How Health Plan Enrollees Value Prices Relative to Supplemental Benefits and Service Quality

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Abstract
This paper empirically assesses the relative roles of prices, supplemental benefits, and service quality in the decision to choose health plans. We link representative German enrollee panel data from 2007 to 2010 to (i) measures of service quality, (ii) measures of supplemental benefit provision on top of federally mandated essential benefits, and (iii) prices for almost all public health plans. Mixed logit models incorporate a total of 1,700 health plan choices with more than 50 choice sets for each individual. The findings suggest that, compared to prices, service quality and supplemental benefits play a minor role in choosing health plans.

Keywords: health care consumers, service quality, non-essential benefits, prices, health plan switching, German sickness funds, SOEP

JEL classification: D12; H51; I11; I13; I18

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1 Introduction

Health plan literacy has become a buzzword in the current health care debate. It refers to the provision of extensive information and education on health care, in addition to a set of options to choose from. Theory postulates that a high degree of health care literacy leads to behavioral changes—e.g., health plan switching—which would make the market more efficient and improve quality. Increasing consumer health literacy is thus generally seen as a promising road to gradually improving the efficiency and quality of health care systems around the world. Yet it remains controversial to what extent consumers are actually relying on available information when making important choices, for example in choosing health plans.

Health plan choice essentially depends on the factors (i) price—typically a non-linear trade-off between premiums and cost-sharing amounts, (ii) benefits covered, (iii) clinical health care quality—e.g., via provider networks or managed care, and (iv) service quality of the insurer. Empirically estimating the impact of these four factors is challenging, particularly in the US setting where we observe a fragmented health care landscape with hundreds of thousands of different health plan parameters. Most US employees are limited to a choice of two or three plans—mostly being HMOs or PPOs—making it challenging to disentangle the generalizable impact of single determinants. That being said, most empirical studies on health plan choice determinants exploit the US setting (Dowd and Feldman, 1994; Cutler and Reber, 1998; Royalty and Solomon, 1999; Strombom et al., 2002; Atherly et al., 2004; Buchmueller, 2006; Buchmueller et al., 2013). In single payer markets such as Canada or the UK, people do not have any choice with regard to their health plans. This limitation explains the absence of empirical studies on the determinants of health plan choice for these countries.

This study focuses on the German case which is, for several reasons, a particularly interesting one to analyze. The German Statutory Health Insurance (SHI) represents a “third way” between government run single payer systems without any choice and the US, where health care is pre-dominantly offered through less regulated private entities. Although the US system has moved towards an increasingly regulated system under the Affordable Care Act (ACA), the German market is still more heavily regulated and
standardized. However, Germany combines this heavy regulation with a relatively large number of health plans to choose from. About 130 sickness funds (=health plans\(^1\)) compete for 90% of the population which, to a large degree, is mandatorily insured with the SHI. Most of these health plans operate nationwide although several are only offered in some of the 16 German states. Depending on the state of residency, SHI insured can choose between 40 and 70 health plans. As a comparison: In the US non-group market, which is organized at the state level around the so called ‘Exchanges’, on average 50.9 different plans (min. 7 and max. 169) were offered by 3.9 different insurers in the first year (Dafny et al., 2015).

An interesting feature of the German SHI market is that, unlike the US, managed care is legally prohibited. Furthermore, selective contracting does not exist. This implies the absence of provider networks and means that all consumers have a free choice of providers. In addition, it means that inpatient and outpatient reimbursement rates are not negotiated between insurers and providers but centrally determined. Consequently, reimbursement rates do not vary across the 130 health plans. Providers do not know or care about patients’ SHI sickness funds, which eliminates the relevance of health plan determinant (iii) above—variation in health care quality.

German social legislation also prohibits deductibles and coinsurance rates and only allows small copayments for inpatient and outpatient care. Those small copayments for inpatient and outpatient care do not vary across SHI plans either.\(^2\) This regulation shuts down the non-linear trade-off between premiums and cost-sharing in factor (i) above.

Finally, German social legislation establishes a very generous “essential benefit package” similar to the one under the ACA in the US. Essentially all medically necessary inpatient and outpatient treatments are covered.\(^3\) However, sickness funds may “voluntarily” offer the coverage of supplemental benefits such as alternative treatments or immunizations for tropical diseases to differentiate their product.

This study empirically exploits the regulatory standardization in conjunction with the extensive health plan choice set in the German market. We link representative en-

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\(^1\)We use the terms “health insurance (company),” “sickness fund,” and “health plan” as interchangeably.

\(^2\)For the time period under consideration, the copayments were €10 ($13) per day for a hospital day as well as €10 per calendar quarter for outpatient visits. Total cost-sharing is capped at 2% of the annual income, for chronically ill at 1%.

\(^3\)As in other countries, the coverage of dental care and eyeglasses is limited.
rollee panel data to publicly available health plan prices, as well as standardized health plan quality information, and exploit changes in these health plan characteristics across 130 plans and over 4 years. The study exploits standardized supply-side information from a well-respected private company that consistently surveys and ranks all German health plans. Thus, the empirical approach exploits the same standardized supply side information that German consumers can access in online portals and magazine rankings in order to select health plans. *Optional supplemental benefits* are benefits that health plans voluntarily provide on top of the generous essential benefit package (e.g. ayurveda, homeopathy, osteopathy, urine therapy, preventive check-ups, specific immunizations). *Service quality* is mostly defined by health plan accessibility (via physical branches, hot-lines or the internet) and the quality of information provided to customers looking for help.

We empirically model the relationship between the three health plan choice parameters *(i)* price, *(ii)* “non-essential” supplemental benefits as well as *(iii)* service quality and the decision to actively choose a new health plan. As discussed, Germany prohibits deductibles and co-insurance rates which facilitates the pricing structure. In addition, as a result of uniform reimbursement rates, health care quality does not vary across plans and free choice of providers exist. Since health plans do not negotiate reimbursement rates and are heavily regulated, they solely can trade-off the three product parameters *(i)* to *(iii)*. Likewise, consumers face a trade-off between these three parameters. We mirror and model the relevance of these plan parameters and assess their quantitative relevance.

The empirical specifications employ mixed logit models that take heterogeneity in consumer preferences as well as unobserved health plan characteristics into account. To model how consumers value the trade-off between the parameters *(i)* to *(iii)* we focus the empirical analysis deliberately on people who switch plans and make an active, revealed preference, choice between these parameters. This implies that all findings on how consumers value health plan characteristics are conditional on enrollees who actively choose plans. As such we circumvent the issue of state dependence. In addition, the approach focuses on the policy-relevant subgroup of informed consumers with a high willingness to actually switch plans and make active choices.
Our findings show a significantly negative price effect but no indication that supplementary benefits and service quality play an important role in the decision to choose health plans. Heterogeneity analyses with respect to individuals’ age, gender and health indicate only modest effect heterogeneity.

Most generally, this paper contributes to the large literature on adverse selection and moral hazard in health insurance markets (e.g. Cardon and Hendel, 2001; Heiss et al., 2009; Carlin and Town, 2009; Bolhaar et al., 2012; Handel, 2013; Einav et al., 2013; Bajari et al., 2014). The paper also links to research on Medicare Part D which demonstrates that the elderly do not always enroll in the optimal health plan but that their choices improve over time (Heiss et al., 2006, 2013; Abaluck and Gruber, 2011; Ketcham et al., 2012, 2015). Most specifically, this paper adds to a substantial body of empirical research on the impact of prices and switching costs on health plan choice⁴ (e.g. Strombom et al., 2002; Atherly et al., 2004; Schut and Hassink, 2002; Buchmueller, 2006; Tamm et al., 2007; Frank and Lamiraud, 2009; Buchmueller et al., 2013; Schmitz and Ziebarth, 2011; Wuppermann et al., 2014; Starc, 2014). However, there exist only a few empirical studies on the role of benefits and quality.

