying the kernel type does not have a significant impact on the outcomes compared to the main models for both switch analyses. Hence, results remain robust after varying kernel type and bandwidth.

Time Effects

Even though the relevant health care reforms that may have an impact on the respective switch are accounted for by various sample restrictions and the inclusion of appropriate variables, there might still be potential time effects that could bias the results. In order to account for these, specific time frames are controlled for as a robustness check. The intervals are chosen such that at most one relevant regulatory change in the health care system is embedded in each time frame. Thus, the observation years 2001-2012 are grouped into four parts: (1) 2001-2003 (no reform), (2) 2004-2006 (Health Care Modernization Act of the SHI,

"GKV Gesundheitsmodernisierungsgesetz"), (3) 2007-2008 (Competition Reinforcement Law, "GKV Wettbewerbsstärkungsgesetz"), and (4) 2009-2012 (introduction of the Health Care Fund in the SHI and obligation to contract in the PHI). Tables 3.10 and 3.16 show that there are no significant effects of the respective time frames. The coefficients of the treatment indicators do not vary compared to the main models.

Outliers

The propensity scores of the within-system [between-system] analysis have a mean value of 0.03 [0.02] and range from 0.007 [0.0004] to 0.074 [0.18] (not shown here). To account for outliers, 2% of the two lowest and highest scores are excluded from the analysis as a robustness check[25]. In this case, the propensity scores range from 0.02 [0.002] to 0.05 [0.07] with its mean value still being at 0.03 [0.02]. Again, neither the main effects for within-, nor for between-system switches, change to a notable extent. However, for the SHI-to-SHI switch, the twice lagged treatment indicator for *No Health Worries* is now positive and significant, whereas in the main analyses, it was the three times lagged indicator. Nevertheless, the main interpretations remain the same: the anticipatory effect is still negative, whereas all of the contemporary effects are positive and indicate that shortly after a switch, individuals perceive their health better. In the longer run it may be that worries gradually go down.

Placebo Regression

In order to control whether economic or time trends drive the results, a placebo regression is applied. The respective treatment indicators are shifted such that no overlaps of the main regression are present, hence, the data is manipulated in a way so that it artificially generates an insurance switch three, four, five and

[25] Excluding 10%, as suggested by Crump et al. (2009), would reduce the sample size too strongly, hence, I only exclude the most critital outliers.

six years before the actual switch happened. Further, the years are chosen that the possibility of any anticipatory effects is ruled out, as no effects are assumed to arise more than two years before the switch actually takes place. As expected, none of the effects are significant (see Tables 3.13 and 3.19), which states that there are no significant effects due to confounding time or economic trends.

Contemporary Effects

Without applying a distributed lag model and thereby not taking into account the leads and lags of the respective treatment indicators, the baseline contemporary effects of the inner-system switch become slightly smaller, but still remain positive and significant. Regarding the SHI-to-PHI switch, the contemporary effects are still insignificant like in the main model.

Alternative Definition of the Control Group (Between-System Analysis)

As described in Section 3.4, the control group in the analysis of the between-system switch consists of individuals that have switched from one SHI to another SHI, whereas the treatment group includes those who switch from SHI to PHI. Hence, both groups contain switchers and the only difference is the insurance type they switch to. In this sensitivity analysis, the control group is defined such that it includes not only the SHI-to-SHI switchers, but also the non-switchers that are covered by the SHI. Therefore, the difference between control and treatment group is not only the insurance type they switch to, but is enhanced by the non-switchers which could then additionally reflect the switch-effect that arises in the short-run and not only the system-effect that emerges in the longer run. However, the coefficients do not vary to a notable extent. These findings state that for a switch from SHI to PHI, which can be considered as a major change in terms of status (not necessarily with respect to the content of the benefit package), it is not the short-run effect by the switch itself, but rather the system differences

between SHI and PHI and the potentially higher social status that individuals might associate with being privately insured, that drive the results and have an impact on health perception. Hence, no further effects arise after including also the SHI insured never-switchers and it can be stated that switch-effects only arise after an inner-system switch, and system- and quality-effects show up with a time lag in the longer run when switching from SHI to PHI.

Subsample Self-Employed (Between-System Analysis)

Self-employed individuals were excluded from the main analysis of the between-system switch, because they have the possibility to choose between the public and the private system, independent of their income. Therefore, selection issues may especially arise for these cases, as low-income and unhealthy self-employed tend to stay in the public system, whereas high-income and healthy self-employed choose the private system, due to the differences regarding premium calculation (income-related vs. risk-rated). Even though this issue is minimized by restricting the sample to those who have a gross labor income closely around the compulsory insurance threshold[26], self-employed could still have characteristics that are non-observable and significantly distinguish them from the remaining individuals. Referring to summary statistics, it is indeed the case that the self-employed who earn at least 1,500€ less than the compulsory insurance threshold are more likely to be publicy insured (not shown here), whereas the majority of those who earn more than that are more prone to be privately insured. Further, average health outcomes are slightly higher for the self-employed than for regular employees. Therefore, the analysis for the subsample of self-employed is conducted. Results are depicted in Table 3.21. Note that the control group consists of both, switchers from SHI to another SHI and also non-switchers who are covered by the SHI. The sample size reduces to roughly 3,400 observations. Now, only the contemporary effect for self-assessed health is still significant, whereas the

[26] At most 1,500€ below the compulsory threshold

leads and lags are insignificant. Hence, the outcomes for the subsample of self-employed individuals clearly differs from the results of the main analyis, which shows that there are some unobservable characteristics that would have biased the results if self-employed individuals had been left in the sample.

3.7 Conclusion

In this study, the effect of switching health insurances on perceived health was investigated. More specifically, by disentangling a switch from one public insurance company to another from a switch from public to private health insurance, the switch-effects can be distinguished from quality- and system-effects that arise due to the different schemes. As the catalog of benefits in the public system is regulated by law and therefore does not vary to a great extent across the public insurance companies, a within-system switch only entails minor before-after differences in terms of benefits and the general (insurance) status. Therefore, any effects on subjective health outcomes are attributed to the act of switching. Regarding the between-system switch, however, the change entails major before-after differences. Therefore, not only switch-effects, but also quality- and system-effects are expected to arise. Whereas the former should only be present in the short-run, the latter are more likely to show up in the longer run, when first experiences in the new system have been made.

The analysis is conducted within a broad empirical strategy, implementing Propensity Score Matching in combination with a distributed lag model, which then can be referred to as regression-adjusted matching (Bang and Robins, 2005). Regarding the within-system switch, it can be stated that short-run effects of the switch on perceived health are present. Shortly after the switch from one SHI to another, individuals rate their health better, are more satisfied with their health status and have less worries about their health. These effects are no longer significant in the

long run. For the between-system analysis, however, contemporary effects are not existent, whereas perceived health in later periods significantly improves.

Given the heated political and social debate about the two-tier system in the German health insurance market, this study provides new insights into the subjective evaluation of a change of insurance (companies and system) and the effects on perceived health. While previous studies have already shown that being covered by the PHI entails a better health status than being publicly insured, this study further takes into account the time structure and also considers short-run effects on subjective health outcomes that arise due to the process of switching. Not considering these factors would imply an overestimation of the positive impact of having PHI on health found by previous literature, as the incorporated and not disentangled switch-effect would then be falsely attributed to the quality differences between the systems. As the results do not show any short-run health effects after a between-system switch, however, the hypothesis of an overestimation cannot be confirmed.

To answer the question whether *change is good*, it can be stated that for minor before-after differences regarding the insurance status and the content of the insurances' benefit package (as in the within-system switch), a change entails significant and positive subjective health effects in the short-run, as a positive connotation can be linked to the change. For major before-after differences as in the case of a between-system switch, however, there are no short-run switch-effects. The effects of changing the insurance type on health outcomes arise with a time lag, as it takes some time until the advantages of being insured in the private system are experienced (e.g., shorter waiting times).

Therefore, the findings of this study emphasize the importance of considering the type and scope of a change (of insurance). System- and quality-effects arise in the longer run for major changes, whereas switch-effects emerge in the short-run in case of minor changes.

3.A Appendix

Table 3.6: Eligibility to purchase PHI: Income thresholds

Year	Compulsory Insurance Threshold		Contribution Ceiling	Max. Rate per Individual
	Amt. per Month	Amt. per Year	Amt. per Year	Amt. per Month
2001	3,336.17€	40,034€	40,034€	497,09€
2002	3,375.00€	40,500€	40,500€	502,88€
2003	3,825.00€	45,900€	41,400€	514,05€
2004	3,862.50€	46,350€	41,850€	519,64€
2005	3,900.00€	46,800€	42,300€	525,23€
2006	3,937.50€	47,250€	42,750€	530,81€
2007	3,975.00€	47,700€	42,750€	530,81€
2008	4,012.50€	48,150€	43,200€	536,40€
2009	4,050.00€	48,600€	44,100€	547,58€
2010	4,162.50€	49,950€	45,000€	558,75€
2011	4,125.00€	49,500€	44,550€	553,16€
2012	4,237.50€	50,850€	45,900€	569,93€
2013	4,350.00€	52,200€	47,250€	586,69€

Source: https://www.gbe-bund.de/gbe10/abrechnung.prc_abr_test_logon?p_uid=gast&p_aid=0&p_knoten=FID&p_sprache=D&p_suchstring=8862
Note: A contribution rate of 14.9% is applied for the calculation of the maximum rate per individual per month.

