Christoph Schwierz, Ansgar Wübker,
and Björn A. Kuchinke

The Impact of Private versus Social Health Insurance on Offered Waiting Times in German Acute Care Hospitals

rwi

Ruhr Economic Papers

Ruhr Economic Papers #120

Christoph Schwierz, Ansgar Wübker,
and Björn A. Kuchinke

The Impact of Private versus Social Health Insurance on Offered Waiting Times in German Acute Care Hospitals

Christoph Schwierz, Ansgar Wübker, and Björn A. Kuchinke*

The Impact of Private versus Social Health Insurance on Offered Waiting Times in German Acute Care Hospitals

Abstract
This paper shows that patients with private health insurance (PHI) are being offered significantly shorter waiting times than patients with statutory health insurance (SHI) in German acute hospital care. This behavior may be driven by the higher expected profitability of PHI relative to SHI holders. Further, we find that hospitals offering private insurees shorter waiting times as compared to SHI holders have a significantly better financial performance than those abstaining from or with less discrimination.

1. Introduction

It is well documented that in many health systems medical services are rationed by waiting lists rather than prices (Lindsay and Feigenbaum 1984, Cullis and Jones 1986). In times of rationed medical supply, waiting lists discriminate between urgent and less urgent needs of treatment, but also between profitable and costly patients. Often holders of private health insurance (PHI) pay either more for equal services or have access to more innovative and costly treatments not available to holders of statutory health insurance (SHI) or those without any insurance (Lüngen et al. 2008, Krobot et al. 2004). Thus, discriminating between PHI and SHI patients is potentially profitable for providers of medical services. Indeed, empirical results show that private insurees benefit from better access to medical care including shorter waiting times (Asplin et al. 2005, Ward et al. 2008).

The main objective of this paper is to assess the impact of PHI versus SHI on offeredwaiting times until medical treatment within German acute care hospitals. To this aim, we requested individual appointments from hospitals within an experimental study design, which allows for causal inferences of PHI versus SHI on waiting times (Asplin et al. 2005). Further, we assess the association between observed hospital characteristics, such as the hospitals financial performance and ownership form, and the discrimination in waiting times between PHI and SHI holders.

Empirical literature has shown that waiting times for medical appointments are strongly related to profit considerations of the providers of medical services. Studies using US data found that a decrease in remuneration for the treatment of Medicare patients led to an increase in their waiting times (Resneck et al. 2004). Medicaid patients were shown to have higher waiting times than privately insured patients, who pay more for equal treatments (Asplin et al. 2005, MASG 1994). In German ambulatory care, where the remuneration for treating private policyholders is on average 20-35% higher than for treatments of statutory insurees, the difference in waiting time between these patient types amounts to 300% (Lüngen et al. 2008). These studies confirm that discrimination by insurance type occurs be it in ambulatory or stationary care, within different health system designs and different types of health insurances. Moreover, they indicate that this behavior is motivated by financial incentives. Our study provides first-time empirical evidence of the discrimination in waiting times within the German acute care hospital sector.

The paper is organized as follows. Section 2 presents key features of the regulatory framework of health insurance and its impact on patient selection within the German acute care health sector. Section 3 describes the data.

Section 4 specifies the estimation strategy, while results are described in section 5. Section 6 concludes.

2. The role of health insurance in the German hospital sector

Before 2004 acute care hospitals in Germany acted under a cost-plus reimbursement system. This changed in 2004 after introduction of the Prospective Payment System (PPS), creating strong incentives for economic discipline in the hospital sector. Under PPS hospitals get a fixed payment for the treatment of each patient in a diagnosis-related group (DRG), regardless of the actual costs incurred by the care of the patient.[2] A large literature documents hospitals' responses in introducing cost-saving or reimbursement-increasing measures under PPS. These measures include decreases in the length of stay (Cutler 1995), selective reductions in expenditures for high-cost patients (Meltzer and Chung 2002), upcoding[3] (Dafny 2005) and selection of profitable patients (Ellis 1998). Due to the regulatory framework of health insurance in Germany, the insurance status is a potential indicator for a profitable selection of patients. The main regulations shall be shortly described in the following.

In Germany, PHI is only available to some segments of society, namely civil-servants, self-employed and individuals with an annual income above 48.150 €. The rest of society is covered by compulsory SHI (Specke 2005). The cost of holding a PHI depends on morbidity and age. Therefore, one finds individuals with a lower morbidity rate to self-select into PHI and those with a higher morbidity rate to choose SHI which does not base premiums on the individual risk characteristics. Consequently, PHI holders are on average healthier and have a higher income than SHI holders (Kriwy and Mielck 2006). Moreover, with higher income private insurees are more sensitive towards high waiting times than SHI holders, because their opportunity cost of waiting (which may be foregone income or leisure time) is higher (Besley et al. 1999, Johannesson et al. 1998). In contrast, when given the choice between a high waiting time at a local hospital and a low waiting time at a more distant hospital, SHI holders often prefer the first option (Tai et al. 2004). The stronger preference of private insurees for low waiting

---

[2] In reality prices are not 100% fix. Prices are fixed within an upper and lower boundary of the length of stay of the patient, in order to account for less (more) cost-intensive in-(out-)liers. Moreover, special compensation rules apply if hospitals exceed or fall below the number of patient cases that was agreed upon with insurance companies.

