

Schreyögg, Jonas; Grabka, Markus M.

**Article — Accepted Manuscript (Postprint)**

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The European Journal of Health Economics

**Provided in Cooperation with:**

German Institute for Economic Research (DIW Berlin)

*Suggested Citation:* Schreyögg, Jonas; Grabka, Markus M. (2010) : Copayments for Ambulatory Care in Germany: A Natural Experiment Using a Difference-in-Difference Approach, The European Journal of Health Economics, ISSN 1618-7598, Vol. 11, Iss. 3, pp. 331-341, <https://doi.org/10.1007/s10198-009-0179-9>

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<https://hdl.handle.net/10419/66149>

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## Copayments for Ambulatory Care in Germany: A Natural Experiment Using a Difference-in-Difference Approach

By Jonas Schreyögg and Markus M. Grabka

## Abstract

In response to increasing health expenditures and a high number of physician visits, the German government introduced a copayment for ambulatory care in 2004 for individuals with statutory health insurance (SHI). Because persons with private insurance were exempt from the copayments, this health care reform can be regarded as a natural experiment. We used a difference-in-difference approach to examine whether the new copayment effectively reduced the overall demand for physician visits and to explore whether it acted as a deterrent to vulnerable groups, such as those with low income or chronic conditions. We found that there was no significant reduction in the number of physician visits among SHI members compared to our control group. At the same time, we did not observe a deterrent effect among vulnerable individuals. Thus, the copayment has failed to reduce the demand for physician visits. It is likely that this result is due to the design of the copayment scheme, as the copayment is low and is paid only for the first physician visit per quarter.

*JEL classification:* C13; I18; L31

*Keywords:* copayments, ambulatory care, difference-in-difference, count data, hurdle model

## 1. Introduction

In many industrialized countries, health expenditures account for a substantial share of GDP and are increasing more rapidly than GDP in a considerable number of cases. Between these countries, however, there are large differences with respect to the share of health expenditures in GDP. Germany has the third-highest share of health expenditures among OECD countries. One of the more likely reasons for this can be found in the moral hazard inherent in public health care systems. Indeed, looking at the demand for ambulatory care in Germany, it is striking that the average person made 10.0 physician visits per year in 2006,<sup>1</sup> whereas this same figure was 7.8 for all European countries and 6.8 for the EU [1].

To help counter increasing health expenditures and the high number of physician visits, the German government introduced a copayment of €10 per calendar quarter to be paid by individuals covered under statutory health insurance (SHI) upon their first contact with a physician's or dentist's office. The legislation came into effect on 1 January 2004 and has attracted attention in many European countries, leading to discussions about introducing similar schemes. Like earlier attempts to reform the German health care system, the introduction of copayments for ambulatory care aimed at tackling the moral hazard problem. Exemption rules based on income and chronic disease status were defined as a way to avoid a deterrent effect that might cause certain vulnerable

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<sup>1</sup> In the absence of WHO data for Germany, we have used data on the number of physician contacts, provided by the German Socio-Economic Panel (SOEP) for the year 2006. According to a study based on claims data from one of the largest German sickness funds, the average person in Germany makes as many as 16.3 physician visits annually [2].

individuals, such as poor or disabled persons, or those with chronic diseases, to avoid seeking necessary care.

In this study we aimed to evaluate the effects of this reform. In particular, we analysed whether the reform has had an impact on the demand for ambulatory physician services while retaining the necessary and desirable demand of vulnerable groups. The reform can be regarded as a natural experiment, because privately insured individuals are fully exempt from the copayments. Thus, within the framework of this natural experiment, we used a difference-in-difference approach, comparing the demand for physician visits before and after the reform among individuals with SHI and those with private insurance. At the same time, we examined the effects of the reform on vulnerable groups.

## 2. Copayments for ambulatory care in the German health care system

The German health care system is dominated by statutory health insurance (SHI), which is financed primarily by mandatory payroll deductions. Nearly 88% of the population is covered by comprehensive SHI. Beyond a certain income threshold, employees can decide either to remain in the SHI or to obtain private health insurance (PHI) instead. Self-employed persons can always choose between SHI and PHI. Approximately 6% of the population is fully covered by PHI. Another 6%, including civil servants, pensioners, or their families, are covered by governmental schemes (GS). All persons insured under SHI, PHI, or GS have access to a comprehensive benefit catalogue covering hospital services, ambulatory visits, pharmaceuticals, medical aids, etc. Ambulatory services include visits to general practitioners, specialists, and dentists. Before 2004, patients with

