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Abstract

Collective wage agreements still play an important role in the German wage bargaining system. However, there is a critical debate in Germany whether collective agreements deliver the flexibility needed by firms to adjust to the needs of international competition and technological change. In recent years, the social partners in some industries have responded to this possible lack of flexibility by introducing so called opening clauses into their collective bargaining agreements. These allow firms to deviate from their collective agreement under certain conditions.

The aim of this paper is to empirically analyze the prevalence of opening clauses in the German manufacturing sector and their impact on the wage structure. To provide a basis for the empirical analyses, a survey on the existence and intensity of opening clauses in central collective agreements has been conducted. Thereby, these sectoral data about opening clauses are exactly combined with those from the German Structure of Earnings Survey 1995 and 2001, a linked employer-employee dataset from German official statistics. The results show the number of collective bargaining agreements containing opening clauses increasing remarkably since 1991. Furthermore, the implementation of opening clauses into collective contracts creates significant effects on wages.

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Zusammenfassung

Flächentarifverträge spielen im deutschen System der gemischten Lohnbildung noch immer eine bedeutende Rolle. Ob die zentral verhandelten Verträge den Betrieben ausreichende Möglichkeiten bieten, Löhne und Arbeitszeit an die betrieblichen Rahmenbedingungen anzupassen, ist jedoch seit geraumer Zeit Gegenstand einer zwischen Arbeitgebern und Gewerkschaften kontrovers geführten Debatte. Flexible Anpassungen an die betriebliche Ebene sind gerade vor dem Hintergrund des internationalen Wettbewerbs und technologischer Veränderungen erforderlich. Seit den 90er Jahren werden daher die kollektiven Tarifverträge zunehmend dadurch flexibilisiert, dass Öffnungs- und Härteklauseln vereinbart werden, die es den Betrieben erlauben, vom Tarifvertrag abweichende Regelungen zu treffen.

Ziel dieser Studie ist es, das Vorhandensein von Öffnungsklauseln im Produzierenden Gewerbe zu erfassen und die Auswirkungen auf die Lohnstruktur zu untersuchen. Als Daten stehen Ergebnisse einer eigenen Erhebung zu Existenz und Grad der tarifvertraglichen Öffnung in verschiedenen Tarifbereichen zur Verfügung. Diese werden der Gehalts- und Lohnstrukturerhebung 1995 und 2001 exakt zugespielt. Im Ergebnis zeigt sich, dass die Zahl der Flächentarifverträge, die Öffnungsklauseln vorsehen, seit 1991 stark angestiegen ist. Zudem lassen sich für die Einführung von Öffnungsklauseln zwischen 1995 und 2001 signifikante Lohneffekte beobachten.

1 Introduction

Since the second half of the last century, regionally industry-wide central collective bargaining agreements (CBA) have dominated the German system of wage setting. Since the 1990's, the system of collective bargaining has been criticized to be insufficiently flexible towards international competition and technological change (cf. Artus 2001, p. 97). Therefore, an ongoing debate on decentralizing collective bargaining has started. Consequently, the social partners have introduced so called opening clauses into central collective contracts which allow to adapt these contracts to firm-specific needs. Until now, there is a lack of empirical research on decentralised collective contracts mainly because suitable data have not been available. This study uses newly available data collected from public sources to focus on two main questions: First, which types of flexible elements have been introduced to central contracts and when have they been introduced? Second, what impact of different types of opening clauses on the wage structure can be observed?

Recent studies focussed mainly on the declining bargaining coverage which can be interpreted as firms' requirement for flexibility (cf. e.g. Kohaut/Schnabel 2003). Furthermore, the existence of opening clauses on firm level and the question whether these are actually used by firms is considered (cf. e.g. Kohaut/Schnabel 2006; Franz/Pfeiffer 2006). However, problematically in these studies is that firms actually not using opening clauses often do not know if the relevant collective contracts contain opening clauses. Additionally, these survey data provide only firm level information.

The present study uses data on the existence of opening clauses in collective bargaining agreements which has been collected from public sources. These are merged to the German Survey on Earnings Structure which is a linked employer-employee data set from official statistics. For each firm and its workers it is known, if the collective bargaining agreement contains opening clauses but not if the firms actually make use of it. So, it is now possible to analyse the impact of existing opening clauses on the wage structure.

The remainder of this study is as follows. Section 2 describes different types of collective bargaining flexibility and presents empirical evidence for the years 1991 to 2004. Section 3 analyses the impact of opening clauses on the wage structure and section 4 concludes.

2 More Flexibility within Central Collective Bargaining Agreements

2.1 Different Types of Flexibility

In the German bargaining system central collective bargaining agreements are only legally binding if both the worker is a union member and the firm is member of the employers' association. In case a firm is not, even a unionized worker is not entitled to the collectively bargained wage. Consequently, unions favor firms to be covered under a collective contract. In former times, wages and working time were fixed in the collective contracts by the social partners for all covered firms. The fixed wages constituted a kind of minimum wage. All firms were allowed to pay a higher wage than the bargained , according to the legal principle of favourability ("*Günstigkeitsprinzip*").