[3] Upcoding refers to switching patients from appropriate lower-paying to higher-paying DRGs in order to inflate reimbursement.

times puts pressure on hospitals to lower their waiting times, in order not to loose them to competing hospitals.

Further, the treatment of PHI holders can generate additional remuneration not available in basic SHI.[4] These are hotel-benefits (private rooms), more costly treatment by the chief physician and access to innovative and costly treatment methods.[5] In addition, even without coverage of additional hospital services, private insurees might generate lower costs of treatment given the same reimbursement due to their better health status and therefore probably faster recovery and shorter lengths of stay.

In short, there are arguments why positive discrimination of PHI versus SHI holders may pay-off for a hospital in Germany: the probability that PHI holders have low morbidity rates, additional income sources for treating PHI patients and the aversion of PHI patients towards high waiting times.

3. Data

3.1 Hospital characteristics

We use a densified measure of the financial performance of hospitals: the probability of default (PD) of an enterprise within one year. This has been estimated and provided by Augurzky et al. (2009). The yearly PDs are evaluated on the basis of balance sheets and profit and loss statements from acute care hospitals by the use of a rating tool.[6] Augurzky's et al. (2009) PDs are derived from 311 balance sheets from the years 2001 to 2005 and covering 435 or 24% of all hospitals situated in Germany in 2006. On average, the sample includes bigger hospitals, slightly overrepresents hospitals of private ownership and mirrors well the regional distribution of hospitals on the level of the German Federal States.[7] The total PD in the sample amounts to

---

[4] SHI holders can voluntarily purchase supplementary private insurance to cover additional hospital services. Currently 5.1 Million (7.1 %) of SHI-Insurees chose this option (Verband der privaten Krankenversicherung e.V. 2007).

[5] In 2006 the additional remuneration due to hotel benefits and treatment by the chief physician amounted to 2.5 bill. €, or 4% of total hospital revenues. For a one-bed room the revenue amounted to 82,61 Euro per day, which is around 2.4% of average costs per patient in 2006 (GBE 2008).

[6] The evaluation of the PD is based on key operating figures, such as liquidity, the debt to equity ratio or current assets. See Augurzky et al. (2009) for a more detailed description of the data and the model.

[7] The number of hospitals is higher than the number of balance sheets due to the inclusion of hospital chains. These provide only one balance sheet for all hospitals in a chain. We do not consider purely psychiatric hospitals in our sample. See also Augurzky et al. (2009).

1.31%. On average, public hospitals have a PD of 1.52%, private-not-for-profits 0.98% and private for-profits 1.47%. As a rough categorization creditors regard companies with a PD up to 1.00% as creditworthy. These companies are normally able to take up loans with relatively low costs. With a PD in the range of 1.00% - 2.60% obtaining a credit becomes more difficult and more costly, but is usually still possible. PDs above 2.60% suggest great difficulties up to the impossibility to borrow money.

We merge the yearly PD and with hospital-level and regional-level data in order to control for observed heterogeneity across hospitals as well as for common market characteristics. On the hospital-level these are the ownership form of the hospital (private for-profit, private not-for-profit, public), hospital size measured in the number of beds and the year of the balance sheet information. Regional-level data account for the levels of capacity utilization by ownership type and the amount of public subsidies in the hospital sector on the level of the German Federal States. Finally, we add a dummy distinguishing East from West German hospitals. The variables are described in the appendix in Table A1.

3.2 Waiting times

Data on waiting times for appointments at acute care hospitals in Germany was not available prior to this study. Therefore, it was collected following an experimental study design, as proposed by Asplin et al. (2005). Trained graduate students, who posed as patients, called hospitals using standard interview questions and data collection forms with the aim of obtaining an appointment for a doctoral consultation. During the call the interviewers had to make clear that they already went through a thorough medical check by an ambulatory doctor in short period before the request for appointment, such that their diagnosis was already established.[8] An important aspect of our experimental design of the study was to keep insurance status exogenous to waiting times. For this purpose the interviewers were told not to actively communicate their insurance type. Only upon request by the personnel of the hospital the interviewers presented themselves as SHI holders. Hospitals actively requesting the insurance type were then recalled for a second time within a few days after the first call.[9] During the second call the

---

[8] Usually patients obtain appointments through the ambulatory health sector. The gatekeeper, i.e. the house doctor, provides his patients with an appointment for a hospital stay. In order to directly obtain an appointment, our interviewers told the hospital personnel that they had to abstain from a routine referral by their doctors due to a recent tenancy changeover to a new hometown.

[9] The average lag between first and second call was 7 days. The lag was meant to be kept short in order to minimize the risk that a sudden change in capacity utilization of a hospital significantly impacts on waiting times. Where possible, in order to prevent the interviewer from

anonymous interviewer claimed to be privately insured. Hospitals not asking for the insurance type were not recalled. The interviewers obtained information on whether an appointment was consented to or refused, what the waiting time in days until the appointment was and on which day of the week the call was made. Upon attainment, all appointments were cancelled in order not to bind hospital capacity. The calls were randomly spanned over the weekdays (Monday to Friday) in 2007.

