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ABSTRACT

The Effect of a Ban on Gender-Based Pricing on Risk Selection in the German Health Insurance Market*

Starting from December 2012, insurers in the European Union were prohibited from charging gender-discriminatory prices. We examine the effect of this unisex mandate on risk segmentation in the German health insurance market. While gender used to be a pricing factor in Germany's private health insurance (PHI) sector, it was never used as a pricing factor in the social health insurance (SHI) sector. The unisex mandate makes PHI relatively more attractive for women and less attractive for men. Based on data from the SOEP we analyze how the unisex mandate affects the difference between women and men in switching rates between SHI and PHI. We find that the unisex mandate increases the probability of switching from SHI to PHI for women relative to men. This effect is strongest for self-employed individuals and mini-jobbers. On the other hand, the unisex mandate had no effect on the gender difference in switching rates from PHI to SHI. Because women have on average higher health care expenditures than men, our results imply a reduction of advantageous selection into PHI. Our results demonstrate that regulatory measures such as the unisex mandate can reduce risk selection between public and private health insurance sectors.

JEL Classification: I13, D82, H51

Keywords: unisex mandate, public and private health insurance, risk selection, Germany

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1 Introduction

Gender is one of the most frequently used pricing factors in health insurance markets. Information on gender is easy to collect and accounts for a higher average use of health care services among women. However, on 1 March 2011, the European Court of Justice held discriminatory prices between men and women to be unacceptable on the grounds of gender equality (European Union, 2012). The ruling placed a ban on using gender as a pricing variable and forced insurance companies to rewrite their contracts into new 'unisex' health plans.

In this study, we examine the effect of this ban on gender-based pricing on risk segmentation in the German health insurance market. The German health insurance market consists of a social health insurance (SHI) and a private health insurance system (PHI). The two systems differ in many aspects, including benefit packages, eligibility rules, and how premiums are calculated. Eligibility for PHI is restricted to certain employment groups such as high income individuals, the self-employed, mini-jobbers, and civil servants, whereas SHI is, in principle, open to all German residents. While insurance premiums in the PHI market are based on individual health risk, SHI premiums depend solely on income.

The ban on gender-based pricing can affect risk segmentation between SHI and PHI by placing both systems on equal grounds regarding gender as a pricing factor. Risk segmentation between SHI and PHI is at the heart of an ongoing debate about fairness and financial sustainability in the German health insurance system (Panthöfer, 2016; Polyakova, 2016). One concern is that cherry-picking of better health risks by PHI leads to a worse risk-pool for SHI. For example, Bünnings and Tauchmann (2015) find that healthier individuals are more likely to opt into PHI, and Grunow and Nuscheler (2014) find that individuals in poorer health are more likely to leave PHI which benefits the private system. Furthermore, men are more likely to be enrolled and to switch into PHI than women.

In this study we examine the effect of the unisex mandate on risk segmentation between both systems using data from the SOEP. Outcome variables are switching decisions from

SHI to PHI, and vice versa. The treatment is the introduction of the unisex mandate. Our empirical approach is akin to a difference-in-differences estimation. However, there is no clearly defined treatment and control group as the introduction of the unisex mandate affects incentives for both men and women. Instead of looking at the effect of the unisex mandate on either men or women, our main parameter of interest measures the effect of the mandate on the difference in switching rates between genders.

We find that the unisex mandate reduces the difference in switching rates from SHI to PHI between genders. After the mandate, relatively more women switched from SHI to PHI. This result is robust to alternative definitions of the sample, and it cannot be explained by pre-trends. As women constitute the higher-risk group in terms of health care utilization, this result implies a reduction of the risk segmentation in the German health insurance system. The effect is strongest for the self-employed and bers. For these groups, the prior difference in switching rates between men and women is entirely eliminated by the change in regulation. In contrast, we find a somewhat weaker effect for high-income employees and no significant effect for civil servants.

The unisex mandate has no significant effect on the difference in switching rates from PHI to SHI between genders. The lack of a measurable effect is likely related to regulatory restrictions on switching from PHI to SHI. We also examine the effect of the unisex mandate on health care utilization and insurance premiums. However, these variables are imprecisely measured in our data, and we do not find a significant effect.

Our study contributes to the literature on how community rating affects adverse selection in health insurance markets. Community rating policies imply that insurance companies are not allowed to charge different premiums according to risk factors such as gender, age, and health conditions. Under community rating disproportionately more high-risk individuals are found to enroll in insurance markets. As the risk pool deteriorates, premiums rise, which may drive low-risk individuals out of the market. Therefore, community rating can lead to inefficient outcomes (Cutler and Zeckhauser, 2000; Buchmueller et al., 2002).

Some theoretical studies specifically discuss the effect of unisex policies on demand for insurance and distributional effects (Oxera, 2011; Finkelstein et al., 2009). Aseervatham et al. (2016) show that the policy's effect on prices may be negligible if gender is strongly correlated with other predictors of risk that can still be used for determining insurance premiums. Riedel (2006) shows that premium refund schemes can counteract the distributional effects of a unisex mandate.

In contrast to previous studies we examine the effect of a unisex mandate not only on the insurance market that is affected by the mandate, but also on another market where the mandate does not lead to a change in regulation. In Germany, the unisex mandate leads to potential changes in premiums only for PHI, whereas premiums for SHI never depended on gender. One of the unintended consequences of the unisex mandate can be a reduction in risk segmentation between SHI and PHI. Thus, limiting the ability of PHI to discriminate based on risk factors such as gender can improve the risk pool for SHI. This mechanism could also be relevant for other countries where private and public health insurance systems coexist.

Our paper is organized as follows. Section 2 describes the institutional background. Section 3 presents the data and describes our empirical strategy. Section 4 shows the estimation results. Finally, Section 5 concludes.

2 Background

Germany's health insurance system consists of two sectors. Most Germans are covered by social health insurance (SHI). However, a non-negligible part of the population is eligible to opt out of SHI, and about 10% are covered by private health insurance (PHI) (Mossialos et al., 2016).

There is no risk selection in the SHI system. SHI cannot reject applicants based on their health, and it covers family members without income for free. Premiums are determined purely based on income rather than individual health. Benefit packages and co-payments are uniform across SHI providers.

In contrast, PHI premiums are calculated based on individual health risk. To determine risk, a screening process takes place, which may also result in a rejection of the applicant. Once approved, the insurer cannot drop a policy holder and may re-assess risk only if the insuree switches to a different insurance plan. PHI offers family coverage, but it is not free. PHI providers offer a wide range of different, often non-linear, contracts with varying co-payment and premiums.

Treatment for private patients is often perceived as better. Care providers receive higher reimbursement rates for PHI insured patients than for SHI insured patients (Jürges, 2009), and waiting times are considerably longer for SHI insured patients (Lungen et al., 2008). Hullegie and Klein (2010) find a positive causal effect of PHI on self-reported health.

Switching between the SHI and the PHI system is subject to requirements on employment and income. In general, SHI is mandatory. Opting out of SHI into PHI is possible only for self-employed, civil servants, employees with incomes above a threshold, and 'mini-jobbers'[1]. Once a person enters PHI, switching back to SHI is possible only if her income falls under the compulsory SHI threshold, and she is no older than 55 years.

The decision to join the SHI or PHI system is also determined by how insurance premiums are shared between employees and employers. Regular employees share contributions with their employer in equal parts in both SHI and PHI. Special rules apply to civil servants, the self-employed, and mini-jobbers. Civil servants pay the full premium in SHI but obtain subsidies for PHI. The self-employed pay the full premium in both systems. Mini-jobbers do not obtain contributions from their employer but are eligible for family insurance, PHI, and voluntary SHI. Under voluntary SHI, they pay a premium of about €150 monthly. These regulatory differences make PHI more attractive for some employment groups than for others.

[1]In 2017, the threshold on annual gross income was €57.600. Individuals with monthly earnings of €450 or less are classified as mini-jobber.

In the year 2004 the European Union passed a directive on equal treatment between men and women in the access to and supply of goods and services (European Union, 2004). However, insurance providers were exempted. On 1 March 2011, the European Court of Justice ruled this exemption to be unacceptable. The ruling placed a ban on gender-based pricing in the insurance sector, which was implemented on 21 December 2012. Private insurers were no longer allowed to charge prices based on statistical discrimination between male and female applicants for any contract signed after this target date. Policyholders with existing insurance contracts had the choice to either keep them or change into new unisex health plans.

3 Methods

3.1 Data

Our analysis is based on the German socio-economic panel (SOEP) which conducts an annual survey of a representative sample of the German population. We use version v32.1[2], and include observations from waves 2004 to 2015 (1,366,080 individual-year observations).

We remove observations on individuals aged 55 or older from the sample because they are not allowed to switch back to SHI (drops 363,059 observations). We also drop observations aged 25 or younger because SHI covers non-working children for free (454,899 observations). Military personnel are excluded as they are covered outside of the health insurance system (4 observations). We also drop observations with missing information on gender, insurance status, health status, children, family status, education, or employment (13, 423,698, 2,594, 177, 6,442, 2,463 and 133 observations respectively).

Furthermore, we exclude observations which likely reflect measurement errors. Individuals are excluded if they are not eligible to choose PHI but report to be enrolled in PHI, or if they are not eligible in either of two consecutive periods but report to switch into PHI (1,982

[2]For further information on the SOEP, see Wagner et al. (2007).

observations). We define eligibility as being a civil servant, mini-jobber, self-employed, a regular employee with an income of at least 75% of the compulsory insurance threshold[3], or reporting voluntary coverage under SHI. We further remove individuals with more than one switch in either direction (308 observations) as this may indicate measurement error rather than actual choice (see Grunow and Nuscheler, 2014).

To study switching between systems, we use the sub-sample of individuals enrolled in SHI and the sub-sample of PHI insurees, respectively. Our sample for the baseline estimation consists of 96,597 observations for the SHI sample and 12,977 observations for the PHI sample.

3.1.1 Variables

Switching. As dependent variables, we construct two binary variables which indicate whether an individual's insurance status changed from SHI to PHI or from PHI to SHI in a given year, respectively. The switching indicator *Switch to PHI* (or *Switch to SHI*) is set to one for the year before an individual is first observed to be privately (or publicly) insured. In this way we make sure that the covariates refer to the situation before the individual decides to switch (see Bünnings and Tauchmann, 2015).

Unisex Mandate. Our main explanatory variable of interest, *Implementation* × *Female*, interacts gender with the years 2013 and 2014 when the unisex mandate was implemented. In addition, we include three control variables that interact gender with the 'pre-announcement' period in 2010, the actual announcement period in 2011, and the 'pre-implementation' period in 2012[4]. The baseline period refers to the years 2009 and before.

[3]Income in the SOEP is likely to be measured imprecisely and is more prone to error than reported insurance status (see Hullegie and Klein, 2010). While 75% of the income threshold is an arbitrary cutoff, using the actual compulsory income threshold in a sensitivity specification (see Section 4) or alternative cutoffs (not reported) do not change the main results.

[4]This choice is related to the annual nature of the SOEP, due to which the timing of the treatment is not straightforward. Unisex pricing came into effect by the end of 2012, following the announcement in March 2011. Because the switching variables are constructed using the current insurance status, we are not able to pin down whether a switch coded for year 2012 took place when the unisex regulation was already implemented or not. For example, consider someone who switches to PHI before 21 December 2012 but only reports to hold PHI to the SOEP in 2013. Then, *Switch to PHI* is coded 1 in year 2012 although it should

Socio-economic Controls. Our selection of control variables closely follows Bünnings and Tauchmann (2015). We include variables for gender, residence in West Germany, blue-collar employment, white-collar employment, German nationality, missing nationality, age categorized in 5-year age bins, years of education, having children, having a non-working spouse, having a spouse in PHI, being a civil servant, being a mini-jobber, being self-employed, not working, quartiles of individual income, income above 75% of the income threshold for PHI coverage, and missing income. Many of these variables affect eligibility or financial incentives for switching between insurance systems. A non-working spouse qualifies for free coverage in SHI, and a spouse insured in PHI may allow for discounts on PHI premiums. We use income quartile categories as measure of income that is less sensitive to measurement error[5].