Table 3.7: Probit: Pr(treated) = 1

	(1) within-system switch	(2) between-system switch
Log(Gross Labor Inc.)	0.000	0.030***
	(0.002)	(0.004)
WTTR	0.002***	0.000
	(0.000)	(0.000)
Male	-0.008***	-0.002
	(0.002)	(0.002)
Age	-0.001***	-0.000***
	(0.000)	(0.000)
Married	0.005**	-0.003
	(0.002)	(0.003)
Children in HH	-0.002	-0.001
	(0.002)	(0.002)
Yrs. of Education	-0.001***	0.001**
	(0.000)	(0.000)
East Germany	0.004*	0.004
	(0.002)	(0.003)
Full-Time Job	0.008***	0.006
	(0.003)	(0.005)
No Health Worries$_{t-1}$	0.002	0.000
	(0.002)	(0.002)
SAH$_{t-1}$	-0.001	0.004*
	(0.002)	(0.002)
Health Satisf.$_{t-1}$	0.001	0.001
	(0.001)	(0.001)
Ins. Premium$_{t-1}$	0.007***	–
	(0.002)	
Hospitalization$_{t-1}$	0.001	0.001
	(0.004)	(0.005)
Constant	–	–
N	31174	8201

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Determinants of being a within-system switcher (column 1) or a between-system switcher (column 2), respectively. *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Robustness Checks: Within-system switch

Table 3.8: Robustness Check: Effect of a Within-System Switch on Health – Variation of Bandwidths

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
Epanechnikov 0.02:			
treatedw$_{j=1}$	-0.019*	0.011	-0.004
	(0.010)	(0.017)	(0.011)
treatedw$_{j=0}$	0.018**	0.027**	0.028***
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-1}$	0.000	0.001	0.005
	(0.007)	(0.014)	(0.009)
treatedw$_{j=-2}$	0.010	0.002	0.016
	(0.007)	(0.015)	(0.010)
treatedw$_{j=-3}$	0.009	0.001	0.018*
	(0.007)	(0.014)	(0.010)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
Epanechnikov 0.04:			
treatedw$_{j=1}$	-0.017*	0.012	-0.004
	(0.010)	(0.017)	(0.011)
treatedw$_{j=0}$	0.019**	0.028**	0.028***
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-1}$	0.001	0.002	0.005
	(0.007)	(0.014)	(0.009)
treatedw$_{j=-2}$	0.011	0.002	0.017
	(0.007)	(0.015)	(0.010)
treatedw$_{j=-3}$	0.008	-0.001	0.017*
	(0.007)	(0.014)	(0.010)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	25718	25718	25718

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a within-system switch (*treatedw*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.9: Robustness Check: Effect of a Within-System Switch on Health – Biweight Kernel

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
Biweight Kernel 0.02			
treatedw$_{j=1}$	-0.019*	0.012	-0.004
	(0.010)	(0.017)	(0.011)
treatedw$_{j=0}$	0.018**	0.027**	0.028***
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-1}$	-0.000	0.001	0.005
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-2}$	0.010	0.002	0.016
	(0.007)	(0.015)	(0.011)
treatedw$_{j=-3}$	0.009	0.002	0.019*
	(0.007)	(0.014)	(0.010)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
Biweight Kernel 0.04:			
treatedw$_{j=1}$	-0.017*	0.012	-0.004
	(0.010)	(0.017)	(0.011)
treatedw$_{j=0}$	0.019**	0.028**	0.028***
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-1}$	0.001	0.003	0.005
	(0.007)	(0.014)	(0.009)
treatedw$_{j=-2}$	0.011	0.002	0.017
	(0.007)	(0.015)	(0.010)
treatedw$_{j=-3}$	0.008	-0.001	0.017*
	(0.007)	(0.014)	(0.010)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	25718	25718	25718

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a within-system switch (*treatedw*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.10: Robustness Check: Effect of a Within-System Switch on Health – Including Time Frames

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
treatedw$_{j=1}$	-0.016	0.026	0.004
	(0.011)	(0.017)	(0.012)
treatedw$_{j=0}$	0.019***	0.028**	0.030***
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-1}$	0.004	0.004	0.004
	(0.008)	(0.014)	(0.010)
treatedw$_{j=-2}$	0.010	0.009	0.016
	(0.008)	(0.015)	(0.011)
treatedw$_{j=-3}$	0.014*	0.012	0.024**
	(0.007)	(0.014)	(0.010)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
Time Frames	Yes	Yes	Yes
N	25718	25718	25718

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a within-system switch (*treatedw*) on subjective health indicators. Timeframes are chosen such that in each interval, one relevant health care reform is included: timeframe1 = years 2001-2003, timeframe2 = years 2004-2006, timeframe3 = years 2007-2008, timeframe4 = years 2009-2013. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** $p<0.01$; ** $p<0.5$; * $p<0.1$. Standard errors (in parentheses) clustered on individual level.

Table 3.11: Robustness Check: Effect of a Within-System Switch on Health – 2% of Lowest and highest Propensity Scores Excluded

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
treatedw$_{j=1}$	-0.019*	0.010	-0.008
	(0.010)	(0.017)	(0.012)
treatedw$_{j=0}$	0.018**	0.026*	0.026***
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-1}$	0.000	0.002	0.006
	(0.007)	(0.014)	(0.010)
treatedw$_{j=-2}$	0.011	0.003	0.018*
	(0.008)	(0.015)	(0.011)
treatedw$_{j=-3}$	0.007	-0.002	0.015
	(0.008)	(0.015)	(0.010)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	24523	24523	24523

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a within-system switch (*treatedw*) on subjective health indicators, excluding observations with lowest and highest 2% of propensity scores. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.12: Robustness Check: Effect of a Within-System Switch on Health – Contemporary Effects only

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
treatedw$_{j=0}$	0.014**	0.022*	0.022**
	(0.007)	(0.013)	(0.009)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	30981	30981	30981

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Contemporary effect of a within-system switch on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.13: Robustness Check: Effect of a Within-System Switch on Health – Placebo Regression

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
Placebo Within-Switch$_{j=-6}$	-0.009	-0.031	-0.025
	(0.016)	(0.033)	(0.024)
Placebo Within-Switch$_{j=-5}$	0.013	0.032	-0.017
	(0.017)	(0.032)	(0.021)
Placebo Within-Switch$_{j=-4}$	-0.019	-0.046	-0.015
	(0.017)	(0.031)	(0.020)
Placebo Within-Switch$_{j=-3}$	-0.000	-0.001	-0.006
	(0.016)	(0.029)	(0.020)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	7903	7903	7903

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Placebo effect of leads and lags of a within-system switch (*treatedw*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Robustness Checks: Between-system switch

Table 3.14: Robustness Check: Effect of a between-system switch on Health – Variation of Bandwidths

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
Epanechnikov 0.02:			
$\text{treatedb}_{j=1}$	0.023	0.025	0.033
	(0.017)	(0.039)	(0.037)
$\text{treatedb}_{j=0}$	-0.017	-0.049	0.014
	(0.017)	(0.041)	(0.020)
$\text{treatedb}_{j=-1}$	0.044***	0.101***	0.046**
	(0.015)	(0.028)	(0.024)
$\text{treatedb}_{j=-2}$	-0.022	-0.022	-0.022
	(0.017)	(0.037)	(0.026)
$\text{treatedb}_{j=-3}$	0.011	0.091***	0.048*
	(0.016)	(0.032)	(0.025)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
Epanechnikov 0.04:			
$\text{treatedb}_{j=1}$	0.016	0.037	0.032
	(0.019)	(0.039)	(0.031)
$\text{treatedb}_{j=0}$	-0.020	-0.043	0.024
	(0.018)	(0.041)	(0.020)
$\text{treatedb}_{j=-1}$	0.043***	0.096***	0.043*
	(0.014)	(0.027)	(0.024)
$\text{treatedb}_{j=-2}$	-0.022	-0.009	-0.007
	(0.017)	(0.034)	(0.025)
$\text{treatedb}_{j=-3}$	0.008	0.087***	0.028
	(0.016)	(0.033)	(0.026)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	7011	7011	7011

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** $p<0.01$; ** $p<0.5$; * $p<0.1$. Standard errors (in parentheses) clustered on individual level.

Table 3.15: Robustness Check: Effect of a between-system switch on Health – Biweight Kernel

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
Biweight 0.02:			
$\text{treatedb}_{j=1}$	0.023	0.023	0.031
	(0.017)	(0.038)	(0.039)
$\text{treatedb}_{j=0}$	-0.017	-0.051	0.011
	(0.017)	(0.041)	(0.020)
$\text{treatedb}_{j=-1}$	0.042***	0.101***	0.046*
	(0.015)	(0.028)	(0.023)
$\text{treatedb}_{j=-2}$	-0.022	-0.026	-0.025
	(0.017)	(0.038)	(0.027)
$\text{treatedb}_{j=-3}$	0.011	0.088***	0.051**
	(0.016)	(0.031)	(0.024)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
Biweight 0.04:			
$\text{treatedb}_{j=1}$	0.018	0.036	0.031
	(0.019)	(0.039)	(0.033)
$\text{treatedb}_{j=0}$	-0.019	-0.044	0.022
	(0.018)	(0.041)	(0.020)
$\text{treatedb}_{j=-1}$	0.045***	0.099***	0.046*
	(0.014)	(0.027)	(0.024)
$\text{treatedb}_{j=-2}$	-0.022	-0.011	-0.010
	(0.017)	(0.035)	(0.025)
$\text{treatedb}_{j=-3}$	0.009	0.090***	0.033
	(0.016)	(0.033)	(0.026)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	7011	7011	7011

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** $p<0.01$; ** $p<0.5$; * $p<0.1$. Standard errors (in parentheses) clustered on individual level.