For example, using employer data from General Motors and accounting for health plan fixed effects, Scanlon et al. (2002) estimate changes in health plan market shares due to the introduction of quality report cards. They observe that employees avoid subscribing to health plans with below average ratings. Chernew et al. (2008) use the same data and apply a Bayesian learning model to show that only 3% of enrollees switch health plans due to report cards. Estimating a cross-sectional conditional logit model on health plan choices of Harvard employees, Beaulieu (2002) finds a positive relationship between higher quality ratings and the probability of health plan choice. In one of the few non-US studies, Boonen et al. (2015) employ a logit model to estimate switching determinants in the Dutch health care market. They find that younger, healthier, and better educated enrollees are more likely to leave their plan. In addition, the self-reported willingness to search for consumer information, higher prices, and lower consumer quality ratings are positively associated with the likelihood to leave the current health plan. In contrast, exploiting data on federal US employees, Wedig and Tai-Seale (2002) use a nested

⁴Overviews are provided by Kolstad and Chernew (2009) and Gaynor and Town (2012).
multinomial logit model to show how report cards increase price elasticity. Harris (2002) conduct a discrete choice experiment in West Los Angeles and conclude that large quality differences would be required for consumers to accept provider access restrictions. Dafny and Dranove (2008) analyze the response of federal retirees to public quality ratings while controlling for market-based learning and find that both public and nonpublic information play a modest role in health plan decision making. This is in line with Jin and Sorensen (2006) who exploit public and nonpublic health plan ratings and find evidence that both influence individuals’ decisions but only moderately. Finally, Abraham et al. (2006) do not find that information about higher-quality alternatives affects switching behavior.

Overall, this paper represents one of the few studies on how consumers value the trade-off between prices, benefits and service quality in their decision to choose health plans. A major strength of our analysis is that we are able to reproduce an almost complete picture of each enrollee’s SHI health plan choice set and are not restricted to single regions, employers or certain subgroups of the population. To investigate the relative roles of prices, non-essential benefits, and service quality, we link representative enrollee health plan panel data to detailed objective health plan characteristics from 2007 to 2010. We can almost perfectly assign health plan characteristics to the entire choice sets of all enrollees over time. As discussed, by construction, the German institutional framework eliminates important confounding channels such as additional non-linear variation in cost-sharing dimensions or differences in provider networks and reimbursement rates and thus, perhaps most importantly, health care quality (Ziebarth, 2012; Gruber and McKnight, 2014).

The remainder of the paper is organized as follows: The next section covers the institutional details of the German health insurance market. Section 3 outlines the empirical specification and section 4 presents the data used for estimation. The estimation results are presented in section 5. Section 6 concludes.
2 Institutional Background

The German health insurance system is characterized by the coexistence of statutory health insurance (SHI) and substitutive private health insurance (PHI). This paper focuses on the SHI, which covers roughly 90% of the population most of whom are compulsorily insured. Insurance under the SHI is mandatory for employees with gross wage earnings below a defined threshold (in 2015: €54,900/$60,400 per year). Nonworking spouses and dependent children under 25 years are covered free of charge by SHI family insurance. Further regulations apply to specific groups of the population, such as students and the unemployed, although most of them are covered by SHI. High-income employees, self-employed individuals and civil servants may opt out of the SHI and buy substitutive PHI or stay under the SHI as voluntary members.

Currently the SHI market consists of 130 not-for-profit health insurance companies, also called “sickness funds”, roughly half of which are operating nationwide, while the remaining ones solely operate in some federal states. Switching sickness funds is uncomplicated: the minimum contract period is 18 months and there is no enrollment period; guaranteed issue exists and several specific search engine websites help consumers to compare and switch health plans. Yet, health plan switching is a rare event among SHI enrollees. In a given year only about 5% of all SHI insured switch health plans (Schmitz and Ziebarth, 2011).

About 95% of the SHI benefit package is predetermined by social legislation at the federal level. The federally mandated essential benefit package is very generous relative to international standards, basically including all medically necessary treatments in addition to prescription drugs, birth control, preventive and rehabilitation care as well as rest cures (c.f. Ziebarth, 2010a). Although more generous, this essential benefit package is comparable to the new Essential Health Benefits under the ACA. However, German social legislation additionally heavily restricts cost-sharing. Only small copayments exist that are identical across health plans. Yet, to differentiate their product and attract enrollees, sickness funds have the opportunity to voluntarily offer additional benefits, which are not part of standard package under the SHI. These Optional Supplemental

\[5\]If sickness funds increase prices, enrollees have—independent of the enrollment length—an extraordinary right to cancel the contract and switch funds.
Benefits can be subdivided into (i) alternative medicine and (ii) other non-essential benefits.

Alternative medicine covers complementary treatments such as ayurveda, homeopathy, osteopathy, and urine therapy. Although the effectiveness of alternative medicine is discussed controversially, demand for such treatments seems to be increasing. Along with these alternative medical treatments, sickness funds may also offer conventional “non-essential” medical treatments. Examples for these other non-essential benefits could be preventive check-ups (e.g. the “J2” check-up for adolescents) and certain types of immunizations (e.g. malaria prophylaxis). Typically these benefits are of rather low monetary value, e.g., a single combined vaccination shot against diphtheria and typhoid fever costs about €15. On the other hand, non-essential benefits may also comprise more expensive medical treatments, such as coverage for in-vitro fertilizations. These expensive benefits are typically only relevant for a very small group of enrollees.

Health plan premiums are calculated in form of social insurance contributions. To calculate the employee share of the premium, a sickness fund specific contribution rate is applied to the gross wage, including all fringe benefits, up to a defined contribution ceiling (in 2014: 48,600 € per year). One half of the contribution rate is formally paid by the employee and the other half by the employer. In January 2009 and as part of a health policy reform (GKV-Wettbewerbsstärkungsgesetz), SHI financing was reorganized. Prior to January 2009, premiums were a function of gross wages and the contribution rate. The latter was set independently by each sickness fund, resulting in a variety of contribution rates, ranging from 12.2 to 16.9% of individual’s gross wage earnings in 2008. The reform equalized the contribution rates to 15.5% across all health plans. After 2009, if allocated revenues from the 15.5% standardized contribution rate did not cover the funds’ expenses, sickness funds had to charge an additional monthly euro premium. If allocated revenues exceeded expenses, sickness funds could pay out a bonus to their members. Hence, post reform, price differences were expressed in absolute rather than relative terms, which increased switching behavior significantly (Schmitz and Ziebarth,

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6More precisely, sickness funds are allowed to provide alternative medical treatments only if they fulfill the efficiency principle. According to the German Social Code Book V (paragraph 12), treatments fulfill this principle if they are sufficient as well as medically and economically appropriate, which is, however, a rather vague legal concept.
Section 5.4 investigates the potential role of the pricing reform on how enrollees trade-off prices vs. benefits and service quality.

In addition to differences in prices and optional supplemental benefits, sickness funds compete on **Service Quality**. We define service quality as the general accessibility and the quality of information provided to enrollees. Most sickness funds operate a network of physical branches but also offer hotline services. Running a large number of branches may be preferable to (some) members—e.g., the elderly—but also implies higher operational costs for funds. In order to reduce administrative costs, some sickness funds reduced their branch network significantly over time. A minority of sickness funds do not run any physically accessible branch but are exclusively available by telephone or the internet (“Direktversicherer”). Improved accessibility by phone or the internet was also enforced by the health care reform of 2000 (**GKV-Gesundheitsreformgesetz**). According to this legislation, all sickness funds had to improve their service and consulting. As a result, health plans started to operate different types of hotlines. While some hotlines are fairly general, others provide detailed information, such as information about drugs and their side effects.

### 3 Empirical Specification

Following the contemporary literature that investigates the effect of health plan’s characteristics on health plan choice (e.g. Beaulieu, 2002; Wedig and Tai-Seale, 2002; Jin and Sorensen, 2006; Dafny and Dranove, 2008), we apply discrete choice methods. More precisely, we opt for a random parameters model (Revelt and Train, 1998; McFadden and Train, 2000). The random parameters model (RPL), also called mixed logit model, is a generalization of the conditional logit model (McFadden, 1973). It has two important advantages over the traditional conditional logit that makes it especially attractive in the present analysis.

First, several studies provide indications for the presence of preference heterogeneity with respect to health plan characteristics (e.g., Beaulieu, 2002). For instance, preferences for treatments such as alternative medicine are likely heterogeneously distributed across
the population. While some individuals may value such treatments very highly, others may not care about them at all. The mixed logit model explicitly allows for introducing heterogeneity in consumer preferences by modeling the preference parameters as random variables.

Second, the RPL does not rely on the restrictive independence of irrelevant alternatives (IIA) assumption. The IIA assumption requires that the odds between two alternatives do not depend on which other alternatives are available. As individual choice sets consist of a large number of alternatives (health plans) that can be considered as close substitutes, the IIA assumption is at least questionable.\(^7\) We specify the linear index, measuring individual \(i\)'s inclination to choose health plan \(j\) as

\[
\gamma_i' \text{Premium}_{ij} + \delta_i' \text{Benefits}_j + \zeta_i' \text{Service}_j + \alpha_j + \epsilon_{ij} \tag{1}
\]

\(\text{Premium}_{ij}\) is the monthly health insurance premium in euro. The vectors \(\text{Benefits}_j\) and \(\text{Service}_j\) includes measures for optional supplemental benefits and service quality. Since the premium is income-dependent—unlike \(\text{Benefits}_j\) and \(\text{Service}_j\)—\(\text{Premium}_{ij}\) varies across individuals and sickness funds.