Since some years, employers have demanded more flexibility, because e.g. rising prices for raw materials or labor costs or firms entering international competition. Therefore, firms tend to leave CBA coverage. Wages would be then bargained at the firm level or individually. The social partners have answered this demand for flexibility by introducing so called opening clauses which allow firm-specific adaptations of wages or working time under certain conditions such as tough competition, economic crisis or impending bankruptcy. However, collective contracts without any flexible elements still exist. In the following, four regimes of collective bargaining are distinguished: central bargaining agreements without any opening clauses, with opening clauses on working time, with wage-related opening clauses and firm-specific agreements.

Working time related opening clauses enable firms to lower or increase working time for almost all employees. Opening clauses concerning wages mostly allow firms to cut down or even suspend the payment of vacation or Christmas bonuses, in some cases permit to postpone pay rate increases by several months or even withdraw from a former rise. In the following, our main focus lies on the actual effect on the wage structure caused by implementing opening clauses. As there are many different opening clauses with many different regulations on either or both wages and working time, two types of opening clauses are differentiated (cf. table 1).

Opening clauses on working time include all opening clauses concerning working time regulations which do neither affect the wage directly nor indirectly. Wage-related opening

Table 1: Types of opening clauses

on *opening clauses on working time*	*wage-related opening clauses*
allowing the decreasing or increasing of weekly working time or changing work schedules within a day, a week or even within a year (e.g. working time account). Wages may not be affected.	allowing cutting down or suspending payments or postponing or withdrawing a wage rate increase and/or allowing the decreasing or increasing of weekly working time while wages are affected.

clauses include opening clauses affecting wages directly or indirectly by affecting working time in some specific ways. But how relevant are these different types of flexibility within the collective bargaining system?

2.2 Prevalence of Opening Clauses

Until now, suitable data for empirical research on opening clauses had not been available. As information on opening clauses is recorded within the collective contracts, these are suitable sources being available to the public. Information on opening clauses has been collected in an own survey using data from public registers on collective contracts[1]. The data set on opening clauses actually covers flexible elements in manufacturing industry in the German federal state of Baden-Wuerttemberg during the time period between 1991 and 2004. Besides information whether certain working time or wage adaptations to the firm level are allowed, the year of introduction as well as detailed rules to each opening clause are reported.

At first, a look at the structure of opening clauses in different years is taken (cf. figure 1). Starting in 1991, four out of five collective contracts were inflexible, in other words, there was no possibility to adapt wages or working time to the firm level. About 6% of collective contracts had opening clauses on working time. Astonishingly, in 1996 a lot of social partners had introduced wage-related opening clauses in almost a quarter of all contracts. This share has risen between 1996 and 2004 to 53%. However, the share of contracts without any flexible elements remained at a share of almost a quarter.

[1] All collective contracts are registered by the Ministry of Labor Baden-Wuerttemberg and also available at the *WSI-Tarifarchiv*. See Heinbach (2005, p. 57) for a detailed description of the data set on opening clauses.