Table 3.16: Robustness Check: Effect of a Between-System Switch on Health – Including Time Frames

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
treatedb$_{j=1}$	0.015	0.022	0.015
	(0.019)	(0.043)	(0.037)
treatedb$_{j=0}$	-0.018	-0.047	0.010
	(0.017)	(0.042)	(0.020)
treatedb$_{j=-1}$	0.035**	0.106***	0.023
	(0.016)	(0.029)	(0.029)
treatedb$_{j=-2}$	-0.015	0.013	-0.009
	(0.017)	(0.037)	(0.024)
treatedb$_{j=-3}$	0.007	0.074**	0.036
	(0.015)	(0.033)	(0.025)
reform1	–	–	–
reform2	0.003	-0.035	-0.019
	(0.021)	(0.044)	(0.024)
reform3	–	–	–
reform4	0.005	-0.023	-0.024
	(0.023)	(0.056)	(0.027)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	7004	7004	7004

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators. Timeframes are chosen such that in each interval, one relevant health care reform is included: timeframe1 = years 2001-2003, timeframe2 = years 2004-2006, timeframe3 = years 2007-2008, timeframe4 = years 2009-2013. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** $p<0.01$; ** $p<0.5$; * $p<0.1$. Standard errors (in parentheses) clustered on individual level.

Table 3.17: Robustness Check: Effect of a Between-System Switch on Health – 2% of Lowest and highest Propensity Scores Excluded

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
$\text{treatedb}_{j=1}$	0.024	0.038	0.062**
	(0.019)	(0.044)	(0.025)
$\text{treatedb}_{j=0}$	-0.022	-0.037	0.024
	(0.018)	(0.042)	(0.020)
$\text{treatedb}_{j=-1}$	0.041**	0.088***	0.016
	(0.016)	(0.029)	(0.022)
$\text{treatedb}_{j=-2}$	-0.027	-0.008	-0.041
	(0.019)	(0.039)	(0.028)
$\text{treatedb}_{j=-3}$	0.003	0.081**	0.028
	(0.018)	(0.036)	(0.026)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	6686	6686	6686

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators, excluding observations with lowest and highest 2% of propensity scores. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.18: Robustness Check: Effect of a Between-System Switch on Health – contemporary effect

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
$\text{treatedb}_{j=0}$	-0.013	-0.037	0.019
	(0.015)	(0.034)	(0.019)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	8134	8134	8134

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Contemporary effect of a between-system switch on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.19: Robustness Check: Effect of a Between-System Switch on Health – Placebo Regression

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
Placebo Between-Switch$_{j=-6}$	0.001	-0.022	0.102
	(0.072)	(0.146)	(0.066)
Placebo Between-Switch$_{j=-5}$	0.026	0.020	0.077
	(0.045)	(0.096)	(0.048)
Placebo Between-Switch$_{j=-4}$	-0.027	0.039	-0.039
	(0.045)	(0.113)	(0.063)
Placebo Between-Switch$_{j=-3}$	-0.013	-0.003	-0.006
	(0.038)	(0.091)	(0.047)
Controls	Yes	Yes	Yes
N	2479	2479	2479

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Placebo effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.20: Robustness Check: Effect of a Between-System Switch on Health – Variation of the Control Group

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
treatedb_rob$_{j=1}$	0.014	0.041	0.029
	(0.019)	(0.040)	(0.032)
treatedb_rob$_{j=0}$	-0.018	-0.040	0.023
	(0.018)	(0.041)	(0.020)
treatedb_rob$_{j=-1}$	0.039***	0.096***	0.029
	(0.014)	(0.025)	(0.022)
treatedb_rob$_{j=-2}$	-0.023	-0.005	-0.013
	(0.016)	(0.031)	(0.025)
treatedb_rob$_{j=-3}$	0.005	0.080***	0.021
	(0.016)	(0.030)	(0.025)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	16170	16170	16170

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators. Control group includes both, within-system switchers and SHI insured never-switchers. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 3.21: Robustness Check: Effect of a Between-System Switch on Health – Subsample of Self-Employed Individuals

	(1) SAH	(2) Health Satisf.	(3) No Health Worries
treatedb_rob$_{j=1}$	0.039	0.056	-0.014
	(0.025)	(0.040)	(0.071)
treatedb_rob$_{j=0}$	0.031*	0.045	0.001
	(0.016)	(0.035)	(0.023)
treatedb_rob$_{j=-1}$	0.014	0.033	-0.026
	(0.017)	(0.036)	(0.028)
treatedb_rob$_{j=-2}$	0.018	0.040	0.020
	(0.014)	(0.032)	(0.022)
treatedb_rob$_{j=-3}$	-0.005	-0.003	0.004
	(0.017)	(0.034)	(0.025)
Controls	Yes	Yes	Yes
Lagged Health	Yes	Yes	Yes
N	3461	3461	3461

Note: Authors' calculations based on the SOEP, waves 2001-2012. Marginal effects displayed. Effect of leads and lags of a between-system switch (*treatedb*) on subjective health indicators for the subsample including only self-employed individuals. *SAH* (self-assessed health) coded from 1 (bad) to 5 (very good); *Health Satisf.* coded from 1 (completely dissatisfied) to 5 (completely satisfied); *No Worries* (about own health) coded from 1 (very concerned) to 3 (not concerned at all). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Chapter 4

Because Change Happens - the Effect of Health Shocks on Supplementary Health Insurance Demand*

4.1 Introduction

The key identifying feature of the German health insurance system is its two-tier system. Enrollment in the statutory health insurance (SHI) is obligatory and if certain criteria are fulfilled, one may opt out of the public system and join the private health insurance (PHI). Roughly 90% of the German population is enrolled in the SHI. Ongoing debates criticize quality differences between the two systems. The study of Lüngen et al. (2008) gives evidence for shorter waiting times or better treatments for PHI patients. However, one possibility to receive certain specific benefits of the PHI as a SHI member would be to purchase *additional* private health insurance. This is feasible for all members and does not depend on specific criteria. In 2014, 17.89% of the SHI members purchased additional insurance, which, for instance, can include hospital treatments by the head

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physician or a private room instead of a shared room[1]. The aim of this study is to analyze the demand for additional health insurance. More specifically, I want to investigate if and to what extent prior health shocks might alter an individual's future behavior regarding the consumption of more or better insurance coverage in addition to the already held basic contract. Health shocks can be described as a serious and sudden deterioration of one's health status and according to Riphahn (1999) is defined as a decline of the particular health variable by at least one standard deviation from one period to the next.

Literature shows that unforeseen health events can change individuals' attitudes towards various facets of life. A large strand of literature focuses on labor market outcomes after a health shock. For instance, Datta Gupta et al. (2011) investigate the effect on labor force participation in the U.S. and Denmark. Their findings suggest that U.S. individuals are less likely to return to work than Danish individuals after a health shock. García-Gómez (2011) analyzes the European market and find for each of the 9 chosen countries that the probability to go back to work is decreasing after a health shock and the probability to attain disability status increases. Both effects vary across countries in terms of magnitude. Moreover, working hours may also be affected by health shocks as shown by Cai et al. (2014) for the Australian market: the number of working hours decreases significantly when health status deteriorates and health shocks occur, respectively. Regarding labor supply, Duncan et al. (2013) show that with less support by the Australian Disability Support Pension, the probability of labor supply of single mothers is higher after a health shock. Using Swedish data, Lundborg et al. (2011) find socioeconomic heterogeneity in the causal effect of health shocks on earnings and state that lower educated individuals are hit harder by a health shock and that this effect is strongest for middle- and old-aged individuals.

[1]http://de.statista.com/statistik/daten/studie/170900/umfrage/abschluss-privater-zusatzversicherung

Another strand of literature looks at the effect of health shocks on early retirement decisions. Au et al. (2005) use the Canadian National Population Health Survey (NPHS) and come to the conclusion that health shocks are negatively related to employment decisions and positively related to early retirement. These findings are in line with the analysis by Disney et al. (2006) and Jones et al. (2010), who look at the British market using the British Household Panel Survey (BHPS), and the analysis by Hagan et al. (2008) who investigate the European market using the European Community Household Panel (ECHP).

Further, consumption and savings behavior are also influenced by the experience of health shocks (Davies, 2010; Islam and Maitra, 2012; Mohanan and Maselko, 2010). Davies (2010) analyzes Malawian data, the Complimentary Panel Survey (CPS), and finds that the level of consumption is negatively affected by health shocks in the short-run, but the effect vanishes in the long-run. Islam and Maitra (2012) use household panel data provided by the Bangladesh Institute for Development Studies (BIDS) and their results show that after a health shock, households tend to sell their livestock in order to compensate the sudden and unexpected expenditures, which poses a burden in the long-run. However, having access to some kind of insurance, in this case in form of a microcredit, individuals can handle the situation better and do not incur long-term detriments. A positive relationship between health shocks and increasing debt has also been found by Mohanan and Maselko (2010), who analyzed survey data that was conducted by the Center of Population Dynamics in India. They use bus accidents as exogenous health shocks and therefore additionally apply data on bus accidents provided by the Central Office of the KSRTC in Bangalore. Bíró (2013) – using data of the Survey of Health, Ageing and Retirement in Europe (SHARE) – illustrates that consumption expenditures increase if subjective mortality hazard increases and Karagiannaki (2009) gives evidence that precautionary savings increase after a health shock using the BHPS and the English Longitudinal Study of Ageing

(ELSA). Hence, the latter outcomes may imply that individuals seek for more security by covering potential future needs in advance. This goes in line with the theory of demand for insurance and the underlying expected utility theory, and aims at "trading" an uncertain great loss for a certain small loss (Friedman and Savage, 1948; Arrow, 1963; Newhouse, 1978). Therefore – linking this to the occurrence of a health shock – the need for additional insurance could be triggered by the increasing awareness of health incidents in the future, if the individual has already experienced one. The willingness to take precautionary actions in order to minimize the potential threat of facing high health expenditures and/or lower care quality in absence of supplementary insurance increases.