Health. The SOEP surveys self-assessed health on a scale from 1 (very good) to 5 (bad). We include a 'good health' indicator if self-reported health is good or very good[6].

Risk Attitude. Uncertainty over future health care needs and family size may affect choice between SHI and PHI (Thomson and Mossialos, 2006). We use one of Bünnings and Tauchmann (2015)'s measures of risk attitude by constructing an indicator that is one if self-reported willingness to take risks is above 6 on a scale from 1 (low) to 10 (high). We include an indicator for missing observations and interpolate values for years 2005 and 2007, in which the question was dropped. We include an interaction term for the interpolated values and the years 2005 and 2007.

Other Controls. We also include a number of variables specifically for estimating switches from SHI to PHI. Time at risk dummies capture the number of years in a row that

correctly be coded 1 in 2011 if the exact date of the switch was available.

[5]Annual gross income is computed using the respondents' reported monthly salary as well as 13th month and 14th month salaries, and all further bonuses.

[6]In contrast to previous studies on the German health insurance system using SOEP data, we view self-assessed health as a control variable. Nevertheless, the main analysis is supplemented by an instrumental variable specification in the sensitivity checks (see section 5) following Grunow and Nuscheler (2014); Bünnings and Tauchmann (2015) in treating self-assessed health as a continuous variable with measurement error. Similarly, alternative specifications treating self-assessed health as continuous or as categorical variable do not affect the main results (not displayed).

an individual has already been eligible to opt out of SHI. A binary variable for left-censoring marks individuals who are eligible for PHI at the time when they enter the panel. We measure awareness about the possibility to choose PHI by an indicator of whether insurance in SHI was reported as voluntary. Finally, we control for the sampling process: We add indicators for employees whose income is higher than 75% but lower than the compulsory insurance threshold, for individuals who report voluntary insurance in SHI but are not eligible to take up PHI according to their employment or income and for mini-jobbers or employees with an income above 75% but not 100% of the compulsory insurance threshold[7].

3.1.2 Descriptive Statistics

The final sample consists of 110,308 person-year observation from 25,756 unique individuals. Table 1 presents the number of individuals observed by calender year in Panel A[8] and by the number of years they participate in the survey in Panel B. Our panel is unbalanced, but about half of all individuals are included for at least four years.

Panel C of table 1 presents summary statistics by insurance type and gender[9]. Insurance enrolment differs strikingly between men and women. About 16.7% of male observations are insured in PHI, while this is the case for only about 8.1% of female observations. There are 820 switches from SHI to PHI and 525 switches from PHI to SHI in our sample. Switches from SHI to PHI occur about twice as often for men than for women, while switches from PHI to SHI occur with almost equal probabilities for both genders. In both systems, the average number of doctor visits is lower for men than for women. Good health is reported more often by PHI than SHI insurees.

[7] In particular, these are observations which would not be eligible to switch to PHI in Bünnings and Tauchmann (2015)'s sample.

[8] The variation in the number of individuals observed by year can be attributed to changes in the sample sizes of the underlying survey (see Glemser et al., 2016) and availability of our key dependent variable, health insurance type.

[9] The full sample presented in Table 1 includes observations from a small number of individuals who switched from one insurance system to the other and back. The sub-sample of SHI insurees (PHI insurees) used in the baseline estimation includes individuals only until they switch to PHI (SHI) for the first time. For individuals who switched back and forth once, some observations may be dropped in the sub-samples but not in the full sample.

Figure 1 shows the share of PHI insurees among men and women for different periods. In all sub-periods this share is higher for men than for women[10].

Figure 2 shows switching rates between insurance systems across years for men and women separately without yet controlling for other observable characteristics. At any point in time, opting out of SHI is more common for men. The difference in switching rates from SHI to PHI between men and women is relatively constant at about 0.6% before 2010, but becomes smaller after the unisex mandate is implemented. In contrast, switching rates from PHI to SHI fluctuate widely across years, and the variation in the gender difference is quite high.

Table 1: Sample characteristics

Panel A: # Observations by calendar year				
2004: 9948	2005: 9312	2006: 9607	2007: 8958	2008: 8338
2009: 8286	2010: 6845	2011: 12143	2012: 13121	2013: 11506
2014: 12244	**Total: 110308**			
Panel B: # Individuals by years of observation				
1: 6023	2: 3247	3: 3468	4: 4871	5: 1140
6: 1007	7: 1162	8: 829	9: 1046	10: 612
11: 2351	**Total: 25756**			
Panel C: Means for main variables[a]				
	SHI		PHI	
	Male	Female	Male	Female
Switch to PHI (from SHI)	0.012	0.006		
	(0.107)	(0.078)		
Switch to SHI (from PHI)			0.038	0.042
			(0.192)	(0.201)
# Doctor Visits	1.757	2.382	1.504	2.531
	(3.376)	(3.608)	(2.776)	(3.769)
Good Health	0.571	0.560	0.667	0.645
	(0.495)	(0.496)	(0.471)	(0.479)
Observations	**41,662**	**55,421**	**8,344**	**4,881**

[a] Standard deviations in parentheses. Variable means are shown only for the main health-related variables of our analysis. Table B.1 in Online Appendix B shows means for the full list of variables that we use in our main estimation.

[10]This pattern persists once possibly confounding factors are accounted for, see Online Appendix B.

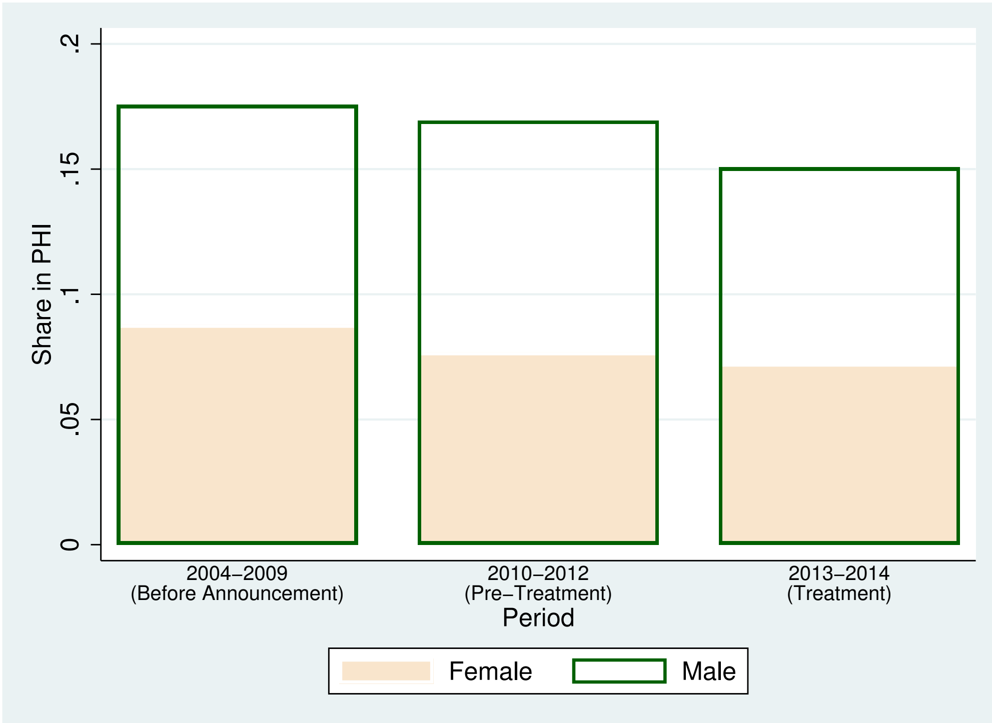


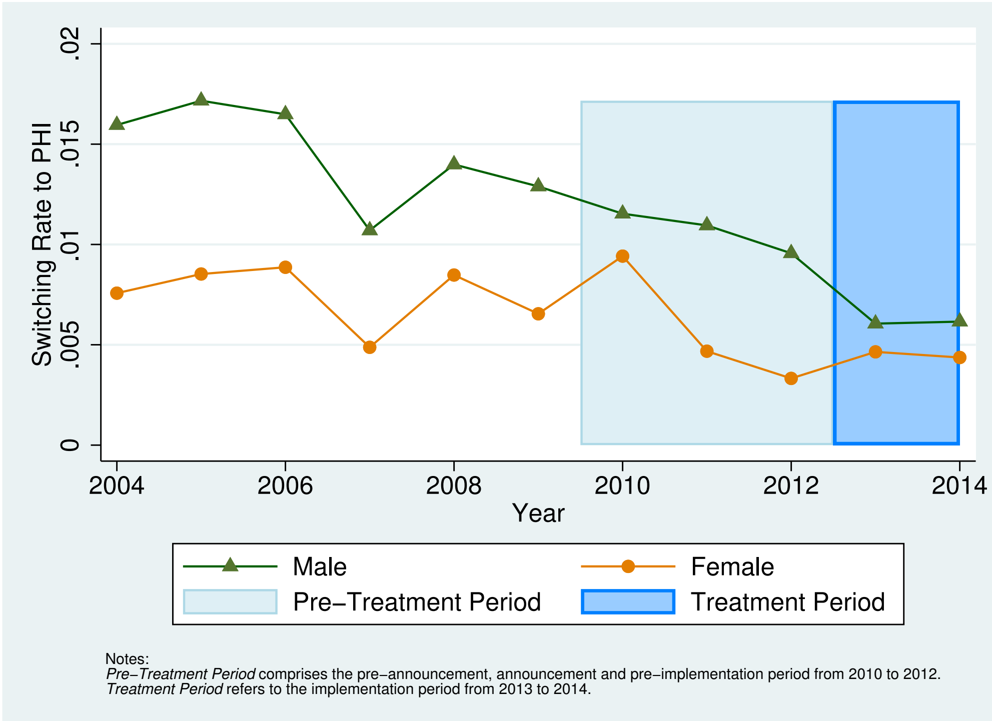
Figure 1: Enrolment in PHI in the full sample over time, by gender

3.2 Empirical Framework

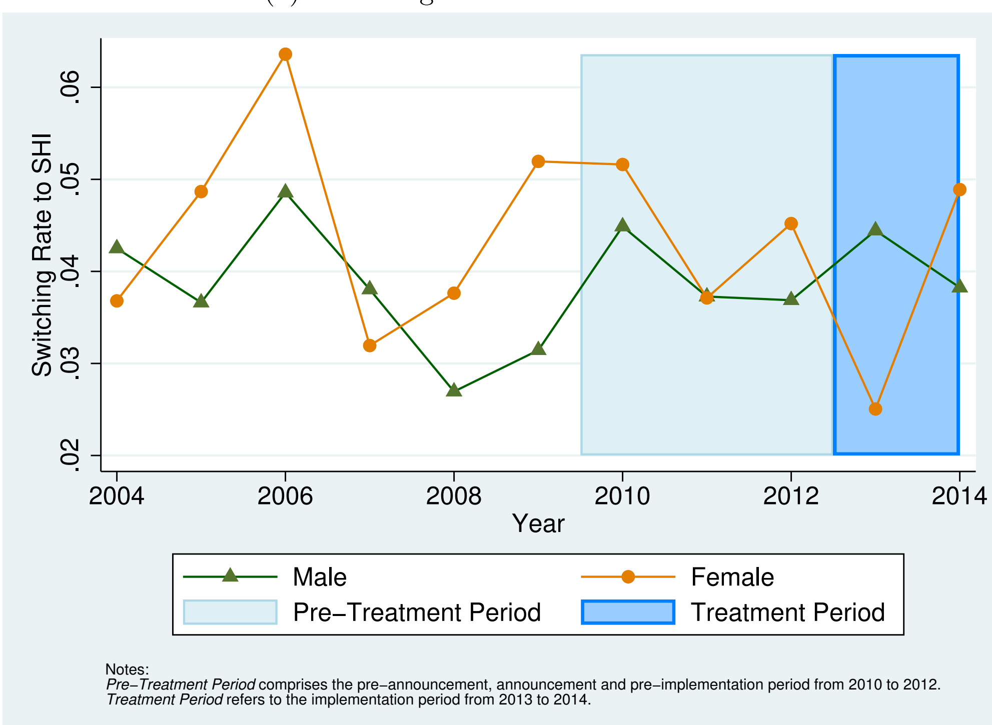
Our main analysis examines how the unisex mandate affects switching decisions between insurance systems. We analyze both switching from SHI to PHI and from PHI to SHI, and we examine the relationship between gender and switching decisions before and after the implementation of the unisex mandate. The unisex mandate can lead to lower insurance premiums for women and to higher insurance premiums for men. Thus, the unisex mandate makes PHI relatively more attractive for women. We test two main hypotheses related to the effects of the unisex mandate:

1. The implementation of the unisex mandate increases the probability to switch from SHI to PHI for women relative to men.

