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Ambulatory care at the end of a billing period

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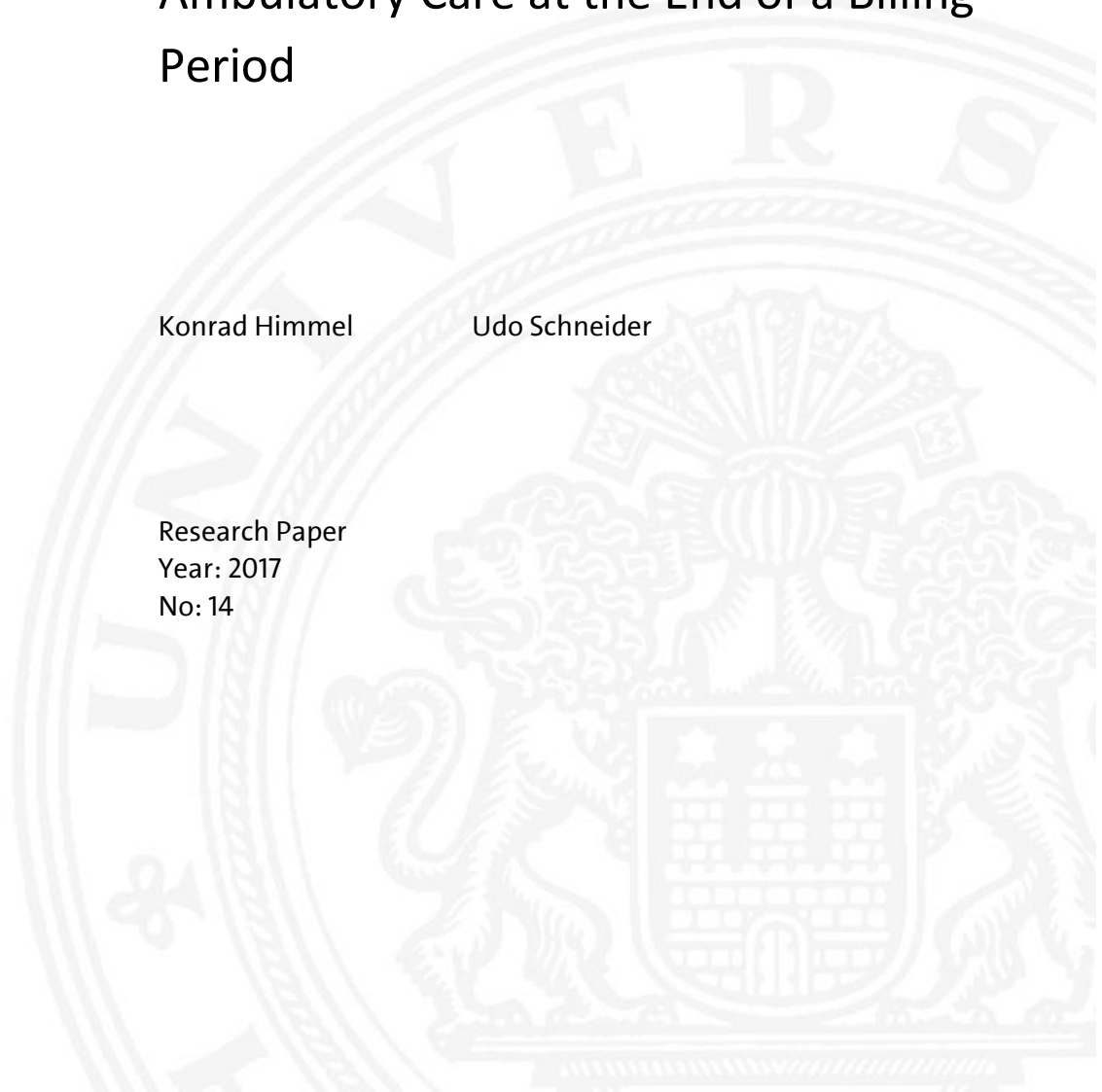
Hamburg Center
for Health Economics

Ambulatory Care at the End of a Billing Period

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Abstract

The ambulatory physician payment system in the German Social Health Insurance (SHI) offers incentives to reduce practice activity at the end of a billing period. Most services within a period are reimbursed at full cost only up to a certain threshold. Furthermore, capitated payments make follow-up treatments within a billing period less profitable. Using claims data from Germany's largest sickness fund with about nine million members, we find a decrease of all services limited by a threshold at the end of a billing period and an immediate increase at the beginning of the following period. For services that are not limited, we do not find an effect. An increase of ambulatory emergencies at the end of a billing period suggests a negative welfare effect for patients.

Keywords: ambulatory care, expenditure targets, global budget, physician payment, health care utilization

JEL classification: I11, H51

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1 Introduction

The ambulatory reimbursement system for those insured under the German Social Health Insurance (SHI) is designed to keep costs low and manageable. On the one hand, global budgets for most services of a physician have expenditure targets for physicians. When physicians reach a certain threshold, services above these thresholds are reimbursed at much lower rates than those within the thresholds. On the other hand, most services rewarded within a quarter are compensated through quarterly (contact) capitation payments, which implies that follow-up contacts are compensated only partially or not at all. Both characteristics of the reimbursement system lead to a decrease in compensation rates during a quarter and therefore create incentives to provide fewer services.