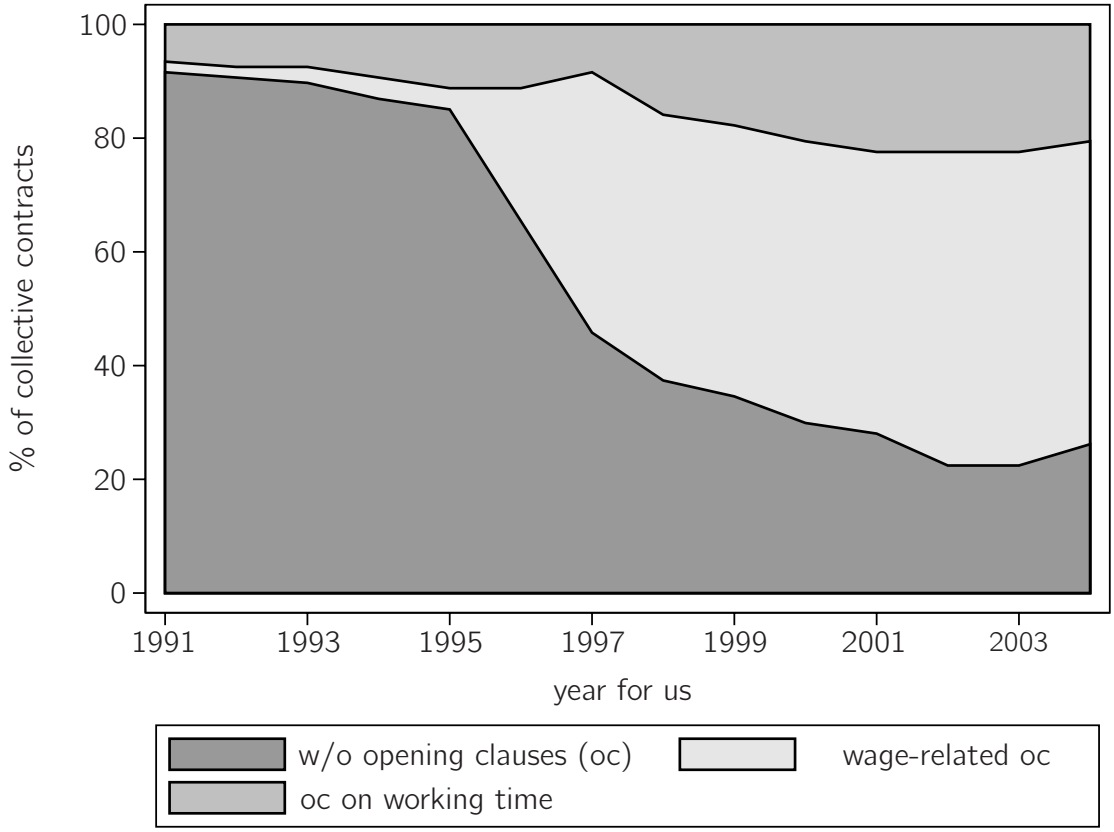

Figure 1: Manufacturing relevant collective contract with opening clauses, Baden-Württemberg, 1991-2004. Source: data set on opening clauses, own calculations.

As different shares of workers are covered by these collective contracts, table 2 reports the share of covered workers by different flexible contracts each in 1995 and 2001. The share of workers covered by CBA with wage-related opening clauses has increased from 6% to 81% of all covered workers between 1995 and 2001 (cp. table 2). The share of workers being covered by collective contracts only allowing working time related opening clauses has risen slightly from 6% to 10%. Finally, in 2001 only a share of 9% were covered by a collective contract without any flexible elements.

Summing up, figure 1 as well as table 2 show the system of central collective bargaining having been partly decentralized by introducing flexible elements such as opening clauses, although not all collective bargaining agreements contain such flexible elements. The share of workers being covered by a central collective contract with opening clauses was at 90% in 2001. As opening clauses lead to a more heterogeneous structure of the collective contract landscape, this fact has to be taken into account when the impact on wages is analysed in the next section.

Table 2: Share of workers which are covered by a collective contract in the manufacturing sector in Baden-Württemberg. Source: German Structure of Earnings Survey 1995, 2001; own calculations.

Collective Contract with ...	% of workers 1995	2001
opening clauses on working time	6	81
wage-related opening clauses	6	10
without any opening clauses	78	9
Total	100	100

3 Analyzing the Impact of Different Flexible Wage Setting Regimes on the Wage Structure

3.1 Theoretical Considerations

The impact of collective bargaining on the wage structure has been analysed both by theoretical and empirical studies. Research on the German system of wage setting result in collective bargained wages to be higher compared to individually agreed ones (cf. e.g. Bechtel et al. 2006; Fitzenberger et al. 2006; Gerlach/Stephan 2005), whereas the study of Alda et al. (2005) does not find significant wage differences between individually and collectively bargained wages. Furthermore, these studies point out that the wage distribution is likely to be more compressed under collective bargaining regimes. All these studies use only one or two regimes of collective bargaining: central and firm-specific bargaining. As this study analyzes the impact of different flexible collective contracts on the wage structure, four collective wage-setting regimes are distinguished: central bargaining agreements without any opening clauses, with opening clauses on working time, with wage-related opening clauses and firm-specific agreements. Based on these four different collective wage-setting regimes, potential consequences for the wage structure are discussed shortly in the following.

There can be found several reasons why some collective bargaining agreements have not provided any flexible element until now. Negotiations on implementing opening clauses have not been concluded successfully yet, while firms do not demand flexibility, because wages and working time both being fixed in a collective contract fits their requirements. This could be the case if wages are quite low and working time is adequate. Compared to

individually bargained wages, they may be higher with a compressed distribution.

If firms are only confronted with order inflow not being constant over time or similar situations, they solely demand a more flexible arrangement of working time. Even without opening clauses, firms can extend working time, but they have to pay overtime bonuses. To prevend financial losings for the firms, opening clauses on working time now allow these to arrange working time flexibly without having to pay overtime bonuses. Bargaining more flexible working time arrangements may result in unions demanding a higher wage increase to compensate forgone overtime bonuses. So, compared to wages under central collective bargaining without opening clauses, wages may be higher.