Regarding the interplay of health shocks and insurance coverage, literature is scarce and rather deals with the subject of being insured or not and the consequence thereafter (see for instance Anderson et al., 2012; Hadley, 2007). Zhao (2015) provides a theoretical model that deals with the effects of health shocks on the demand for health insurance. He constitutes that the demand for (actuarially fair) health insurance decreases after a health shock - under the assumption that the shock increases health expenditures and decreases longevity at the same time.

For the German market, there is one empirical study by Grunow and Nuscheler (2014) that looks at the relationship between health shocks and insurance. They find that a health shock increases the probability of switching from the private health insurance system to the public one.

Since insurance demand is also driven by one's risk attitude, the issues of moral hazard and adverse selection may arise. Bolhaar et al. (2008) analyze the existence of moral hazard and advantageous or adverse selection on the Irish market for supplementary insurance and find no evidence for moral hazard, but strong evidence for advantageous selection. Keane and Stavrunova (2014) study the U.S. market for additional insurance (Medigap) and find contrary results. For Germany, Schmitz (2011) investigates the relationship between risk aversion and

supplementary insurance demand using the GSOEP and finds advantageous selection: risk-averse men are more likely to purchase additional private health insurance, but are less likely to incur a hospital stay thereafter.

The effect of *health shocks* on *supplementary* insurance demand in Germany has not been analyzed yet (to the best of my knowledge). Hence, in this study I estimate the probability of purchasing additional insurance after the incidence of a health shock. A further contribution is to differentiate between emotional and physical shocks. While the outcome of the latter may be clearer, as it can be regarded to as a "direct" effect after suffering physical pain, the former might be more of a "indirect" effect, for instance evoked by grief due to death of a close family member, which in turn raises the awareness of health issues. It is crucial to investigate whether emotional shocks, too, affect the demand for insurance and health care respectively, and to what extent. Even though both, physical and emotional shocks are analyzed, the focus of this paper is on the latter. Further, by taking into account individuals' willingness to take risks, this study sheds light on whether adverse or advantageous selection prevails on the German market for supplementary health insurance.

4.2 The German Health Insurance System

The health insurance system in Germany consists of two schemes: (1) the public and (2) the private insurance. Enrollment is mandatory, however, the private system only accepts clients for the full coverage scheme that fulfill certain restrictions such as exceeding a certain income threshold or being a civil servant or

self-employed[2]. Further, in order to be a suitable candidate for the PHI, specific health check-ups are required and the PHI can reject enrollment if certain health criteria are not met. Therefore, those who are covered by the PHI are in better health conditions (due to selection) and for this reason are not part of this analysis. Major differences between these two systems are, for instance, the premium calculation (income-based vs. risk-based), the reimbursement system (in-kind vs. in-cash provision), or the content of coverage (universal vs. individual), which have been subject to many debates and research studies regarding quality differences and preferential treatment of privately insured patients (see Lüngen et al., 2008). This study, however, deals with the special case of holding public insurance but simultaneously adding components of the private system to one's insurance scheme. All SHI patients can purchase specific components of the private system without the necessity of meeting the requirements of the private system in general. These additional components contain, for instance, coverage of the daily hospital allowance, hospital treatment by the head physician or being put in a single-room instead of a shared multi-bed room [3]. The price varies among different insurance companies and usually only depends on the individual's age. However, one's medical history (specified by the individual him-/herself) could also be taken into account, and companies can charge a higher premium in case of pre-existing conditions. The data used in this study also provides information on the exact content of supplementary coverage (see Section 4.3).

[2]The Health Care Reform of 2007 constitutes an obligation to contract for insurance companies. This regulation was enforced since April 2007 for the SHI, and since July 2007, everyone who fulfills the necessary criteria has the right to join the PHI. Further, since 2009, a basic tariff has to be offered for individuals that do not meet the criteria for full coverage in the PHI. Prior health checks are not allowed, so every individual can enroll. However, the basic tariff of the PHI does not provide the same benefits as the standard tariff. It offers comparable services as in the SHI, but to a much higher cost. Therefore, only individuals who (for specific reasons) cannot be covered by the SHI anymore, are attracted by the basic tariff.

[3]http://www.pkv.de/themen/krankenversicherung/zusatzversicherung/.

4.3 Data and Descriptive Statistics

The data source for the analysis is the German Socio-Economic Panel (GSOEP)[4], using waves 2000 to 2012[5]. I exclude privately insured individuals and the small fraction that is uninsured, since these may generally differ from publicly insured beforehand regarding socioeconomic status and hence, preferences and necessity of additional private insurance benefits. Civil servants and self-employed individuals are also excluded. In order to make sure that individuals hold their own insurance contract and are not covered by family insurance, the sample includes employed individuals between 25 and 60 years of age. Further, as mentioned above, the supplementary insurance contract can be broken down into several coverage components. The major ones are (1) hospital stay, (2) dentures, (3) corrective devices, and (4) coverage abroad. To ensure plausibility that the potentially increasing demand can be attributed to a health shock, cases are excluded where individuals hold/purchase additional coverage containing *only* (2), (3), and/or (4). Therefore, if an effect is found, it means that a health shock leads to a higher probability of purchasing additional private insurance which – in any case – includes better coverage for hospital procedures.

The dependent variable is given by an indicator whether a supplementary insurance contract exists in time t[6]. The control variables of interest are indicators for the occurrence of an emotional or physical health shock. An emotional health shock (EHS) is defined as a deterioration of one of the following variables from time $t-1$ to t by at least one standard deviation (following Riphahn, 1999): (a) self-assessed health[7], (b) satisfaction with health[8] , and (c) life satisfaction[9].

[4] Data are extracted using PanelWhiz (Haisken-DeNew and Hahn, 2010).
[5] Year 2009 is excluded from the analysis, because the question for additional insurance is not asked for in this wave.
[6] "Do you have supplementary health insurance? (Yes/No)".
[7] "How would you describe your current health? (1 very bad - 5 very good)".
[8] "How satisfied are you with your health? (1 completely dissatisfied - 10 completely satisfied)"
[9] "How satisfied are you with your life, all things considered? (1 completely dissatisfied - 10 completely satisfied)".

A physical health shock (PHS) is given when (a) hospital stays[10], or (b) number of nights spent in hospital[11], or (c) sickness absence of more than 6 weeks[12] worsen by at least one standard deviation from time $t-1$ to t. Hence, in order to reduce potential bias due to unobserved individual characteristics that is associated with a certain health level, health shocks are defined as significant changes of the respective health variables and not as a simple deterioration below a specific benchmark (see Westermaier et al., 2013). Both kinds of shocks are accounted for, plus an interaction term (EHS*PHS) for assessing the relevance and magnitude of each shock, if both occur simultaneously.

General explanatory variables are: age, age^2, log(gross labor income), gender, marital status, an indicator for having children, years of education, an indicator for living in East Germany, and the willingness to take risks[13]. Year fixed effects are included in each model. Various restrictions are added to the models: Restriction 1 confines the sample to only those individuals who did not experience a health shock for at least three years before the first shock. Restriction 2 ensures that after the indicator for having supplementary insurance turns from 0 to 1, the individual is no longer observed[14]. The preferred specification contains both Restrictions, 1 and 2. In addition, specifications without any and including only one of the two restrictions are estimated and displayed in the Appendix.

The full sample without the above mentioned restrictions consists of 85,526 person-year observations. Table 4.1 shows that on average, 14% of all individuals have purchased supplementary private health insurance. The probability to experience an emotional health shock amounts to 26%. Physical health shocks occur less often and are experienced by 8% of the sample. All health indicators are

[10] "Were you admitted to a hospital for at least one night [in the previous year]? (Yes/No)"
[11] "How many nights total did you spend in the hospital last year?".
[12] "Were you on sick leave from work for more than 6 weeks at one time last year? (Once/Several Times/No)"
[13] "Would you describe yourself as someone who tries to avoid risks (risk-averse) or as someone who is willing to take risks (risk-prone)? (0 risk averse - 10 risk-prone)".
[14] This case is excluded, since an insurance status turning from 1 to 0 should not be considered.

above their respective median value. Household net income amounts to €2,837 on average[15]. The gender distribution in the sample is exactly equal. The average age is about 42 years. 68% of all are married and almost half of the sample have children living in the household. Educational status is 7 years at least and 18 years at most with an average of 12 years. 24% of the observed individuals are living in East Germany. The overall willingness to take risks is rather neutral with an average of 4.65 on a scale from 0 (risk-averse) to 10 (risk-prone).

In Table 4.2, I compare the samples after including each of the two restrictions separately in columns (1) and (2), and finally including all of the restrictions in the last column, which corresponds to the final sample for the main analysis. Including only Restriction (1) that no health shocks should have occurred three years before the first one, the mean value of those buying additional insurance is 11%. With Restriction (2) that individuals are no longer observed after the purchase of insurance, the likelihood of having additional insurance is per definition lower than in the sample without restrictions and amounts to 4%. Accounting for both restrictions, 3% of the final sample purchases additional health insurance. The likelihood of having an emotional health shock is higher than having a physical one throughout all restrictions and amounts to 18% (EHS) and 6% (PHS) in the final sample. 2% of the individuals experience both kinds of shocks. The health indicators are still well above the median and the remaining explanatory variables do not differ from the sample without restrictions throughout the specifications, either. The sample size, however, reduces to 34,166 observations including Restriction (1), 69,968 including Restriction (2), and 28,867 including both (1) and (2).