It is well recognized in the literature that physicians respond to financial incentives. In particular, incentives of capitation payments versus fee-for-service payments have been widely discussed. Empirical and experimental evidence shows, that capitation payments lead to a lower provision of services than a fee-for-service scheme¹. However, so far little is known about the influence of global budgets. Fan et al. (1998), in a laboratory experiment among medical students, analyzed how costs for medical services can be controlled under a global budget. The authors differentiated between two systems: expenditure targets and expenditure caps. Expenditure targets are thresholds up to which a physician's services are compensated at a regular price. Services beyond the threshold are only compensated at lower rates. Within the system of expenditure caps, prices are not set ex-ante. Instead, physicians are paid by points. The value of a point is determined ex-post by dividing the global budget by the total number of points. The authors showed that more services are delivered under a system of expenditure caps than under expenditure targets.

In an empirical analysis, Schmitz (2013) made use of a shift in the German SHI from expenditure caps to expenditure targets in 1997. Supporting the conclusion of Fan et al. (1998), he showed that physicians reacted to the reform by treating SHI patients less intensively and simultaneously increasing the number of appointments for privately insured patients, for whom reimbursement did not change. Nassiria and Rochaix (2006)² analyzed expenditure ceilings for physicians in the Canadian context that are similar to the expenditure targets discussed above. When ceilings are met, prices drop by about 75 percent. To analyze the impact

¹ E.g. Gaynor and Gertler (1995), Iversen and Luras (2000), Gosden et al. (2001), Devlin and Sarmab (2008), Hennig-Schmidt et al. (2011), Kantarevic et al. (2011) or Brosig-Koch et al. (2016)

² Their analysis is based on Rochaix (1993)

of the ceilings Nassiria and Rochaix (2006) used a natural experiment in which the ceiling was discontinued for a short period. They were able to show with monthly billing data of 677 GPs that during the ceiling deregulation overall activity increased and a shift to more technical and lucrative procedures took place.

Not much is known about the influence that payment systems have on the distribution of services during a billing period. Only Nassiria and Rochaix (2006) showed that ceilings in Canada lead to a drop of services for affected physician specialties at the end of a quarter. In the German context, where expenditure targets are used to implement global budgets, Himmel et al. (2012) were the first to analyze the distribution of services within a quarter. On the basis of an estimation of the probability of having an appointment the authors were able to show a reduction of contacts at the end of a quarter. But their analysis faced two major limitations. First, their data only covered registered contacts and might have been systematically distorted as some follow-up contacts might not have been included. Second, during the course of their analysis quarterly co-payments³ led to demand-side incentives to shift contacts between quarters. This effect might have counteracted supply-side incentives.

In our study, we analyze the consequences of the German reimbursement scheme for resident physicians in the SHI system. Expenditure targets and lump-sum payments lead to declining reimbursement rates in the course of a quarter. We are interested in how this effects the distribution of services within a quarter and in the consequences for patients. Using claims data from Germany's largest insurer with about nine million insured individuals in 2013 and 2014 in a period without quarterly co-payments for patients allowed us to eliminate all the major limitations of Himmel et al. (2012). As an approximation of physician performance we use representative treatments that appear regularly in our data. Our regressions estimate the difference between the end of a billing period and the beginning of the following period. We include adjustments to control for weekday and seasonal patterns. We analyze possible substitution effects by distinguishing services that are limited by a threshold or not. To control for possible adverse effects for patients, we also analyze emergency and rescue services at the end of a quarter.

We find a decrease of all services limited by a threshold at the end of a billing period and an immediate increase at the beginning of the following period. For services that are not limited,

³ Effects of the „Praxisgebühr“ have been discussed in several studies, e.g. Augurzky et al. (2006), Rückert et al. (2008), Schreyögg and Grabka (2010) or Farbmacher and Winter (2013).

we do not find this strong effect. We observe an increase of those services at the end of a period for some physician specialties. Emergency visits also increase at the end of a quarter.

The paper is organized as follows. We start with an illustration of the reimbursement scheme for resident physicians in the German SHI system in section 2 before we describe the data and the method in section 3. The results are presented in section 4. Section 5 identifies possible welfare effects for patients on the basis of an analysis of emergency and rescue services. Section 6 discusses limitations of our study before we conclude.

2 Reimbursement and Incentives

Reimbursement for resident physicians in the German SHI is organized by 17 regional physicians' associations. Physicians are paid by their physicians' association, which negotiates a global budget for most services of the catalogue with SHI insurers each quarter. Criteria for the budget are the regional prices of health care services and the morbidity of the SHI insured persons. Adherence to the budget and distribution among physicians are the responsibility of each physicians' association. In order to manage with a limited budget, individual expenditure targets for physicians are implemented. Physicians are assigned an amount of services up to which they are guaranteed to receive full prices. For services beyond this threshold they only receive a reduced price.