Three clinical conditions were selected by a medical practitioner before the interviews conditional on two attributes.[10] First, they should not be life-threatening or being declared as emergency cases, but should necessitate a medical treatment within short notice (maximum two weeks) in order not to result in otherwise avoidable detrimental health effects. Second, they should be treatable within the sample of hospitals for which data on hospital characteristics was readily available. The chosen conditions are Weber B Fracture, cervical conization and stenosis. Weber B Fracture is a fracture of the ankle joint treated operatively in surgical departments. Cervical conization is an operative treatment in gynecology departments, when cancer is suspected. Stenosis is a constriction of the coronary vessels treated by a stent implantation in cardiology departments.[11] Hospitals which had more than one of the departments in question, received calls to each of the departments.

Table 1 presents descriptive statistics for the number of appointments acquired as well as the waiting times obtained by several subsamples. In the left part of the table, statistics for all appointments are shown. In the right part of the table, the subsample of all the remaining appointments after matching waiting times to hospital characteristics is presented. During the study period a total of 751 appointments from 531 hospitals was obtained. Matching waiting times with other observable characteristics of hospitals, such as their financial performance, leads to a reduction of the sample to 498 observations. Only 27 calls ended without successfully obtaining an appointment, either because the clinic did not provide treatment for the selected clinical condition or because the clinic did not answer the phone or because, in very few cases, the clinic did not provide an appointment because it was fully-booked for the next weeks to come.

---

being re-identified by the personnel of the hospital, second calls were done, by different interviewers. Furthermore, caller identification for all outgoing calls was blocked.

[10] We thank Dr. med. Lüder Herzog from the Dresdner Hospital for his help in the selection of the appropriate clinical conditions.

[11] The four-digit codes within the International Classification of Diagnoses in its 10th-German Modification are "S82.6" for Weber B Fracture, "I25.1" for stenosis and "C53.9" for cervical conisation.

Table 1
Number of appointments and waiting times

	All obtained appointments			Remaining appointments with matched data		
	Obs.	Mean	SD[1]	Obs.	Mean	SD
Total number of calls	751 (531)[2]	5.88	5.33	498 (326)	6.15	5.72
Appointments	724 (504)	5.88	5.33	498 (326)	6.15	5.72
Insurance not asked for	398 (341)	5.76	4.61	248 (201)	5.26	6.25
Insurance asked for	326 (163)	6.55	5.52	250 (125)	7.04	5.32
PHI holder	163	5.10	5.14	125	5.69	4.33
SHI holder	163	8.00	5.90	125	8.39	5.87
Weber B Fracture	213 (189)	1.77	3.08	133 (118)	2.09	3.32
Insurance not asked for	163 (163)	1.65	2.83	103 (103)	1.83	2.87
Insurance asked for	50 (25)	2.16	3.83	36 (18)	2.82	4.35
PHI holder	25	0.88	1.76	18	1.17	2.01
SHI holder	25	3.50	4.88	18	4.59	5.44
Stenosis	176 (114)	9.28	5.97	144 (92)	9.11	5.80
Insurance not asked for	51 (51)	9.55	5.83	37 (37)	10.30	5.70
Insurance asked for	126 (63)	9.18	6.06	104 (52)	8.71	5.81
PHI holder	63	7.60	5.08	52	7.05	4.56
SHI holder	63	10.80	6.57	52	10.41	6.48
Cervical Conization	335 (264)	6.70	4.37	221 (166)	6.72	4.46
Insurance not asked for	188 (188)	6.89	4.66	108 (108)	6.81	4.73
Insurance asked for	150 (75)	6.46	3.96	110 (55)	6.62	4.19
PHI holder	75	5.84	3.61	55	5.77	3.73
SHI holder	75	7.11	4.21	55	7.53	4.48

Notes: [1] Standard deviation; [2] Numbers in parentheses indicate the number of hospitals; Authors' calculations.

A total of 163 times, i.e. in 29 percent of all cases, the interviewers were asked for their health insurance type, which ensued a follow-up call to each of these hospital to obtain waiting times for a PHI holder. Waiting times are lower if hospitals do not ask for the insurance type of the patient (Table 1). This hints at overall lower capacity utilization in these hospitals as compared to those which actively investigated the insurance type of the patient. Table 1 further shows that average waiting times clearly differ by the insurance type (Table 1). Private insurees wait on average 5.1 days, whereas SHI holders wait on average 2.9 days longer. Overall, the pattern of differences in waiting times, as described above, remains the same in the matched subsample: Hospitals which have investigated the insurance type of the patient have on average higher waiting times than those who were not interested in this type of information. Also, PHI holders have shorter waiting times than SHI holders.

Table 1 further decomposes waiting times by each clinical condition. Clearly, the propensity to ask for the insurance status or not depends on the clinical condition. Patients with Weber B Fracture are asked relatively seldom, patients with cervical conization are asked little more than half of the times and patients with stenosis are asked relatively often. Accordingly, waiting times increase in the same order of clinical conditions. Short waiting times in case of Weber B Fracture will be most probably related to the occurrence of acute pain that patients with this clinical condition have to endure. On the other hand, the relatively long waiting times for patients with stenosis and cervical conization may be explained by the lack of acute pain for these patients. The decomposition shows that within all diagnoses PHI patients have shorter average waiting times than SHI patients, once the hospitals ask for the insurance status.