2. The implementation of the unisex mandate decreases the probability to switch from PHI to SHI for women relative to men.



(a) Switching Rates from SHI to PHI



(b) Switching Rates from PHI to SHI

Figure 2: Switching Rates for male and female, aggregated by years

Switching from SHI to PHI

To study the effects of the unisex policy onto switching from SHI to PHI, we estimate the following equation:

$$\begin{aligned} SwitchPHI_{it} = \alpha_1 + \beta_1(impl_t \times fem_i) + \gamma_1 fem_i \\ + \delta_1^{'}(pre\text{-}treat_t \times fem_i) + \zeta_1^{'} d_t + \eta_1^{'} X_{it} + \theta^{'} W_{it} + \epsilon_{1,it} \end{aligned} \quad (1)$$

The dependent variable is $SwitchPHI_{it}$, a binary variable which indicates whether there was a switch from SHI to PHI for individual i in year t. fem_i indicates whether i is female. $impl_t$ is a binary indicator for the implementation period of the unisex mandate in 2013-2014. $pre\text{-}treat$ includes three indicators for the 'pre-announcement' period in 2010, the actual announcement period in 2011, and the 'pre-implementation' period in 2012. d_t includes year dummies. X_{it} is a vector containing individual-time-specific control variables. In the main specification, X_{it}, includes socio-economic indicators, health, and risk attitude. W_{it} includes additional variables used for analyzing switching to PHI.

β_1, γ_1, δ_1, ζ_1, η_1, and θ are parameters. β_1 is the main parameter of interest, and it captures the effect of the unisex mandate on differences in switching decisions between women and men. If $\beta_1 > 0$, this provides evidence in favor of hypothesis 1 which predicts that the unisex mandate increases the difference in switching rates between women and men.

γ_1 captures the correlation between gender and switching decisions prior to the announcement of the unisex mandate. δ_1 measures different trends for men and women during the period when the unisex mandate was already announced, but not yet implemented. ζ_1 measures underlying time trends.

Our empirical approach is similar to a difference-in-differences estimation approach. However, in contrast to a standard difference-in-differences setting our treatment variable, the implementation of the unisex mandate, affects incentives for both men and women. Thus, there are no clearly defined treatment and control groups. Instead of estimating the effect of the unisex mandates on only one group, our approach estimates the effect of the unisex mandate on the *difference* in switching rates between women and men.

The estimation coefficient for β_1 can be interpreted as causal effect if the following exogeneity assumption holds: $\mathbb{E}[\epsilon_{1,it}|fem_i, d_t, X_{it}, W_{it}] = 0$. This assumption requires that in the absence of the unisex mandate the outcome variable $SwitchPHI$ would have followed a common trend for both both women and men, conditional on the control variables. If for example switching rates from SHI to PHI were increasing already before the implementation of the unisex mandate for women, but not for men, this would violate the exogeneity assumption.

As test for a possible violation of the exogeneity assumption we examine whether there were different pre-trends in switching rates between men and women in the years before the unisex mandate was announced. We also examine whether our results can be attributed to a change in child care policies during our study period.

Our empirical approach is based on a linear regression model for a binary outcome variable. Alternatively, a binary choice specification could be used. However, interaction terms in nonlinear models are difficult to interpret (see Norton et al., 2004), and we therefore focus on a linear probability model in our main specification[11].

Switching from PHI to SHI

We also examine the effect of the unisex mandate on switching from PHI to SHI based on an empirical approach that mirrors the approach described above. We estimate the following equation:

$$\begin{aligned} SwitchSHI_{it} = {} & \alpha_2 + \beta_2(impl_t \times fem_i) + \gamma_2 fem_i \\ & + \delta_2'(pre\text{-}treat_t \times fem_i) + \zeta_1' d_t + \eta_2' X_{it} + \epsilon_{2,it}, \end{aligned} \tag{2}$$

[11]We present results for a probit model in Online Appendix C.

The outcome variable is $SwitchSHI_{it}$, a binary variable which indicates whether there was a switch from PHI to SHI for individual i in year t. The other variables are defined above. α_2, β_2, γ_2, δ_2, ζ_2, η_2 are parameters.

The main parameter of interest is β_2 which measures the effect of the unisex mandate on differences in switching decisions between women and men from PHI to SHI. If $\beta_2 < 0$, this is in line with hypothesis 2 which predicts that the unisex mandate reduces the difference in switching rates between women and men from SHI to PHI.

4 Results

Baseline Results

Table 2 shows results for the effects of the unisex mandate on switching decisions between the two health insurance systems in Germany. Column (1) shows results for switches from SHI to PHI based on estimation equation 1. The main coefficient of interest measures the interaction effect between female and the implementation period. The unisex mandate increases switching rates of women by 0.4 percentage points relative to men. The coefficient is statistically significant at the 1% level.

Moreover, the coefficient for female shows that before the unisex mandate was announced women were 0.6 percentage points less likely than men to switch from SHI to PHI, after controlling for covariates. Thus, the unisex mandate decreased the gender differences in switching probabilities by two thirds.

Coefficients for interaction terms between female and time periods between the announcement and the implementation of the unisex mandate are statistically insignificant at the 5 percent level. Further coefficients are as expected. Civil servants and the self-employed are more likely to switch to PHI than the reference group of regular employees, while minijobbers are less likely to do so. Moreover, better health is associated with a higher probability to switch to PHI, in line with results by Bünnings and Tauchmann (2015).

Column (2) of Table 2 shows results for switching from PHI to SHI based on regression equation 2. While the point estimate indicates that the unisex mandate decreases switching rates from PHI to SHI for women relative to men, this effect is not statistically significant. One possible explanation for the lack of a significant effect is that switching from PHI to SHI is highly restricted. PHI insured individuals can switch to SHI only in special situations for example if their income falls below a threshold.

Table 2: Results from the main switching analysis

	Switch to PHI	Switch to SHI
	Full sample (SHI)	Full sample (PHI)
	(1)	(2)
	Linear	Linear
Fem × Implemented	0.004***	-0.010
	(0.001)	(0.009)
Fem × Pre-Announcement	0.005*	0.004
	(0.003)	(0.017)
Fem × Announced	-0.001	-0.010
	(0.002)	(0.012)
Fem × Pre-Implementation	0.000	0.002
	(0.002)	(0.012)
Female	-0.006***	0.006
	(0.001)	(0.005)
Civil Servant	0.203***	-0.145
	(0.023)	(0.097)
Self-Employed	0.016	-0.104
	(0.010)	(0.098)
Mini Job	-0.025***	0.018
	(0.004)	(0.024)
Good Health	0.003***	-0.007*
	(0.001)	(0.004)
Constant and Year Dummies	yes	yes
Soc.-econ. Controls[a]	yes	yes
Switch to PHI Controls[b]	yes	no
Self-Assessed Risk[c]	yes	yes
Observations	96597	12977

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Switch to PHI Controls include the variables *Time at Risk*, *Left-censored*, *Awareness*, *Lower income threshold*, *Voluntarily in SHI* and *Extended Eligibility.*

[c] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS. Cluster-robust standard errors in parentheses.

Sensitivity Analysis

The exogeneity assumption requires that in the absence of the unisex mandate switching rates for men and women would have followed a common trend. While we cannot test this assumption for the period when the unisex mandate was implemented, we can look at pre-trends in switching rates for earlier periods. In Figures 2a and 2b we have already seen that switching rates to PHI followed a similar pattern for both genders in the years before the unisex mandate was announced. For switching to SHI the pattern is more noisy.

In a more formal analysis we conduct a 'placebo' difference-in-differences estimation in which we interact female with year dummies. This allows testing for different trends between women and men in the years before the mandate was implemented. Estimation coefficients for these interaction terms are shown in Figure 3[12]. None of the coefficients for the years before the implementation is statistically significant. This supports the exogeneity assumption.

Next, we examine whether our results are robust to alternative specifications of the sample, and to alternative choices of covariates. Table 3 shows results for switching to PHI, and Table 4 shows results for switching to SHI.

In column (1) of Table 3 we show that results are in line with the baseline results from Column 1 of Table 2 if we restrict the sample to individuals who, in at least one of two consecutive years, have an income strictly above the mandatory insurance threshold (rather than above 75% of the threshold), hold voluntary social insurance, or who are civil servants, self-employed or mini-jobbers. Column (2) shows results for the original sample specification of Bünnings and Tauchmann (2015), which does not include mini-jobbers. Here, the main coefficient is positive, but significant only at the 10 percent level.

Column (3) of Table 3 presents results for a sample that excludes individuals with children below the age of three years. Simultaneous with the implementation of the unisex mandate there was a reform in child benefits for children up to three years. Estimation results are essentially unchanged compared with the baseline results.

In column (4) of Table 3 we instrument health status by the less subjective measures legally attested disability status and number of hospitalization days in order to account for

[12]Numerical results are reported in Online Appendix C.