The most common individual expenditure targets are so-called standard service volumes ('Regelleistungsvolumina' (RLV)). These are calculated for each physician individually by multiplying the number of SHI patients in the previous year's quarter with a physician-specialty-specific value and an adjuster for the age structure of these patients. If the number of patients in the same quarter of the previous year exceeds a certain limit, additional patients are only considered with a lower value. For all services that are delivered within the RLVs, physicians are paid the full price. For services beyond the RLVs, reimbursement rates are determined ex-post. A remaining budget is distributed among all physicians according to the number of services they delivered beyond the RLV. This typically leads to a huge drop in reimbursement rates for services beyond the RLVs. For instance, services beyond the RLVs in the first quarter in 2013 in Hamburg were only paid at 4.94 percent of the original price in the GP sector and at 6.61 percent in the specialist sector (Kassenärztliche Vereinigung Hamburg 2013). There are no nation-wide statistics on the number of physicians that exceed the threshold. Only one physicians' association has published data on the threshold, indicating that GPs on average exceeded their thresholds between 0.8 and 5.9 percent in 2014. Specialists, according

to these data, exceeded their threshold between 24.7 and 37.1 percent in the same year (Niedersächsisches Ärzteblatt 2014/2015).

In addition to services within the global budget, there are certain services which are always reimbursed at full prices. Examples are vaccinations, prevention services and outpatient surgeries. Physicians are paid according to a catalogue that defines services and prices for treating SHI patients. This catalogue is the result of negotiations between representatives of the German SHI sickness funds and the Federal Association of Physicians. Reimbursement is designed as a mixture of lump-sum payments and fee-for-service payments. Lump-sum payments are paid per patient for one quarter of the year. How many services are covered by lump-sum payments differs strongly between physician specialties. Whereas GPs are mostly paid by lump-sum payments, fee-for-service is more common among specialists.

Lump-sum payments as well as thresholds lead to falling reimbursement during a quarter. After exceeding the threshold, services are reimbursed at a much lower price. When reimbursement is below marginal costs, there might even be incentives to completely stop providing some services. Lump-sum payments also lead to incentives for lower performance. The cost of services that are already reimbursed by a lump-sum payment must fully borne by physicians. The decline in reimbursement rates is of lower importance at the beginning of a quarter, as prices are high and lump-sum payments can be charged. At the end of a billing period physicians have often met the threshold and many services have already been reimbursed due to earlier contacts in the same quarter.⁴

From theory it is not clear how physicians will react to future price drops. Even for a simple case where individuals are free to choose hours worked and effort per hour Fehr and Goette (2007) argue that an expected drop in wages can have different impacts on labor supply. While neoclassical theory suggests a positive elasticity of labor supply and therefore a drop in performance when expected wages are lower, reference-dependent theory can also explain a negative elasticity that leads to an increase in performance in order to keep income high or above the daily reference. Evidence from a field experiment by Fehr and Goette (2007) among

⁴ Besides the payment scheme, also regulations for prescriptions might offer incentives for lower activity at the end of a quarter. Physicians in the German SHI are asked to prescribe drugs and special services, such as massages, cost-efficiently. Each physician receives an amount for all prescriptions of each quarter depending on the number of patients. Exceeding these thresholds might cause claims from sickness funds against the physician. This might lead physicians to reduce their practice activity at the end of a quarter when thresholds for prescriptions have been reached. But incentives to do not seem to be very strong. First, sickness funds may be able to reclaim some of the money only when a physician exceeds the threshold by more than 25 percent of a year's average. Second, this is only checked randomly and only repeated excesses can lead to claims. Third, as only excesses on a year's average are relevant for claims, incentives to reduce practice activity in order to avoid claims should be strongest at the end of a year. This is one reason why transitions of years are excluded in the analysis. See section 3.

workers suggests that the overall elasticity of labor supply is positive, even if the elasticity of effort per hour is negative. These results can not be transferred one by one to the situation of SHI physicians, however. The situation in the German SHI system is more complex. On the one hand, privately insured persons and services that can always be charged at full prices offer substantial substitution possibilities that could result in a reduction of services affected by a drop in prices, and an increase of those services which are not affected. On the other hand, decreasing prices are endogenous in the reimbursement scheme: The more services are delivered at the beginning of the quarter, the lower prices are at the end of a quarter. The better physicians anticipate the effects on future prices, the lower one can expect the drop in performance at the end of a quarter to be. Demand and supply-side uncertainties might have particularly negative effects on the ability to foresee future price drops.

We hypothesize that a drop in prices caused by thresholds and lump-sum payments leads to a reduction of physicians' performance in affected services at the end of a quarter. We can predict two ways that physicians might react. First, they might substitute their income with services that are always paid at full cost or by treating privately insured more intensively. Second, it seems plausible that physicians could lower their overall performance by reducing office hours. This seems to be more likely when possibilities for substitution are limited.

3 Data and Method

The analysis is based on data from the Techniker Krankenkasse, Germany's largest insurer. With about 9.34 million insured in 2015 it held an SHI market share of 13 percent. We use all available ambulatory billing data for the years 2013 and 2014. Our sample is not representative, as the sample population is younger on average than the entire SHI population. We generally use data of all insured persons, but for technical reasons we exclude observations of insured persons that move between districts in the course of a year. Whenever a person moves between districts, we excluded all data on the individual for the relevant year. When the individual moved within a district, we kept all observations. We also removed the individual from our sample when we did not have valid information on the residence of the individual or when the individual joined or left the insurer within the observation period.