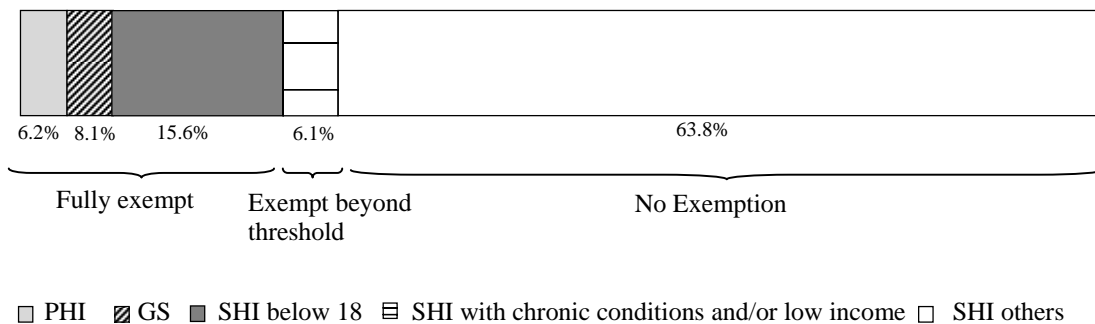
SHI were not required to make copayments for ambulatory physician visits. However, other types of copayments have a long tradition in the SHI system. Copayments are required, for example, for prescription drugs, hospital care, or health care-related transportation [3].

As part of the Statutory Health Insurance Modernization Act, copayments for doctor visits were introduced with effect from 1 January 2004. One copayment of €10 per calendar quarter is paid by patients upon their first visit to a physician's office. Subsequent visits to the same physician during the same quarter do not require a copayment. Similarly, visits to other physicians during the same quarter do not require a copayment if the patient presents a referral from the first physician. However, patients who visit another physician during the same quarter without a referral by the first physician must make an additional copayment of €10. Thus, if a patient always presents a referral from the first physician, the total fee will be €10 per quarter. The introduction of this referral system aimed at a reduction of redundant physician visits by reinforcing the importance of general practitioners [4].

This new copayment regulation was fully applied only to persons covered by SHI. Persons with PHI and some individuals with GS are exempt from the regulation. Children and adolescents up to the age of 18 who are covered by SHI are excluded, as well. In order to reduce the financial burden of the various copayments, individuals covered by SHI who have spent more than 2% of their gross household income per annum on copayments of any kind (e.g. for pharmaceuticals) are eligible for exemption from the

physician fee. This also applies to SHI members with chronic conditions once they have spent more than 1% of their gross household income per annum on copayments of any kind (the so-called 1% rule) [5, 6]. Figure 1 summarizes the application of the copayments according to insurance status.

Figure 1. Application of copayments according to insurance status



Source: own figures based on data from the German Federal Ministry of Health [5], Association of Private Health Insurance [6], and a Federal Ministry of Health estimate of SHI members with chronic conditions and/or low income. Displayed groups do not add up to 100% because 0.2% of the population is uninsured.

### 3. Previous studies on co-payments in ambulatory care

Based on economic theory, as well as on experiences with previous health care reforms in Germany and elsewhere, one would expect the introduction of copayments for ambulatory care to lead to a decline in the number of physician visits. Most previous studies on natural experiments in this area have been conducted in the US and Canada, and suggest that copayments in ambulatory care are an effective way to reduce the number of physician visits. Cherkin et al [7] showed that a copayment of approximately US\$5 resulted in a 14% decrease in physical examinations. Scitovsky and McCall [8] found an even stronger effect, with the introduction of a 25% coinsurance provision leading one year later to approximately 24% fewer physician visits. Although the authors

also argued that this was potentially a short-lived effect that could fade over time, the results of a follow-up study showed evidence that the number of doctor visits either remained much the same or was even slightly lower.

Although copayments have frequently been found to be effective in reducing the number of physician visits, they can also act as a deterrent to vulnerable groups if the system of copayments is not carefully designed (i.e. if the rules for exemption do not have the intended effect). There is substantial evidence from countries other than Germany that a change in copayments can discourage vulnerable groups from seeking necessary care. In a study described by Roemer et al [9], only short-term effects could be observed. Imposing user charges of approximately US\$1 for the first two doctor visits initially reduced demand for physician services, but led over the long-term to levels higher than those observed in the control group, thus offsetting any savings. The long-term effects of copayments were also analysed by Beck and Horne [10] for members of a universal public medical care and hospital insurance programme in Canada. Between 1968 and 1971, the Province of Saskatchewan imposed user charges of approximately 33%. Although this clearly reduced the number of physician visits, the findings of the study showed that it was primarily elderly and low-income individuals who had been affected. Moreover, when considering substitution effects, the authors concluded that the reform had not led to significant cost savings. This finding was complemented by Manning et al [11], who showed that a reduction in the use of physician services can also be accompanied by increased treatment intensity in the form of longer or more expensive treatment episodes. In a Swedish study presented by Elofsson et al [12], costs appeared to



be the main barrier to seeking care. Roughly 22% of all respondents within a random sample of individuals aged 17 or above stated that copayments had caused them to forgo a doctor's visit at least once during the previous year. This decision was strongly associated with poor financial circumstances. Among those who assessed their financial situation to be poor, the probability of foregoing care was 10 times higher than among those who assessed their financial situation to be fair or good. However, among women, avoiding physician visits was also associated with chronic disease.

Winkelmann [13] examined whether increased copayments for prescription drugs in Germany, a measure introduced as part of an earlier health care reform in 1997, had indirect effects on the number of physician visits. Since prescriptions are issued by physicians, Winkelmann argued that the demand for prescription drugs and the demand for physician visits are intrinsically linked. He concluded that increased copayments reduced the number of physician visits by approximately 10% on the average.