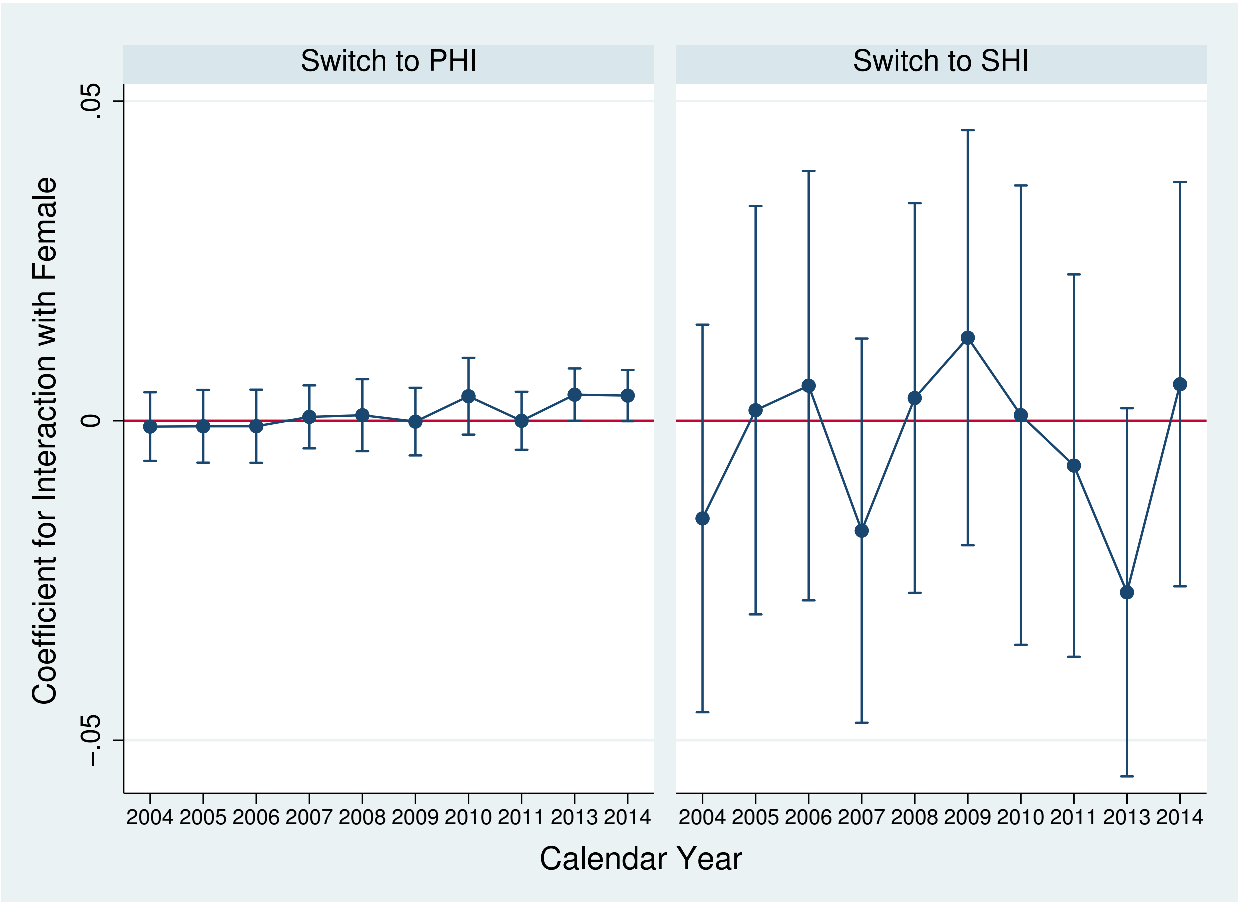


Figure 3: Estimated coefficients and 95% confidence intervals for the interaction terms between female and periods, full sample linear switching specification with pre-trends

potential measurement error in self-assessed health (see also Grunow and Nuscheler, 2014; Bünnings and Tauchmann, 2015). The findings are in line with the baseline results.

In columns (5) to (7) of Table 3 we present results for alternative sets of covariates. Results are not sensitive if we omit covariates and even when we control for nothing more than time trends.

Table 4 shows corresponding sensitivity analyses also for switching to SHI. As for the baseline results in Column (2) of Table 2, all coefficients are negative, but insignificant.

Table 3: Results from the sensitivity checks for switching from SHI to PHI

	Switch to PHI						
	Eligible	Eligible (TB)	No children ≤3 years	Full sample (SHI)	Full sample (SHI)	Full sample (SHI)	Full sample (SHI)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Linear	Linear	Linear	IV Linear	Linear	Linear	Linear
Fem × Implemented	0.012***	0.010*	0.005***	0.004***	0.005***	0.005***	0.005***
	(0.004)	(0.006)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Female	-0.020***	-0.022***	-0.006***	-0.006***	-0.007***	-0.005***	-0.007***
	(0.003)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Good Health	0.008***	0.011***	0.003***		0.006***	0.005***	0.004***
	(0.002)	(0.002)	(0.001)		(0.001)	(0.001)	(0.001)
Self-Assessed Health[a]				-0.005***			
				(0.001)			
Constant and Year Dummies	yes	yes	yes	yes	yes	yes	yes
Soc.-econ. Controls[b]	yes	yes	yes	yes	no	no	yes
Switch to PHI Controls[c]	yes	yes	yes	yes	no	no	no
Self-Assessed Risk[d]	yes	yes	yes	yes	no	no	no
Employment Controls[e]	yes	yes	yes	yes	no	yes	yes
Pre-Treatment Trends[f]	yes	yes	yes	yes	yes	yes	yes
Observations	27502	20353	80333	94582	96597	96597	96597

[a] Self-assessed Health is instrumented by *Disabled* and *# Hospitalization Days* in the IV specifications. Estimation by GMM.

[b] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[c] Switch to PHI Controls include the variables *Time at Risk*, *Left-censored*, *Awareness*, *Lower income threshold*, *Voluntarily in SHI* and *Extended Eligibility*.

[d] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

[e] Employment Controls includes the variables *Civil Servant, Self-Employed, Mini Job.*

[f] Pre-Treatment Trends includes the interaction variables *Fem × Pre-Announcement, Fem × Pre-Announced, Fem × Pre-Implementation.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS (except for specification (4)). Cluster-robust standard errors in parentheses.

Table 4: Results from the sensitivity checks for switching from PHI to SHI

	Switch to SHI				
	No children ≤3 years (1) Linear	Full sample (SHI) (2) IV Linear	Full sample (SHI) (3) Linear	Full sample (SHI) (4) Linear	Full sample (SHI) (5) Linear
Fem × Implemented	-0.006	-0.011	-0.012	-0.010	-0.010
	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)
Female	0.003	0.007	0.007	0.005	0.006
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Good Health	-0.008*		-0.004	-0.003	-0.006
	(0.004)		(0.004)	(0.004)	(0.004)
Self-Assessed Health[a]		-0.007			
		(0.007)			
Constant and Year Dummies	yes	yes	yes	yes	yes
Soc.-econ. Controls[b]	yes	yes	no	no	yes
Self-Assessed Risk[c]	yes	yes	no	no	no
Employment Controls[d]	yes	yes	no	yes	yes
Pre-Treatment Trends[e]	yes	yes	yes	yes	yes
Observations	10905	12885	12977	12977	12977

[a] Self-assessed Health is instrumented by *Disabled* and *# Hospitalization Days* in the IV specifications. Estimation by GMM.
[b] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*
[c] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*
[d] Employment Controls include the variables *Civil Servant, Self-Employed, Mini Job.*
[e] Pre-Treatment Trends includes the interaction variables *Fem × Pre-Announcement, Fem × Pre-Announced, Fem × Pre-Implementation.*
* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS (except for specification (2)). Cluster-robust standard errors in parentheses.

Heterogeneity Analysis

Next, we examine the effect of the unisex mandate on switching to PHI separately for employment groups that face different incentives to join PHI. Estimation results are shown in Table 5[13].

For self-employed individuals and mini-jobbers we find large and significant effects of the unisex mandate on the difference in switching rates between women and men. The unisex mandate increases the probability of switching for women relative to men by 3.7 percentage points for the self-employed and by 2 percentage points for mini-jobbers. This completely eradicates the pre-existing gender difference of -2.9 percentage points and -1.6 percentage points, respectively. For regular employees, the largest group in the SHI system, we also find a positive and significant effect, but the effect size is somewhat smaller. The unisex mandate increases the the probability of switching for women relative to men by 0.3 percentage points. In contrast, we find no significant effect for civil servants.

These heterogeneous effects can be explained by incentives which differ between employment groups. Civil servants have strong financial incentives to be privately insured, regardless of whether unisex tariffs are offered or not. Civil servants receive subsidies from their employers for PHI, but not for SHI. In contrast, self-employed individuals, mini-jobbers, and regular employees face weaker financial incentives to be privately insured. This can explain why their choice to switch to PHI is more price-sensitive, and why price changes due to the unisex mandate have a larger effect for these employment groups.

[13] As these specifications do not include non-working individuals, the number of observations does not fully add up to the number of observations in the full sample.

Table 5: Results from the heterogeneity analysis for switching from SHI to PHI

	Switch to PHI			
	Employees	Civil Servants	Self-Employed	Mini Jobbers
	(1)	(2)	(3)	(4)
	Linear	Linear	Linear	Linear
Fem × Implemented	0.003***	-0.112	0.037***	0.020***
	(0.001)	(0.096)	(0.011)	(0.007)
Female	-0.004***	-0.047	-0.029***	-0.016**
	(0.001)	(0.059)	(0.008)	(0.007)
Good Health	0.003***	0.037	0.014***	0.001
	(0.000)	(0.040)	(0.005)	(0.002)
Constant and Year Dummies	yes	yes	yes	yes
Soc.-econ. Controls[a]	yes	yes	yes	yes
Switch to PHI Controls[b]	yes	yes	yes	yes
Self-Assessed Risk[c]	yes	yes	yes	yes
Observations	70983	630	4938	6099

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Switch to PHI Controls include the variables *Time at Risk*, *Left-censored*, *Awareness*, *Lower income threshold*, *Voluntarily in SHI* and *Extended Eligibility.*

[c] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS. Cluster-robust standard errors in parentheses.

Effects on Utilization and Premiums

So far we have shown that the unisex mandate increases switching probabilities from SHI to PHI for women relative to men. This can have implications for risk segmentation between SHI and PHI.

The private sector tends to attract better health risks (Grunow and Nuscheler, 2014; Bünnings and Tauchmann, 2015), and PHI insurees have on average better self-reported health than SHI insurees (see Table 1). The unisex mandate can reduce the gap in average risk between the two systems if it improves the risk pool of SHI relative to PHI.

Women have on average higher health care expenditures than men[14]. In the summary

[14]In Online Appendix D we show this based on aggregate statistics from the Federal Financial Supervisory

statistics in Table 1 we have seen that the average number of doctor visits is higher for women than for men. In Table D.3 of Online Appendix D we show that this finding holds even after controlling for numerous covariates.

If the unisex mandate attracts more women into PHI and women have on average higher health care expenditures, then we would expect an increase in health care expenditures for PHI relative to SHI. Ideally, we would like to test this hypothesis using data on health care expenditures for PHI and SHI. Unfortunately, the SOEP includes no data on health care expenditures, and data from official statistics are not comparable over our study period[15].

Instead, as a crude measure of utilization we examine the effect of the unisex mandate on the number of doctor visits for PHI insurees relative to SHI insurees. However, we find no significant effect[16].

In addition, we also look at the effect of the unisex mandate on PHI premiums which are included in the SOEP. Women pay significantly higher premiums than men, even after controlling for detailed covariates[17]. We find that the unisex mandate reduces insurance premiums of women relative to men, once civil servants are excluded[18]. However, these results need to be taken with a grain of salt, as information on PHI plans is extremely limited in the SOEP. While data on premiums is included, PHI plans can differ widely in terms of coverage and co-payments, such that premiums are not directly comparable between different plans. We also do not observe when individuals switch between PHI plans.

Authority (BAFIN) for PHI and from the Federal Insurance Office (BVA) for the year 2012. Average health care expenditures are higher for women than for men both within the PHI system and the SHI system.

[15]The Federal Financial Supervisory Authority (BAFIN) collects data within the PHI system and the Federal Insurance Office (BVA) collects data from the SHI system. From 2010 to 2013, data reporting, format and sampling within PHI underwent several changes. Similarly, data sampling within SHI changed between 2008 and 2011.

[16]Estimation results are shown in Table D.4 in Online Appendix D.

[17]Estimation results are shown in Table D.1 in Online Appendix D.

[18]Estimation results are shown in Table D.2 in Online Appendix D.

5 Conclusion

We assess the effect of a unisex mandate which removes gender from the list of price determinants on risk segmentation in the German health insurance market. The unisex mandate forbids to use gender as a determinant of insurance premiums. While gender has never been used in the social health insurance (SHI) system, it was a common pricing factor in the private health insurance (PHI) system. We examine how this change in regulation affects switching between both sectors.

We find that the unisex mandate increases the probability of switching from SHI to PHI for women relative to men, while it has no significant effect on gender differences in switching rates from PHI to SHI. The impact on the probability to switch from SHI to PHI varies across employment groups. The response to the mandate is strongest for self-employed individuals and mini-jobbers while we find a somewhat weaker effect for regular employees and no significant effect for civil servants. This could be related to differences in financial incentives. We interpret our results as a reduction of advantageous selection from the lower-risk group of men into PHI.

Our study focuses on the effect of the unisex mandate on switching decisions between the two systems rather than on health care utilization and insurance premiums for which data is limited.