Due to legal restrictions, the data does not contain detailed information on physicians or practices, but each physician has a unique ID that includes her or his specialization. Practices, too, can be uniquely identified. This allows us to indirectly derive information on physicians and practices via their billing behavior and the patients being treated. From the information on

patients we can then generate general information, e.g. the field of activity of a practice. From the number and the specialization of the physicians, we can identify the size and specialization of a practice. Finally the charged services give us an impression of the physician activity, e.g. whether they are treating conservatively or not.

Choice of Physician Specialty and Services

Incentives differ strongly between physician specialties. We concentrate on the largest specialties (by total number of resident physicians) and analyze the selected physician specialties separately. An overview is given in table 1, which shows data from the Federal Physicians Association on the analyzed physician specialties. Besides the total number of resident physicians, table 1 also includes the share of SHI insured persons and SHI revenues for each physician specialty. Revenues beside those from SHI patients are mostly generated from privately insured patients, self-pay patients or patients covered by the social accident insurances. In table 1 revenues for SHI patients are further divided, on the one hand into those revenues generated by Global-Budget-Services (GB Services) that are part of the global budget and therefore not always reimbursed at full price, and on the other hand those from Non-Global-Budget-Services (NGB services) that are beneficial and always reimbursed at full prices.

Table 1: Physician specialty

	Physicians ²	SHI Shares ³		SHI Revenues ¹	
		Patients	Revenues	GB	NGB
GP Sector					
General Practitioners	50,544	90.4%	82.7%	86.5%	13.5%
Pediatricians	5,703	87.4%	80.6%	77.7%	22.3%
Specialist Sector					
Gynecologists	9,862	87.4%	68.4%	53.3%	46.7%
Eye specialists	5,171	84.4%	58.6%	56.4%	43.6%
Orthopedists	4,582	87.2%	61.6%	89.0%	11.0%
ENT specialists	3,671	87.4%	67.7%	91.2%	8.8%
Dermatologists	3,389	83.6%	60.7%	64.3%	35.7%

¹ In percent of SHI revenues; data from 2012, orthopedist from 2013 (Kassenärztliche Bundesvereinigung 2012, Kassenärztliche Bundesvereinigung 2013)

² First quarter 2013 (Kassenärztliche Bundesvereinigung 2013)

³ ZI-Praxis-Panel (2014)

Table 1 shows that in the GP sector SHI revenues are more dominant than in the specialist sector. GPs generate more than 80 percent of their revenue by treating SHI insurants, whereas specialists generate only between 58.6 and 68.4 percent of their income from these insured persons. Table 1 shows on the right-hand side both, the shares of SHI revenues generated by services that are limited by an expenditure target (GB services) and those generated by services that are always paid at full prices (NGB services). In the GP sector, SHI services limited by an expenditure target dominate on average, but in the specialist sector, shares vary greatly. While for gynecologists, 53.3 percent of all SHI revenues are generated by GB services, ear-nose-throat (ENT) specialists generate up to 91.2 percent of SHI revenues from these services.

Due to lump-sum payments not all physician-patient contacts appear in the data. As the data is generated mainly for billing reasons, services that are not relevant for payment, e.g. when they are already covered by a lump-sum payment, will not appear in the data. We therefore use only physician-patient contacts that include services that are representative for the physician specialty and that always lead to payment and therefore always appear in our data. In our selection of services, we use the 30 services most common to each physician specialty (Kassenärztliche Bundesvereinigung 2012). For the selection of services we therefore apply the following criteria⁵:

- no lump-sum payment or limited chargeability within the course of a quarter
- patient-physician contact necessary
- billed by at least 80 percent of the physicians of the physician specialty
- delivered in more than 10 percent of all cases of a physician specialty

Physician specialties are analyzed separately and we distinguish in our analysis whether services are part of a target expenditure or always reimbursed at full prices. We do not consider physician specialties for which we are not able to find services that satisfy all of the above criteria.⁶

Weekday Adjustment

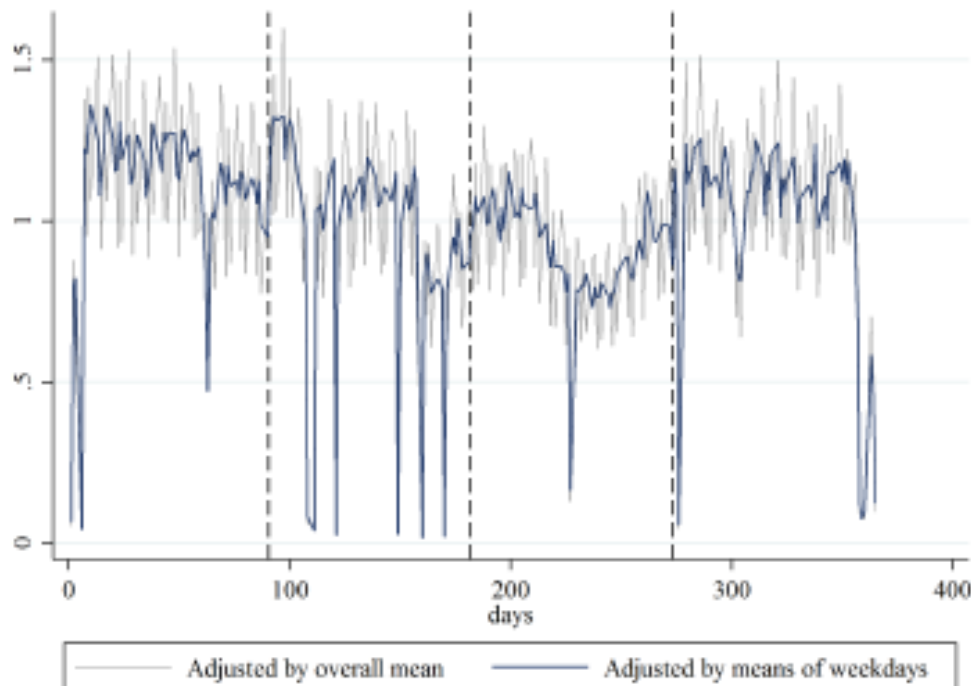
A look at the raw data for a typical physician specialty in figure 1 shows a strong weekday pattern (see grey line). This can be explained by office hours of practices. It is quite common among resident physicians to have reduced office hours on Wednesdays and Fridays resulting in fewer contacts. This can be handled in the analysis by adjusting the number of contacts for