Our study adds to earlier approaches by conceptually dividing the copayment effect into two effects. Firstly, a person may want to avoid making a copayment for the first visit per quarter and thus not visit any physician at all during that quarter. Secondly, a person may reduce the number of physician visits after the first visit due to the increased transaction costs of obtaining the necessary referrals. Consequently, we investigated whether (a) the probability of visiting a physician has decreased and (b) the demand for physician visits declined among non-exempt SHI members since the introduction of copayments compared to the PHI members as our control group. We also investigated whether

vulnerable groups such as members of the SHI with chronic conditions or low income have shown lower demand for physician visits since the introduction of copayments compared to our control group.

### 3. Data and methods

The primary data source in this study is the German Socio-Economic Panel (SOEP) [14]. Initiated in 1984, the SOEP is a representative longitudinal survey of approximately 22,000 individuals aged 16 and above living in private households. Part of the core questionnaire, which is administered each year, gathers data on health-related variables such as current health status, insurance status, and health care utilization (e.g. number of physician visits over the past 3 months). Because the copayment was introduced at the beginning of 2004 and most surveys are completed in the first months of the year we dropped data for this transition year. We used data from the pre-intervention years 2000-2003 and the post-intervention years 2005-2006. We excluded all individuals under the age of 18 and GS members, from the dataset, because it seemed likely that the age restriction and changes to the reimbursement system of the GS during the post-reform period would make these groups unsuitable as controls. Thus, GS members who usually have coverage of 50-80% under GS and subsequently have partial PHI coverage are also excluded from the group of PHI insured. As a result, only data on PHI members with full coverage, and on SHI members over the age of 18, remained in the dataset. From this dataset we eliminated switchers from SHI to PHI during 2000 and 2006.<sup>2</sup>

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<sup>2</sup> One would assume that with the introduction of copayments in the SHI, individuals who can opt for the PHI showed a higher probability to switch to the PHI. However, the PHI attracted even less new members in 2004 than in previous years [15].

Our study approach was to pool the data from the abovementioned 6 years (i.e. from 2000-2003 and 2005-2006) and to estimate the effects of copayments by comparing the expected number of physician visits before and after the intervention using a difference-in-difference (DID) approach [16, 17]. Few studies have used a DID approach to measure the effects of changes in copayment [13, 18]. In the present study, we used the following model:

$$y_{it} = \beta_0 + \beta_1 x_i + \beta_2 z_t + \beta_3(x_i \times z_t) + \beta_4 w_{it} + \varepsilon_{it}$$

where  $y_{ij}$  is the outcome variable for person  $i$  at time  $t$ .  $x_i$  is the treatment vector indicating whether person  $i$  is subject to the increased copayment, while  $z_t$  indicates the occurrence of the copayment in period  $t$ . The interaction term denotes the utilization of a person who was required to make a copayment after the new copayment came into effect. The vector  $w_{it}$  represents a variety of socio-economic characteristics that we controlled for.

We constructed 5 DID estimators, each of which was related to a pre-post change in physician visits. Firstly, we compared non-exempt SHI members to PHI members to explore whether the introduction of copayments had led to a general reduction in the demand for physician visits. Secondly, the group of SHI members with chronic conditions was compared to the group of PHI members to investigate whether vulnerable groups had been affected by the copayment reform. We followed the official definition of ‘chronic condition’, based upon which affected individuals can qualify for the so-called

1% rule. We included persons with approved disability of more than 60% or who had qualified as beneficiaries of long-term care insurance (grades II or III). Thirdly, we sought to define a group of persons with low income whose total copayments (for ambulatory care and other services) most likely exceeded the threshold of 1% or 2% of gross household income per annum. Thus the lowest income quintile was taken as a proxy for SHI members with low income and compared to PHI members. [Fourthly](#), as an alternative proxy for low income we included all persons who received public welfare benefits and compared this group to the group of PHI members. Public welfare recipients are not generally exempt from copayments in the SHI in Germany, but given their relatively low transfer income, copayments can easily exceed the 1% income threshold. However, as long as the transfer income of these individuals does not exceed the income threshold, one may assume a significant decline in the demand for physician visits. Finally, in an alternative specification all vulnerable groups and the group of PHI members – which either were fully exempt or which can in principle apply for an exemption – were compared to members of the SHI who are not exempted from the physician fee.

It is important to note that the group of PHI members does in fact differ from the group of SHI members according to certain characteristics. PHI members are usually better educated, have a higher income, are healthier and are younger. However, in the context of this study we can use PHI members as a control group, because a difference-in-difference approach is applied. By comparing the treatment group to the control group before and

after the intervention the difference-in-difference minimizes the risk of bias which may occur due to group differences [18].

Throughout the models we controlled for a number of variables reflecting socio-economic characteristics, which have been shown to influence the demand for physician visits [19]. These socio-economic characteristics are represented by vector  $w_{it}$  in our model. We expect that omission of these variables would potentially lead to bias. In particular, we included variables for gender, age, age-squared implying that physician visits increase with age and that women tend to have more physician visits than men. We also included employment status (i.e. full-time, part-time, or unemployed), self-employment and existence of children in household assuming that more working time and children in household increase opportunity costs when consulting a physician. We further controlled for educational level and household income in quintiles to consider that lower education or lower household income may both lead to stronger reductions in physician visits.