4. Empirical strategy

Our data collection design imposes a two-part decision process on hospitals: First, the decision whether to ask for the insurance status of a patient; Second, the proposal of a waiting time until the appointment. This decision process can be appropriately modeled by a two-part model with a binary outcome model in the first step and a count data model in the second step, because waiting times are measured in full days.

In the first step, we estimate the probability that a hospital asks for the patient's insurance status:

$$y_{ih} = \gamma T_i + \beta p d_h + \delta X_h + \lambda D_i + \varepsilon_{ih}, \tag{1}$$

where y_{ih} is 1 if a hospital asks for the insurance status of a patient and 0 otherwise; T_i is a vector of dummies denoting the weekday of the call for appointment; pd_h is the probability of default of hospital h of admittance; X_h is a vector of other observed hospital and regional attributes; D_i is a vector of dummies of the patient's clinical condition and ε_{ih} is the random error. We estimate one model without the observed hospital characteristics to retain all available appointments and one with the subsample of data for which hospital characteristics are observable. The estimation is done by probit models with standard errors corrected for clustering of observations within hospitals.

In the second step, we estimate the association between the offered waiting times and our observable explanatory variables. In order to account for

potential unobserved heterogeneity of hospitals, we first estimate a number of hospital fixed-effects models. For the waiting time w_{ih} of patient i in hospital h we assume that:

$$w_{ih} = c + \alpha I_i + \tilde{\gamma} T_i + u_h + \tilde{\varepsilon}_{ih}, \tag{2}$$

where c is a constant; I_i is a dummy for the insurance status of the patient, with 1 for a PHI and 0 for a SHI holder; u_h is a hospital fixed-effect and the other variables correspond to those used in equation (1). We are interested in the causal effect of insurance status on waiting times.

We then continue to assess whether waiting times are associated with observable characteristics of hospitals within the sample of matched data. The model is then:

$$w_{ih} = \tilde{c} + \tilde{\alpha} I_i + \tilde{\tilde{\gamma}} T_i + \tilde{\beta} pd_h + \tilde{\delta} X_h + \tilde{\lambda} D_i + \tilde{\varepsilon}_{ih}. \tag{3}$$

Because hospital characteristics do not vary by the insurance type of patients, we forgo hospital fixed-effects in this model. Also, because of the small sample size we do not estimate separate models for each diagnosis.

Finally, we estimate how observable characteristics of hospitals and patients are associated with differences in waiting times between PHI and SHI holders:

$$\Delta w_{ih} = \tilde{\tilde{c}} + \mu_i^0 T_i^0 + \mu_i^1 T_i^1 + \tilde{\tilde{\beta}} pd_h + \tilde{\tilde{\delta}} X_h + \tilde{\tilde{\lambda}} D_i + \tilde{\tilde{\varepsilon}}_{ih}, \tag{4}$$

where Δ denotes the within-hospital difference in waiting times between PHI and SHI holders and T_i^0 (T_i^1) is a vector of variables denoting the weekday of a call for appointment for a SHI (PHI) patient.

When estimating equations (2) to (4), we provide results for two samples of hospitals. First, we assume that hospitals not asking for the insurance type of the patient would have offered identical waiting times to both PHI and SHI holders. Therefore, for this subsample of appointments we duplicate the number of observations and assign one half of the observations to SHI and the other half to PHI patients. We then pool this data with appointments for hospitals who have asked for the insurance type and use all in one regression. The strategy basically imposes a no discrimination constraint between PHI and SHI holders for the subsample of hospitals who did not investigate the insurance type. Intuitively, the resulting estimates are conservative and could be, loosely speaking, a lower bound for the impact of insurance type

on waiting times. Second, we restrict the data to only those hospitals who have asked for the insurance type of patients. In analogy to the pooled estimate above, this estimate will yield an upper bound of discrimination, because it focuses on the subsample of hospitals which have an obvious interest in the insurance type of their patients and can therefore discriminate easily.

We estimate equations (2) and (3) by count models, because the offered waiting times are measured in full days. The usual procedure with two-part models based on count data is first to estimate the binary outcome as in equation (1). Then the positive counts are estimated separately based on a truncated-at-zero count data model. However, our data is special in the sense that zeros in the first step do not exclude a positive observation for the same individual in the second step. We therefore include the zero waiting times in the second step as well, comparing the results based on the Poisson model, the negative binomial model or zero inflated model (Cameron and Trivedi 1998). We have tested the best fit of the models by the Akaike information Criterion and Bayesian information criterion. Both criteria favored the negative binomial model for equations (2) and (3). Also, the LR-test has confirmed that waiting times are overdispersed, which makes the negative binomial model more appropriate than the Poisson model. The standard errors were corrected for clustering of multiple observations within the same hospital.