⁵ For a list of services that are used in the analysis see table 5 in the appendix.

⁶ For the selected services see table 5 in the appendix.

each day and district by the mean of the weekday in each year and district. As there is hardly any activity of resident physicians on weekends, we neglect weekend days in our analysis.

Figure 1: Weekday Adjustment



As an example, the services of the global budget of ENT specialists in Bavaria in 2014 are used. The grey line shows the physician activity as the share of the overall mean. The blue line shows the physician activity as the share of the weekday mean. Transitions of quarters are marked by vertical lines.

With this adjustment, coefficients can be interpreted as percentage points of the yearly mean. Moreover, districts and years become directly comparable as they no longer depend on the underlying year and the number of insured persons.

Seasonal Adjustment

After the adjustment for weekdays, the data displays seasonal patterns. Holidays and school holidays in particular influence the provision of services (see figure 1). Therefore we use global data on holidays, school holidays and bridging days for each federal state and merge them with our data. A few special days, such as carnivals, that are not public holidays, but have a similar effect on physician contacts are also considered. Since the data is collected on a day-by-day basis we are able to control very precisely for seasonal effects.

Identification Strategy

Our strategy for identification of the effect at the end of a quarter relies on a comparison of services provided at the end of a quarter to the beginning of the following quarter. A linear regression model (OLS) is used in which we use the weekday adjusted contacts y as the dependent variable. The variable $Transition_i$ describes the transitions between the first and second quarters of a year ($i = 1$), the second and third quarters ($i = 2$), and the third and fourth quarters ($i = 3$). $Transition_i$ is specified as an indicator variable that stands for the 28 days before and the 42 days after the transition. The explaining variables $End-of-quarter$ indicate the last 28 to 14 days and the 14-1 days to the end of the first, second, and third quarters of a year. $Beginning-of-quarter$ indicates the first 14 days of the following quarter. These variables therefore measure the average difference to the 15-42 days of the following quarter. X are the variables of the seasonal adjustment.

$$y_{ijt} = \beta_0 + \beta_1 End_of_quarter + \\ \beta_2 Beginning_of_quarter + \\ \beta_{3i} Transition_i + \beta_4 X + \epsilon_{ijt}$$

A main advantage of this empirical strategy is the short time between the end of a quarter and the reference period. We therefore minimize the influence of medium- and long-term trends on the data. The transition of years is neglected in the analysis as additional supply and especially demand-side incentives cannot be ruled out.⁷

4 Results

The results are shown in table 2. Regressions are run separately for each physician specialty and for both cases, i.e. services that are, and are not limited by a global budget. Each regression uses 218.196 observations, each for one day and district. Coefficients can be interpreted as percentage points of the average provision of services. A graphical illustration of the results is given in figure 2.

⁷ Co-payments in SHI, for instance, are limited to a certain amount per year and insured. If the insured have already reached the limit for co-payments they have an incentive to switch contacts from the next to the current year. If the insured person hasn't reached the limit yet and expects to reach the limit next year, the person has an incentive to delay the payment to the following year.

Table 2: Distribution of Services

	End-of-quarter		Beginning-of-quarter
	28 - 15	14 - 0	0 - 14
Global Budget (GB) Services			
GP Sector			
General Practitioners	-5.07***	-8.71***	7.11***
Pediatricians ¹	-	-	-
Specialist Sector			
Gynecologists	-6.53***	-11.45***	2.46***
Eye specialists	-6.82***	-13.88***	-0.93
Orthopedists	-1.77*	-9.15***	-2.29**
ENT specialists	-2.71***	-9.69***	3.05***
Dermatologists	-4.78***	-14.15***	0.91
Non Global Budget (NGB) Services			
GP Sector			
General Practitioners	-6.38***	-10.71***	-3.50***
Pediatricians	3.83***	-0.06	-0.85
Specialist Sector			
Gynecologists	0.82	-2.94***	-1.58**
Eye specialists ¹	-	-	-
Orthopedists ¹	-	-	-
ENT specialists ¹	-	-	-
Dermatologists	1.67	-3.63***	0.40

* $p < 0.01$, ** $p < 0.001$, *** $p < 0.0001$

¹ No calculation, see section 3

Coefficients for each physician specialty come from separate regressions with each using $N = 218:196$ observations. These coefficients can be interpreted as percentage points of the average and indicate the deviation from Transition_i .