To account for time- and individual-invariant unobservable health plan characteristics that might be correlated with our explanatory variables, we include a set of health plan fixed effects (\(\alpha_j\)). Essentially, we assume that the unobserved part of utility consists of a sickness fund-specific fixed effect and a random error term.\(^8\) This approach assumes away that time varying unobservable health plan factors exist that are correlated with the characteristics under scrutiny. We also assume the \(\epsilon_{ij}\) to be iid and to follow a type I extreme value distribution which leads us to the familiar conditional logit model. Recall that we empirically condition on individuals who make active health plan choices and,

\(^7\) The IIA assumption is arguably less problematic for studies in the U.S., as choice sets in employer-sponsored settings typically do not comprise more than five alternatives. However, Wedig and Tai-Seale (2002) restrict their estimation sample to choice sets with five or fewer alternatives to make the IIA assumption more plausible. Moreover, Harris (2002) find statistically significant evidence that preference heterogeneity exists, suggesting that the IIA assumption is violated.

\(^8\) This is similar to the approach adopted by Chernew et al. (2004). In general, one could allow the alternative-specific fixed effects to vary across individuals, similar to the other explanatory variables. Due to the large number of alternatives in our choice sets, this would require to estimate distribution parameters of more than 100 additional random variables. Given the already high dimensional optimization problem, this approach is not feasible in the present analysis.
by revealed preferences, provide information on how they personally value the trade-off between Premium_{ij}, Benefits_{ij} and Service_{ij}.

The coefficient vectors $\gamma_i$, $\delta_i$ and $\zeta_i$ comprise the preference parameters of interest. As indicated by the subscript $i$, these preferences are allowed to vary across individuals but are assumed to be constant for the same individual over time. We choose the most common distributional form for the coefficients and assume that individual preferences are normally distributed.\(^9\) Since the likelihood function has no closed-form solution, we apply maximum simulated likelihood methods to estimate the parameters.\(^10\)

Finally, although we have substantial information on individual socio-economic characteristics, we do not directly include them in the model. Considering that they are alternative invariant, including these variables would require interacting them with each alternative in the respective choice set. However, individual choice sets are quite large and range from 41 to 73 health plans to chose from. Considering socioeconomic characteristics would inflate the number of coefficients enormously and would be impractical for computational reasons.

4 Data

We make use of two different data sources, which are described in detail below, and combine them to a dataset that precisely mirrors the choice sets of German SHI enrollees.

4.1 Individual Level Data

The German Socio-Economic Panel Study (SOEP) provides individual-level panel data. The SOEP is a representative longitudinal survey that started in 1984 and collects annual information at the household and at the individual level. Currently, the SOEP comprises more than 20,000 individuals from more than 10,000 households (Wagner et al., 2007). We use the waves 2008 to 2011.

\(^9\)We assume a diagonal variance-covariance matrix of the coefficients, and hence uncorrelated coefficients.

\(^10\)We use the Add-On package mixlogit for Stata (Hole, 2007). Estimation results are based on 50 Halton draws. Any data or computational errors are our own.
Sample Selection. The estimation exploits information on enrollees’ current health plan as well as their insurance status. First, we exclude those individuals who are covered by PHI.

Second, we restrict the sample to sickness fund enrollees, not the total number of insured. The latter would also include family members insured at no cost under SHI family insurance. We focus on the paying members so we have exactly one observation per health plan choice decision. Paying members are the insurance holder, gainfully employed and earn more than €400 gross per month.\textsuperscript{11}

Third, to ensure that the empirical results are not driven by the high degree of state dependence—only 5.3\% switch health plans every year—we focus on health plan switchers and those who opt out of the family insurance to become a paying member. These individuals mostly likely inform themselves carefully about their existing health plan options and the existing trade-offs. This implies that all results are conditional on the subsample of enrollees who switch plans. The findings certainly have external validity for the slightly larger subgroup of enrollees who, in general, express a high willingness to switch plans. Although being a minority, note that these consumers who make active choices are the policy-relevant target group and drive competition in the market. Our final estimation sample consists of 1,726 choices from 1,594 different individuals (that is, about 100 individuals change their sickness fund twice in the observation period).

Choice Sets. To precisely replicate individual choice sets, we consider enrollees’ state of residence because some health plans only operate in specific states. Panel A of Table 1 shows that the average choice set includes 58 sickness funds. The minimum number of plans to chose from is 41 and the maximum is 73. Choice sets are smallest for individuals living in Mecklenburg-Western Pomerania, ranging from 41 to 53 between 2008 and 2011. Individuals residing in North Rhine-Westphalia have the largest choice sets, ranging from 55 (2011) to 73 (2008).\textsuperscript{12} This choice set is roughly comparable to the number of options in the US Medicare Part D market as well as the state level ‘Exchanges’ which offer on

\textsuperscript{11}This excludes all those insured under SHI family insurance, the unemployed for some of whom social security pays the health insurance premium, full-time students who just pay an income-independent flat premium (2014: €64,77 per month) or who are insured under their parents’ family insurance, pensioners as well as special population groups, such as draft soldiers or low-income earners.

\textsuperscript{12}Due to several mergers of sickness funds, the number of active health plans is decreasing over time.
### Table 1: Descriptive Statistics

#### Panel A: Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>25,920</td>
<td>25,476</td>
<td>27,352</td>
<td>21,140</td>
<td>99,888</td>
</tr>
<tr>
<td>Health Plan Switches</td>
<td>388</td>
<td>447</td>
<td>477</td>
<td>414</td>
<td>1,726</td>
</tr>
<tr>
<td>Standard Switchers</td>
<td>231</td>
<td>293</td>
<td>318</td>
<td>285</td>
<td>1,127</td>
</tr>
<tr>
<td>Exit Family Insurance</td>
<td>157</td>
<td>154</td>
<td>159</td>
<td>129</td>
<td>599</td>
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</table>

#### #Health Plans

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>Min.</th>
<th>Max.</th>
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<tbody>
<tr>
<td>Health Plans</td>
<td>66.8</td>
<td>5.4</td>
<td>53.0</td>
<td>73.0</td>
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#### Panel B: Individual Characteristics

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</thead>
<tbody>
<tr>
<td>Self-Assessed Health</td>
<td>2.34</td>
<td>0.84</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>1,724</td>
</tr>
<tr>
<td>Very Good</td>
<td>0.13</td>
<td>0.34</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1,724</td>
</tr>
<tr>
<td>Good</td>
<td>0.49</td>
<td>0.50</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1,724</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>0.29</td>
<td>0.45</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1,724</td>
</tr>
<tr>
<td>Poor</td>
<td>0.08</td>
<td>0.27</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1,724</td>
</tr>
<tr>
<td>Bad</td>
<td>0.01</td>
<td>0.10</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1,724</td>
</tr>
<tr>
<td>Age</td>
<td>37.03</td>
<td>12.63</td>
<td>37</td>
<td>18</td>
<td>80</td>
<td>1,726</td>
</tr>
<tr>
<td>Female</td>
<td>0.55</td>
<td>0.50</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1,726</td>
</tr>
<tr>
<td>Monthly Gross Income [EUR]</td>
<td>1,959</td>
<td>1,413</td>
<td>1,700</td>
<td>400</td>
<td>12,885</td>
<td>1,726</td>
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#### Panel C: Health Plan Characteristics

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</thead>
<tbody>
<tr>
<td>Premium [EUR]⁺</td>
<td>152.98</td>
<td>8.04</td>
<td>158</td>
<td>133</td>
<td>178</td>
<td>323</td>
</tr>
<tr>
<td>Branch Network</td>
<td>0.00</td>
<td>1.00</td>
<td>-0.15</td>
<td>-2.42</td>
<td>2.48</td>
<td>323</td>
</tr>
<tr>
<td>Hotline Service</td>
<td>0.00</td>
<td>1.00</td>
<td>0.28</td>
<td>-2.95</td>
<td>1.39</td>
<td>323</td>
</tr>
<tr>
<td>Alternative Medicine</td>
<td>0.00</td>
<td>1.00</td>
<td>-0.17</td>
<td>-2.16</td>
<td>3.16</td>
<td>323</td>
</tr>
<tr>
<td>Other Non-Essential Benefits</td>
<td>0.00</td>
<td>1.00</td>
<td>0.06</td>
<td>-4.73</td>
<td>1.93</td>
<td>323</td>
</tr>
</tbody>
</table>

Sources: Müller and Lange (2010); Lange (2011), German Federal (Social) Insurance Office, National Association of Statutory Health Insurance Funds, annual reports of the sickness funds, information by sickness funds. SOEP v28. Authors’ calculation based on the SOEP.⁺ denotes fictive absolute EUR premiums based on a monthly gross income of €2,000 for the sake of illustration. The reason is that the premium depends on three parts: the sickness fund contribution rate, the individual income, and the sickness fund add-on premium (after 2009). In order to show average euro amounts on the health plan level, we use a hypothetical monthly gross wage of €2,000. In the regression models, exact premiums are calculated based on enrollee and sickness fund level information.

average 50.9 different plans (min. 7 and max. 169) by 3.9 different insurers (Dafny et al., 2015).