Firms suffering from a high wage level set by the collective contract demand possibilities to lower labor costs when they are faced with an economic crisis, though competition or impended bankruptcy. According to Fitzenberger and Franz (1999), unions act as follows when opening clauses and wage increase are bargained at the same time: by demanding a wage increase, unions consider only the better-off firms , as they know the bad firms are likely to apply the opening clauses immediately, resulting in a decrease in wages. So, unions undertake a kind of wage differentiation. However, the overall wage effect after the introduction of opening clauses is not clear. Hypothetically, the overall wage level would increase, if no firm applied the nowexisting opening clauses. But, the new wage level could be less or more than the old, depending on the number of firms applying the opening clauses immediately. Wage dispersion would increase if only some firms lowered their wages and others payed the higher bargained wage. But in a situation where almost every firm will adapt opening clauses e.g. in an overall economic crisis, wage dispersion is likely to be compressed and the wage level will almost certainly be lower.

At last, firms can leave central collective contracts and bargain wages firm-specifically. Compared to the central level, firms may profit from decentralised bargaining, because firm-specific particularities can be explicitly considered. Consequently, the wage level is expected to decrease if firms suffer from economical disadvantages. The other way around, if firms are well off, firm-specific bargaining may lead to a higher wage level compared to the central bargained wage, because unions profit more from the firms' revenues. However, there might be some additional cost for the firm if bargaining takes place on the firm level like strikes or the costs of contracting, while these costs are borne by unions and employers' associations in central bargaining. So, firms face the decision between more flexibility solutions on the one hand and lower costs and possibly increased social peace on the other. The next section presents descriptive statistics for the different wages setting

regimes.

3.2 Data and Descriptive Evidence

The impact of different bargaining regimes on the wage is analyzed by using the German Structure of Earnings Survey (GSES). The GSES is a linked employer-employee data set containing representative data from firms and their workers in the manufacturing sector including two independent cross sections in 1995 and 2001. Detailed information on workers' wages, working time and individual as well as firm-specific characteristics has been collected by German official statistics using a two-stage random sample design. At the first stage, a random sample stratified by region, industry and firm size has been taken out of all firms belonging to the manufacturing sector as well as parts of the service industries[2]. Afterwards, workers had been chosen randomly at the firm level. This paper uses a subsample of the GSES, containing firms with 100 to 10,000 employees from the manufacturing industries in the federal state of Baden-Württemberg. At the firm level, only blue-collar workers working more than 30 hours a week are considered.

The identifier of the individually applied collective contract marks the key variable of the present study. Data provides information whether an individual worker is paid accordingly to an individual, a firm-specific or a central bargaining agreement, as well as which specific collective contract has been applied. This creates an interface to enrich the sample with additional agreement-specific information. The data chosen from GSES data is merged with the data set on opening clauses to get also information whether the individually applied central collective contract contains opening clauses.

To analyze the impact of different types of opening clauses on the wage structure, five different wage-setting regimes are distinguished: there are collective contracts *without any opening clauses*, *with opening clauses on working time* and *with wage-related opening clauses* on a central level, and *firm-specific* and *individually agreed* contracts on the firm level. Table 5 presents descriptive statistics for all variables used in the study, separated by wage-setting regimes.

Table 3 summarizes log hourly wages by wage-setting regimes. The log of gross hourly wage is computed using the gross monthly compensation[3] divided by the monthly working

[2]For descriptions of the GSES data set see Hafner (2006) or Frank-Bosch (2003)

[3]Gross monthly compensation without any bonuses and premiums

time[4]. In both years, wages under collective contracts are higher on average (1995: $>$ 2.55, 2001:$>$ 2.66) than individually agreed wages (1995: 2.44, 2001: 2.55). Bargained wages covered by collective contracts allowing wage-related opening clauses, are , on average, the lowest in 1995, but not in 2001. Wages under a collective regime with opening clauses on working time are the highest in 2001. Wage dispersion is measured by the standard deviation of log hourly wages. It differs only slightly between 0.19 and 0.26 in both years. The wage dispersion by wage-setting regimes has been reduced for the firm level contracts and has increased for collective agreements with wage-related opening clauses between 1995 and 2001.

Table 3: Descriptive statistics of log gross hourly wages, blue-collar workers in firms with 100 - 10,000 employees in the manufacturing sector, Baden-Württemberg. Source: GSES 1995, 2001, own calculations.

	collective bargaining agreement			firm level	individual
log hourly wage	w/o oc	working time oc	wage-related oc	contract	contract
mean (1995)	2.60	2.59	2.55	2.56	2.44
s.d. (1995)	0.21	0.26	0.19	0.23	0.25
# obs.	32019	3091	4126	1132	6758
# firms	846	84	106	31	345
mean (2001)	2.66	2.80	2.73	2.70	2.55
s.d. (2001)	0.19	0.24	0.23	0.19	0.25
# obs.	1400	1846	10860	815	4123
# firms	46	72	365	23	209

A look at the box-plots in figure 2 illustrates the wage distributions by wage-setting regimes. The median is represented by the line in the middle of the box, whereas the boundaries represent the 25^{th} and 75^{th} quantiles, respectively. The already mentioned findings are completed by looking at the dispersion and especially at the outliers represented by the circles. Wages under collective coverage with wage-related opening clauses have the widest dispersion with numerous outliers in both directions.