Risk segmentation in the German health insurance market is a topic of great policy relevance. The ability of PHI to pick better risks is often regarded as unfair. The pricing based on statistical health risk by PHI providers yields strong incentives for self-selection. In our study we demonstrate that regulations such as the unisex mandate can reduce risk selection between the private and public health insurance system.

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Appendices

A Variables

For easier reference, table A.1 summarizes section 3. It presents a description for every variable relevant in the overall analysis.

Table A.1: Description of the Variables

Variable	**Description**
Dependent Variable	
Switch to PHI	Indicator for switching to PHI between t and $t+1$
Switch to SHI	Indicator for switching to SHI between t and $t+1$
Insured in PHI	Indicator for being enrolled in PHI in $t+1$
# Doctor Visits	Number of doctor visits in the past three months for $t+1$
PHI Premiums	Monthly premiums paid in PHI in $t+1$
Health	
Self-Assessed Health	Self-assessed health on a scale from 1 (best) to 5 (worst)
Good Health	Indicator for self-assessed health being 1 (very good) or 2 (good)
# Hospitalization Days	Number of hospitalizations in the past twelve months
Disabled	Indicator for being legally attested as disabled
Socio-Economic Controls	
Female	Indicator for female
Education	Years of education
West	Indicator for living in West-Germany
German	Indicator for having German nationality

Table A.1 – continued from previous page

Variable	Description
Nationality Missing	Indicator for nationality not being reported / surveyed for
Any Child	Indicator for receiving child benefits
Age	Indicators for age groups 26 - 30, 31 - 35, 36 - 40, 41 - 45, 46 - 50
Income Quartiles	Indicators for having a current annual gross earnings within 2nd, 3rd or 4th quartile
Income Above Lower Threshold	Indicator for having a current annual gross earnings above 75% of the mandatory income threshold
Income Missing	Indicator for income not being reported
Civil Servant	Indicator for being employed as civil servant
Self-Employed	Indicator for being self-employed
Mini-Jobber	Indicator for being employed with up to €400 (until 2012) or €450 per month (since 2013)
Not Working	Indicator for being unemployed, studying, in training, voluntary social service or in sheltered workshop
Industrial Sector Worker	Indicator for being an industrial sector worker
White-Collar Worker	Indicator for being a white-collar worker
Spouse in PHI	Indicator for having a privately-insured spouse
Spouse Not Working	Indicator for having a non-working spouse
Self-Assessed Risk Attitude	
Risk-Loving	Indicator for a self-reported willingness to take risks above 6 on a scale from 1 (low) to 10 (high), interpolated for years 2005 and 2007

Table A.1 – continued from previous page

Variable	Description
Risk-Loving Missing	Indicator for a self-reported willingness to take risks not being reported
Risk-Loving Interpolated	Interaction effect for Risk-Loving and years 2005 and 2007, for which the measure was interpolated
Other Controls	
Time at Risk	Indicators for years in a row that an individual has been eligible to switch under the extended definition
Left-censored	Indicator for being eligible at point of entry into the sample
Awareness	Indicator for correctly reporting to be voluntarily insured
Lower Income Threshold	Indicator for having an income above 75% of the income threshold but not above the original threshold and being a regular employee
Voluntarily in SHI	Indicator for having an income lower than the mandatory income threshold while being a regular employee but reporting to be voluntarily insured in SHI
Extended Eligibility	Indicator for being either a mini-jobber or satisfying the lower but not the original income threshold while being a regular employee
Left-censored (Premiums)	Indicator for time in PHI being left-censored, i.e. switch to PHI is not observed within the period of study

B Additional Descriptives

B.1 Variable Means

Table B.1 presents the means for the full list of variables used in the main estimation.

Table B.1: Variable means with standard deviations in parentheses

	SHI		PHI	
	Male	Female	Male	Female
Employment				
Civil Servant	0.011	0.004	0.317	0.571
	(0.104)	(0.063)	(0.465)	(0.495)
Self-Employed	0.058	0.047	0.352	0.226
	(0.234)	(0.211)	(0.478)	(0.418)
Mini Job	0.021	0.095	0.011	0.067
	(0.143)	(0.293)	(0.103)	(0.250)
Socio-economic Variable				
Age	41.205	40.962	43.502	42.800
	(7.843)	(7.832)	(6.727)	(7.385)
Years of Education	12.291	12.381	14.577	15.583
	(2.577)	(2.512)	(2.957)	(2.675)
West Germany	0.761	0.767	0.809	0.845
	(0.427)	(0.423)	(0.393)	(0.362)
German	0.884	0.875	0.939	0.954
	(0.321)	(0.331)	(0.238)	(0.209)
Any Child	0.597	0.653	0.607	0.590
	(0.491)	(0.476)	(0.489)	(0.492)
Annual Gross Income (1000 EUR)*	31.943	15.397	42.607	31.417
	(25.159)	(16.497)	(43.991)	(29.397)
Income Missing	0.086	0.082	0.029	0.060
	(0.280)	(0.274)	(0.167)	(0.238)
Income Above Lower Threshold	0.318	0.086	0.538	0.380
	(0.466)	(0.281)	(0.499)	(0.485)
Not Working	0.128	0.267	0.004	0.014
	(0.334)	(0.442)	(0.062)	(0.116)
Industrial Sector Worker	0.372	0.133	0.007	0.011
	(0.483)	(0.340)	(0.083)	(0.104)
White-Collar Worker	0.429	0.547	0.319	0.176
	(0.495)	(0.498)	(0.466)	(0.381)
Spouse in PHI	0.034	0.096	0.271	0.421
	(0.182)	(0.294)	(0.445)	(0.494)
Spouse Not Working	0.081	0.011	0.041	0.011

Table B.1 – continued from previous page

	SHI		PHI	
	Male	Female	Male	Female
	(0.273)	(0.107)	(0.198)	(0.104)
Risk Attitude				
Self-Assessed Risk-Lovingness*	0.294	0.167	0.370	0.174
	(0.455)	(0.373)	(0.483)	(0.379)
Risk-Loving Missing	0.073	0.095	0.063	0.060
	(0.261)	(0.293)	(0.243)	(0.238)
Other Controls				
Time at Risk (in years)	0.943	0.494	4.285	3.836
	(2.060)	(1.376)	(2.846)	(2.711)
Left-Censored	0.153	0.057	0.560	0.492
	(0.360)	(0.232)	(0.496)	(0.500)
Awareness	0.223	0.074	0.298	0.125
	(0.416)	(0.262)	(0.457)	(0.331)
Lower Income Threshold	0.161	0.058	0.025	0.028
	(0.368)	(0.234)	(0.155)	(0.165)
Voluntarily in SHI	0.043	0.040	0.000	0.000
	(0.202)	(0.197)	(0.000)	(0.000)
Eligibility	0.016	0.081	0.006	0.045
	(0.124)	(0.273)	(0.078)	(0.208)
Other Health Variables				
# Hospitalization Days*	0.868	1.075	0.465	0.881
	(5.479)	(5.943)	(3.676)	(6.388)
Disabled*	0.081	0.059	0.032	0.044
	(0.272)	(0.236)	(0.175)	(0.205)
Monthly PHI Premiums (1000 EUR)*			0.354	0.319
			(0.198)	(0.161)
Observations	**41,662**	**55,421**	**8,344**	**4,881**

* Only non-missing values are considered.

B.2 Income and the Mandatory Insurance Threshold

Table B.2 displays the relationship between insurance status and income for regular employees (excluding civil servants and mini-jobbers) in either the original SOEP sample or the final sample. Observations for which income is missing are excluded. The original sample includes individual-year observations, for which age is between 26 and 54 and is restricted to waves 2004 to 2015, while the final sample corresponds to the sample used in the main analysis.

In the original sample, almost 40% of the observations reporting to be insured in PHI as regular employees should not be eligible to do so. In the final sample, this number is reduced to about 10%. These cases result from allowing income to be above 75% of the mandatory income threshold without dropping an observation.

Table B.2: Insurance status and income for regular employees

	Raw Sample				**Final Sample**		
	Income Above the Mandatory Insurance Threshold				Income Above the Mandatory Insurance Threshold		
	No	Yes	Total		No	Yes	Total
SHI	100,743	10,196	110,939	**SHI**	71,006	7,702	78,708
	90.81%	*9.19%*	*100%*		*90.21%*	*9.79%*	*100%*
PHI	2,595	4,060	6,655	**PHI**	342	3,136	3,478
	38.99%	*61.01%*	*100%*		*9.83%*	*90.17%*	*100%*

B.3 Enrolment

To see how gender and enrolment are related over time when possibly confounding factors are accounted for, we regress a dummy for enrolment in PHI in the next period on a set of covariates including socio-economic controls, employment controls, self-assessed risk and self-assessed health for different time periods. The coefficient associated with the *female* indicator is informative about the correlation between gender and enrollment. Table B.3 reports the results. Column (1) shows the results when we restrict the full sample to observations before the announcement, Column (2) when we restrict the sample to observations during the pre-treatment period and Column (3) when we restrict it to observations after the implementation of the unisex mandate.

Despite restricting the sample to the period in which only unisex contracts are offered, Column (3) shows that enrollment in PHI is still correlated with gender. According to the estimate, women are by about 5% less likely to be privately insured, everything else hold constant.

Table B.3: Results from the enrolment analysis

	PHI		
	Full sample (2004 to 2009) (1) Linear	Full sample (2010 to 2012) (2) Linear	Full sample (2013 to 2014) (3) Linear
Female	-0.053***	-0.052***	-0.046***
	(0.005)	(0.005)	(0.005)
Civil Servant	0.721***	0.755***	0.767***
	(0.021)	(0.018)	(0.020)
Self-Employed	0.355***	0.341***	0.287***
	(0.021)	(0.019)	(0.021)
Mini Job	-0.003	0.001	-0.007
	(0.008)	(0.008)	(0.007)
Good Health	0.012***	0.015***	0.017***
	(0.003)	(0.003)	(0.003)
Year Dummies	yes	yes	yes
Soc.-econ. Controls[a]	yes	yes	yes
Self-assessed Risk[b]	yes	yes	yes
Constant	yes	yes	yes
Observations	54449	32109	23750

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS. Cluster-robust standard errors in parentheses.

C Additional Results

C.1 Utilization among Switchers

In Table C.1, we analyze the number of doctor visits as a measure of utilization of health care services.

We investigate whether there are measurable differences between switchers and non-switchers. In case of the SHI sample, the explanatory variable of interest, switching, refers to SHI in the current and PHI in the next period, while for the PHI sample, it refers to SHI in the past and PHI in the current period. We find that the number of doctor visits is lower for switchers to PHI compared to non-switchers. The effect is significant on the 1%-level for the sample of SHI insurees and appears to be driven by men.

This result hints at some advantageous selection among switchers to PHI in terms of utilization.

Table C.1: Results from the analysis of utilization among switchers

	No. Doctor Visits					
	Full sample (SHI)	Women (SHI)	Men (SHI)	Full sample (PHI)	Women (PHI)	Men (PHI)
	(1)	(2)	(3)	(4)	(5)	(6)
	IV Linear	IV Linear	IV Linear	IV Linear	IV Linear	IV Linear
Switch to PHI in next period	-0.338***	-0.221	-0.386***			
	(0.084)	(0.152)	(0.096)			
Switched to PHI in the Past Period				-0.089	-0.108	-0.042
				(0.168)	(0.370)	(0.146)
Female	0.475***			0.720***		
	(0.047)			(0.098)		
Good Health	-1.245***	-1.323***	-1.098***	-1.117***	-1.453***	-0.891***
	(0.033)	(0.044)	(0.048)	(0.093)	(0.180)	(0.096)
Year Dummies	yes	yes	yes	yes	yes	yes
Soc.-econ. Controls[a]	yes	yes	yes	yes	yes	yes
Self-Assessed Risk[b]	yes	yes	yes	yes	yes	yes
Employment Controls[c]	yes	yes	yes	yes	yes	yes
Constant	yes	yes	yes	yes	yes	yes
Observations	97083	55421	41662	10391	3842	6549

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

[c] Employment Controls include the variables *Civil Servant, Self-Employed, Mini Job.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Cluster-robust standard errors in parentheses.