Model (4) also includes negative integer values and was first estimated by ordinary least squares (OLS). However, tests indicating heteroscedasticity indicate that OLS is inefficient as compared to an estimation using a heteroscedasticity-consistent variance-covariance matrix of the error term. As the form of heteroscedasticity is unknown, we estimate the equation additionally by feasible generalized least squares (Wooldridge 2002). For this purpose we use the residuals ε_{ih} from equation (3) after estimation by OLS. We then regress the log of the squared residuals $\ln(\varepsilon_{ih}^2)$ on all explanatory variables by OLS, use the fitted values $\hat{g}_{ih} \equiv \ln(\hat{\varepsilon}_{ih}^2)$ from this regression and estimate (3) with weighted least squares and weights $w_{ih} = \exp(-\hat{g}_{ih})$.

5.   Results

Estimation results of equation (1) are presented in Table 2. These confirm that the probability of being asked for the insurance status is significantly decreased for the clinical condition Weber B Fracture and increased for calls on stenosis relative to the clinical condition of cervical conization. Further, calls later than Monday increase the probability of this outcome. In the

subsample of hospitals with matched data the only additional significant determinant of the assessed probability is being geographically located in East Germany.

Table 2
Determinants of the probability to ask for the patients' insurance type

	All hospitals		Matched data	
Independent Variables	Marginal Effects	z-value	Marginal Effects	z-value
Probability of default	-	-	-0.012	(1.01)
For-profit hospital	-	-	0.690	(0.77)
Private non-profit hospital	-	-	0.012	(0.19)
#Beds	-	-	-0.004	(1.16)
#Beds^2	-	-	0.004	(1.58)
Regional Capacity Utilization	-	-	0.157	(1.21)
Regional Capacity Utilization^2	-	-	-0.001	(1.18)
East Germany	-	-	-0.251***	(3.68)
Public subsidies	-	-	0.005	(1.56)
Last PD before 2004	-	-	-0.069	(0.77)
Diagnosis: Fracture	-0.161***	(3.68)	-0.219***	(3.60)
Diagnosis: Stenosis	0.270***	(5.25)	0.232***	(3.55)
Tuesday	0.141**	(2.21)	0.135	(1.55)
Wednesday	0.149**	(2.23)	0.200**	(2.16)
Thursday	0.119*	(1.85)	0.111	(1.29)
Friday	0.217***	(2.78)	0.225**	(2.29)
Pseudo R^2	0.11		0.18	
Chi^2-test for joint significance of beds	-		3.52	
Chi^2-test for joint significance of capacity utilization	-		1.61	
Observations	561		373	

Notes: Estimates from probit models; Constant included; Standard errors corrected for clustering of observations within hospitals; constant included; ***, **, * significant at 1%, 5% and 10% level respectively.

Table 3 presents the marginal effects of PHI versus SHI status as well as the levels of statistical significance as modeled in equation (2), i.e. after accounting for hospital fixed-effects and the days of the calls for appointment. In the left part of the table, the conservative estimates are presented, where it is assumed that hospitals not asking for the insurance type offer identical waiting times to PHI and SHI patients. The right part of the table shows estimates for the subsample of hospitals investigating the insurance status. For the sake of brevity the estimates of the other covariates are omitted.

First, in all estimation results PHI is related to shorter waiting times than SHI. Thus, clearly insurance status is a significant predictor of waiting times. The average effects vary between the conservative and non-conservative estimates as well as between diagnoses. The conservative estimate of -0.61 is more than 3 times lower than the estimate of -2.19 for the subsample of hospitals who have investigated the insurance status. This difference in estimates is mainly driven by the low propensity of hospitals to ask for the insurance status within the clinical condition of Weber B Fracture, such that the assumption of identical waiting times is reducing the overall effect of insurance status on waiting times.

Table 3
Marginal effect of PHI versus SHI on waiting times

Sample	All appointments[1]			Insurance type asked for[2]		
	Obs.	Marginal effect	z-value	Obs.	Marginal effect	z-value
All diagnoses	1122	-0.61***	(5.02)	326	-2.19***	(6.05)
Stenosis	212	-1.62***	(3.93)	128	-3.06***	(4.15)
Weber B Fracture	365	-0.30**	(2.04)	52	-2.91**	(2.16)
Cervical Conization	545	-0.38***	(3.32)	146	-1.43***	(3.48)

Notes: [1] All appointments and assuming identical waiting for PHI and SHI holders in the subsample of hospitals not asking for the insurance type; [2] Subsample of hospitals asking for the insurance type; Poisson model including hospital fixed-effects, the weekday of the call for appointment and a constant; Standard errors corrected for clustering within hospitals; ***, **, * significant at 1%, 5% and 10% level respectively

Considering the magnitude of the effects, it is of course uncertain whether in the extreme case of a 3 day difference in waiting times, the relatively high waiting times for SHI patients would be detrimental to their health status. However, because in all clinical conditions patients get access to medical care mostly within the admissible range of waiting times, negative health effects are not very probable.

In Table 4, we investigate whether waiting times across hospitals can be significantly explained by some of their observable attributes. As before, the insurance status is a strong predictor of waiting times. Moreover, the hospitals' PDs are positively related to waiting times. Out of the remaining explanatory variables only regional public subsidies, hospital size and the patients' diagnoses are significantly related to waiting times on the 5 percent significance level in either of the both estimates. Thus, overall there are few

observable hospital characteristics that are significant predictors of individ-
ual waiting times.