Summing up, there is descriptive evidence for the theoretical considerations mentioned above. The results are also consistent with findings of other studies using the same or comparable data (cf. e.g. Bechtel et al. 2006; Fitzenberger et al. 2006; Gerlach/Stephan 2005). As differences of means and shares of covariables point out (cf. table 3), individual or firm-specific characteristics may influence the differences in average wages by wage-

[4]Working time without any overtime

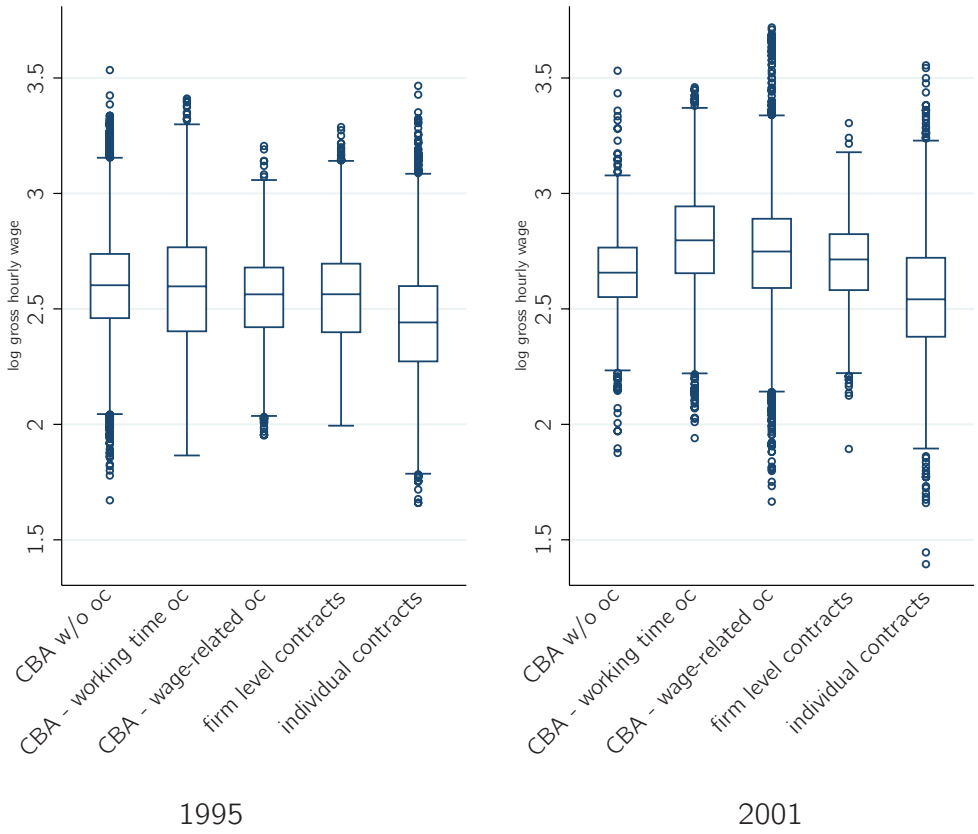

Figure 2: Box plots of log gross hourly wages, blue-collar workers in firms with 100 - 10,000 employees in the manufacturing sector, Baden-Württemberg. Source: German Structure of Earnings Survey 1995, 2001; own calculations.

setting regimes. So, the next section investigates these issues.

3.3 A First Approach Using Pooled Ordinary Least Squares

The paper further uses an expanded Mincer (1974) wage equation to answer the question which impact flexible elements within collective contracts have on wages and how this has changed between 1995 and 2001. The log hourly wage of an individual worker $\ln w_i$ is explained through a set of individual characteristics x_i like age, education and tenure:

$$ln\ w_i = x_i'\beta + u_i. \tag{1}$$

The error u_i holds the usual assumptions. To account for the effects of different wage-setting regimes, dummy variables d_oc_i for four collective bargaining regimes are assigned.

Individual contracts hold as the reference category. As GSES data consists of two cross-sections in 1995 and 2001, the variables are independently but not identically distributed. Therefore, a dummy variable for the time d_{2001} is added to equation (1) , as well as dummy variables for the interaction of year and central collective agreements $d\_2001 \cdot d\_oc_i$. The interaction variables cover all additional time based effects such as increases in wages or prices:

$$\ln\ w_i = x_i'\beta + \delta_0 \cdot d_{2001} + \gamma_1 \cdot d\_oc_i + \delta_1 \cdot (d_{2001} \cdot d\_oc_i) + u_i. \qquad (2)$$

As heteroscedasticity has been found in all models, the resulting equation is estimated using pooled ordinary least squares with hetero-scedasticity-consistent standard errors (cf. Wooldridge 2002, p. 129).