C.2 Switching to PHI in the Implementation Period

We restrict the full sample of individuals enrolled in SHI to the implementation period from 2013 to 2014 and assess whether gender is still correlated with switching to PHI. The econometric framework for this test mirrors equation 1 of the main analysis but excludes the interaction terms with time and does not provide a causal interpretation:

$$SwitchPHI_{it} = \alpha + \gamma fem_i + \zeta^{'} d_t + \eta^{'} X_{it} + \theta^{'} W_{it} + \epsilon_{it}$$

where the notation follows the one used in the main analysis.

Column (1) from Table C.2 shows the results from the main linear specification which includes the full set of covariates as presented. Being female no longer affects the probability to switch from SHI to PHI significantly, once we look only at the period after the unisex mandate is implemented.

Column (2) shows the results when the set of covariates is reduced and Column (3) shows the results when self-assessed health is instrumented by disability status and number of hospitalization days. The results from Column (2) and (3) reinforce that gender is no longer significantly correlated with the switching to PHI.

Table C.2: Switching from SHI to PHI, waves 2013 to 2014

	Switch to PHI		
	Full sample (PHI, 2013 to 2014)		
	(1)	(2)	(3)
	Linear	Linear	IV Linear
Female	-0.002	-0.001	-0.002
	(0.001)	(0.001)	(0.001)
Civil Servant	0.214***		0.205***
	(0.040)		(0.040)
Self-Employed	-0.004		-0.009
	(0.017)		(0.017)
Mini Job	-0.027***		-0.028***
	(0.006)		(0.006)
Good Health	0.002**	0.005***	
	(0.001)	(0.001)	
Self-Assessed Health[a]			-0.001
			(0.002)
Year Dummies	yes	yes	yes
Soc.-econ. Controls[b]	yes	no	yes
Switch to PHI Controls[c]	yes	no	yes
Self-assessed Risk[d]	yes	no	yes
Constant	yes	yes	yes
Observations	21111	21111	19267

[a] Self-assessed Health is instrumented by *Disabled* and *# Hospitalization Days* in the IV specifications. Estimation by GMM.

[b] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[c] Switch to PHI Controls include the variables *Time at Risk*, *Left-censored*, *Awareness*, *Lower income threshold*, *Voluntarily in SHI* and *Extended Eligibility.*

[d] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Cluster-robust standard errors in parentheses.

C.3 Probit specification

Additionally to the linear model of switching from one to the other insurance system, we also estimate a non-linear probit specification:

$$
\begin{aligned}
SwitchPHI^{*}_{it} &= \alpha + \beta(impl_t \times fem_i) + \gamma fem_i \\
&\quad + \delta^{'}(pre\text{-}treat_t \times fem_i) + \zeta^{'} d_t + \eta^{'} X_{it} + \theta^{'} W_{it} + \epsilon_{it} \\
SwitchPHI_{it} &= \begin{cases} 1 \text{ if } SwitchPHI^{*}_{it} > 0 \\ 0 \text{ else} \end{cases},
\end{aligned}
$$

where $\epsilon_{it} \sim N(0,1)$ and the notation follows the one used in the main analysis. $SwitchSHI_{it}$ and $SwitchSHI^{*}_{it}$ are specified accordingly.

In contrast to the linear specification, the coefficients cannot be interpreted in a straightforward way, even if marginal effects are computed. In a normal difference-in-differences analysis, the treatment effect corresponds to the marginal effect as computed e.g. by the Delta-method. However, this simplification rests on the assumption that the control group is not affected by the treatment. For interaction terms other than that, interpreting the full interaction effects in a non-linear model is non-trivial. While a stata package for logit and probit models called `inteff` exists, it is restrictive in not allowing to include yearly effects.

We report the results from the probit model in Table C.3. Under the assumption that male individuals where not affected by the reform, the treatment effect is significantly different from 0 on a 10% level for switching from SHI to PHI and estimated to be positive. The estimate would translate into an average marginal increase of 0.3% in switching rates for women as opposed to men post-implementation.

However, if male individuals are allowed to be affected as well, the coefficients can no longer be easily interpreted. As noted by Norton et al. (2004), the interaction effect may be non-zero even if the direct estimate to the interaction term is 0, and statistical significance of the estimate cannot be tested in a standard way. Our probit estimation results should therefore be treated with caution.

Table C.3: Results from the switching analysis, probit specifications

	Switch to PHI	Switch to SHI
	Full sample (SHI)	Full sample (PHI)
	(1)	(2)
	Probit	Probit
Fem × Implemented	0.179**	-0.129
	(0.084)	(0.115)
Fem × Pre-Announcement	0.191*	0.069
	(0.114)	(0.172)
Fem × Announced	-0.070	-0.112
	(0.106)	(0.159)
Fem × Pre-Implementation	-0.144	0.029
	(0.108)	(0.139)
Female	-0.270***	0.076
	(0.041)	(0.064)
Civil Servant	1.295***	-0.100
	(0.195)	(0.420)
Self-Employed	0.282	0.175
	(0.196)	(0.423)
Mini Job	-0.554***	0.458***
	(0.139)	(0.109)
Good Health	0.213***	-0.080*
	(0.033)	(0.045)
Year Dummies	yes	yes
Soc.-econ. Controls[a]	yes	yes
Switch to PHI Controls[b]	yes	no
Self-assessed Risk[c]	yes	yes
Constant	yes	yes
Observations	96597	12977

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Switch to PHI Controls include the variables *Time at Risk*, *Left-censored*, *Awareness*, *Lower income threshold*, *Voluntarily in SHI* and *Extended Eligibility*.

[c] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by Maximum Likelihood. Cluster-robust standard errors in parentheses.

C.4 Pre-Trends

Table C.4 reports the exact numerical results from an analysis of whether pre-trends in switching rates differed between men and women, see Figure C.4 in Section 4.

Table C.4: Results from the switching analysis, yearly interactions

	Switch to PHI	Switch to SHI
	Full sample (SHI)	Full sample (PHI)
	(1)	(2)
	Linear	Linear
Fem × 2013	0.004*	-0.027*
	(0.002)	(0.015)
Fem × 2014	0.004*	0.006
	(0.002)	(0.016)
Fem × 2004	-0.001	-0.015
	(0.003)	(0.015)
Fem × 2005	-0.001	0.002
	(0.003)	(0.016)
Fem × 2006	-0.001	0.005
	(0.003)	(0.017)
Fem × 2007	0.001	-0.017
	(0.003)	(0.015)
Fem × 2008	0.001	0.004
	(0.003)	(0.016)
Fem × 2009	-0.000	0.013
	(0.003)	(0.017)
Fem × 2010	0.004	0.001
	(0.003)	(0.018)
Fem × 2011	-0.000	-0.007
	(0.002)	(0.015)
Female	-0.006***	0.009
	(0.002)	(0.011)
Good Health	0.003***	-0.006*
	(0.001)	(0.004)
Constant and Year Dummies	yes	yes
Soc.-econ. Controls[a]	yes	yes
Switch to PHI Controls[b]	yes	no
Self-Assessed Risk[c]	yes	yes
Employment Controls[d]	yes	yes
Observations	96597	12977
F-Test (Fem × 2004 to Fem × 2011)	$F_{8,203180} = 0.33$	$F_{8,3333} = 0.70$

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*
[b] Switch to PHI Controls include the variables *Time at Risk*, *Left-censored*, *Awareness*, *Lower income threshold*, *Voluntarily in SHI* and *Extended Eligibility*.
[c] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*
[d] Employment Controls includes the variables *Civil Servant, Self-Employed, Mini Job.*
* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS. Cluster-robust standard errors in parentheses.

D Utilization and Premiums

D.1 Premiums

As a supplemental analysis, we investigate premiums in PHI using the SOEP data set. However, as there is no detailed information on the coverage of different health plans in the SOEP, potential selection issues cannot be considered. The results in this section have to be treated with caution.

First, we regress premiums (in natural logarithm) on the gender indicator. Column (1) of Table D.1 shows regression results when only time is controlled for. Women pay significantly *lower* premiums in PHI than men. Column (2) shows regression results when, additionally, being a civil servant is controlled for. In this case, women pay significantly *higher* premiums than men. The difference between the results in Column (1) and Column (2) can be explained by a higher share of women in the civil servants group, which receives subsidies and therefore pays lower premiums. Column (3) shows that even when additionally controlling for socio-economic factors, employment and health, PHI premiums for women are significantly higher. This corroborates women as the higher-risk group to the insurer.

We next analyze the effects of the unisex reform on premiums as the dependent variable. Figure D.1 illustrates that premiums for men have increased stronger over time than for women. In fact, following the unisex reform, average premiums for women fall below the ones for men for the first time during the period of study, once civil servants are excluded.

The graphs also indicate, however, that the common trend assumption may be violated.

Table D.2 displays results from analyzing the effects of the reform on premiums in a regression framework. This applies a similar methodology as in the main analyses:

$$
\begin{aligned}
Premiums_{it} = \alpha + \beta(impl_t \times fem_i) + \gamma fem_i \\
+ \delta^{'}(pre\text{-}treat_t \times fem_i) + \zeta^{'} d_t + \eta^{'} X_{it} + \theta^{'} W_{it} + \epsilon_{it},
\end{aligned}
$$

using the same notation as above. The results point to a potential decrease in premiums for women, as indicated by Figure D.1. As the information on premiums is not a clean measure of individual costs, these results are still strongly restrictive.

Table D.1: Results from the analysis of premiums

	Log(premiums)		
	Full sample (PHI) (1) Linear	Full sample (PHI) (2)	Full sample (PHI) (3)
Female	-0.035***	0.018***	0.157***
	(0.008)	(0.006)	(0.017)
Civil Servant		-0.189***	-0.534***
		(0.006)	(0.147)
Self-Employed			0.145
			(0.146)
Mini Job			-0.302***
			(0.079)
Good Health			-0.024*
			(0.012)
Year Dummies	yes	yes	yes
Soc.-econ. Controls[a]	no	no	yes
Premiums Controls[b]	no	no	yes
Self-Assessed Risk[c]	no	no	yes
Constant	yes	yes	yes
Observations	10025	10025	10025

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

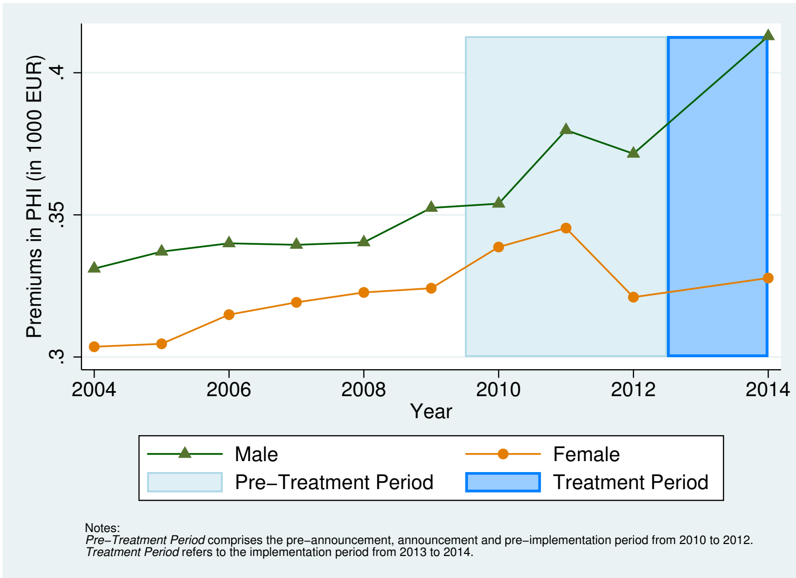
[b] Premium Controls includes the variable *Left-censored (Premiums).*

[c] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*
* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Cluster-robust standard errors in parentheses.