Finally, Table 4.6 in the Appendix shows descriptive statistics including all restrictions for various subgroups: (1) those who have additional insurance, regardless of the occurrence of health shocks (AI1), (2) those who never purchase additional

[15]Smallest and largest percentiles are excluded from the sample to account for outliers.

insurance (AI0), (3) those who have experienced at least one emotional shock, but no physical shock, regardless of supplementary insurance status (EHS1PHS0), (4) those who never had an emotional health shock, but at least one physical shock (EHS0PHS1), (5) those who experience both kinds of shocks at least once (EHS1PHS1), and (6) those who never had a health shock (EHS0PHS0). Column (1) shows that among those who have additional insurance, 27% (8%) have experienced an EHS (PHS) at some point, and 3% have experienced both kinds of shocks. For the subsample that has never owned an additional insurance contract (column (2)), the incidence of shocks is lower in all cases. Among those who have had at least one EHS, but no PHS, the likelihood of having additional insurance is 4% (column (3)) and 5% for the sample that has experienced at least one PHS, but no EHS. 1% of those who had both, EHS and PHS, and 6% of those who never had either kind of shock, hold additional insurance, which seems counterintuitive, but is actually due to the restrictions of the sample (those who had a shock are only observed up to that particular period).

Life satisfaction and the subjective health indicators do not vary to a great extent across all subgroups, however, the lowest value in all cases is reached for those who had both kinds of shocks. The number and incidence of hospital stay and sickness absence is higher for additional insurance owners, and seems to prevail especially when a PHS has occurred: for instance, if only a PHS was experienced, the average probability of having a hospital stay is 17%, whereas it only amounts to 1% in case of an EHS. The likelihood of a sickness absence of more than six weeks is also higher for individuals that experienced a PHS (8%) rather than a EHS (1%). This is plausible, since hospital stays and sickness absence are more common if one is physically injured (e.g. broken leg). As expected, those who have additional private insurance have a higher household net income. The statistics of the remaining explanatory variables are quite similar across all subsamples.

Table 4.1: Descriptive Statistics I: Full Sample, No Restrictions

	N	Mean	Std. Dev.	Min	Max
Add. Private Health Insurance	85526	0.14	0.35	0	1
EHS	85526	0.26	0.44	0	1
PHS	85526	0.08	0.26	0	1
EHS*PHS	85526	0.03	0.17	0	1
Life Satisfaction	85526	7.08	1.62	0	10
Satisfaction w/ Health	85526	6.94	1.98	0	10
Self-Assessed Health	85526	3.54	0.84	1	5
Hospital Stay Last Yr. (Yes/No)	85526	0.09	0.29	0	1
# of Hospital Stays Last Yr.	85526	0.90	5.00	0	280
Out Sick $>$ 6 Wks. Last Yr.	85526	0.05	0.22	0	1
HH Net Income	85526	2837.15	1248.95	1000	9000
Log(HH Net Income)	85526	7.86	0.42	7	9
Male	85526	0.50	0.50	0	1
Age	85526	42.49	9.35	25	60
Age^2	85526	1892.94	798.59	625	3600
Married	85526	0.68	0.46	0	1
Children in HH (Yes/No)	85526	0.44	0.50	0	1
Years of Educ.	85526	12.30	2.50	7	18
East Germany	85526	0.24	0.43	0	1
Willingness to Take Risks	85526	4.65	2.24	0	10

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. Descriptive Statistics of full sample without including any restrictions. *Emotional Shock (EHS)* $= 1$ if SAH or Life Satisfaction or Satisfaction with Health deteriorates by at least 1 SD from t-1 to t. *Physical Shock (PHS)* $= 1$ if hospital stays or sickness absence of more than 6 weeks deteriorates by at least 1 SD from t-1 to t.

Table 4.2: Descriptive Statistics II: Comparison of Means across various Restrictions

	(1) Restr. 1 mean/sd	(2) Restr. 2 mean/sd	(3) Restr. 1+2 mean/sd
Add. Private Health Insurance	0.11	0.04	0.03
	(0.31)	(0.19)	(0.18)
EHS	0.20	0.26	0.18
	(0.40)	(0.44)	(0.38)
PHS	0.07	0.07	0.06
	(0.25)	(0.26)	(0.24)
EHS*PHS	0.02	0.03	0.02
	(0.14)	(0.16)	(0.13)
Life Satisfaction	7.22	7.06	7.22
	(1.48)	(1.62)	(1.48)
Satisfaction w/ Health	7.17	6.95	7.18
	(1.83)	(1.98)	(1.83)
Self-Assessed Health	3.63	3.55	3.64
	(0.78)	(0.84)	(0.78)
Hospital Stay Last Yr. (Yes/No)	0.08	0.09	0.08
	(0.27)	(0.28)	(0.27)
# of Hospital Stays Last Yr.	0.74	0.89	0.74
	(4.52)	(5.08)	(4.64)
Out Sick $>$ 6 Wks. Last Yr.	0.04	0.05	0.04
	(0.20)	(0.22)	(0.20)
HH Net Income	2878.75	2745.60	2802.05
	(1251.73)	(1180.88)	(1191.58)
Log(HH Net Income)	7.88	7.83	7.86
	(0.41)	(0.41)	(0.41)
Male	0.52	0.50	0.52
	(0.50)	(0.50)	(0.50)
Age	42.21	42.31	42.05
	(9.26)	(9.38)	(9.30)
Age^2	1867.27	1878.02	1854.39
	(788.51)	(799.27)	(790.32)
Married	0.69	0.68	0.69
	(0.46)	(0.46)	(0.46)
Children in HH (Yes/No)	0.44	0.45	0.44
	(0.50)	(0.50)	(0.50)
Years of Educ.	12.45	12.17	12.33
	(2.53)	(2.46)	(2.49)
East Germany	0.26	0.25	0.26
	(0.44)	(0.43)	(0.44)
Willingness to Take Risks	4.65	4.62	4.63
	(2.21)	(2.26)	(2.22)
N	34166	69968	28867

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. *Emotional Shock (EHS)* $= 1$ if SAH or Life Satisfaction or Satisfaction with Health deteriorates by at least 1 SD from t-1 to t. *Physical Shock (PHS)* $= 1$ if hospital stays or sickness absence of more than 6 weeks deteriorates by at least 1 SD from t-1 to t. Column (1) shows mean values of variables including Restriction 1: no emotional shock within three years before the 1st shock, (2) includes Restriction 2: individual is dropped after insurance status changed from 0 to 1 (if insurance bought), and (3) includes both Restrictions, 1 and 2.

4.4 Methods

4.4.1 OLS Fixed Effects

In a first step, an OLS FE model is estimated, accounting for individual-specific time-invariant effects:

$$\begin{aligned}\text{Add.Insurance}_{it} =& \beta_0 + \beta_1 \text{EHS}_{it-1} + \beta_2 \text{PHS}_{it-1} + \beta_3 \text{EHS*PHS}_{it-1} \\ &+ \beta X'_{it} + \lambda_t + \alpha_i + \epsilon_{it}\end{aligned} \tag{4.1}$$

where the dependent variable indicates whether or not additional insurance is purchased at time t, conditional on whether or not an emotional health shock (EHS) and/or a physical health shock (PHS) occurred in $t-1$. $\mathbf{X}$ is a vector containing further explanatory variables: (log) household net income, age, age squared, marital status, children in household, years of education, an indicator for living in East Germany, and the willingness to take risks. α_i accounts for individual-specific characteristics. Year fixed effects are also included in the model (λ_t). The error term is given by ϵ_{it}.

4.4.2 Discrete Time Hazard Model (DTHM)

In order to estimate a DTHM, the relevant time span of the analysis and various model specific variables need to be specified. First, the success variable of interest in this case is the purchase of supplementary insurance. Hence, a success is defined when individual i switches her additional insurance status from 0 to 1. Therefore, the individual is no longer observed after she switched her status to 1. Individuals that already hold additional insurance at the first survey are not included in the model. Further, the time at risk is defined by the time span starting either in year 2000 (if the individuals' entry to the survey was before 2000) or the respective entry year if entry is later than year 2000, and ending at the time when supplementary insurance is bought or at the end of the last survey in year

2012, if no insurance has been bought (see Figure 4.1 below for visualization). Hence, time-at-risk-dummies are included in the model (τ_{it} in equation 4.2). The treatment variables are the occurrence of an EHS and/or PHS. The control group includes individuals that have never experienced the respective shock.

The overall time span of the analysis needs to be specified as well. Hence, the relevant years after an EHS and/or PHS happened until additional insurance is purchased need to be defined. Further, it should not be regarded as relevant, if an individual concludes an insurance contract many years after a health shock happened, because the effects are most likely not to be attributed to the shock anymore. Therefore, for the main analyses, I set the time span to a maximum of two years[16].