Table 4
Marginal effect of PHI versus SHI and hospital characteristics on waiting times

Independent Variables	All appointments[1]		Insurance type asked for[2]	
	Marg. Effect	z-value	Marg. Effect	z-value
PHI holder	-0.768***	(6.31)	-2.671***	(6.84)
Probability of default	0.093*	(1.82)	0.287**	(2.27)
For-profit hospital	0.753	(1.14)	-1.711	(1.17)
Private non-profit hospital	0.888*	(1.91)	0.057	(0.06)
#Beds	0.003	(1.21)	0.004	(0.92)
#Beds^2	-0.003	(1.56)	-0.006*	(1.82)
Regional Capacity Utilization	-0.101	(0.13)	-3.107	(1.44)
Regional Capacity Utilization^2	7.0 E-04	(0.14)	0.019	(1.34)
East Germany	0.415	(0.83)	1.281	(1.04)
Public subsidies	0.004***	(2.62)	-0.027	(1.36)
Diagnosis: Fracture	-6.021***	(9.08)	-4.921***	(3.04)
Diagnosis: Stenosis	1.525***	(4.35)	2.280***	(3.57)
Last PD before 2004	0.767	(1.44)	0.496	(0.44)
Chi^2-test (whole model)	217.20***		169.80***	
F-test for joint significance of beds	3.69		14.26***	
F-test for joint significance of capacity utilization	0.03		5.13*	
Observations	746		250	

Notes: [1] Including only hospitals with waiting times for both PHI and SHI holders; Negative
binomial model; Standard errors corrected for clustering of observations within hospitals;
constant and differences in weekdays of calls between PHI and SHI patients included;***, **, *
significant at 1%, 5% and 10% level respectively.

Finally, Table 5 presents the results of estimates of the difference in waiting
times between PHI and SHI holders as in equation (3). The results show
that for high PDs this difference is more positive. In other words, hospitals
with a poor financial performance do not benefit PHI holders with lower
waiting times as compared to SHI holders.

To better understand the association between the PD on discrimination in
waiting times between patient types, we graph the expected mean difference
in waiting times for a range of values of the PD. To this end, following the
estimation results of equation (5) we set the PD at a given value and, using
simulated parameters values, we generate the average expected waiting

time, as well as the 95 percent confidence interval at each value of the PD.[12] We draw 1,000 simulations of the estimated model parameters from their asymptotic sampling distributions. To generate the expected mean waiting times all variables other than the PD are set at their mean values.

Table 5
Marginal effects on the difference in waiting times between PHI and SHI holders

Independent Variables	All appointments[1]		Insurance type asked for[2]	
	Coeff.	t-value	Coeff.	t-value
Probability of default	0.062**	(2.11)	0.434***	(2.64)
For-profit hospital	-0.403	(1.10)	1.241	(1.60)
Private non-profit hospital	-0.108	(0.40)	0.076	(0.69)
#Beds	-0.001	(0.50)	-0.007**	(2.03)
#Beds²	0.001	(0.64)	0.006**	(2.24)
Regional Capacity Utilization	-0.610	(0.64)	-0.234	(0.09)
Regional Capacity Utilization²	0.003	(0.70)	0.003	(0.26)
East Germany	-2.574**	(2.10)	-4.580***	(2.64)
Public subsidies	0.001	(0.16)	0.034	(3.72)
Last PD before 2004	0.480	(1.47)	-2.131	(1.63)
Diagnosis: Fracture	0.080	(0.32)	-1.911	(1.39)
Diagnosis: Stenosis	-0.610	(1.24)	-0.361	(0.53)
F-test (whole model)	3.77**		4.12***	
F-test for joint significance of beds	0.62		4.93*	
F-test for joint significance of capacity utilization	1.00		7.82**	
Observations	373		125	

Notes: FGLS estimation results; Standard errors corrected for clustering within hospitals; vectors including days for call of appointment and constant included; tested for interactions between PHI and ownership form / hospital size / diagnoses; ***, **, * significant at 1%, 5% and 10% level respectively

Figure 1 presents the simulated expected values and the 95 percent confidence interval of waiting times for the range of values of the PD. The left panel of the figure shows the linear relationship between PD and the dependent variable for hypothetical values of the PD from zero to ten percent. The positive slope reveals that increasing values of the PD go along with relatively high waiting times of PHI as compared to SHI holders. Also the shape of the confidence interval illustrates that the degree of uncertainty regarding the simulated waiting times drastically increases once the difference in waiting times between PHI and SHI holders becomes positive. The right panel of the figure shows the difference in waiting times for the 1st to

[12] We use CLARIFY, a STATA add-on, for this purpose (Tomz et al. (2001), King et al. (2001)).

the 99th percentile of the actual PDs in the sample. The graph reveals that hospitals with a PD below one percent, which totals around 70 percent of all hospitals in our sample, tend to benefit PHI holders with relatively low waiting times. Discrimination decreases for hospitals with PDs above one percent.