In order to consider differences in mentality associated with residence location we included variables for residency in former East or West Germany and the population at residence location. We also included variables for active sports and smoker as we believe that both reflect a certain lifestyle that may lead to behavioural differences towards physician visits. In addition, we controlled for health by including a variable on self-reported health based on the categories very good, good, fair, poor, and very poor as we expect that persons with poor health generally require more visits than others. Variables

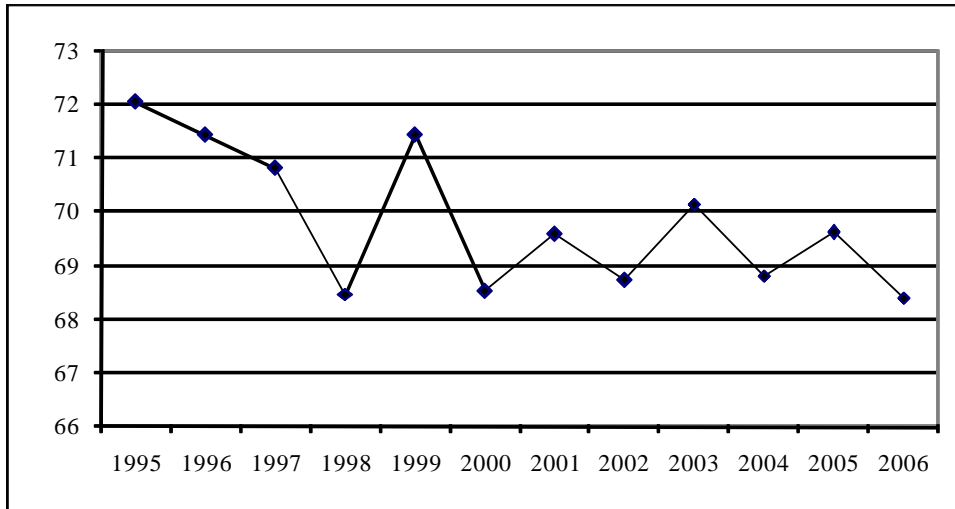
for months were used to control for all other unobserved temporal factors affecting demand for physician visits. In an alternative specification we restricted the population to those respondents who gave their interview at the end of quarter (i.e. March 15. up to March 31., June 15. – June 30. and September 15. – September 30.).

.... xxxx

We controlled for quarters instead of months as the quarter is the administrative unit in the German context i.e. the copayment is paid per quarter and physicians are paid per quarter. Controlling for temporal factors is particularly important in this context, because interviews take place in different months of the year and seasonal influences such as influenza during the winter months may otherwise bias the results. A descriptive overview of the sample is given in the appendix.

To model the impact of the copayment regulation, we proceeded in two steps. Firstly, we used a logit model to evaluate whether the probability of visiting a physician had decreased following the introduction of copayments. In this model, the outcome variable takes the value of 1 if the person has visited a physician and 0 if not. As can be seen in figure 2, the percentage of individuals who visited a physician during the past 3 months has decreased slightly over the last 10 years (i.e. from approximately 72% to less than 69% in 2006). However, the introduction of the copayment in 2004 appears to have had no impact on the demand for physician visits.

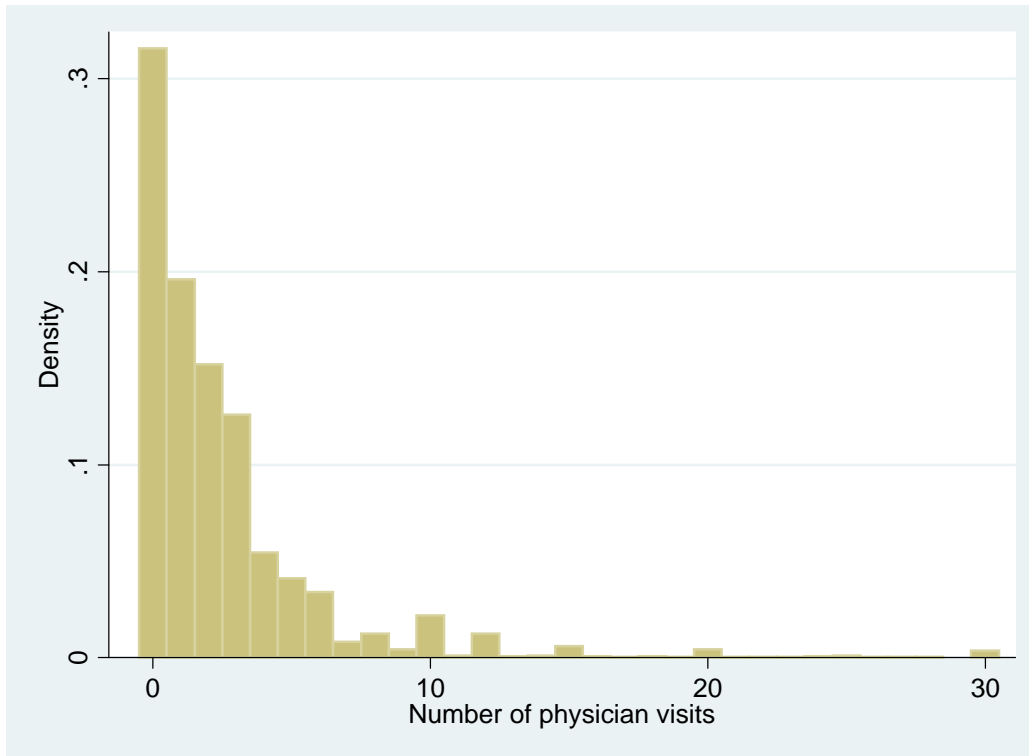
Figure 2. Percentage of individuals who had visited a physician during the past 3 months  
1995-2006