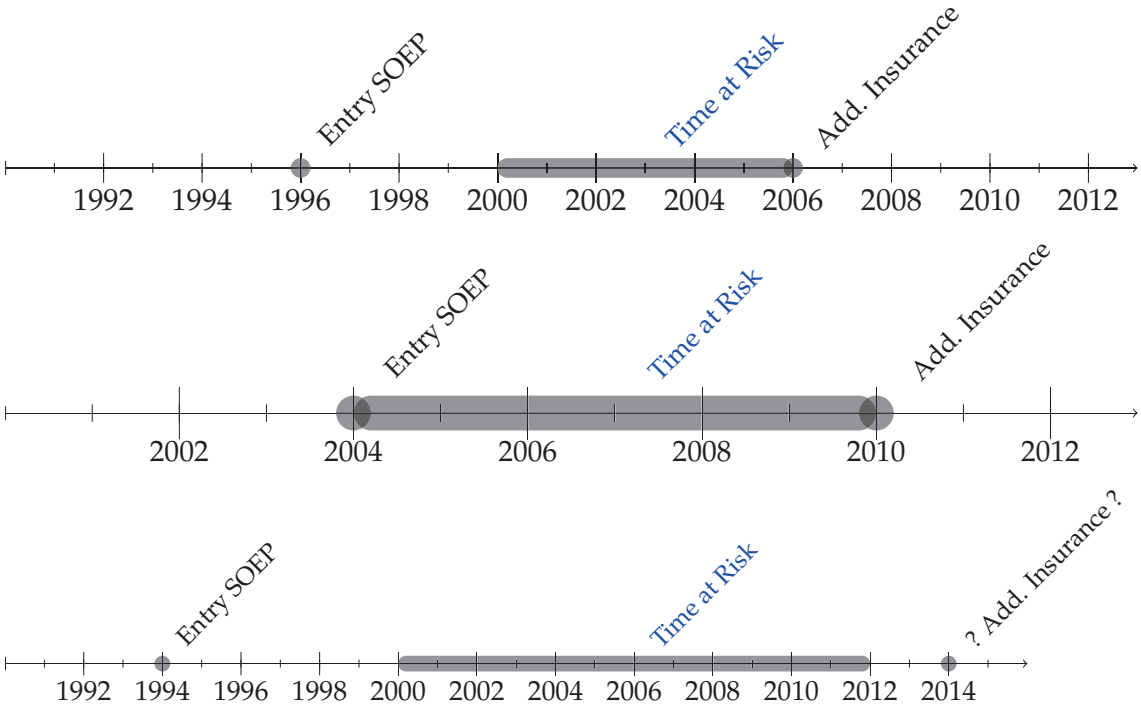
The estimated equation of the DTHM looks as follows:

$$\begin{aligned}\Pr(\text{Add.Insurance} = 1)_{it} =& \alpha_0 + \alpha_1 \text{EHS}_{it-1} + \alpha_2 \text{PHS}_{it-1} + \alpha_3 \text{EHS*PHS}_{it-1} \\ &+ \alpha X'_{it} + \lambda_t + \tau_{it} + u_{it}\end{aligned} \tag{4.2}$$

where the dependent variable denotes the probability of purchasing supplementary insurance. The treatment variables EHS and PHS and their interaction term are as described in the OLS FE model. The same holds for the explanatory variables comprised of the vector $\mathbf{X'}$. Year fixed effects are given by λ_t, time-at-risk-dummies are given by τ_{it} and u_{it} stands for the error term. Analogously to the OLS estimations, the two restrictions are also successively added to the model. Note that in the DTHM, Restriction 2 is binding and needs to be included in all cases. Hence, the estimations can only have two possible specifications: only including Restriction 2 or including both restrictions.

[16]Including those for whom this time span contains a missing value, since these are individuals who either never purchase additional insurance or individuals who never experience the respective health shock.

Figure 4.1: Time at Risk



4.5 Results

4.5.1 Main Models

Table 4.3 displays the main results of both preferred specifications, OLS FE and DTH models, including all restrictions as mentioned above. The number of observations amounts to 28,867 person-year observations. Note that the time span that is taken into account after a health shock occurred is set to two years. The reason for that is that an effect on insurance demand many years after a health shock seems to be unlikely to be attributed to that shock. Hence, two years seemed to be appropriate[17]. In both models, an EHS, as well as a PHS increase the probability to purchase supplementary insurance significantly. Since the two models do

[17]See for instance Bradley et al. (2012) who investigate the effect of health shocks on employment and insurance status within a ECHI-environment and also choose a two-year time span within which the potential health shock should occur. I also considered alternative time spans (one/three years after a shock occurred). Results do not vary to a notable extent.

not differ to a great extent, and the preferred model is the DTHM, I will discuss the results of the second column of the main models more thoroughly in the following. Having an EHS (PHS) significantly increases the demand for additional insurance by 1.5 (1.9) %-points. The interaction effect, however, is negative, but the absolute size of the interaction term is still smaller than the sum of the two single factors. Hence, for individuals who experience both kinds of shocks, the effect of each shock is smaller than having only one, but in total still has a positive effect on the likelihood to buy supplementary insurance.

A higher household net income has a positive and significant effect on supplementary insurance demand, as the likelihood of affordability is higher than for low-income households. Gender does not seem to play a role in the demand for additional insurance. The effect is not significant and the size is around zero. The same is true for age. Being married is negatively associated with buying additional coverage. A further result that supports the idea of "higher insurance demand due to higher awareness" is the positively significant effect of years of education. Living in East Germany reduces the probability of buying supplementary insurance by 1.0%-points compared to living in the Western part of Germany. Finally, the willingness to take risks does not have a significant effect on the probability to purchase additional insurance.

4.5.2 Variation of Restrictions

Table 4.7 in the Appendix reports the results of the various OLS FE and DTH specifications: column (1) shows OLS FE results without including any of the two restrictions, (2) includes only the restriction that no emotional health shock had occurred three years before the first one, (3) includes only the restriction that individuals are dropped from the analysis after their insurance status changes from 0 to 1, and finally, (4) displays the DTH results including only Restriction 2. The effect of an emotional shock remains robust throughout all specifications,

however, the size varies between 1.3%-points to 3.3%-points and is smallest for model (3). This could be attributed to the fact that individuals who do not change their insurance status, but already hold a supplementary private insurance at the time of their entry to the analysis, are only observed for a single period . Therefore, no emotional shock that could have happened later can be observed. The same is true for physical health shocks. The interaction term is negative throughout all estimations, but the absolute size is still smaller than the sum of the single effects. The remaining explanatory variables remain robust across the different specifications with respect to signs, but vary in terms of size as in the case just described above, and also differ slightly regarding significance.

4.5.3 Baseline Outcomes

The baseline outcomes are presented in Table 4.8 in the Appendix. Excluding all further control variables and only considering the respective shock indicators does not alter the results of the main models to a great extent. Having an EHS and/or a PHS still has a positively significant effect on additional insurance demand and the interaction effect is also negative. Hence, the effect of shocks on supplementary insurance demand remains stable. Adding further covariates does not change the outcome in terms of signs and significance. Regarding the magnitude, the baseline effects in the OLS FE model are slightly larger, but the effects of the DTH model do not differ from the specification including all control variables.

4.5.4 Summary of Results

To sum up, it can be stated that the demand for supplementary private health insurance is driven by the experience of an emotional health shock, as well as a physical shock. Shocks might trigger a higher consciousness for potential future health needs and induce individuals to think more about their current coverage.

Moreover, individuals are thereby confronted with the value of life. Therefore, they try to do their best to secure a good care status and potentially enjoy higher quality of care in case of an insured event. Both, OLS and DTH models, show similar results, which remain robust with respect to signs and significance across various specifications including different restrictions. Only the size of the effect decreases, the more restrictions are included. Finally, in contrast to the study by Schmitz (2011), the willingness to take risks does not play a significant role in this analysis.

Table 4.3: Effect of Emotional Health Shock on Add. Insurance Demand: Main Models

	(1) OLS FE Restr. 1+2	(2) DTH Restr. 1+2
EHS	0.010***	0.015***
	(0.003)	(0.003)
PHS	0.021***	0.019***
	(0.005)	(0.005)
EHS*PHS	-0.022***	-0.028***
	(0.008)	(0.011)
Log(HH Net Income)	-0.002	0.018***
	(0.004)	(0.003)
Male	–	0.001
		(0.002)
Age	0.010***	-0.000
	(0.002)	(0.001)
Age^2	-0.000**	-0.000
	(0.000)	(0.000)
Married	0.006	-0.006**
	(0.005)	(0.003)
Children in HH (Yes/No)	0.007**	0.002
	(0.003)	(0.002)
Years of Educ.	0.002	0.003***
	(0.003)	(0.000)
East Germany	-0.018	-0.010***
	(0.014)	(0.003)
Willingness to Take Risks	0.001	0.001
	(0.001)	(0.000)
Constant	-0.310***	–
	(0.052)	
Year Dummies	Yes	Yes
Time At Risk	No	Yes
N	28867	28867

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. *Emotional Shock (EHS)* = 1 if SAH or Life Satisfaction or Satisfaction with Health deteriorates by at least 1 SD from t-1 to t. *Physical Shock (PHS)* = 1 if hospital stays or sickness absence of more than 6 weeks deteriorates by at least 1 SD from t-1 to t. Regressions include both, Restriction 1: no emotional health shock within three years before the 1st shock, and Restriction 2: individuals dropped after their insurance status changed from 0 to 1 (if additional insurance is bought). *** $p<0.01$; ** $p<0.5$; * $p<0.1$. Standard errors (in parentheses) clustered on individual level.

4.6 Robustness Checks

MCS and PCS Scores

Since the indicators for emotional and physical health shocks used in the main estimations are self-constructed (according to existing health shock definitions), it may be necessary to test whether the results remain robust to other emotional/mental and physical shock measures. Therefore, the Mental and Physical Component Summary Scores (MCS and PCS) are supposed to serve as additional measures. These may be a more direct measure which might grasp the more acute form of the emotional and physical shock definitions implemented in the main models. The MCS and PCS scores are obtained via the SF12-questionnaire which is a shortened version of the SF36 questionnaire regarding health-related quality of life (Nübling et al., 2006; Ware et al., 2002). Twelve items containing information on mental and physical health are included. All items are transformed and range from 0 to 100. Further, the values are standardized to a mean of 50 and standard deviation of 10. The sample size is only half the size of the main sample, since the MCS and PCS scores are available since 2004 and are only provided every other year. Hence, due to the lower number of observations, I only use them as robustness checks.