These result are intuitive, as hospitals with high PDs will tend to have low rates of capacity utilization or will therefore not discriminate between patients but rather give all of them equally fast access to their services. On the other hand, hospitals with a low PD will tend to utilize their capacity to a greater extent and will probably try to increase profits by discriminating between PHI and SHI holders. This may be achieved by a management system for waiting lines, where offers of waiting times are based on medical and profit considerations. Unfortunately, we do not observe whether actually discriminating hospitals have a waiting line management and whether this system drives the PD. Therefore, it is not possible to establish a causal link between the discrimination in waiting times and the PD in our study.

Figure 1
Simulated differences in waiting times between PHI and SHI holders by levels of the probability of default
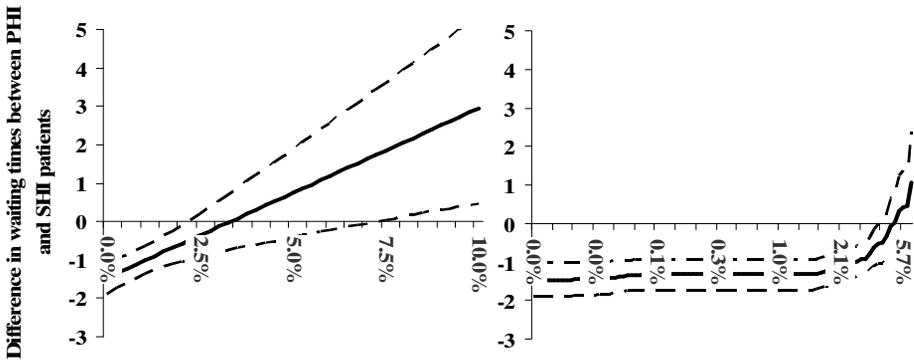
Dashed lines show 95-percent confidence intervals

6.   Conclusion

The main objective of this paper was to assess the causal impact of private (PHI) versus statutory health insurance (SHI) on offered waiting times until medical treatment in German acute care hospitals. Further, we assessed the association between observed hospital characteristics, such as the hospitals

financial performance, and the discrimination in waiting times between PHI and SHI holders.

First, the results show clear evidence of shorter waiting times for holders of PHI relatively to holders of SHI. Thus, access to medical stationary health care in Germany is asymmetrical w.r.t. the insurance status. The preferential treatment of PHI holders may be explainable by profit and cost considerations. In Germany hospitals treating PHI holders profit from remuneration generated by additional services, which are often unavailable to SHI holders. Further, due to health insurance regulations, PHI holders tend to be a high income group, which is at lower risk of generating unremunerated costs for the hospital. Furthermore, PHI holders are more sensitive towards high waiting times than SHI holders. Overall, it makes sense to benefit PHI holders with shorter waiting times, as this ensures potentially more and more profitable patients. Considering the magnitude of the effects, it is not possible to say whether even the high difference of 3 days in waiting times between PHI and SHI patients may damage the health due to longer waiting times. Most probably, however, it should not because most waiting times are in a medically acceptable range of time.

Second, we find that hospitals benefiting private insurees with shorter waiting times as compared to SHI holders have a significantly better financial performance than those abstaining from or with less discrimination. Hospitals which perform financially well will most probably have higher rates of capacity utilization and will therefore not be able to admit all patients requiring an appointment. Therefore, they will probably establish a management of waiting lines and admit patients based not only medical but also profit considerations. Because it is more profitable to benefit PHI holder with short waiting times, the association between the financial performance and discrimination in waiting times is intuitive. Unfortunately, we do not observe whether actually discriminating hospitals have a waiting line management and whether this system drives the PD. Therefore, it is not possible to establish a causal link between the discrimination in waiting times and the PD in our study.

Literature

Asplin, B.R., Rhodes, K.V., Levy, H., Lurie, N., Crain, A.L., Carlin, B.P., and A.L. Kellermann (2005), Insurance Status and Access to Urgent Ambulatory Care Follow-up Appointments. Journal of the American Medical Associacion 294: 1248–1254.

Augurzky B., Engel, C.M. Schmidt, and C. Schwierz (2009), Ownership and Financial Performance in the German Hospital Sector, Ruhr Economic Papers, forthcoming, Essen.

Besley, T., Hall, J. and I. Preston (1999), The demand for private health insurance: do waiting lists matter? *Journal of Public Economics* 72: 155–181.

Cameron, A. C. and P. K. Trivedi (1998), Regression Analysis of Count Data. NewYork: Cambridge University Press.

Cullis, J.G. and P.R. Jones (1986), Rationing by Waiting Lists: An Implication. *The American Economic Review*: 76(1): 250–256.

Cutler, D. (1995), The incidence of adverse medical outcomes under prospective payment. *Econometrica* 63: 29–50.

Dafny, L. S. (2005), How Do Hospitals Respond to Price Changes? *The American Economic Review* 95(5): 1525-1547.

Ellis, R. P. (1998), Creaming, skimping and dumping: provider competition on the intensive and extensive margins1. *Journal of Health Economics* 17(5): 537-555.

GBE - Gesundheitsberichterstattung (2008), http://www.gbe-bund.de/, download: 22.03.2008.

Grimmett, G./Stirzaker, D. (2003), Probability and Random Processes 3rd edition. Oxford University Press, New York.