Source: SOEP, including all groups.

Secondly, when choosing an appropriate econometric model to examine whether the number of physician visits declined after the introduction of copayments, we had to consider that the distribution of our dependent variable ‘number of physician visits’ was largely skewed to the right and contained a large proportion of zeros. Figure 3 displays the kernel densities for the entire sample (i.e. including all groups). Several estimation techniques have been proposed in the literature to deal with distributional characteristics like these. Among them are Poisson and negative binomial models, as well as zero-inflated or hurdle/two-part models [20, 21].

Figure 3. Number of physician visits during the past 3 months



Source: SOEP, pooled information for the years 2000-2003 and 2005-2006.

One of the main assumptions of the Poisson distribution is that variance is equal to the mean. However, in the presence of overdispersion, estimates based on a Poisson regression model will most likely be inefficient. Overdispersion is characterized by excess zeros and/or unobservable individual characteristics. While excess zeros are obviously an issue, unobservable individual characteristics may also be relevant to this study. Although socio-demographic characteristics and self-perceived health may capture a fair portion of the variation in demand for physician visits, there are most likely further determinants of health that cannot be controlled for. A negative binomial model is one alternative to address this potential problem.



Because 31% (see Figure 3) of all persons in the full sample answered that they had not visited any physician at all during the past 3 months, excess zeros are clearly also an issue in our data. This problem can be addressed by applying the ZIP (zero-inflated poisson) and ZINB (zero-inflated negative binomial) models. In these models, the likelihood of being in either group is estimated using a logit or probit specification, whereas the counts in the second regime are estimated using a poisson or negative binomial specification [22]. An alternative to zero-inflated models is a two-part/hurdle approach. The hurdle model addresses the problem of excess zeros by using two equations, a binary model to predict zeros and a zero-truncated model for the remaining counts.

There are two main differences between the hurdle model and the ZINB model. First, the ZINB model postulates a symmetrical probability distribution while the Hurdle model assumes an asymmetrical probability distribution. Second, the ZINB model uses an untruncated model in the second stage while the Hurdle model uses a truncated model. Thus, the zero-inflated models allow zero values to occur in the first and second stage regression (i.e. there are two sources of zeros in the ZINB model: necessary and potential zeros) while the hurdle model does not permit the occurrence of zeros once the “hurdle” has been passed i.e. in the second stage regression [23].

The hurdle model is used frequently for count data when, for instance, the recurrence of cancer is measured [24]. This model assumes that each person has the same risk of a defined event as opposed to zero-inflated models which assume that there are necessary

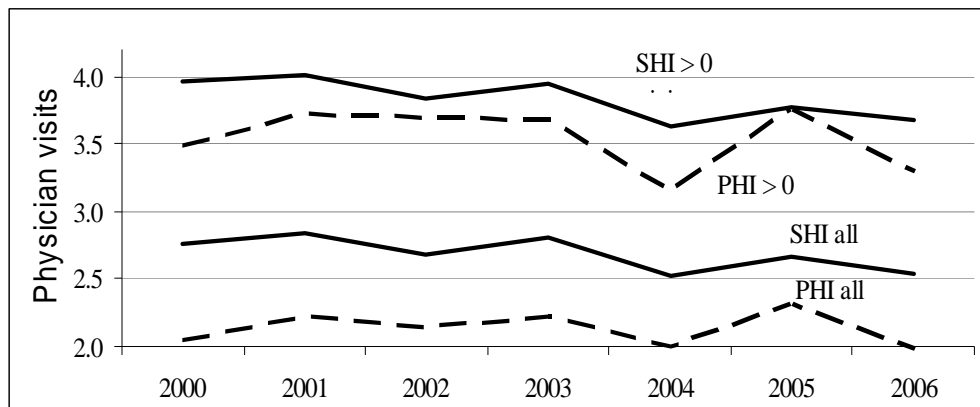
and potential zeros i.e. necessary zeros implies that some persons never visit any physician. In our case it seems reasonable to assume that every person has to visit a physician at some stage, i.e. has the same risk of visiting a physician. Since, we do not need to differentiate between two different kinds of zeros a hurdle model, which only allows persons with at least one visit to pass the hurdle, seems the more appropriate model in this context.