Overall, the empirical identification relies on 400 to 500 observed health plan decisions per year, where each individual has 50 to 60 health plans to chose from. Thus, we
observe about 25,000 potential options per year, totaling 100,000 options over the four
years under consideration.

SOEP interviews are typically carried out in the first quarter of the year, while sick-
ness fund characteristics were collected at the end of a calendar year in November and
December. Thus we link the respondents’ health plan choice sets at the time of the inter-
view in the first months of a year with the health plan information as provided at the end
of the prior calendar year. Hence, we make use of switching and health plan data for the
years 2007 to 2010.

We use the self-reported wage earnings in the SOEP to calculate health plan premiums
for all potential choices in euro amounts in every year. In addition, we use the age,
gender and self-reported health status (SAH) information to test for heterogeneity. Panel
B of Table 1 shows the demographics for our sample of switchers: 55% of the sample is
female and the average age is 37 years. Thirteen percent self-rate their health as ‘very
good’ and 49% as ‘good’.

4.2 Health Plan Level Data

Health plan characteristics (contribution rate, optional supplemental benefits and service
quality) are provided by a private company (Kassensuche GmbH). The information are
collected via questionnaires that are sent out annually to all existing sickness funds. Sick-
ness funds have a strong incentive to participate in the survey, as Kassensuche GmbH
operates a large German web portal where consumers can compare a broad range of
characteristics across all sickness funds. Moreover, at the end of each year, a popular
weekly business magazine (Focus Money) publishes a detailed overview and ranking
of the best 50 health plans as surveyed by Kassensuche GmbH. This health plan rank-
ing is comprised of subscores for several subcategories, measured on continuous scales.
These subscores provide the basis for the benefit and service quality measures used in
our regression models.\textsuperscript{13}

Since this information is exactly the one consumers obtain, being able to directly ex-
\textsuperscript{13}The number of subcategories has slightly changed over time, therefore we use only those subscores
\textsuperscript{13}ploit its variation is one main advantage of our approach. The main drawback of using
these data is the interpretation of the scores which is not straightforward as we discuss below. To account for slight differences in the calculation of the sub-scores over time, the regression models make use of the $z$-transformed subscores.\textsuperscript{14} In total, we have information on 115 different sickness funds covering the years 2007 to 2010. The health plans included every year have a total market share of around 80% and also represent 80% of all existing plans (Müller and Lange, 2010).

**Price information** for each sickness fund is mainly based on publicly available planspecific pre-2009 contribution rates. Post-2009, when contribution rates were unified, we additionally consider sickness fund specific add-on premiums and refunds (see Section 2). To calculate the exact monthly premiums (in euros) for each enrollee, we link plan specific contribution rates with individuals’ gross income and also consider the federal contribution ceiling.\textsuperscript{15} We do not consider the employer share of the premium, which is legally fixed at 50% of the total premium.\textsuperscript{16} We disregard the employers’ share since employees typically believe that their entire premium is represented by the employee share. Thus, employees likely make decisions based on their share alone. As seen in Panel C of Table 1, the calculated employee shares—based on average monthly gross wages of €2,000—range between €133 and €178, with a mean value of €153. To the extend that employees base their health plan choices on the full premium, we obtain a lower bound for the price effect in the regression models below.

**Service Quality** is measured by two variables: (i) hotline service and (ii) branch network. **Hotline service** considers the different types of available hotlines (medical, non-medical) and how many hours these hotlines are staffed. Differences in staff quality—e.g., the share of staff with special qualifications such as social insurance clerks (“Sozialversicherungsfachangestellte”), physicians, nurses or pharmacist—are accounted for by weighting the hotline’s operating hours accordingly, where higher staff quality receives a higher weight. The score of **branch network** measures the density of the branch network relative to the plan’s operating region. More precisely, the original score (before the $z$-

\textsuperscript{14}The $z$-transformation is conducted for each year separately.
\textsuperscript{15}The contribution ceiling is determined by the federal regulator and increases every year.
\textsuperscript{16}Effective July 1, 2005, the strict equal sharing of contributions was altered. Between 2005 and 2015, the employees’ share was $0.9 + 0.5 \times (cr - 0.9)$ percent of their gross wage up to the contribution ceiling, where $cr$ denotes the overall contribution rate. In the example above, this amounts to an employee share of 7.45 percent and an employer share of 6.55 percent of the gross wage.
transformation) is derived from the log of the total number of branches divided by the number of federal states in which the sickness fund operates.

**Trading-Off Prices and Service Quality.** Figures 1a and b display the trade-off between health plan prices and service quality as measured by the hotline quality and density of physical branches. Note that, in theory, one would expect a positive relationship between these health plan parameters since less branches and fewer hotlines mean lower (administrative) costs. Figure 1a visualizes exactly this trade-off. The x-axis plots the sickness fund-specific contribution rate and the y-axis the (non-transformed) hotline service quality score as calculated by *Kassensuche GmbH.*

We observe clear positive relationship, where cheaper plans also exhibit significantly less hotline service quality. However, interestingly, across the entire price distribution in the market consumers could easily chose plans that dominate others and get better hotline quality for less money.

A very similar picture is displayed by Figure 1b which plots the trade-off between the service quality parameter *branch network* and prices. Again, in line with expectations, one observes a very clear positive and significant relationship between prices and the density of physical branches where consumers can go in person. The relationship here is even clearer than for the hotline service quality: consumers who value personal customer contact clearly have to pay higher prices than consumer who do not care about physical branches. However, also in this case, at least when just considering these two dimensions, we observe plans that clearly dominate others.

**Optional Supplemental Benefits** are summarized by the two subscores: (i) *alternative medicine* and (ii) *other non-essential benefits.* The score of *alternative medicine* is mainly based on the number of different alternative medical treatments offered by each sickness fund. Sickness funds are not entirely free to offer any additional treatment, but can choose from a list of around 20 approved treatments (e.g. ayurveda or homeopathy). Additionally, the score takes into account whether these treatments are restricted to certain regions or physicians. More restrictions lead, *ceteris paribus,* to a lower score.

The score of *other non-essential benefits* covers additional services that are not part of

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17Since the contribution rate was equalized after 2009 in the course of a price framing reform (see Section 2), for reasons of simplicity, Figure 1 is only based on the two years 2007 and 2008. Schmitz (2011) show that (i) there was a high correlation between pre- and post 2009 health plan pricing, and that (ii) the decision to charge add-on premiums was not significantly correlated with more or less service quality or supplemental benefits.
the essential SHI benefit package as defined by the federal regulator (*Kassenleistungen*). Examples for such non-essential benefits are certain immunizations (e.g., for tropical diseases) or preventive screenings for breast or skin cancer in younger ages. Table Panel C of Table 1 provides descriptive statistics on *alternative medicine* and other non-essential benefits. While the z-transformation renders the mean uninformative, the negative median value indicates that the distribution of *alternative medicine* is skewed to the right.

**Trading-Off Prices and Optional Supplemental Benefits.** Since the descriptive z-transformation in rather uninformative, Figures 1c and d again plot the original scores against health plan prices. Interestingly, Figure 1c shows that the provision of other non-essential benefits is not significantly correlated with health plan prices. The plotted line representing the non-essential benefit score is basically flat across the entire price distribution. Obviously, very cheap plans as well as very expensive plans seem to offer either
very few or many supplemental benefits. On the other hand, the type of supplemental benefits offered may vary greatly. Figures 1d is more specific and plots the relationship between alternative medicine and prices exhibiting again a clear positive relationship with a plenitude of dominated plans in this two-dimensional trade-off.