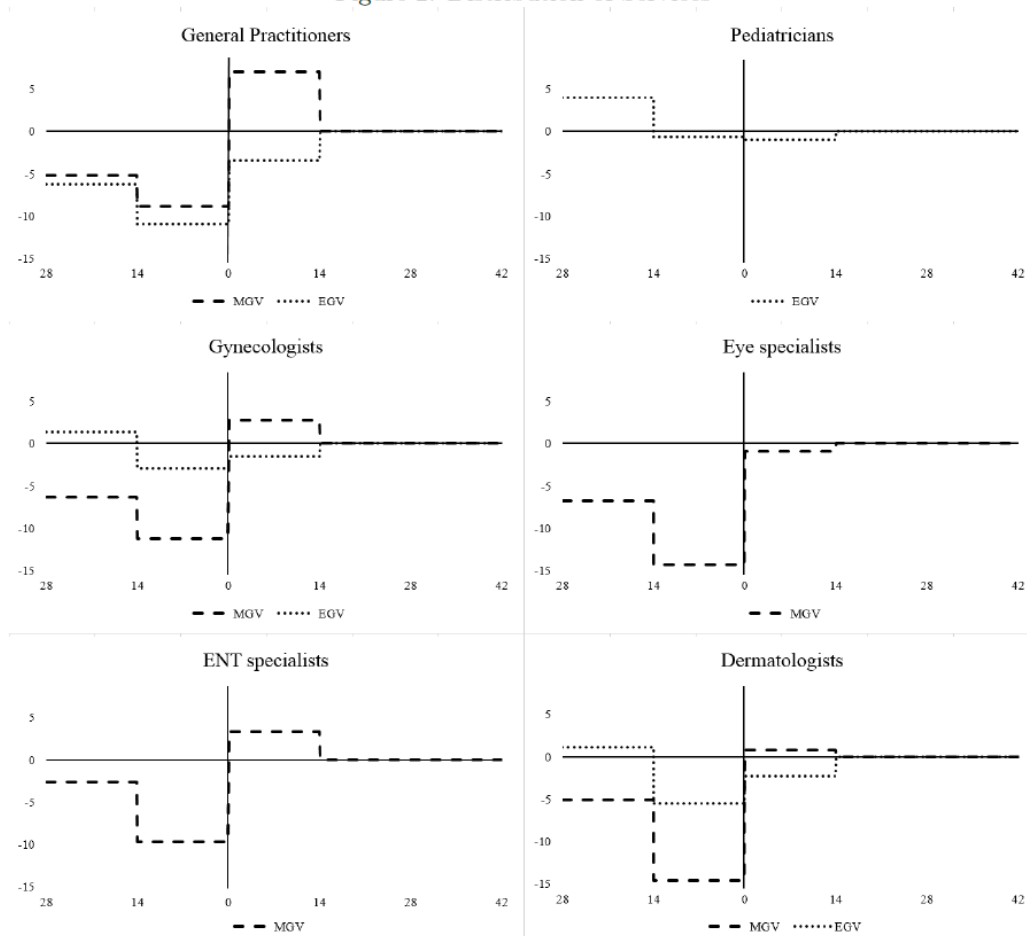
Services limited by a global budget (GB) are reduced at the end of a quarter. The reduction of services increases towards the end of the quarter and is highly significant for each physician specialty. The reduction in the last two weeks of the quarter is strongest for dermatologists, with a reduction of 14.15 percentage points, and smallest for GPs, with a reduction of 8.71 percentage points. Reductions prior to the last two weeks are significantly smaller and vary between 1.77 and 6.82 percentage points. For GPs we find considerable catch-up effects. The

number of services provided by GPs increases by 7.11 percentage points in the first two weeks of a quarter. That indicates that services are mainly shifted from the end of a quarter to the beginning of the next quarter. For specialists, we find only nonsignificant or very slight catch-up effects that are of much smaller size than reductions right before the transition.

The lower part of table 2 shows the results for NGB services that are always paid at full prices. For GPs, the results for the end of the quarter are very similar to those above. This suggests that these physicians reduce overall performance at the end of a quarter. NGB services at the beginning of a quarter are still reduced, which is in line with the argument that GPs catch up with GB services at the beginning of the following quarter. Pediatricians even seem to increase NGB services in the 28 to 15 days before the transition. In the specialist sector, end-of-quarter reductions of NGB services are much smaller than those of GB services and only appear right before the transition. At the beginning of the following quarter we find a small reduction of NGB services only for gynecologists. This can also be explained by a small catch-up effect in GB services.

These results show a strong reaction of all physician specialties to expenditure targets. We find a very unequal distribution of services at the transition of quarters. Services that, are potentially no longer reimbursed at full prices are reduced as early as four weeks before the transition and the reduction becomes more marked towards the end of a quarter. For specialists, this strong trend can only be observed for these services. Services that are always reimbursed at full prices are much less affected. This clearly indicates a reaction to expenditure targets. Physicians seem to reduce only those services that are limited by the target, probably with the goal of avoiding either hitting the target or further exceeding it. No other services are reduced. For pediatricians, we even find a significant increase in the 28 to 15 days before the transition, which may be a sign of substitutive behavior to compensate for a decline in revenues from services that are no longer reimbursed at full prices. For GPs, we observe an overall reduction of performance. One plausible explanation is that services offered by GPs are very closely connected so that price drops for one service automatically lead to a drop in all services. Another explanation could be that GPs generate only a very small fraction of their income from privately insured persons and services that are not limited by expenditure targets (see table 1). In contrast to specialists, GPs are mainly paid by lump-sum payments that can only be billed once per patient and quarter. This generates incentives to shift follow-up contacts into the next quarter so that services can be billed again. Large catch-up effects for GPs hint at lump-sum payments driving results for GPs rather than expenditure targets.