We tested for heterogeneity by using the  $t$  test. A significant alpha suggests that unobservable heterogeneity accounts for dispersion. In this case using a negative binomial model would be more efficient in the second step than using a poisson model [25]. To determine the best model fit we also compared the models according to AIC (Akaike's information criterion) and BIC (Bayesian information criterion).

#### 4. Results

Figure 4 illustrates how the number of physician visits for non-exempt SHI members and PHI members developed between 2000 and 2006. The upper two lines indicate the average number of physician visits for those who made at least one physician visit per quarter, whereas the lower lines indicate the average number of physician visits for all persons within each of the groups. Although there was a general trend towards a decrease in the number of physician visits for non-exempt SHI members, the number dropped sharply for both lines after the introduction of copayments in 2004, but rose to nearly pre-2004 levels in 2005. Although PHI members are exempt from copayments, the number of physician visits among these individuals showed a similar drop after the introduction of copayments in 2004. One reason for this unexpected decrease in the number of physician visits among PHI members may be the general population's uncertainty about the new system of copayments. Indeed, the copayments were subject of intense discussion in the media at the time and the rules for exemption were not fully transparent.

Figure 4. Number of physician visits during the previous quarter for PHI members and non-exempt SHI members



Source: SOEP, years 2000-2006.

Table I shows the results for hurdle model including the first stage logit regression and the second stage truncated negative binomial regression. In each model we show marginal effects and their standard errors for the group difference, i.e. the difference between treatment group and control group for all included years, as well as the DID estimators. For the first stage logit model we observed significant group differences (a) between non-exempt SHI members and PHI members, and (b) between SHI members with chronic conditions and PHI members. Both groups of SHI members had a higher probability of physician visits. While this finding is not surprising for those with chronic conditions, it must also be taken into account that PHI members tend to be better risks compared to non-exempt SHI members. It is striking that the probability of visiting a physician decreased (by 2.5 percentage points) after the reform (i.e. compared to PHI members) for those in the lowest income quintile, whereas the other DID estimators had positive signs. However, only the DID estimator for the SHI members with chronic conditions was slightly significant while all others were insignificant. The results of the second stage truncated negative binomial model also showed significant group differences for the first and second comparator groups. Apart from the lowest income quintile group the DID estimates showed reductions throughout all models which, however, were insignificant. It is notable that the number of visits among persons with public welfare dropped by about 7.1 percentage points, however again not statistically significant. When all vulnerable groups and the members of the PHI were combined,

again the DID estimator give no significant differences between members of the SHI and the combined control groups.

In the alternative specification we restricted the population to those who were interviewed at the end of each quarter (see right panel of table 1). Compared to the results for the total population we find that only the DID estimator in the first stage now showed a highly significant positive effect for SHI members with chronic conditions. ... newly introduced DMP programs in the SHI ... ?

The second stage model now showed a negative effects even also for SHI in the lowest income quintile due to the introduction of the physician fee however, for all groups the DID estimators were not statistically significant.

The estimated results of the performed models show overdispersion expressed by significant Ln alphas. This indicates preference for a negative binomial model as the second stage model. In order to test the model fit for alternative count data models we compared AIC and BIC criteria for the zero-inflated negative binomial model, the hurdle negative binomial model and the hurdle poisson model. Table II displays the results for the AIC and BIC criteria. AIC and BIC criteria show the lowest value for the negative binomial hurdle model throughout all comparator groups. This confirms that the hurdle negative binomial model has the best fit for our data.

Table I. Estimates for the first and second stage models (displayed as marginal effects)

Treatment group vs. PHI as control group	First Stage: Logit Model		Second Stage Truncated Negative Binomial Model	
Model	Coefficient	SE	Coefficient	SE
<i>SHI w/o. exemption (n=135,974)</i>				
SHI	0.038***	0.007	-0.022 ***	0.057
DiD SHI	0.003	0.009	-0.026	0.073
Ln $\pi$			-0.605 ***	0.020
<i>SHI w. chronic condition (n=22,615)</i>				
Chronic	0.162***	0.012	0.809***	0.151
DiD Chronic	0.031*	0.017	-0.036	0.134
Ln $\pi$			-0.265 ***	0.036
<i>SHI-public welfare (n= 18,991)</i>				
Public assistance	-0.003	0.021	-0.001	0.142
DiD Public assistance	0.008	0.020	-0.071	0.132
Ln $\pi$			-0.156 ***	0.054
<i>SHI-lowest income quintile (n=22,833)</i>				
Lowest income quintile	0.016	0.022	-0.023	0.172
DiD Lowest income quintile	-0.025	0.017	0.061	0.122
Ln $\pi$			-0.085 *	0.048
***P<0.01, **P<0.05, *P<0.1				

Source: SOEP, pooled information for survey years 2000-2003, 2005-2006

Table II: Model fit according to AIC and BIC

Models	SHI w./o. exemption		SHI w. chronic condition		SHI-public welfare		SHI-lowest income quintile	
	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC
Zero-inflated negative binomial model	514004	514937	96712	97474	69216	69962	85255	86018
Negative binomial hurdle model	512117	513050	96359	97121	69073	69819	85063	85827
Poisson hurdle model	580452	581375	116718	117473	79457	80195	98114	98869

## 5. Discussion

In this study, we examined the effects of introducing quarterly copayments for ambulatory care in Germany in 2004 in combination with a referral system. We developed a DID framework by using PHI members as a control group throughout the models. For our modelling approach, we subdivided the effects of the copayment conceptually and proceeded in two steps. We first applied a logit model measuring the probability of visiting a physician and subsequently applied a truncated negative binomial model measuring the change in the number of physician visits. Thus our study expands upon approaches to measuring the effect of copayments by adding a hurdle negative binomial model within a DID framework.