**Joint Distribution of Services and Benefits.** Looking at the joint distribution of non-price health plan parameters, we find positive correlations between all measures, ranging from 0.102 (other non-essential benefits and branch network) to 0.549 (alternative medicine and hotline service). This shows that sickness funds seem to position themselves either at the high or low non-price segment in the market, rather than trying to built a specific reputation by offering very specific extra benefits or boosting specific quality indicators. This is in line with Figure 1 and positive correlation between the non-price scores and prices.

Overall, the positive correlation of prices on the one hand, and service quality or extra benefits on the other hand indicates that sickness funds are aware of the quality-price trade-off when differentiating their product. Another interesting descriptive result is the following: Considering all five health plan parameters jointly, the majority of plans in the market are dominated by at least one competitor. That is, there is at least one competitor that dominates in all five dimensions. This holds for every single year with the shares of dominated plans ranging from 0.67 (2008) to 0.90 (2010).

**Changes in Prices and Non-Price Attributes over Time.** Next Figure 2 shows the distribution of year-to-year changes in the three health plan parameters: price, hotline service quality, other non-essential benefits, and alternative medicine. The empirical identification of the estimated effects relies on both (i) the cross-sectional variation and trade-off between prices, service quality and supplemental benefits as illustrated in Figure 1, and (ii) the variation in these parameters over time. For example, in one model specification, we include health plan fixed effects.

Figure 2a is in line with intuition and shows that, while many health plans keep prices stable, a significant amount increases them. We observe a significant share of plans that increased contribution rates by up to 2ppt. As an example, an increase in the contribution rate by 1ppt equals an increase in the employee share of the monthly premium by €10
when considering the average gross wage of switchers in our sample, which is €2,000. Figure 2a shows that very few plans decrease prices.

Figure 2: Changes in Health Plan Prices, Supplemental Benefits, and Service Quality Over Time

![Figure 2a: Density distributions for changes in contribution rates between $t=0$ and $t=1$](image)
![Figure 2b: Density distributions for changes in hotline service quality scores between $t=0$ and $t=1$](image)
![Figure 2c: Density distributions for changes in non-essential benefit scores between $t=0$ and $t=1$](image)
![Figure 2d: Density distributions for changes in alternative medicine scores between $t=0$ and $t=1$](image)

Figure 2b illustrates annual health plan level changes in the hotline service quality score. Again, the mass point is around zero indicating no changes. However, interestingly, one observes an almost symmetric distribution with a significant amount of plans gaining up to 20 score points and a significant amount of plans loosing up to 20 score points. Loosing or gaining 5 score points actually represents a significant change, given that the overall scale ranges from 0 to 30 points.

Similar distributions, albeit with more mass above and below zero, are shown in Figures 2c and d for changes in other non-essential benefits and alternative medicine. Particularly when it comes to the overall other non-essential benefits score, we observe a lot of plans with significant increases and well as decreases in the number of supplemental
benefits that they offer. This is also observed in Figure 2d for the very specific indicator alternative medicine. However, as for alternative medicine, more plans seems to cut back these offers rather than extending them.

In summary, Figure 1 illustrates nicely the cross-sectional variation across plans and plan parameters that we are exploiting in the empirical models. In addition, Figure 2 illustrates the variation over time in health plan prices, supplemental benefits, and service quality. Thus the empirical approach relies on rich sources of identifying variation. Recall that we focus on the policy-relevant group of switchers who are very likely to actively inform themselves about these parameters and trade-offs before they switch. We exploit the same sources of information that are offered to them, and then empirically model the trade-offs between prices, service quality, and supplemental benefits that switchers are willing to make by their own revealed choices.

5 Switchers’ Revealed Preferences on the Trade-Off Between Prices, Service Quality, and Supplemental Benefits

5.1 Descriptives

To obtain a first impression about the relevance of prices, supplemental benefits, and service quality in individuals’ decisions to choose health plans, we compare the health plan parameters of switchers’ new and old plans. Recall that the entire empirical analysis conditions on policyholders who actively choose new health plans. This subgroup is the policy-relevant target group of interest, plus these consumers have very likely informed themselves about the health plan parameter trade-offs modeled here.

Table 2 shows that the monthly premium of the new health plan is on average a significant €3.56 lower than the premium of the old health plan. There are no significant differences between the old and new plan’s branch network or hotline service quality. The same applies to alternative medicine and other non-essential benefits. Overall, the quality differences between old and new plans are very small, below 0.05 of a standard deviation, and not statistically different from zero.

\footnote{The results are based on a subset of 729 switches for which we know all three health plan parameters for the old and the new plan. Note that, for the main analysis, we only need information on the new plan.}
The descriptive results provide first evidence that premium differences may be an important determinant of switchers’ plan choice, whereas service quality and supplemental benefits seem to play a minor role. Note that this interpretation would also be valid for the following case: Let’s assume that premiums are constantly rising (cf. Figure 2) and that enrollees had optimized their utility and the implied trade-off between plan parameters by their initial plan choice. A premium increase may now be the trigger to switch plans but most importantly: Enrollees obviously re-validate their initial (optimal) choice when trading lower prices for similar or even lower supplemental benefits and service quality. As illustrated by Figure 1, choosing constant prices for higher benefits or quality would almost always be possible. In this scenario, we would still be able to infer that consumers are not willing to pay higher premiums in return for better service quality and more supplemental benefits.

Table 2: New and Old Health Plan Characteristics for Switchers

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>( \bar{X}^{\text{new}} )</th>
<th>( \bar{X}^{\text{old}} )</th>
<th>( \Delta )</th>
<th>s.e.( \Delta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium</td>
<td>162.47</td>
<td>166.04</td>
<td>-3.56***</td>
<td>(0.30)</td>
</tr>
<tr>
<td>Branch Network</td>
<td>0.91</td>
<td>0.88</td>
<td>0.04</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Hotline Service</td>
<td>0.75</td>
<td>0.77</td>
<td>-0.02</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Alternative Medicine</td>
<td>0.88</td>
<td>0.85</td>
<td>0.03</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Other Non-Essential Benefits</td>
<td>0.37</td>
<td>0.34</td>
<td>0.03</td>
<td>(0.04)</td>
</tr>
</tbody>
</table>

Notes: Authors’ calculation. The table shows means of sickness fund characteristics for new and old health plans. The calculations are based on 729 observations. Standard errors of the differences in means are in parentheses. *** \( p < 0.01; ** p < 0.05; * p < 0.1 \)

5.2 Main Results from Mixed Logit Models

Table 3 shows two different specifications of the model outlined in Section 3. It reports the estimated means and standard deviations of the random coefficients. Model 1 solely includes health plan premiums, service quality, and supplemental benefits, whereas Model 2 adds a set of sickness fund fixed effects. Incorporating fund fixed effects nets out time-invariant health plan characteristics and exploits the timely variation in Figure 2.
<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium</td>
<td>$-0.092^{***}$ (0.006)</td>
<td>0.003 (0.016)</td>
</tr>
<tr>
<td>Service Quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branch Network</td>
<td>1.600^{***}$ (0.052)</td>
<td>0.774^{***}$ (0.065)</td>
</tr>
<tr>
<td>Hotline Service</td>
<td>0.964^{***}$ (0.108)</td>
<td>0.618^{***}$ (0.119)</td>
</tr>
<tr>
<td>Supplemental Benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Medicine</td>
<td>$-0.044$ (0.041)</td>
<td>0.039 (0.135)</td>
</tr>
<tr>
<td>Other Non-Essential Benefits</td>
<td>0.433^{***}$ (0.055)</td>
<td>0.755^{***}$ (0.071)</td>
</tr>
<tr>
<td>Health Plan Fixed Effect</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td># Observations (=switches×#plans)</td>
<td>99,888</td>
<td>99,888</td>
</tr>
<tr>
<td># Health Plan Switches</td>
<td>1,726</td>
<td>1,726</td>
</tr>
</tbody>
</table>

Notes: Authors’ calculation. The table shows estimated coefficients of both, mean and standard deviation of the random parameters. Estimated standard errors are in parentheses. $^{***} p < 0.01; ^{**} p < 0.05; ^{*} p < 0.1$
**Model 1.** As indicated by the significantly negative mean of *premium* in Model 1, sickness funds with lower premiums are preferred by people who choose new health plans. The corresponding estimated standard deviation is close to zero and not statistically significant, suggesting that the relationship between premiums and health plan choice is largely homogeneous across individuals looking for new plans.

With respect to service quality, the mean coefficients are positive and significant for *branch network* as well as *hotline service*. In addition, the estimated standard deviations are significantly different from zero and indicate consumer heterogeneity in switching decisions.