Figure 2: Distribution of Services



This figure is a visualisation of Table 2. The coefficients are measured in percentage points of the yearly mean. Days are measured as the distance to the transition of quarter. The vertical line indicates the transition.

Additional Results

As argued in section 2, uncertainties about future price drops might negatively influence the distribution of services within a quarter. The size of the practice can have a large impact on these uncertainties. Physicians that share one practice are each assigned expenditure targets separately, but they can usually pool all targets into one for the entire practice. The practice can even receive additional payments for having more than one specialization. Larger practices and especially those that have more than one specialization can therefore be expected to be less sensitive to demand and supply-side uncertainties. Shortages of labor supply, e.g. caused by illness of a physician, can easily be compensated by other physicians, and shortages in demand for services of one specialization can be compensated by a higher demand for services of another specialization. Both possibilities for compensation increase the ability to predict future price drops more precisely and therefore to distribute services more equally over the course of a

quarter. Moreover, larger practices might have a higher degree of organization than smaller ones, which might additionally strengthen the effect. In table 3 we therefore distinguish between practices with only one specialization and those that have more than one specialization.

The results for small practices do not differ substantially from those of all practices in table 2. When focusing on large practices, we find that the end-of-quarter effects are much smaller for specialists. We observe only small reductions of up to 5.00 percentage points for GB services right before the transition. For dermatologists in large practices, we even find no effect of the

Table 3: Distribution of Services by Practice Size

	Small Practices ¹			Large Practices ¹		
	End-of-quarter	Beginning-of-quarter		End-of-quarter	Beginning-of-quarter	
	28 - 15	14 - 0	0 - 14	28 - 15	14 - 0	0 - 14
Global Budget (GB) Services						
GP Sector						
General Practitioners	-5.22***	-8.84***	7.05***	-4.59***	-8.75***	6.87***
Pediatricians ²	-	-	-	-	-	-
Specialist Sector						
Gynecologists	-6.36***	-11.25***	2.76***	-2.59	-5.00***	-0.33
Eye specialists	-6.81***	-14.27***	-0.93	-2.30*	-2.87**	0.69
Orthopedists	-2.01*	-10.20***	-2.52**	-0.06	-2.86*	-2.53
ENT specialists	-2.62***	-9.77***	3.27***	-0.76	-2.78**	0.26
Dermatologists	-5.12***	-14.60***	0.77	-0.74	-0.57	-0.27
Non Global Budget (NGB) Services						
GP Sector						
General Practitioners	-6.23***	-10.99***	-3.43***	-5.78***	-10.01***	-3.52***
Pediatricians	3.99***	-0.66	-1.00	3.67	1.60	1.16
Specialist Sector						
Gynecologists	1.38*	-2.92***	-1.51**	1.52	-0.24	-1.43
Eye specialists ²	-	-	-	-	-	-
Orthopedists ²	-	-	-	-	-	-
ENT specialists ²	-	-	-	-	-	-
Dermatologists	1.09	-5.54***	-2.27*	-1.17	-0.50	-1.13

* $p < 0.01$, ** $p < 0.001$, *** $p < 0.0001$

¹ small practices have only one specialization, large practices more than one specialization

² no calculation, see section 3

Coefficients for each physician specialty come from separate regressions with each using $N = 218:196$ observations. These coefficients can be interpreted as percentage points of the average and indicate the deviation from Transition _{i} .

quarter at all. However, effects for GPs do not seem to differ by practice size.⁸

The differentiation between specialization and practice size shows that reductions at the end of a quarter are mostly driven by small practices with only one specialization. These practices

⁸ Note that most services are provided by single-physician practices and therefore regressions on the left hand side of table 3 have a higher statistical power.

are exposed to more demand and supply-side uncertainties, which may explain the findings in table 3. In the case of GPs, the results do not differ by practice size, which seems to confirm the assumption that lump-sum payments for GPs within a quarter are responsible for the reduction. This incentive is independent of practice size and uncertainties, and should therefore not differ between practices. As argued above, large catch-up effects that occur only for GPs are in line with this argument.

5 Emergency visits

An important question is how patients are affected by the unequal distribution of services at the transition of a quarter. A possible reaction of patients to health problems might be the usage of emergency services. As emergency and rescue services are well documented, we can analyze effects of the transition of a quarter on the distribution of these services. We use the same empirical strategy to identify possible effects on emergency services. Emergency services can be grouped into outpatient emergencies and rescue services. Outpatient emergencies are further distinguished between whether they are delivered by the emergency medical service organized by the physicians' associations or by hospital emergency rooms. Rescue services involve an ambulance with or without transportation to hospital or another institution of health care.