Our results suggest that copayment and referral system initially reduced the number of physician visits in 2004, the year of the intervention. However there was no significant reduction in the number of non-exempt SHI members with at least one physician visit, or in the overall number of physician visits made by non-exempt SHI members compared to our control group of PHI members. Our findings suggest that the introduction of this specific copayment has had only a transitory effect and has failed to reduce the relatively high demand for physician visits compared to other OECD countries. Our study results are in line with the results found in another study by Augurzky et al. [26] which is based on SOEP data too. This study could not find any reduction in the demand for physician visits either. Although this study also used a difference-in-difference approach our study adds value by extending the included years after the reform to 2006 and by modelling two stages considering the count data character of the data while Augurzky et al. [26] used a



probit model only. Another study by Grabka et al (2006) [27], also based on SOEP data, found that physician visits were reduced after the introduction of the copayment. However, this study only includes the intervention year of 2004 and thus, did not use a difference-in-difference design. Therefore this study captured the initial reduction after the introduction depicted in figure 4.

It is likely that the failure to reduce the demand for physician visits beyond a transitory effect is due to the design of the copayment scheme. The copayment is relatively low and has to be paid only for the first visit per quarter and not for each visit (i.e. as long as patients present a referral from the first physician). Thus, the potential behaviour-modifying effect of the copayments largely disappears after the first physician visit. Evidence from the US suggests that a copayment for each visit might be more effective [7, 8]. For example, in a study on HMO enrollees in Washington State, Cherkin et al [7] found that a copayment of only \$5 per physician visit led to a significant decrease in the overall number of visits. For Germany, Winkelmann's findings [13] also suggest that the 1997 increase in copayments for prescription drugs was more effective at reducing the number of physician visits than the copayment scheme examined in this study.

According to our results, there is no evidence that the copayment introduced in 2004 decreased the probability that persons with chronic conditions or low income will visit a physician. Therefore, we have to conclude that the copayments do not act as a deterrent among vulnerable populations. This result may be due either to the low amount of the copayment or the effectiveness of the income thresholds. These study results are at odds

with the results obtained by Rückert et al [28], who investigated the likelihood for delayed or avoided physician visits following the introduction of the copayment with a special emphasis on different income groups. They found that the likelihood of delaying and avoiding physician visits is significantly higher in the lowest income group. However, this study relies on surveys of the Bertelsmann Healthcare Monitor conducted after the introduction of the copayment from 2004 to 2006 and thus does not use a difference-in-difference methodology. Therefore comparability of both studies is limited from a methodological point of view. In addition survey questions differ from our study as participants were asked “Did you avoid a physician contact” or “Did you delay a physician contact” due to the copayment during the last 3 months.

It is important to consider the limitations of our study when interpreting its results. Before the health care reform in 2004, a number of over-the-counter (OTC) drugs were still in the SHI benefit catalogue. After the reform, however, these were completely excluded. This also has the potential to lead to a reduction in the number of physician visits. Although our data do not allow us to control for this effect, it is unlikely that this has subjected our study results to bias, because the copayments for prescriptions before the reform often exceeded the price for OTCs. Theoretically it would have been possible to take up a supplementary private health insurance plan to cover potential copayments per quarter potentially blurring our results. However, according to our information there are currently no plans like this available on the market.

A further limitation of the study is that we were not able to control for different care episodes which may have influenced the decision to visit a physician. This information is theoretically available in administrative data of sickness funds. However, for this particular research question we cannot rely on administrative data of sickness funds, because sickness funds in Germany do only receive detailed information on outpatient care since 2004 i.e. there is no data on physician visits for the years before 2004. In addition, sickness fund data would have provided no information on private health insured as control group and on life-style. It would have also provided less information on socio-economic characteristics. Considering these problems, we believe that the use of SOEP data is the best available option to investigate the effects of the copayment intervention as a natural experiment.

Our observations have important policy implications for decision-makers in Germany and other countries. Given the current framework, the copayments for ambulatory care in Germany have a pure funding effect and do not provide behavioural incentives with respect to physician visits, although Germany has a relative higher number of doctor visits compared to other OECD countries. If decision-makers intend to reduce moral hazard effectively, a different copayment scheme is needed. Based on the US experience, imposing copayments for each physician visit might be more effective. An alternative might be to launch prevention programmes that focus on helping vulnerable groups avoid certain health problems and the physician visits that these would entail. This could reduce the financial burden for vulnerable groups and has the potential to decrease overall health expenditures.