Johannesson, M., Johansson, P.-O. and T. Söderqvist (1998), Time spent on waiting lists for medical care: an insurance approach. *Journal of Health Economics* 17: 627–644.

King, G. Tomz, M. and J. Wittenberg (2000), Making the Most of Statistical Analyses: Improving Interpretation and Presentation. *American Journal of Political Science* 44(2): 347-61.

Kriwy, P. and A. Mielck (2006), Versicherte der gesetzlichen Krankenversicherung (GKV) und der privaten Krankenversicherung (PKV): Unterschiede in Morbidität und Gesundheitsverhalten. *Gesundheitswesen* 68: 281-288.

Krobot, K.J., Miller, W.C., Kaufman, J.S., Christensen, D.B., Preisser, J.S. and M.A. Ibrahim (2004), The disparity in access to new medication by type of health insurance: Lessons from Germany. *Medical Care* 42: 487–491.

Lindsay, M.C. and B. Feigenbaum (1984), Rationing by waiting lists. *The American Economic Review* 74: 404–417.

Lüngen, M., Stollenberg, W., Messner, P., Lauterbach, K.W. and A. Gerber (2008), Waiting times for elective treatments according to insurance status; a randomised empirical study in Germany. *International Journal for Equity in Health* 7: 1-7.

Medicaid Access Study Group (MASG) (1994), Access to Medicaid recipients to outpatient care. *New England Journal of Medicine* 330: 1426–1430.

Meltzer, D. and J. Chung (2002), Effects of Competition under Prospective Payment on Hospital Costs Among High- and Low-Cost Admissions: Evidence from California 1983 and 1993. *Forum for Health Economics & Policy* 5(4): 1-52.

Resneck, J., Pletcher, J.R. and N. Lozano (2004), Medicare, Medicaid, and access to dermatologists: the effect of patient insurance on appointment access and wait times. *Journal of the American Academy of Dermatology* 50: 85-92.

Siciliani, L. (2006), A dynamic model of supply of elective surgery in the presence of waiting times and waiting lists. *Journal of Health Economics* 25: 891-907.

Specke, H. (2005), Der Gesundheitsmarkt in Deutschland, Daten – Fakten – Akteure, 3. Auflage, Bern.

Tai, W.C., F.W. Porell and E.K. Adams (2004), Hospital choice of rural Medicare beneficiaries: patient, hospital attributes, and the patient physician relationship. *Health Services Research* 39: 1903–1922.

Tomz, M., Wittenberg, J. and G. King (2001), CLARIFY: Software for Interpreting and Presenting Statistical Results. Version 2.0 Cambridge, MA: Harvard University, http://gking.harvard.edu.

Verband der privaten Krankenversicherung e.V. (2007), Zahlenbericht der privaten Krankenversicherung 2006/2007, Köln.

Ward, E., Halpern, M., Schrag, N., Cokkinides, V., DeSantis, C., Bandi, P., Siegel, R., Stewart, A. and A. Jemal (2008), Association of Insurance with Cancer Care Utilization and Outcomes. *CA - A Cancer Journal for Clinicans* 58: 931-945.

Wooldridge, J. M. (2002), Econometric Analysis of Cross-Section and Panel Data, MIT Press, Cambridge.

Appendix

Table A1
Descriptive Statistics

Variable	Description	Mean	SD	Min	Max
Outcome					
Waiting time	Individual waiting time in days per patient until an appointment for a medical consultation.	6.15	5.35	0	25
Hospital characteristics					
Probability of default (PD)	One-year probability of default for each hospital based on logit scores.	1.28	2.12	2.8*E-4	14.31
Private nonprofit hospital	1 if private not-for profit hospital , 0 otherwise	0.40	0.49	0	1
Private for-profit hospital	1 if private for profit hospital , 0 otherwise	0.19	0.39	0	1
Public hospital	1 if public hospital , 0 otherwise	0.41	0.49	0	1
Number of beds/100 (sq.)	Number of beds/100 (squared)	3.53	2.52	1.00	16.15
Last PD before 2004	1 if latest balance sheet data available before 2004, 0 otherwise	0.13	0.34	0	1
Regional characteristics					
Regional Capacity Utilization	Regional capacity utilization on the level of the German Federal States by ownership type of the hospitals	76.29	3.64	54.40	84.70
East Germany	1 if hospital is situated in East Germany, 0 otherwise	0.25	0.44	0	1
Public subsidies	Ratio of the sum of public funds directed to basic reinvestment per bed in the Federal State related to the average value in East German as well as West German Federal States.	1.00	0.21	0.74	1.30
Diagnoses					
Diagnosis: Fracture	Weber B Fracture is the fracture of the ankle joint treated operatively in surgical departments.	0.27	0.45	0	1
Diagnosis: Stenosis	Constriction of the coronary vessels treated by a stent implantation in cardiology departments	0.29	0.46	0	1
Diagnosis: Cervical conization	Cervical conization is an operative treatment in gynaecology departments, when cancer is suspected	0.44	0.49	0	1

Notes: Authors' calculations; Statistics on variables which were dropped from the model due to their statistical insignificance are not shown for the sake of brevity.