The findings for supplemental benefits suggest that *alternative medicine* is not significantly associated with health plan choice. Both the estimated mean and the standard deviation are close to zero and not significantly different from zero. In contrast, the estimated mean parameter of *other non-essential benefits* exhibits a positive sign and is highly significant.

Since the models impose that the coefficients follow a normal distribution, one can use the estimated mean and standard deviation to calculate the share of individuals that place a positive value on optional supplemental benefits (Train, 2009). The corresponding probability is given by $P(X > 0) = 1 - F_X(0) = 1 - \Phi(0 - 0.433/0.755) \approx 0.717$, where $\Phi$ represents the cumulative distribution function of the standard normal distribution. The calculation would suggest that, according to Model 1, around 70% of all enrollees would value optional supplemental benefits.

**Model 2.** It is likely, however, that the measures at the sickness fund level also capture other unobserved health plan characteristics, such as brand loyalty or the reputation of the fund. Therefore, Model 2 adds a full set of sickness fund fixed effects. Although slightly smaller in absolute magnitude, the estimated mean coefficient for *premium* exhibits the expected negative sign and remains highly significant. As in Model 1, the estimated standard deviation is virtually zero, indicating a homogeneous relationship between premiums and health plan choice. Literally everyone in the sample places a negative value on higher prices.
In contrast, when including health plan fixed effects, the measures for service quality and optional supplemental benefits dramatically shrink in size and become insignificant. In terms of size, these coefficients now fall within the same range as the estimated premium coefficient. However, not only are the standard errors much larger, the variables are also measured on different scales. Comparing the effect of an increase by one standard deviation—which is about eight for the premium and one for the other variables (cf. Table 1, Panel C)—the response to a price increase equals eight times the response of an increase in service quality or supplemental benefits. In sum, we conclude that (i) health plan fixed effects are essential, (iii) the price relevance is high and homogenous, and (iii) the mean relevance of non-price attributes is small.

The standard deviations of the coefficients for hotline service and non-essential benefits are small and insignificant, whereas those for branch network and alternative medicine suggest significant heterogeneity in consumer preferences. Using the formula above, one finds that 40 to 60% of switchers either place a positive or negative value on branch network and alternative medicine. Although the effectiveness of alternative medicines is not proven, some consumers seem to value alternative treatment methods and direct customer contact, whereas others may actually think that it is a waste of money.

**Summary.** The estimation results suggest that differences in health plan premiums are the main determinant in sickness fund choice for those who are actually willing to switch health plans. Medically unnecessary supplemental benefits and service quality play, on average, a negligible role in consumers’ choices. Outside of the traditional rational choice setting, an explanation for these findings could be that quantitative premium differences are easy to understand and process for most people. The monetary trade-off to service quality parameters is much more abstract and may only become apparent when customers actually need help (Schram and Sonnemans, 2011). Another non-traditional explanation could be a low awareness of non-price health plan differences between plans.
5.3 Quantifying the Tradeoff between Prices, Service Quality, and Supplemental Benefits

Let us now have a closer look at the relative importance of the different health plan parameters. When using discrete choice model estimates—which are based on a linear index as in equation (1)—the ratios of the coefficients represent marginal rates of substitution (MRS). We are primarily interested in how consumers value health plan differences in service quality and supplemental benefits as compared to premium differences. More specifically, we are interested in \(-\delta_i/\gamma_i\) and \(-\zeta_k/\gamma_i\) indicating at which rate enrollee \(i\) is willing to trade off additional benefits or service quality against a lower premium, where \(k\) indexes benefit and quality characteristics. In other words, if health plan \(j\) increases premiums by one unit, the probability that the plan being chosen by enrollee \(i\) does not change if, at the same time, its hotline service improves by \(-\zeta_k^{\text{access}}/\gamma_i\) units. Interpreting these ratios, however, requires scales that measure a one unit change. As no natural scale is available for service quality and optional benefits, we define a unit as one standard deviation in the sample distribution. Similarly, we define one premium unit. Unlike for the service and benefit measures, an increase in the monthly premium by one standard deviation can also be expressed as an absolute \(\mathbf{8}\) increase (cf. Table 1, Panel C). This value has some intuitive appeal, as it represents the typical premium differential between health plans after 2009. For health plans that increased premiums, \(\mathbf{8}\) (or about 5% of the employee share) is also close to the average premium increase between 2003 and 2011 (Schmitz and Ziebarth, 2011).

Mixed-logit estimation does not yield estimates for \(-\delta_i/\gamma_i\) and \(-\zeta_k/\gamma_i\) at the individual level and, for this reason, does not allow for the calculation of individual marginal rates of substitution. What one obtains from the estimation are normally distributed population parameter estimates \(\mu_k\) and \(\sigma_k\). Because \(MRS_k\) is a ratio of normal random variables, its distribution involves a Cauchy-component rendering the mean (and higher-order moments) undefined. It cannot be consistently estimated (cf. Marsaglia, 1965; Cohen Freue, 2007). Hence, we discuss quantiles instead of the means of \(MRS_k\). In particular, we focus on the median of \(MRS_k\). Rather than directly interpreting \(-\beta_k/\beta_{\text{premium}}\) as ML-estimate for

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19One may just as well refer to this ratio as ‘rate of substitution’ since it does not change due to linearity.
the median of $MRS_k$, we simulate the percentiles of the $MRS$-distributions—along with corresponding 95-% confidence bands—on basis of the results for Model 2 (cf. Table 3, right panel).\textsuperscript{20}

The Density of the Branch Network vs. Lower Prices

Let us start with $MRS_{\text{branch}}$. The simulated median of $MRS_{\text{branch}}$ is 0.128, indicating that the median enrollee trades off lower premiums against a higher density of branches at a rather small rate. More precisely, an increase in the branch network by one standard deviation (SD) is just valued as one-eighth SD of the premium, which translates into €1 per month. However, the simulated 95%-confidence interval of $[-0.324, 0.564]$ indicates that this value is imprecisely estimated.\textsuperscript{21} Nevertheless, even the upper confidence bound is only 0.56 and lets us exclude—with 95% statistical certainty—that consumers would trade an increase in the branch density network by one SD for more than €8.50 per month.

This picture somewhat changes when we consider the estimated heterogeneity in the $MRS$. Although the exact shape of the estimated $MRS$ distribution depends heavily on distributional assumptions (and should be interpreted with caution), assessing other quantiles may provide insights into the heterogeneity of consumer preferences. At the 95\textsuperscript{th} percentile, the rate of substitution is more than ten times larger than at the median (point estimate 1.307). This means that, according to our estimates, those five percent of enrollees who have the strongest preferences for face-to-face services and a high branch density are willing to accept a 1.3 SD increase in the monthly premium (€10) for a one SD increase in the branch density. However, this number carries a lot of uncertainty (confidence interval: $[0.286, 3.064]$).

\textsuperscript{20}The reason is that the ratio of the means $\mu_k/\mu_l$ does not provide an accurate approximation of the median of the corresponding ratio distribution—if the denominator distribution has a mean close to zero and a non-vanishing density at zero. To estimate the percentiles, we draw 2 million random numbers from the relevant ratio distributions, with the point estimates $\hat{\mu}_k$, $\hat{\mu}_l$, $\hat{\sigma}_k$, and $\hat{\sigma}_l$ entering the involved normal distributions, and then average the simulated quantiles over 2,000 replications. Due to the large size of the pseudo sample, the estimated percentiles exhibit very little sampling variability and averaging has almost no effect. To simulate the confidence bands, we also sample 2,000 times where, in each replication, the four relevant parameters are drawn from the (estimated) jointly-normal distribution of the ML-estimator.

\textsuperscript{21}Using $-\hat{\mu}_{\text{branch}}/\hat{\mu}_{\text{premium}}$ directly as estimate for $\text{med}(MRS_{\text{branch}})$ and applying the delta-method for calculating confidence intervals yields results (point estimate: 0.128, confidence interval: $[-0.306, 0.561]$) that just marginally deviate from the simulation-based counterpart. This can be explained by the small value of $\hat{\sigma}_{\text{premium}}$ that lets the density of the denominator almost vanish at zero.
On the other hand, according to the estimated distribution of $MRS_{branch}$, 42% of new health plan enrollees were not willing to accept any premium increase in exchange for more physical branches. Taking sampling errors into account, with 95% statistical certainty, one cannot even reject a share as high as 77%. Obviously, as compared to premiums, a large fraction of active health care consumers do not place a high value on company’s physical branch density. However, given the large consumer heterogeneity, a small fraction seems to value face-to-face services a great deal.