The descriptive statistics (Table 4.4) show the normed values (to a mean of 50 and a standard deviation of 10) of the MCS and PCS scores and the dummy variable of having an MCS or PCS shock or both (given by the interaction term). The number of observations without any restrictions does not even add up to half of the number of observations of the main models without any restrictions (see Table 4.1) and amounts to about 40,000 person-year-observations. Since a MCS or PCS shock is defined as deterioration of one's MCS or PCS score by at least one standard deviation from one period to the next, a difference value cannot be computed for the first wave (2002), which is the reason for a further drop of the

number of observations. Across all restrictions, the percentage of those having experienced either kind of shock does not vary. 8% of all individuals had (at least) one MCS shock, whereas the probability of having at least one PCS shock is lower and amounts to 6%. Having both shocks at the same time is rather unlikely and only occurs for 1% of the individuals. Turning to the Results Table 4.5, which

Table 4.4: Descriptive Statistics: MCS and PCS Scores

	N	Mean	Std. Dev.	Min	Max
No Restrictions:					
MCS Score	40018	49.87	9.31	4	79
PCS Score	40018	51.98	8.13	9	74
Shock MCS	40018	0.08	0.27	0	1
Shock PCS	40018	0.06	0.24	0	1
Shock MCS*Shock PCS	40018	0.01	0.08	0	1
Restr. 1:					
MCS Score	16694	50.52	8.87	4	78
PCS Score	16694	52.93	7.53	9	74
Shock MCS	16694	0.08	0.28	0	1
Shock PCS	16694	0.06	0.25	0	1
Shock MCS*Shock PCS	16694	0.01	0.08	0	1
Restr. 2:					
MCS Score	32115	49.91	9.29	4	79
PCS Score	32115	51.97	8.14	9	74
Shock MCS	32115	0.08	0.27	0	1
Shock PCS	32115	0.06	0.24	0	1
Shock MCS*Shock PCS	32115	0.01	0.08	0	1
Full Restrictions:					
MCS Score	12978	50.62	8.84	4	78
PCS Score	12978	52.87	7.58	9	74
Shock MCS	12978	0.08	0.26	0	1
Shock PCS	12978	0.06	0.24	0	1
Shock MCS*Shock PCS	12978	0.01	0.08	0	1

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. MCS and PCS Scores are included in the survey biannually since 2002. Therefore, *Shock MCS* and *Shock PCS* only contain information starting in 2004, since the MCS (PCS) shock is defined as deterioration of MCS (PCS) Scores by at least 1 SD from t-2 to t

displays the estimation results of models including all restrictions, the effect of an MCS shock on the demand for additional private insurance is similar to the effect of emotional shocks. Individuals that have experienced an MCS shock have a by 1.6%-points higher probability of purchasing supplementary insurance in the

OLS FE model, as well as the DTH model. Again, the effect is estimated within a observation period of two years after the shock[18]. The number of observations is 12,978 for 5 years (2004, 2006, 2008, 2010, 2012). The coefficient of the PCS shock is insignificant in both models. The same is true for the interaction term, which is most likely due to the very low number of individuals for whom it applies (to have both, MCS and PCS shocks, at the same time). Hence, the results of the main models can be summarized to the extent that the effects of mental and emotional shocks on additional health insurance demand are quite similar. However, the effects of PCS shocks and the self-constructed definition of physical health shocks seem to diverge in terms of significance, but are still similar regarding signs and magnitude.

[18] In case of a shock, a time frame of two years after the shock (if additional insurance is purchased) is considered as relevant.

Table 4.5: Robustness Check: Effect of MCS and PCS Shocks on Add. Insurance Demand

	(1) OLS FE Restr. 1+2	(2) DTH Restr. 1+2
Shock MCS	0.016***	0.016**
	(0.006)	(0.007)
Shock PCS	0.007	0.012
	(0.006)	(0.008)
Shock MCS*Shock PCS	0.002	-0.002
	(0.023)	(0.020)
Log(HH Net Income)	0.004	0.031***
	(0.006)	(0.005)
Male	–	0.002
		(0.003)
Age	0.009***	-0.002
	(0.003)	(0.002)
Age^2	-0.000	0.000
	(0.000)	(0.000)
Married	0.012	-0.006
	(0.008)	(0.004)
Children in HH (Yes/No)	0.004	-0.000
	(0.005)	(0.004)
Years of Educ.	-0.004	0.003***
	(0.004)	(0.001)
East Germany	-0.005	-0.009**
	(0.017)	(0.004)
Willingness to Take Risks	-0.000	0.000
	(0.001)	(0.001)
Constant	-0.271***	–
	(0.086)	
Year Dummies	Yes	Yes
Time At Risk	No	Yes
N	12978	12978

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. MCS and PCS Scores are included in the survey biannually since 2002. Therefore, *Shock MCS* and *Shock PCS* only contain information starting in 2004, since the MCS (PCS) shock is defined as deterioration of MCS (PCS) Scores by at least 1 SD from t-2 to t. Restriction 1: no MCS (PCS) shock within three years before the 1st shock, and Restriction 2: individuals dropped after their insurance status changed from 0 to 1 (if additional insurance is bought). *** $p<0.01$; ** $p<0.5$; * $p<0.1$. Standard errors (in parentheses) clustered on individual level.

4.7 Conclusion

This paper has investigated whether emotional and physical health shocks increase demand for additional private insurance for publicly insured individuals. The research question specifically aims at disentangling emotional/mental issues from physical ones, because the effect of physical shocks, e.g., a broken leg, seems to be more tangible and the demand for insurance, therefore, more straightforward. As a consequence, potentially rising costs for the health care system are easier to predict and quantify, as the demand for insurance can be traced back to a concrete event.

Emotional shocks (defined as a deterioration of either self-assessed health, health satisfaction, or life satisfaction by at least one standard deviation from t-1 to t), however, are not as easily identified, since they are individually perceived and more of a subtle nature. The demand for health insurance, in this case private additional insurance that can be purchased on a voluntary basis and is adjusted to one's needs, is complex and difficult to fully comprehend. Therefore, this paper sheds light on an additional factor that can have an impact on supplementary private insurance demand: increasing awareness of the necessity of (high quality) coverage that is evoked by a sudden deterioration of one's perceived health status. Many factors could affect an emotional shock, for instance, grief due to loss of a close family member or friend or psychological crises after a separation/divorce, respectively.

The preferred empirical model, the Discrete Time Hazard model, considers the time being "at risk" for buying additional insurance for each individual, up to two years after an emotional and/or physical shock. The probability of individuals who have experienced a health shock to buy additional private insurance is found to be significantly higher than for individuals who never experienced a shock. The findings – in particular regarding the emotional shocks – are con-

firmed in a robustness check in which MCS and PCS scores are applied instead of the self-constructed shock variables.

As the German market for *additional* private insurance has not been thoroughly analyzed yet, especially with respect to the determinants of demand and the role of emotional health shocks, the results of this paper give first insights on the existence of a significant increase in supplementary insurance demand after the experience of a health shock. Not only physical complaints lead to a higher willingness to insure oneself against potential future risks by more/better coverage, but also emotional and mental concerns play a crucial role.

Knowing this, a major concern arises: as the demand for supplementary insurance significantly increases *after* a health incidence, the insurance companies now charge a higher premium due to the pre-existing conditions. In severe cases, it might even not be possible to buy additional insurance anymore, as one is labeled as a high-risk candidate[19]. This would fail to fulfill the initial purpose of purchasing supplementary private insurance, as the intention was to secure good coverage and to avoid high payments. Hence, the coverage needs to exist before unforeseen events occur, which either calls for an extension of the SHI's benefit package by default, or for specific measures to increase the individuals' awareness to insure themselves beforehand.

With respect to the relevance of emotional health issues, it may be further necessary not only to provide additional insurance regarding the four major components (hospital treatments, coverage abroad, dentures, corrective devices), but also to extend them by offering supplementary support with focus on psychological matters. In Germany, there is a shortage of psychotherapists who are licensed by the public insurance. Therefore, the waiting time for an initial appointment for publicly insured individuals amounts to three months on average, which is un-

[19] https://www.verbraucherzentrale.de/Zusatzversicherungen-zur-gesetzlichen-Krankenversicherung-1

reasonable for those in need of psychological counseling and clearly exceeds the recommended waiting time of three weeks (BundesPsychotherapeutenKammer, 2011). If individuals pay out of their own pocket and go to a private practice, however, an immediate appointment is feasible. Thus, introducing a supplementary insurance package covering psycho-therapeutical treatments could be a possible solution to the supply side shortage, since not only SHI licensed psychotherapy practices would be accessible to the publicly insured patients, but all practices. As a consequence, patients in need of immediate psychological counseling would get faster access to care and do not need to worry about waiting times or out-of-pocket payments anymore.