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Appendix: Descriptive overview of the sample

	PHI		SHI w/o exemption		SHI with chronic conditions		SHI lowest income quintile		SHI with public welfare	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Physician contact	0.60	0.49	0.68	0.47	0.94	0.24	0.69	0.46	0.63	0.48
No. physician visits	2.03	3.30	2.31	3.35	6.04	5.95	2.63	3.80	2.43	3.76
Current health status										
Very good	0.14	0.35	0.10	0.30	0.01	0.08	0.10	0.29	0.10	0.30
Good	0.47	0.50	0.42	0.49	0.07	0.25	0.36	0.48	0.37	0.48
Fair	0.29	0.45	0.34	0.47	0.30	0.46	0.34	0.47	0.31	0.46
Poor	0.08	0.28	0.12	0.33	0.36	0.48	0.17	0.37	0.17	0.37
Very poor	0.01	0.11	0.02	0.15	0.28	0.45	0.04	0.20	0.05	0.21
Active sports	0.41	0.49	0.28	0.45	0.14	0.35	0.22	0.41	0.13	0.34
Smoker	0.26	0.44	0.29	0.45	0.18	0.38	0.33	0.47	0.53	0.50
Household Income										
1. quintile	0.05	0.22	0.15	0.36	0.23	0.42	1.00	0.00	0.62	0.48
2. quintile	0.06	0.23	0.21	0.41	0.26	0.44	0.00	0.00	0.19	0.39
3. quintile	0.11	0.31	0.22	0.42	0.22	0.41	0.00	0.00	0.09	0.28
4. quintile	0.19	0.39	0.21	0.41	0.17	0.37	0.00	0.00	0.05	0.22
5. quintile	0.58	0.49	0.19	0.39	0.11	0.32	0.00	0.00	0.02	0.15
Male	0.61	0.49	0.46	0.50	0.51	0.50	0.33	0.47	0.42	0.49
Age	47.5	16.1	46.5	17.1	63.6	14.8	46.3	19.7	39.7	14.5
Age squared	2514	1585	2457	1697	4271	1776	2528	1964	1788	1276
Children in household	0.07	0.26	0.08	0.27	0.01	0.11	0.09	0.29	0.19	0.39
Educational level										
High	0.39	0.49	0.14	0.35	0.09	0.29	0.07	0.25	0.08	0.27
Medium	0.44	0.49	0.60	0.49	0.59	0.49	0.48	0.50	0.49	0.50
Without any degree	0.16	0.37	0.25	0.43	0.30	0.46	0.43	0.50	0.41	0.49
Information is Missing	0.01	0.12	0.01	0.11	0.02	0.12	0.02	0.13	0.02	0.14
Employment status										
Full-time empl.	0.52	0.50	0.41	0.49	0.09	0.28	0.12	0.33	0.11	0.31
Part-time empl.	0.04	0.20	0.11	0.31	0.02	0.15	0.10	0.30	0.06	0.25
Unemployed	0.01	0.11	0.07	0.25	0.04	0.19	0.17	0.38	0.49	0.50
Self-employed	0.30	0.46	0.04	0.20	0.01	0.10	0.02	0.15	0.02	0.16
West-German	0.87	0.33	0.74	0.44	0.77	0.42	0.73	0.44	0.65	0.48
Population at residence location (city/town)										
< 2,000	0.06	0.24	0.10	0.30	0.07	0.26	0.09	0.28	0.07	0.26
2 -5,000	0.09	0.29	0.15	0.36	0.14	0.35	0.15	0.36	0.15	0.35
5-20,000	0.22	0.41	0.20	0.40	0.18	0.38	0.18	0.38	0.14	0.35
20-50,000	0.17	0.37	0.19	0.39	0.18	0.38	0.18	0.39	0.19	0.39
50.-100,000	0.09	0.29	0.08	0.26	0.09	0.28	0.08	0.27	0.07	0.25
100.-500,000	0.19	0.40	0.17	0.38	0.20	0.40	0.18	0.39	0.21	0.41
>500,000	0.17	0.38	0.11	0.32	0.15	0.36	0.13	0.34	0.17	0.37
Month of interview										
January	0.12	0.33	0.19	0.39	0.23	0.42	0.21	0.40	0.10	0.30
February	0.23	0.42	0.27	0.44	0.29	0.45	0.25	0.43	0.32	0.47
March	0.21	0.41	0.21	0.40	0.19	0.39	0.18	0.38	0.24	0.43
April	0.16	0.37	0.13	0.34	0.11	0.32	0.13	0.33	0.14	0.35
May	0.11	0.31	0.08	0.27	0.07	0.25	0.08	0.28	0.07	0.26
June	0.08	0.27	0.06	0.23	0.05	0.22	0.06	0.24	0.06	0.24
July	0.05	0.21	0.03	0.18	0.03	0.16	0.04	0.18	0.04	0.19
August	0.02	0.15	0.02	0.14	0.02	0.13	0.02	0.15	0.02	0.14
September	0.01	0.11	0.01	0.11	0.01	0.08	0.02	0.13	0.01	0.10
October	0.01	0.08	0.01	0.08	0.00	0.07	0.01	0.09	0.00	0.06
N	14,762		121,876		7,998		8,184		4,317	

Source: SOEP, pooled information for survey years 2000-2003, 2005-2006.