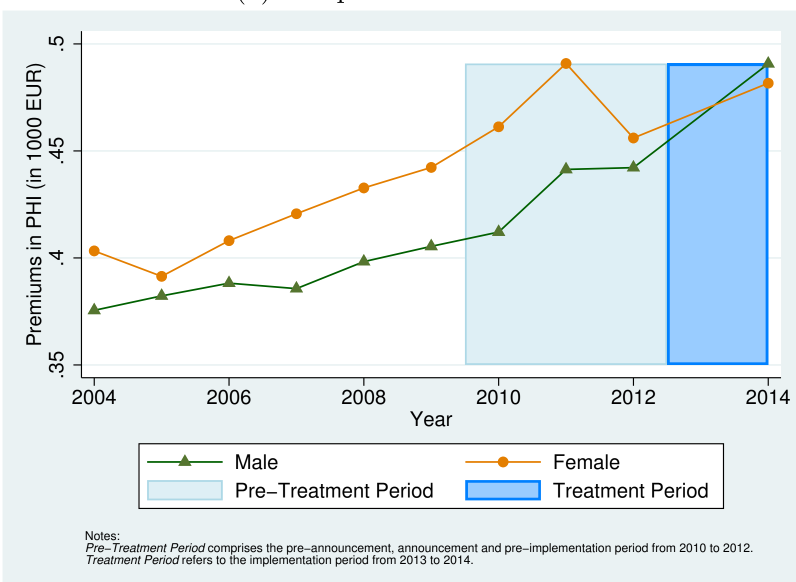
Table D.2: Results from the analysis of the reform's effects on premiums

	Log(premiums)	
	Full sample (PHI)	No Civil Servants
	(1)	(2)
	Linear	Linear
Fem × Implemented	-0.058**	-0.083*
	(0.028)	(0.042)
Fem × Pre-Announcement	0.086***	0.097**
	(0.027)	(0.041)
Fem × Announced	0.036	0.077*
	(0.035)	(0.040)
Fem × Pre-Implementation	0.018	-0.010
	(0.028)	(0.038)
Female	0.153***	0.128***
	(0.019)	(0.027)
Civil Servant	-0.534***	0.000
	(0.147)	(.)
Self-Employed	0.144	0.230
	(0.146)	(0.149)
Mini Job	-0.300***	-0.241***
	(0.080)	(0.084)
Good Health	-0.024**	-0.013
	(0.012)	(0.016)
Year Dummies	no	no
Soc.-econ. Controls[a]	yes	yes
Premiums Controls[b]	yes	no
Self-Assessed Risk[c]	yes	yes
Employment Controls[d]	yes	yes
Constant	yes	yes
Observations	10025	5997

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*
[b] Premium Controls includes the variable *Left-censored (Premiums).*
[c] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*
[d] Employment Controls include the variables *Civil Servant, Self-Employed, Mini Job.*
* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Cluster-robust standard errors in parentheses.



(a) Sample of PHI holders



(b) Sample of PHI holders, excluding civil servants

Figure D.1: Average Premiums in PHI over time

D.2 Doctor Visits

We use the number of doctor visits within the past three months a dependent variable in order to analyze realized insurance risk and individual health care utilization. *Number of Doctor Visits* is coded using the information from the year to follow to ensure that all control variables can be treated as given. We focus on the number of doctor visits because of data availability in the SOEP. A lack of detailed plan aspects in the SOEP makes a sensible comparison of prices almost impossible.

Table 1 indicates that the utilization of health care services in terms of doctor visits is higher for women than for men. In Table D.3, we show that this relationship between gender and utilization holds even after controlling for possibly confounding factors. We regress the number of doctor visits on the female indicator and control for socio-economic aspects, employment, self-assessed risk and self-assessed health. This uses the full sample of both PHI and SHI insurees.

The results point towards a higher number of doctor visits among women, which classifies men as the lower-risk group. Column (1) of Table D.3 shows that women visit a doctor about 0.51 on average more often within three months than men, all else constant. Column (2) shows that this holds also when a nonlinear poisson estimation is considered. The estimates translate into a similar average marginal increase of about 0.53 more doctor visits for women in comparison to men. Abolishing separate prices when women are expected to be costlier for the insurer than men implies that the prices become lower for women and higher for men under the unisex policy.

Table D.3: Results from the the utilization analysis

	No. Doctor Visits	
	Full sample (1) Linear	Full sample (2) Poisson
Female	0.514^{***}	0.253^{***}
	(0.042)	(0.021)

Table D.3 – continued from previous page

	No. Doctor Visits	
	Full sample	Full sample
	(1)	(2)
	Linear	Poisson
Insured in PHI	-0.127***	-0.087***
	(0.049)	(0.028)
Civil Servant	0.730***	0.358***
	(0.175)	(0.080)
Self-Employed	-0.260	-0.129
	(0.169)	(0.079)
Mini Job	0.096*	0.055**
	(0.055)	(0.025)
Good Health	-1.240***	-0.582***
	(0.031)	(0.013)
Soc.-Econ. controls[a]	yes	yes
Year dummies	yes	yes
Self-assessed risk[b]	yes	yes
Employment Controls[c]	yes	yes
Constant	yes	yes
Observations	110308	110308

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

[c] Employment Controls include the variables *Civil Servant, Self-Employed, Mini Job.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS. Cluster-robust standard errors in parentheses.

The average number of doctor visits by health insurance system over time is plotted in Figure D.2. In all years, the number of doctor visits is higher for SHI than for PHI. The variation in the difference between both groups is large and does not seem to be affected by the unisex intervention in a definite way.

The unisex mandate may not only affect risk segmentation as identified by switchers but might also affect the risk pool of PHI insurees. Ideally, we would observe adjustments in the menu of insurance contracts as to account for such changes in the distribution of risks. However, due to data limitations, we focus on effects that can be measured by utilization. The unisex policy might have worsened the risk pool of PHI and led to a relative increase in

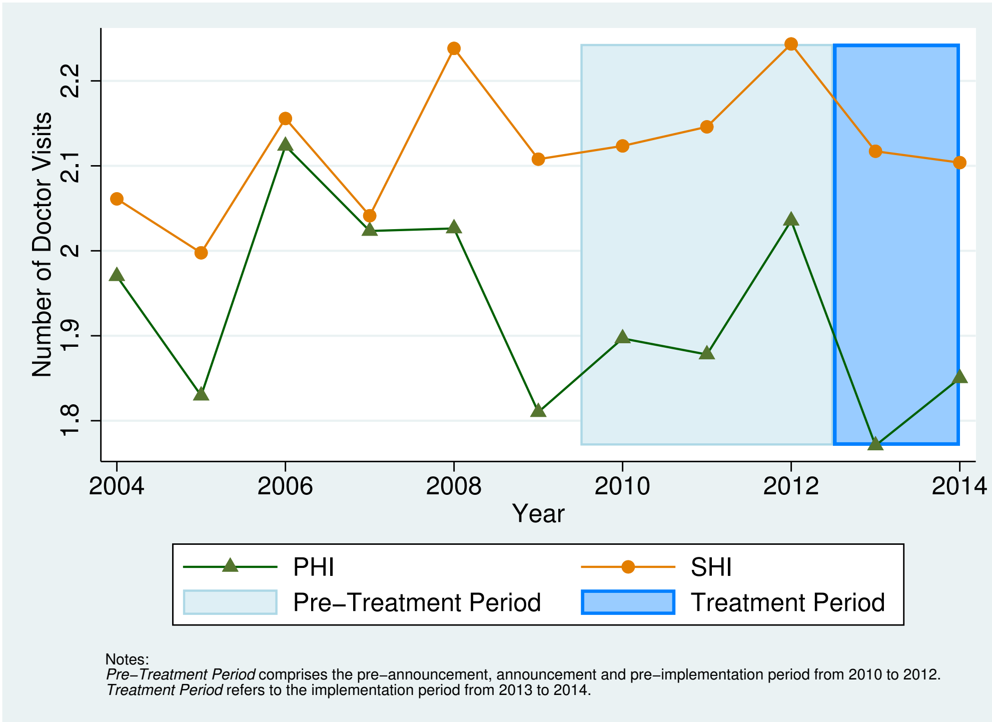


Figure D.2: Number of Doctor Visits in PHI and SHI, aggregated by years

realized risk. To investigate this line of thought, we study the policy's effect on the utilization of health care services in both systems as measured by the number of doctor visits.

We test the following hypothesis:

1. The implementation of the unisex policy worsens the risk pool in PHI as measured by the utilization of health care services.

The hypothesis predicts the risk pool in PHI to deteriorate due to the unisex mandate and, as a measure of insurance risk, utilization in PHI to increase as compared to SHI. To assess the aggregate effect of the intervention on the pool of risks, we employ a similar difference-in-differences-style framework as in the switching analysis. However, instead of comparing women to men, we consider the two insurance types PHI and SHI in this part of the analysis.

We estimate the following regression model:

$$
\begin{aligned}
Utilization_{it} = \alpha + \beta(impl_t \times PHI_{it}) + \gamma PHI_{it} \\
+ \delta^{'}(pre\text{-}treat_t \times PHI_{it}) + \zeta^{'} d_t + \eta^{'} X_{it} + \epsilon_{it},
\end{aligned} \tag{3}
$$

where the dependent variable $Utilization_{it}$ refers to the number of doctor visits i has in t and $\mathbb{E}[\epsilon_{it}|PHI_{it}, X_{it}, d_t] = 0$ is assumed. Again, exogeneity of the error term implies that common trends for the untreated outcomes need to hold. This requires that, once differences in observable characteristics are controlled for, utilization in both groups PHI and SHI evolve with the same time trends and, absent the intervention, this co-movement can be extrapolated to the implementation period.

Rejecting $\beta = 0$ indicates that enforcing the unisex policy in the PHI market affected risk segmentation between the private and the public market way as measurable by realized risk. In particular, finding $\beta > 0$ would be in line with hypothesis 3.

Analyzing how the risk pools evolve over time is based on identifying changes in the overall pool of enrollees. As explained above, overall enrollment is likely to be less responsive to regulatory changes than switching rates. The empirical setup of this analysis is less clean and presumably less conclusive than the main analysis.

We present the results of estimating equation 3 in Table D.4. The difference in utilization patterns between SHI and PHI is not affected by the unisex policy on any conventional significance level. Moreover, the discussion of Figure D.2 calls in question whether the common trends assumption holds. The conclusions from this analysis might be limited because the number of doctor visits serves only as a crude measure of health care utilization.

All in all, it is not possible to specify with certainty whether unisex tariffs in the private system had a causal effect on ex post risks in the PHI as compared to the SHI market. However, two aspects point to an at most modest response. First, coverage in PHI is skewed towards men even in the period after unisex pricing has been implemented (see Table B.3

of section 3). In fact, as other factors determining pricing or eligibility might be correlated with sex, the ratio of male to female enrollees may be different in PHI and SHI even in the long run (see Aseervatham et al., 2016). Second, PHI companies may have responded to the change in regulation and updated their contracts, inducing changes in the behavior of the enrollees. For example, insurances could have transferred a higher share of the costs associated with the utilization of health care services onto the insuree in order to reduce the impact of a worse risk pool (see Riedel, 2006). In order to investigate either of these two mechanisms, however, more comprehensive information from insurers' pricing practices and their offered health plans would be required.

Table D.4: Results from the risk pool analysis

	# Doctor Visits
	Full sample
	Linear
PHI × Implemented	-0.115
	(0.080)
PHI × Pre-Announcement	-0.055
	(0.102)
PHI × Announced	-0.046
	(0.120)
PHI × Pre-Implementation	-0.010
	(0.100)
Insured in PHI	-0.097*
	(0.058)
Female	0.512***
	(0.043)
Good Health	-1.239***
	(0.031)
Constant and Year Dummies	yes
Soc.-econ. Controls[a]	yes
Self-assessed Risk[b]	yes
Observations	110308

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Estimation by OLS. Cluster-robust standard errors in parentheses.