4.A Appendix

Table 4.6: Descriptive Statistics II: Comparison of Subsamples

	(1) AI1	(2) AI0	(3) EHS1PHS0	(4) EHS0PHS1	(5) EHS1PHS1	(6) EHS0PHS0
Add. Private Health Ins.			0.04	0.05	0.01	0.06
EHS	0.27	0.19				
PHS	0.08	0.06				
EHS*PHS	0.03	0.02				
Life Satisfaction	7.17	7.18	7.29	7.51	7.05	7.49
Satisfaction w/ Health	6.97	7.16	7.40	7.46	6.80	7.60
Self-Assessed Health	3.56	3.62	3.74	3.72	3.47	3.80
Hospital Stay Last Yr. (Yes/No)	0.09	0.08	0.01	0.17	0.15	0.03
# of Hospital Stays Last Yr.	0.85	0.74	0.12	1.32	1.48	0.22
Out Sick $>$ 6 Wks. Last Yr.	0.05	0.04	0.01	0.08	0.08	0.01
HH Net Income	3070.13	2783.61	2838.73	2966.18	2725.47	2891.62
Log(HH Net Income)	7.94	7.85	7.87	7.91	7.83	7.88
Male	0.48	0.52	0.57	0.47	0.45	0.58
Age	42.57	42.20	41.65	41.68	42.81	40.90
Age^2	1898.28	1867.72	1816.61	1819.18	1924.63	1752.16
Married	0.68	0.69	0.66	0.75	0.71	0.68
Children in HH (Yes/No)	0.43	0.44	0.44	0.52	0.43	0.45
Years of Educ.	12.70	12.25	12.43	12.47	12.18	12.45
East Germany	0.21	0.27	0.24	0.29	0.30	0.23
Willingness to Take Risks	4.72	4.61	4.65	4.67	4.57	4.77
N	29647	22995	12248	1040	12129	3450

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. AI1: includes individuals who have additional private health insurance, irrespective of shocks. AI0: includes individuals who never have additional private health insurance, irrespective of shocks. EHS1PHS0: includes individuals who had emotional shock(s), but never physical shocks, irrespective of additional insurance. EHS0PHS1: includes individuals who had physical shock(s), but never emotional shocks, irrespective of additional insurance. EHS1PHS1: includes individuals who had both, physical and emotional shocks, irrespective of additional insurance. EHS0PHS0: includes individuals who neither had emotional, nor physical shocks.

Table 4.7: Effect of Emotional Health Shock on Add. Insurance Demand: Main Models

	(1) OLS FE	(2) OLS FE Restr. 1	(3) OLS FE Restr. 2	(4) DTH Restr. 2
EHS	0.033***	0.033***	0.013***	0.017***
	(0.002)	(0.004)	(0.001)	(0.002)
PHS	0.058***	0.057***	0.021***	0.022***
	(0.004)	(0.007)	(0.003)	(0.004)
EHS*PHS	-0.021***	-0.032***	-0.010**	-0.014**
	(0.007)	(0.012)	(0.005)	(0.006)
Log(HH Net Income)	0.012***	0.006	0.002	0.023***
	(0.004)	(0.006)	(0.003)	(0.002)
Male	–	–	–	0.001
				(0.001)
Age	0.010***	0.009***	0.010***	0.000
	(0.002)	(0.003)	(0.001)	(0.001)
Age^2	-0.000***	-0.000	-0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.002	-0.003	0.004	-0.007***
	(0.005)	(0.008)	(0.003)	(0.002)
Children in HH (Yes/No)	0.008**	0.017***	0.004*	-0.002
	(0.004)	(0.005)	(0.002)	(0.002)
Years of Educ.	0.005	0.009*	0.003	0.003***
	(0.004)	(0.005)	(0.003)	(0.000)
East Germany	-0.000	-0.008	-0.007	-0.013***
	(0.013)	(0.016)	(0.007)	(0.002)
Willingness to Take Risks	0.000	-0.000	0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.000)
Constant	-0.379***	-0.379***	-0.367***	–
	(0.068)	(0.100)	(0.041)	
Year Dummies	Yes	Yes	Yes	Yes
Time At Risk	No	No	No	Yes
N	81662	34166	69968	69968

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. *Emotional Shock (EHS)* = 1 if SAH or Life Satisfaction or Satisfaction with Health deteriorates by at least 1 SD from t-1 to t. *Physical Shock (PHS)* = 1 if hospital stays or sickness absence of more than 6 weeks deteriorates by at least 1 SD from t-1 to t. Regressions include both, Restriction 1: no emotional health shock within three years before the 1st shock, and Restriction 2: individuals dropped after their insurance status changed from 0 to 1 (if additional insurance is bought). *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Table 4.8: Baseline Models: exclusion of further controls

	(1) OLS FE Restr. 1+2	(2) DTH Restr. 1+2
EHS	0.020***	0.014***
	(0.002)	(0.003)
PHS	0.028***	0.017***
	(0.005)	(0.005)
EHS*PHS	-0.028***	-0.027**
	(0.008)	(0.011)
Constant	0.027***	–
	(0.000)	
Time At Risk	No	Yes
N	28867	28867

Note: Author's calculations based on the SOEP, waves 2000 - 2012, excluding 2009. *Emotional Shock (EHS)* = 1 if SAH or Life Satisfaction or Satisfaction with Health deteriorates by at least 1 SD from t-1 to t. *Physical Shock (PHS)* = 1 if hospital stays or sickness absence of more than 6 weeks deteriorates by at least 1 SD from t-1 to t. *** p<0.01; ** p<0.5; * p<0.1. Standard errors (in parentheses) clustered on individual level.

Chapter 5

Conclusion

The German health care system faces the major challenge of both, containing rising health care expenditures and also establishing a health care system that offers high quality services and good coverage, at the same time. The development of the demographic structure exacerbates the situation, as society is aging and the need for medical services increases more and more, which makes it even more difficult to overcome the challenge. Two major subdivisions of the health care system, the health- and nursing care market, were closer investigated in this thesis.

Chapter 2 has dealt with the question whether or not there have been quality improvements in German nursing homes after information on their performance was collected and published online as report cards. The evaluation process is carried out by the Medical Review Board of the German Statutory Health Insurance (MRB) and was initiated by the care transparency reform in 2008. The results show that higher transparency indeed has a positive impact on reported nursing home quality. On average, their performance improved by 13.9%-points, which is equivalent to fulfilling one additional risk criterion (out of seven). Hence, the transparency reform can be seen as a success with regard to its impact on quality improvement, implying that public reporting may be an appropriate measure to

encourage better nursing home performance. Therefore, a higher focus on outcome quality should be aimed at and the content of the report cards should be revised, which would then lead to the possibility of promoting exactly those indicators that need to be improved. Further, as nursing homes seem to react to public reporting, this would be a cost-effective way to reach the target of enhancing nursing care quality. However, it is not clear whether the positive effects can be attributed to public reporting, as it could also be a "teaching to the test" effect.

With respect to the health insurance market, **Chapter 3** investigated the effect of switching health insurance on subjective health. If the process of switching insurance entails a significant impact on subjective health, it would imply that the magnitude of the system-difference between SHI and PHI that was found in previous literature should be reconsidered, at least in the short-run. Within-system and between-system switches are separately analyzed and potential health effects due to the switch can thereby be disentangled from health effects due to quality and system differences. Further, a within-system switch is considered as a minor change, as the benefit packages do not significantly differ among the SHI companies. A between-system switch can be regarded as a major change, not necessarily in terms of the content of the benefit package, but rather in terms of the higher reputation, status, and differential treatment that is associated with the private system.
The results show that in the short-run, positive health effects are attributed to the switch itself, whereas in the longer run, these health effects only show up after a switch from the public to the private system. This can then be regarded as system- or quality-effects. Hence, type and scope of a change (of insurance) need to be taken into account in order to attribute the right mechanisms to the found effects and prevent an overestimation of the results.

Chapter 4 demonstrated the effect of health shocks on supplementary insurance demand. More specifically, emotional and mental shocks are disentangled from

physical shocks. Therefore, the study sheds light on an additional factor that can have an impact on supplementary private insurance demand: increasing awareness of the necessity of (high quality) coverage that is evoked by a sudden deterioration of one's perceived health status. The results show that there is a significant increase in supplementary insurance demand not only after a physical health shock, but also after an emotional shock. This gives rise to the issue that, on the one hand, additional private insurance demand increases *after* a health shock, but on the other hand, the purchase of the needed insurance is impeded, as prices substantially increase in case of pre-existing conditions and in severe cases it is not possible to buy supplementary insurance anymore.

Important implications are derived by the three studies of this thesis: (1) in order to improve quality of care in nursing homes, one step is to optimize the evaluation process by the MRB, which – in reference to the challenges of rising HCEs and aging society – would not be a cost-intensive measure. (2) For the assessment of the frequently discussed quality difference between public and private health insurance it is necessary to take into account that these system differences appear in the longer run. For minor insurance changes, switch-effects need to be taken into account, as they have an impact on perceived health of individuals in the short-run. (3) As the current status of the market for supplementary health insurance fails to fulfill its purpose with respect to the rising demand *after* a health shock, a regulatory change regarding the price increase after health incidents is necessary. Further, the content of the additional private health insurance contracts also needs to be optimized by additionally considering emotional and mental incidents. As not only physical shocks affect supplementary insurance demand, but also emotional shocks, this should be supported in a way that insurance coverage is provided more intensively and quickly in these situations.

All in all, relevant questions concerning the current health care situation are analyzed and new and important insights are provided, specifically regarding nurs-

ing care and health insurance. In particular, the "change and choice of nursing home quality and health insurance" was addressed in this thesis. The *change* of laws with respect to the Care Transparency Agreement leads to the *choice* of nursing homes to improve and *change* their quality. The *change* of health insurance and therefore the *choice* of the insurance company that better fits one's preferences leads to a better health perception. A health shock, and hence, a sudden *change* of one's health status leads to a *change* of one's preferences regarding insurance coverage and to the *choice* of supplementary private health insurance.

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Eidesstattliche Erklärung

Ich versichere an Eides statt, dass die vorliegende Dissertation von mir selbstständig und ohne unzulässige fremde Hilfe unter Beachtung der *Grundsätze zur Sicherung guter wissenschaftlicher Praxis an der Heinreich-Heine-Universität Düsseldorf* erstellt worden ist.

Diese Dissertation hat in gleicher oder ähnlicher Form noch keiner anderen Fakultät oder Prüfungsbehörde vorgelegen.

Düsseldorf, den 18.11.2015 _____