The log wage $\ln\ w_i$ is explained using a large set of exogenous variables x_i which are described shortly. Individual workers' age and age squared control for individual experience besides schooling and tenure. Years of schooling and tenure cover the individual and firm-specific human capital. As the return of age and tenure is assumed to be non-linear, squares of these variables are considered. Tenure and tenure squared control additionally for seniority, both resulting in workers with higher tenure earning more than their colleagues with equal qualification or productivity. Dummy variables account for specific individual characteristics like sex, qualification level[5], payment type[6] and extraordinary working time[7]. Dummy variables for different classes of firm size and different belongings to industries[8] control for firm-specific characteristics.

Table 6 reports the results of the estimates of equation (2), where three different specifications of covariates are presented to check for robustness of the estimation. Model (3) includes age and tenure squared whereas the square of these variables is left out in (1) and (2). Model (3) uses an additional dummy variable for workers in firms with more than 200 and less than 499 employees.

Model (1) explains the log hourly wage only by using dummy variables for the different bargaining regimes, the year 2001 and interaction dummies for the bargaining regime in 2001. All estimated variables have positive signs and are highly significant. Compared to individually agreed wages in 1995, wages of covered workers are on average at least 10.7%[9] higher, whereas wage-related opening clauses have the lowest impact. In the year

[5]Workers are put into four groups: high skilled, skilled, semi skilled and unskilled workers.

[6]Workers were paid according to their working time or receive a piecework or bonus wages.

[7]Such as working on Sundays or during night.

[8]The industry sector is computed using the two digit NACE classification.

[9]Coefficients of the dummy variables are transformed by $e^{\beta} - 1$.

2001 an overall wage increase by 10.4% can be observed with all workers. The more flexible collective contracts have an additional wage-increasing effect by at least 8.8% on average. These huge positive effects decline if a full set of explanatory variables is considered (model (2), (3)). Only one coefficient changes its sign: the interaction between wage-related opening clauses and the year 2001 dummy variable has now a slightly negative effect, 0.9% on average. In total, collective bargaining with wage-related opening clauses in 2001 increases wages by about 6.2%. Wages under collective bargaining with working time opening clauses are 12.5% higher than individually agreed wages. The coefficients of the other variables are all highly significant and have the expected sign compared to similar studies (e.g Bechtel et al. 2006; Gerlach/Stephan 2003). Especially individual characteristics like age, tenure and education have a significant effect on the wage level. As expected, the impact of tenure and age is not linear, because the coefficients of the squared variables are significantly negative. An additional year of schooling increases the wage by 1.6%. Female workers are to earn about 12.1% less than their male colleagues with equal qualification. The wage increase is significantly positive if the worker is skilled compared to a unskilled workers by at least 6.6%. The wage also increases if the level of skill increases (high skilled: 26.9%). Different types of incentive wages (bonus wage, piecework wage) further increase the wage level compared to a wage based only on working hours. This is also true for working on Sunday or during night. Furthermore, wages increase with the firm size. If the reference category are firms with 100 to 199 employees, this increase is even higher. For workers in firms with more than 1000 employees, the wage is on average 7.7% higher.

To evaluate the different models, additional tests like LR-Test and Wald-Test are conducted. The Wald-Test with the null hypothesis that $\delta_0 = \delta_1 = 0$ does not hold on any reasonable significance level. A likelihood-ratio test evaluates the goodness of fit with different models. The test favors the model (3). There is no evidence for using a restricted model.

In a second step, the firm-specific mean and firm-specific standard deviation of log hourly wages are computed and explained through an analogous set of variables:

$$\ln \bar{w}_j = x_j'\beta + \delta_0 \cdot d_{2001} + \gamma_1 \cdot d\_oc_j + \delta_1 \cdot (d_{2001} \cdot d\_oc_j) + \nu_j \quad (3)$$

$$\sigma_{j,\ln w_i} = z_j'\beta + \delta_0 \cdot d_{2001} + \gamma_1 \cdot d\_oc_j + \delta_1 \cdot (d_{2001} \cdot d\_oc_j) + \varepsilon_j. \quad (4)$$

The variables x_j represent the mean of discrete or continous variables or the share of the dummy variables x_i in equation (2), z_j represents the firm-specific standard deviation or the

share of variables x_i. The dummy variables representing the wage-setting regimes equal unity if the majority of workers in the firm are paid according to the respective regime.