**Hotline Services and Supplemental Benefits vs. Lower Prices**

Turning to the remaining supplemental benefit and service characteristics, the pattern of estimated $MRS$s resembles what we just discussed for branch network. The estimated median $MRS$s range from $1/7$ to $1/10$ (hotline service: 0.106; alternative medicine: 0.140; other supplemental benefits: 0.118), indicating a rather low median willingness to pay (WTP) for optional supplemental benefits like immunization shots, alternative medicine as well as hotline services. However, the point estimates are accompanied by rather wide confidence intervals. At the 95th percentile, the estimated $MRS$s (hotline service: 0.808; alternative medicine: 1.379; other supplemental benefits: 0.723) are 6 to 10 times larger than the median. On the other hand, about 40% of active consumers are not willing to accept any premium increase in return for more benefits or a better service.

When individuals decide to enroll in health plans, premiums may be compared to all health plan parameters, not just single and very specific services or extra benefits. Thus, in a final step, we analyze how consumers would trade-off a simultaneous increase in all four parameters by one SD. That is, we consider $-(\delta_{branch} + \delta_{access} + \xi_{alt.med} + \zeta_{sup.benefits})/\gamma_i$ and obtain estimates as for any $MRS_k$. This calculation yields an estimated median value of 0.491 (confidence interval: $[-0.181, 1.181]$). Although—not surprisingly—the median WTP for joint improvements in quality and benefits exceeds the median WTP for single improvements, the point estimate is still smaller than one.

Like the $MRS$s for particular quality characteristics, the joint rate of substitution exhibits considerable heterogeneity. At the 95th percentile, the rate is 2.438, i.e., five times larger than at the median. Considering once more the other tail of the distribution, a third
of all active health care consumers are not willing to accept higher premiums at all, even if all four non-price attributes would simultaneously increase by one SD.

5.4 Heterogeneity Analysis

The Reform of 2009

As mentioned in Section 2, our sample period covers a price framing reform that became effective on January 1, 2009. Prior to 2009, price differences between sickness funds were expressed in contribution rate differences. After 2009, one single unique and fixed contribution rate for all sickness funds was introduced. From then on, price differences between health plans were expressed as flat euro add-on premiums or refunds. Schmitz and Ziebarth (2011) and Wuppermann et al. (2014) find substantial effects of this reform on health plan switching behavior.

A-priori, it is unclear whether differences in service quality or non-essential benefits became more or less salient after this price framing reform. On the one hand, because price differences became more salient post reform, premium differences could have increased in importance relative to other plan characteristics. On the other hand, because the market price dispersion decreased after 2009, the smaller savings potential could have made non-price differences more salient to consumers.

To test whether the relevance of prices, service quality and optional supplemental benefits structurally changed post-reform, we split our sample into a pre- (2008/2009) and post-reform (2010/2011) period. As can be seen in Table 4, the estimated mean coefficient of premium is about twice as large post-reform, which is in line with Schmitz and Ziebarth (2011) and Wuppermann et al. (2014). The estimated coefficients for alternative medicine and other non-essential benefits, however, are very similar in pre and post-reform years. The estimates for branch network and other non-essential benefits remain non-significant but increase in size which could indicate an increase in their mean relevance. However, an LR-test fails (p-value 0.599) to reject the null hypothesis of equal distributions.

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22 We opt for assigning the wave 2009 to the pre-reform period, as SOEP interviews are typically carried out at the beginning of a year and, hence, switching most likely refers to the previous year.

23 If this was true, the effects could either stem from the higher price sensitivity, the price compression in the market, or a different subset of enrollees who actually switched plans.
Table 4: Heterogeneity I—Reform 2009

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium × pre</td>
<td>-0.056*** (0.009)</td>
<td>0.001 (0.014)</td>
</tr>
<tr>
<td>Premium × post</td>
<td>-0.092*** (0.031)</td>
<td>0.069 (0.042)</td>
</tr>
<tr>
<td>Service Quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branch Network × pre</td>
<td>-0.010 (0.119)</td>
<td>0.276 (0.200)</td>
</tr>
<tr>
<td>Branch Network × post</td>
<td>0.203 (0.139)</td>
<td>0.475*** (0.167)</td>
</tr>
<tr>
<td>Hotline Service × pre</td>
<td>0.152 (0.189)</td>
<td>0.428* (0.223)</td>
</tr>
<tr>
<td>Hotline Service × post</td>
<td>-0.008 (0.171)</td>
<td>0.125 (0.341)</td>
</tr>
<tr>
<td>Benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Medicine × pre</td>
<td>0.073 (0.115)</td>
<td>0.260 (0.168)</td>
</tr>
<tr>
<td>Alternative Medicine × post</td>
<td>0.093 (0.107)</td>
<td>0.651*** (0.177)</td>
</tr>
<tr>
<td>Non-Essential Benefits × pre</td>
<td>0.010 (0.068)</td>
<td>0.012 (0.180)</td>
</tr>
<tr>
<td>Non-Essential Benefits × post</td>
<td>0.076 (0.102)</td>
<td>0.136 (0.167)</td>
</tr>
<tr>
<td>Health Plan Fixed Effects</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td># Observations</td>
<td>99,888</td>
<td></td>
</tr>
<tr>
<td># Health Plan Switches</td>
<td>1,726</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Authors’ calculation. The table shows estimated coefficients of both, mean and standard deviation. The binary indicator “pre” is one for the SOEP waves 2008 and 2009, while “post” is one for the waves of 2010 and 2011. Estimated standard errors are in parentheses. *** p < 0.01; ** p < 0.05; * p < 0.1

Health and the Potential for Cream Skimming

The German statutory health insurance system combines guaranteed issue with income-dependent contribution rates. Individual risk rating is strictly prohibited. This regulation, however, creates an incentive for sickness funds to engage in active or passive risk selection. To minimize this incentive, a comprehensive risk adjustment scheme exists. The scheme is based on age, gender, a reduced earnings capacity, and 80 chronic illnesses, such as diabetes or cancer. However, because the risk adjustment scheme does not perfectly adjust for all health risks, allocated revenues for high risk enrollees may still be smaller than actual costs. It is unclear to what extent risk selection exists in the German market. Bauhoff (2012) finds evidence for direct risk selection based on the state of residence of the insured—which is found to be very small, however, in quantitative terms—whereas Nuscheler and Knaus (2005) find no evidence for risk selection in the German SHI.
Sickness fund diversity is important for sufficient competition in the market. If health plans are not allowed to diversify their products at all, enrollees have no incentive to search for and switch to the best health plans in the market. On the other hand, such diversity can be exploited for indirect risk selection.

This paper cannot directly test whether cream skimming exists in the German SHI. However, we assess the potential for indirect risk selection by analyzing heterogeneous consumer responses to plan differences in prices, service quality and supplemental benefits. Risk selection strategies could be employed by sickness funds if healthy and unhealthy individuals were attracted differently by different health plan characteristics.

To classify individuals into different risk types, we use the standard self-assessed health (SAH) measure, age, and gender. Even though the German risk-adjustment is also based on health, age, and sex, we argue that our (simplistic) approach is useful for several reasons. First, SAH is a more comprehensive measure and includes more information than the 80 illnesses considered in the risk equalization scheme. Second, SAH represents recent up-to-date information on enrollees’ health. In contrast, the risk adjustment formula only considers diseases that were diagnosed in the previous year. Third, despite its simplicity, SAH has been shown to be an excellent predictor of true health (McGee et al., 1999). Issues related to reporting heterogeneity seem to be mostly limited to age and gender (Ziebarth, 2010b). Fourth, even though age and sex are included in the risk-adjustment formula, these indicators are not perfect risk adjusters. We stratify the results based on these easy-to-observe socio-demographics since they likely carry other important and correlated health information. Gender and age can be easily observed and then employed for active or passive risk selection. For example, it is well known that females in particular age groups consume more health care and have higher expenditures than their male counterparts.