Table 4: Distribution of Emergency Services

	End-of-quarter		Beginning-of-quarter
	28 - 15	14 - 0	0 - 14
Outpatient Emergencies			
All	5.98***	3.97***	0.31
Emergency Medical Service	19.37***	10.56***	2.81
Emergency Rooms	0.85	-0.27	-0.87
Rescue Service			
All	-0.42	-2.73*	0.35

* $p < 0.01$, ** $p < 0.001$, *** $p < 0.0001$

¹ organized by the physician associations

Coefficients for each physician specialty come from separate regressions with each using $N = 218.196$ observations. These coefficients can be interpreted as percentage points of the average and indicate the deviation from $Transition_i$.

The results are shown in table 4. The evidence points to more outpatient emergencies at the end of a quarter. For the interval of the last 28 to 15 days before the transition, the number of

emergencies is increased by 5.98 percentage points. In the last two weeks of the quarter, we observe an increase by 3.97 percentage points. When we distinguish these cases by providers, the pattern is entirely driven by the emergency medical services of the physicians' associations with an increase of 19.37 percentage points in the last 28 to 15 days and 10.56 percentage points in the last 14 days of the quarter. For hospital emergency rooms, we do not find an effect of the transition of the quarter. Instead, a small decline of 2.73 percentage points can be observed directly before the end of the quarter.

These results point to negative effects on patients' well-being. Patients seem to fall back on emergency medical services of the physicians' associations when outpatient services are reduced. The effect is not largest directly before the end of the quarter but in the 28-15 days before, which can be explained by practices' scheduling of appointments. When we see the first reductions in services, physicians decide to reduce performance for these services. For new appointments, this means that waiting times become longer. Typically, patients will have to wait until the beginning of the new quarter, when physicians will catch up on some of these services. When approaching the transition, waiting times should therefore decline. If long waiting times and problems of getting an appointment lead to an increased usage of emergency services, the usage of these services should correspond to the length of waiting times, which explains the above results. Emergency services that are triggered by increased waiting times are usually not for severe emergencies, which may explain why rescue services and emergency rooms are not affected by the transition of quarters.

6 Limitations

We analyzed the change in overall physician activity at the end of a quarter. A more direct way to analyze the influence of the threshold would be to model overall practice performance and reactions to the threshold on the practice level. However, a sample of on average 13 percent of all SHI insured persons is not sufficient to model overall practice performance. Moreover, the data does not contain services that cannot be billed any more, like most follow-up contacts. As we can only use services that can always be billed, we must consider that these services might not be representative for practice performance. The services we observe might be used for substitution of services that can no longer be billed. However, this suggests that the effects we have found might underestimate true reductions in performance at the end of a quarter.

As we only have SHI insured persons in our data, we are not able to identify possible substitution effects in the treatment of privately insured persons. Schmitz (2013) showed in an

analysis of the German compensation scheme for SHI insured persons that a switch from expenditure caps to expenditure targets in the late 1990s led to a decline in treatment intensity of SHI insured persons while the treatment intensity of privately insured persons increased at the same time.

7 Conclusion

The compensation scheme for physicians in the SHI system in Germany offers incentives to reduce performance at the end of a quarter. When individual expenditure targets have been met and capitation payments have already been billed, then incentives for further treatments in the ongoing quarter are limited. Physicians reduce services at the end of a quarter either to avoid hitting the target or to avoid exceeding it.

For all physician specialties, we find a reduction of services that are limited by an expenditure target. Reductions vary between 8.71 and 14.15 percentage points. For GPs we find considerable catch-up effects in the following quarter, whereas these effects are smaller for specialists or even not present at all. GPs seem to react more strongly to lump-sum payments and seem to reduce overall performance. For specialists, services that are limited by expenditure targets are less relevant for overall revenue. They seem to reduce only those services for which compensation is reduced. In the specialist sector, effects are driven by small practices with only one specialization. An increased usage of those emergency medical services that are organized by the physicians' associations points to a negative effect for patients. However, severe effects cannot be shown as other emergency services such as rescue services or usage of hospitals' emergency rooms are not affected.

Since billing periods in Germany are linked to quarters, the time when physicians are likely to reduce performance is the same for all physicians. A possible countermeasure would be to simply shorten billing periods. This would also shorten periods in which targets are exceeded and thus reduce peaks in reductions. However, this would also make physicians more sensitive to demand and supply-side uncertainties. Another, perhaps more practical solution, could be to make billing periods overlap among practices in one area. As a result physicians' performance reductions would not coincide and reductions would be distributed more evenly across time. This solution only works when barriers for switching physicians are low, which can be assumed for the specialist sector, but not necessarily for the GP sector. Another recommendation would

be to reinforce a trend towards larger practices with multiple specializations (Kassenärztliche Bundesvereinigung 2014) for which end-of-quarter effects are much lower.

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Appendix

Table 5: Selected EBM – Services

	GB Services	NGB Services
<hr/>		
GP Sector		
<hr/>		
General Practitioners	01410	01732
Pediatricians	– ¹	01714 - 01719, 01720, 01723
Specialist Sector		
<hr/>		
Gynecologists	01827, 33044	01730
Eye specialists	06330, 06333	– ¹
Orthopedists	34221, 34230 - 34234	– ¹
ENT specialists	09311, 09320, 09323	– ¹
Dermatologists	10340 - 10342	01745
<hr/>		

¹ no services that satisfy requirements

For a detailed description of services see <http://www.kbv.de/html/ebm.php>.

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