Model (1[μ]) and (3[μ]) (cf. table 6) present estimates for the firm-specific mean of the log hourly wage whereas model (1[σ]) and (3[σ]) present estimates for the firm-specific standard deviation of the log hourly wage. Model (1[μ]) finds positive signs with all coefficients of the effects in model (1) on a one precent significance level. With the full set of variables integrated in model (3[μ]), the comparable changes can be observed, whereas some coefficients like age and age squared lose their significance. Furthermore, the coefficients are mostly smaller than with individual wages. The impact of different wage-setting regimes are also comparable.

The firm-specific wage dispersion is measured using the standard deviation of individual log hourly wages. Collective bargaining leads to a compression within the wage distribution. The respective coefficients in model (3[σ]) have a negative sign, significant at least at a 5% level. But the interaction effect is not significant. Only in model (1[σ]) and using a reduced set of variables the interaction of the year 2001 and wage-related opening clauses widens the distribution slightly. This type of opening clauses compresses the wage distribution most, holding all other variables constant. The explanatory power of both specifications is small considering the adjusted coefficient of determination R^2.

To sum up, the positive sign of the interaction variable in model (3) and (3[μ]), covering the implementation of opening clauses on working time between 1995 and 2001, can be interpreted as a wage increasing effect, whereas the implementation of wage-related opening clauses has a slightly negative effect. Fitzenberger and Franz (1999) argue using an insider-outsider framework that the implementation of opening clauses leads to a higher wage increase because unions consider the economic situation of the firms in their negotiations. They conduct "wage differentiation" by splitting the firms into two groups: a better-off group that is able to pay a higher wage increase and a worse-off group of firms negotiating firm-specific deviations or adapting opening clauses immediately. This wage-increasing effect can be found with working time related flexibilization. Furthermore, the less compressed wage distribution compared to other central bargaining regimes supports the idea of wage differentiation. The wage-related opening clauses fulfill the expectation that a negative wage effect can be observed.

Comparing the two types of opening clauses, opposite interaction impacts have been detected. Two reasons may explain these opposite effects. A more decentralized central

wage-setting regime causes a higher wage increase especially if opening clauses on working time flexibilisation are considered. This may represent "a price" for the flexibilisation, because the wage level at the beginning is not that high. Considering only wage-relevant opening clauses, the effect is just converse. Workers in firms under CBA coverage with the possibility of adapting opening clauses ceteris paribus earn higher wages compared to their colleagues in firms without those possibilities in 1995. So, firms with the possibility to adapt opening clauses have payed higher wages, maybe due to an unobserved variable. If opening clauses had been available for many more firms in 2001, wages would have been decreased. Comparing wages in 2001 under CBA coverage with and without opening clauses, the lower values with the wage-related opening clauses could be an evidence for more firms adapting those opening clauses.

However, the model used does not account for causality, i.e. variables controlling the effect of opening clauses may be endogenous. In case heterogeneous firms or industry sectors being able to apply opening clauses, the dummy variable on opening clauses would be correlated with the firm- or industry-specific performance, especially in a case were the relevant variables are not explicitly modeled or not observable.

3.4 A Second Estimation Controlling Endogeneity

If one or more variables of equation (2) are not strictly exogenous, all corresponding coefficients will be inconsistent (cf. Wooldridge 2002, p. 83). As the intention of this study is to measure the effect of wage-setting regimes on the individual wage, the dummy variables should be checked to be exogenous.

It has to be challanged whether the effect of opening clauses found in the previous section is strictly exogenous. Considering collectively bargained wages depend on firm- or industry-specific characteristics which are not explicitly modeled, the assumption $E(d\_oc_i|u_i) = 0$ might not be fullfilled. Empirical studies explaining the determinants of firms' collective bargaining decision find, besides firm size or share of female employees, firm-specific variables like workers council, ownership and age of the firm have a significant influence (cf. e.g. Kohaut/Bellmann 1997; Kohaut/Schnabel 2003). So, firms' decisions to bargain collectively are not exogenous. Unfortunately, the GSES does not provide any information about works councils, ownership or the age of firms.

In the following, the dummy variable for collective bargaining agreements without opening

Table 4: Partial correlation between instrumented and instrumental variables. Source: own calculations

Part.Corr.	CBA w/o OC	CBA with OC
CBA w/o OC(2^{nd} lag)	0.9056	-0.9056
employment share of collective contract area	0.1060	-0.1060

clauses d_cba is expressed as a function of instrument variables z which are uncorrelated with the error term u in equation (2):

$$d\_cba = g(x,z) + v \quad (5)$$

$$cov(z,u) = 0, \quad (6)$$

Collective contracts without opening clauses are instrumented, because there are alternative flexible systems of wage setting, like agreements with opening clauses, firm-specific or individual agreements. The difficulty of a two-stage least squares estimation using instrument variables is to find "good" instruments for the dummy variable d_cba. Two variables representing the collective contract are used as instruments z. The second lag of the dummy variable for opening clauses indicates whether the opening clauses had been already introduced in 1993 (for 1995) or 1999 (for 2001)[10]. Employment shares of the collective bargaining area differ across wage-setting regimes and seem to have no influence on the wage equation. It can be argued, that the introduction of opening clauses might not be that easy in large collective contract areas with a huge share of covered workers, due to union power. The partial correlation coefficients are presented in table 4. Obviously, a high positive correlation can be found between a collective contract without opening clauses and its second lag. The correlation with the employment share is positive but small.