We cannot include the variables in the most flexible way for computational reasons. Estimation time, tractability of the model, and stability of the estimation results are the main reasons for this restriction. Therefore, for each of the variables, we construct a mutually exclusive subset of two dichotomous indicators $G^1$ (group 1) and $G^2$ (group 2) that represent different health risks. SAH is reported on a five point scale, ranging from 1 (very good) to 5 (bad). We require “good health risks” to report at least good health
Table 5: Heterogeneity II—Risk Types

<table>
<thead>
<tr>
<th></th>
<th>Age (G₁: age &lt; 50)</th>
<th>Gender (G₁: males)</th>
<th>SAH (G₁: SAH &lt; 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium × G₁</td>
<td>-0.063*** (0.009)</td>
<td>0.001 (0.015)</td>
<td>-0.054*** (0.010)</td>
</tr>
<tr>
<td>Premium × G₂</td>
<td>-0.053*** (0.013)</td>
<td>0.000 (0.028)</td>
<td>-0.070*** (0.010)</td>
</tr>
<tr>
<td>Service Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branches × G₁</td>
<td>0.056 (0.112)</td>
<td>0.350** (0.145)</td>
<td>0.083 (0.122)</td>
</tr>
<tr>
<td>Branches × G₂</td>
<td>0.004 (0.134)</td>
<td>0.154 (0.398)</td>
<td>-0.008 (0.112)</td>
</tr>
<tr>
<td>Hotline × G₁</td>
<td>0.187 (0.154)</td>
<td>0.442*** (0.158)</td>
<td>0.128 (0.167)</td>
</tr>
<tr>
<td>Hotline × G₂</td>
<td>-0.069 (0.172)</td>
<td>0.153 (0.277)</td>
<td>0.236 (0.174)</td>
</tr>
<tr>
<td>Benefits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Medicine × G₁</td>
<td>0.064 (0.074)</td>
<td>0.325*** (0.123)</td>
<td>0.058 (0.087)</td>
</tr>
<tr>
<td>Alternative Medicine × G₂</td>
<td>0.021 (0.114)</td>
<td>0.272 (0.262)</td>
<td>0.064 (0.074)</td>
</tr>
<tr>
<td>Non-Essential Benefits × G₁</td>
<td>0.060 (0.065)</td>
<td>0.143 (0.158)</td>
<td>0.121 (0.077)</td>
</tr>
<tr>
<td>Non-Essential Benefits × G₂</td>
<td>0.072 (0.114)</td>
<td>0.357** (0.216)</td>
<td>0.042 (0.077)</td>
</tr>
<tr>
<td>Health Plan Fixed Effects</td>
<td>yes</td>
<td></td>
<td>yes</td>
</tr>
<tr>
<td># Observations</td>
<td>99,888</td>
<td></td>
<td>99,888</td>
</tr>
<tr>
<td># Health Plan Switches</td>
<td>1,726</td>
<td></td>
<td>1,726</td>
</tr>
</tbody>
</table>

Notes: Authors’ calculation. The table shows estimated coefficients of both, the mean and the standard deviation of the random parameters. G₁ and G₂ denote good health risks (age < 50; males, SAH < 3) and bad health risks (age ≥ 50; females, SAH ≥ 3), respectively. Estimated standard errors are in parentheses. *** p < 0.01; ** p < 0.05; * p < 0.1. Significant differences between the distributions of estimated preference parameters are highlighted in gray.
(SAH category 1 or 2), while bad health risks fall into categories 3 to 5. Age is collapsed into two binary variables marking individuals aged younger than 50 ($G^1$) and older than 50 ($G^2$). We also use separate indicators for males ($G^1$) and females ($G^2$).

We run regressions for each of these stratifying variables and interact them with plan characteristics. As we have imposed a normal distribution on the random coefficients, a joint test on equal coefficients (mean and SD) tests whether the preference distributions differ significantly between high and low risks. This is essentially the approach adopted by Beaulieu (2002) and Wang et al. (2011), who run conditional logit and mixed logit models on different subsamples and compare the distributions of the estimated parameters across subsamples. Recall that we cannot include baseline levels of socio-economic controls that do not vary over the choice sets for each enrollee (see Section 3).

Table 5 presents the results of the heterogeneity analysis with respect to age, gender, and SAH. Significant differences between the distributions of the preference parameters are highlighted in gray.

With respect to health plan premiums, the estimated distributional parameters are close to what we observe in the main specification without interaction terms (cf. Model 2 in Table 3). No differences are found when we stratify by age, gender, or health status. This means that the sick and the healthy, the young and the old, as well as males and females all value health plan prices in a similar fashion. The same holds for the factor branch network.

With respect to hotline service, the null hypothesis is rejected when we stratify by gender and health status ($p$-values: 0.0059 and 0.0179). The fraction of new enrollees who value a good hotline service differs significantly in the SAH specification ($G^1$ (good health): 71%, $G^2$ (bad health): 19%). Interestingly, good health risks seem to value hotline services more than bad health risks.

The opposite holds for alternative medicine. The hypothesis of equal distributions for gender and health is rejected ($p$-values: 0.0823 and 0.0309), but the fraction of those who value alternative treatments is much larger among bad health risks and women (SAH: $G^1$: 52%, $G^2$: 85%; gender: $G^1$ (men): 54%, $G^2$ (women): 98%).
Finally, with respect to other non-essential benefits, the null hypothesis of equal distributions is again rejected for gender and health (p-values: 0.0823 and 0.0309), indicating that those in good health and women value non-essential benefits (like certain immunizations and preventive check-ups) more than bad health risks (SAH: $G^1$: 71%, $G^2$: 56%; gender: $G^1$ (men): 75%, $G^2$ (women): 55%).

In total, preference differences by age, gender and health status are rather small. To the extent that they exist, they do not point into one clear direction. Females seem to value alternative treatments and non-essential benefits more than males. The unhealthy also value alternative medicine more than the healthy, who—in turn—have stronger preferences for other non-essential benefits like immunizations. To conclude, one could argue that non-price attributes do not seem to be powerful tools for indirect risk selection in the German SHI.

6 Conclusion

This paper exploits a unique institutional setting and linked individual and health plan level data to assess the relative roles of prices, non-essential benefits, and service quality in the decision to choose health plans. Individuals’ health plan choices are modeled using a random parameters model which accounts for health plan heterogeneity and time-invariant unobserved factors. In total, the empirical setting exploits 1,724 health plan switches and almost 100,000 potential choice sets between 2007 and 2010.

We find that prices play the dominant role in the decision to choose health plans and only see limited effects of the provision of non-essential benefits and service quality. In quantitative terms, for the median enrollee, an increase in any of the non-price factors (density of branches, hotline quality, alternative medicine, and other optional supplemental benefits) by one standard deviation is offset by a decrease in premiums by only one-eighth of a standard deviation, or €1 per month. In other words, even when service quality and non-essential benefits play a role in the decision to choose health plans, enrollees are willing to trade them against lower premiums at a rather small rate. On the other hand, we find substantial consumer heterogeneity in the valuation of non-price attributes; for example, a minority values service quality a great deal. However, we find
that up to 70% of enrollees who switch health plans do not value non-essential benefits and service quality at all.

These findings hold in an institutional setting where differences in service quality and optional benefits should, in principle, be more salient than in other markets—due to a heavy federal regulation that standardizes the benefit package and cost-sharing parameters, in addition to a free choice of providers and centrally determined reimbursement rates. On the other hand, the minor relevance of non-price attributes could precisely be the result of the heavy federal standardization, which may lead to consumer unawareness about differences in health plans, or even ignorance. However, online portals—covering the entire German market and providing extensive information on non-price attributes—greatly facilitate the comparison and switching of plans.

Our empirical approach is based on exactly the same standardized supply-side information that consumers gather to make their health plan choices. In addition, we focus on consumers who actually choose new health plans and make active choices. These individuals very likely make informed choices and thereby reveal their preferences on the trade-off between prices, non-essential benefits, and service quality. As a consequence, all findings are conditional on this subgroup of active consumers. They are the policy-relevant group of consumers and drive market competition through behavioral action.

According to standard economic theory, absent adverse and risk selection, allowing health plans to diversify more would unambiguously increase consumer choice and welfare. Our empirical findings reveal heterogeneity in consumer valuation of non-price attributes which underscores this notion. With regard to Germany’s heavily regulated market: allowing insurers to diversify their product to a greater extent could imply (i) selective contracting and the formation of provider networks, (ii) more leeway to vary cost-sharing amounts, or (ii) more leeway to exclude benefits from the very generous federally mandated essential benefit package.

As in every empirical study, the strict interpretation of our results is limited to the specific setting, in our case the German market. However, we believe that the findings are of broader relevance, in particular because this is one of the first papers that disentangles the roles of supplemental benefits and service quality relative to health plan prices.
Future research could address the ability of consumers to cognitively process the information provided to them and how they transmit the information into behavioral action.

References


Kolstad, J. T. and M. E. Chernew (2009). Quality and consumer decision making in the market for health insurance and health care services. *Medical Care Research and Review* 66(1 suppl), 28S–52S.