In Table D.5, we let female-specific dummies enter equations 3 for each year before the actual implementation period. This checks whether, as necessary in order to identify the policy's effect, pre-trends in utilization between SHI and PHI were similar.

This estimation yields time-effects on utilization that are significantly different for men compared to women in a few years on at least the 10% significance level. It shows a large variation of utilization and implies that the common trend assumption may not be met.

Table D.5: Results from the risk pool analysis, yearly interactions

	# Doctor Visits
	Full sample
	(1)
	Linear
PHI × 2013	-0.149
	(0.107)
PHI × 2014	-0.057
	(0.117)
PHI × 2004	0.056
	(0.126)
PHI × 2005	-0.040
	(0.123)
PHI × 2006	0.120
	(0.143)
PHI × 2007	0.146
	(0.158)
PHI × 2008	-0.073
	(0.126)
PHI × 2009	-0.146
	(0.129)
PHI × 2010	-0.042
	(0.123)
PHI × 2011	-0.048
	(0.119)
Insured in PHI	-0.107
	(0.095)
Female	0.512***
	(0.043)
Good Health	-1.239***
	(0.031)
Year Dummies	yes
Soc.-econ. Controls[a]	yes
Self-Assessed Risk[b]	yes
Employment Controls[c]	yes
Constant	yes
Observations	110308
F-Test (PHI × 2004 to PHI × 2008)	F =0.89

[a] Soc.-econ. Controls include the variables *Age, Income Quartiles, Income Above 75% of the Threshold, Income Missing, Years of Education, West Germany, German Nationality, Nationality Missing, Not Working, Industrial Sector Worker, White-Collar Worker, Any Child, Spouse in PHI, Spouse Not Working.*

[b] Self-assessed Risk includes the variables *Risk-Loving, Risk-Loving missing, Risk-Loving Interpolated.*

[c] Employment Controls include the variables *Civil Servant, Self-Employed, Mini Job*.
* ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$). Cluster-robust standard errors in parentheses.

D.3 Claims

D.3.1 Average Claims for Men and Women

To assess whether women can be considered as a higher-risk group in terms of expenses to the insurer, we analyze aggregated claims data published by the German Federal Insurance Office (BVA) and the Federal Financial Supervisory Authority (BAFIN).

Figures D.3 and D.4 display average outpatient and inpatient claims in 2012. Outpatient claims are clearly higher for women compared to men in both insurance systems. In particular, per person claims for women in PHI are more than 50% higher than for men. Average inpatient claims are about the same for women and men, but total expenses are still higher for women in both SHI and PHI. Note that these analyses cannot control for socio-economic differences between individuals.

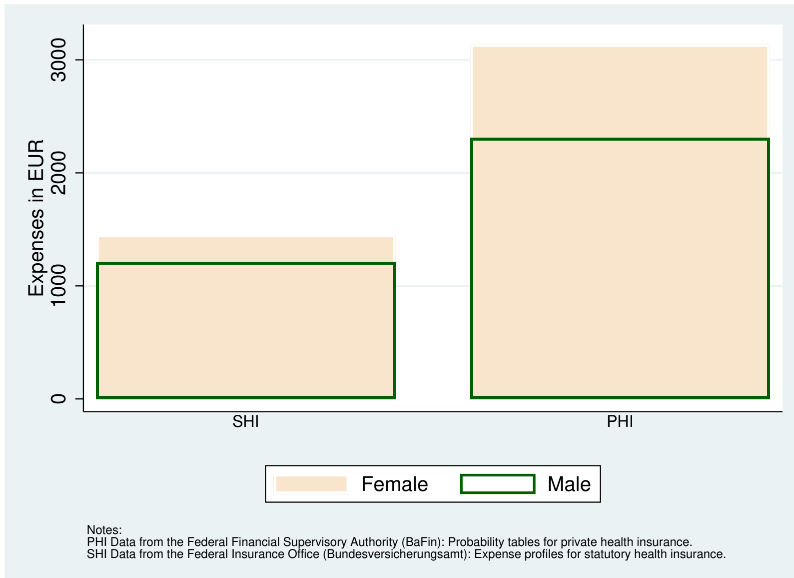
The claims data strongly suggests that women have more expensive risk profiles than men. Private insurers have incentives to set prices higher for women. Moreover, the strong differences in outpatient claims justify using the number of doctor visits as a measure of utilization.

D.3.2 Computations

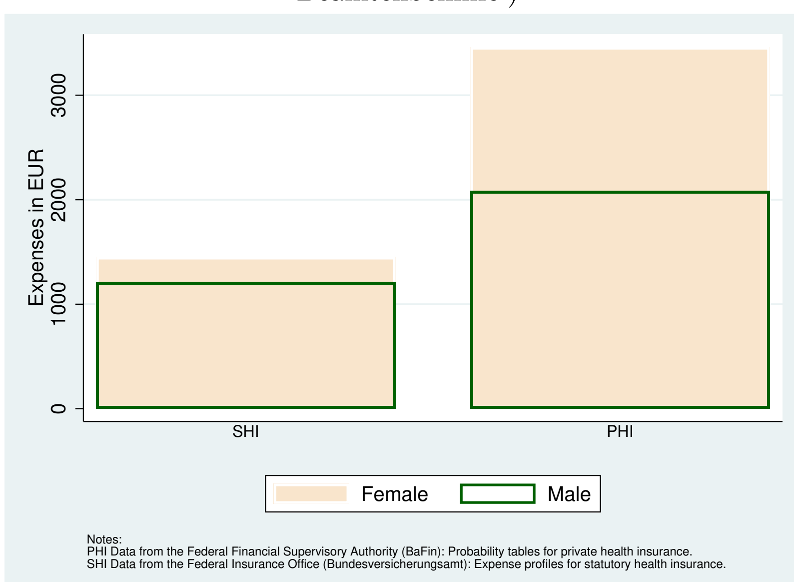
The federal insurance office reports average expenses per insurance day for each year disaggregated by health category, men and women and age for statutory health insurances.

We compute the **average yearly outpatient expenses** and the **average yearly inpatient expenses** for men and women separately, where outpatient expenses refers to the sum of expenses attributed to doctors, pharmacies and other expenses. Only individuals aged 18 or older are considered.

Expenses are computed as follows (omitting the index for gender): First, the number of

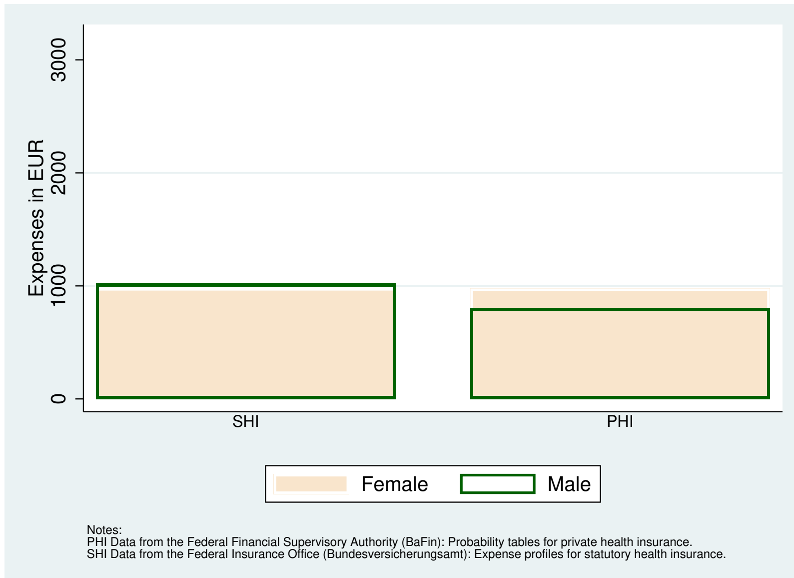


(a) Including civil servants in PHI (including employer subsidies 'Beamtenbeihilfe')

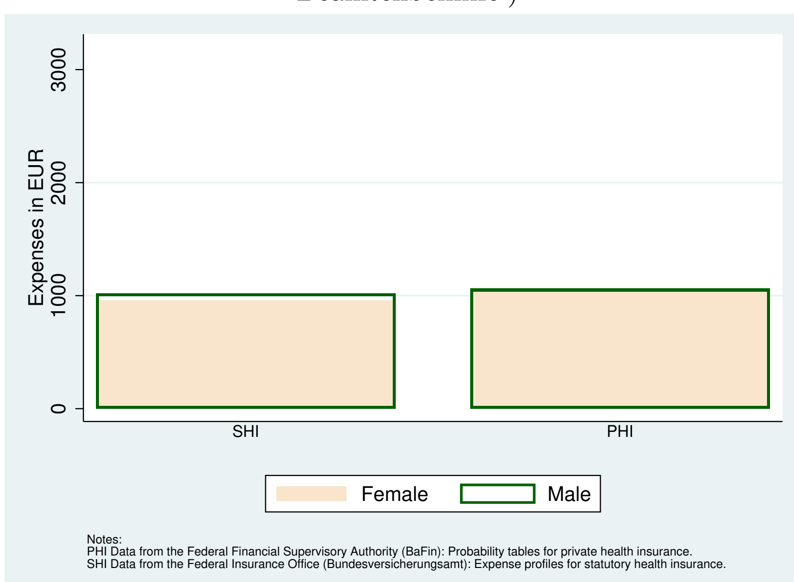


(b) Excluding civil servants

Figure D.3: Average outpatient claims per adult (above age 18) in 2012



(a) Including civil servants in PHI (including employer subsidies 'Beamtenbeihilfe')



(b) Excluding civil servants

Figure D.4: Average inpatient claims per adult (above age 18) in 2012 insurees for each age group is obtained by multiplying the number of insurance days by 365:

$$insurees_a = VT_a * 365,$$

$$insurees_a : \text{Number of insurees in age group } a$$

$$VT_a : \text{Number of insurance days in age group } a \text{ ("Versicherungstage").}$$

To obtain the expenses per year for each age group, the number of insurance days is multiplied by the average costs per insurance day in each age group:

$$expenses_a = VT_a * expensesVT_a,$$

$$expenses_a : \text{Yearly expenses in age group } a$$

$$expensesVT_a : \text{Average expenses per insurance day in age group } a.$$

Summing up the expenses in each age group and dividing them by the total number of insurees finally yields the average cost per year and person:

$$avExpenses = (\Sigma_a expenses_a)/(\Sigma_a insurees_a).$$

The BAFIN publishes average expenses for each year, disaggregated by health category, health plans, men and women and age for private health insurances. For civil servants, the 'Beihilfe-subsidy is ignored and the full expenses are reported.

We compute the **average yearly outpatient expenses** and the **average yearly inpatient expenses** for men and women separately, over all health plans to account for selection effects. Only individuals aged 18 or older are considered.

Expenses are computed as follows (omitting the index for gender): First, the age profiles are multiplied with the normed expenses ("Grundkopfschaden") to obtain the average yearly expense for each age group in each health plan:

$$
\begin{aligned}
expenses_{ah} &= \Sigma_a profile_{ah} * norm_h, \\
expenses_{ah} &: \text{Average yearly expenses for age group } a \text{ in health plan } h \\
profile_{ah} &: \text{Normed expense for age group } a \text{ in health plan } h \\
norm_h &: \text{Grundkopfschaden in health plan } h.
\end{aligned}
$$

Multiplying all expenses for each health plan and age group by the number of insurees in that health plan and age group yield total yearly expenses:

$$
\begin{aligned}
totExpenses &= \Sigma_a \Sigma_h expenses_{ah} * insurees_{ah} \\
insurees &: \text{Number of insurees (Bestandszahlen).}
\end{aligned}
$$

Finally, dividing by the total number of insurees gives average expenses:

$$
avExpenses = totExpenses/(\Sigma_a \Sigma_h insurees_{ah}).
$$