Table 7 reports the results of the estimates, using different instrument variables for the firm-specific mean and standard deviation of log hourly wages. Model (3[μ]) and (3[σ]) use the full set of instrumental variables: employment share and lagged opening clauses information. Models (1[μ])-(2[σ]) each use only one of these instrumental variables. Due to collinearity, some variables e.g. dummy variables for the wage-setting regimes have

[10] In 1995 and 2001 the first lag of the dummy variable for opening clauses is equal to the original value of the dummy variable for opening clauses.

been dropped.

The estimated coefficients deliver similar results compared to the pooled ordinary least squares models. Therefore, only the coefficients of the wage-setting regimes, the interaction terms and the instruments used in the regression will be discussed. Model (1[μ]) explains the firm-specific mean of log hourly wages, where the dummy variable for collective bargaining without opening clauses is assumed to be endogenous. It is instrumented using the employment share of collective contract areas. The effect of collective bargaining is positive, highly significant and, compared to the first approach, much larger in absolute values. A reason for this could be the dummy of firm-specific agreements being dropped due to collinearity, so that the amount of coefficients cover this effect, too. Unfortunately, this cannot be separated. The coefficients of the interaction dummy variables have the same sign as those in the pooled ordinary least squares models, but with opposite significance. Regarding model (2[μ]) and (3[μ]) the signs are the same, whereas the positive effect of the opening clauses related to working time is significant, but the negative effect of the wage-related opening clauses is not. In both models the lagged variables of opening clauses are used. Furthermore, the dummy variables for flexible collective bargaining are dropped due to collinearity.

Explaining the dispersion of log hourly wages, no effect of wage setting can be observed, except a compression in case of collective agreements with wage-related opening clauses.

To evaluate the different models, a Sargan-Test on overidentifying instruments (model (3)) and a Hausman-Test with the null hypothesis the differences in coefficients not being systematic are conducted. The Sargan-Test indicates that the chosen instruments do not overidentify the equation. The Hausman-Test has found there are systematic differences in the coefficients with all models. In summary, pooled ordinary least squares can be considered inconsistent, two stage least squares cannot. Evidence for endogeneity of the wage-setting system has been detected.

4 Summary and Outlook

This study estimates the impact of different wage-setting systems on the wage structure, using data from official statistics and additional information about decentralization in central collective bargaining agreements. Empirical results point out that individual wages under collective bargaining coverage are significantly higher than individual agreed ones, whereas the wage distribution compresses. Furthermore, the implementation of opening clauses between 1995 and 2001 has an additional effect on wages. Opening clauses on working time increased wages between 1995 and 2001, whereas wage-related opening clauses had a wage reducing effect, both compared with wages under central collective bargaining coverage without opening clauses. However, the share of firms covered by a central agreement and paying a wage higher than the collectively bargained one is still high (Kohaut/Schnabel 2003). The negative impact of wage-related opening clauses between 1995 and 2001 can be interpreted such that some firms actually adapt those wage-related opening clauses. As the results reflect particularities of the manufacturing industries in the German federal state of Baden-Wuerttemberg, they should be interpreted carefully. A generalization for whole Germany is only suitable to a limited extent,but still, the results reveal a general tendency.

This study focusses on wage-related opening clauses which allow firms to lower wages under certain conditions. From an theoretical point of view, it would be also interesting whether freely bargained minimum wages are a more efficient instrument to satisfy the firms' requirements, because, in this case, firms would be able to afford the bargained wage at any time while also being enabled to pay higher wages, each depending on their economic situation. So, opening clauses represent an instrument to adapt central collective bargaining agreements to firm-specific needs, at a time where other, probably more economically efficient solutions are absent.

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A Tables

Table 5: Descriptive statistics of covariates, firms with 100 - 10,000 employees in the manufacturing sector (CBA type I), Baden-Württemberg. Source: German Structure of Earnings Survey 1995, 2001; own calculations.

	1995					2001				
	CBA			firm-specific agreement	individual agreement	CBA			firm-specific agreement	individual agreement
	w/o opening clauses	working time oc	wage-related oc			w/o opening clauses	working time oc	wage-related oc		
mean of										
age	39.71	40.10	39.68	39.19	38.65	41.24	40.75	40.53	40.77	39.81
tenure	12.22	11.96	10.82	11.03	8.76	11.40	11.88	12.79	11.51	8.86
years of schooling (mean)	10.46	10.44	10.30	10.40	10.31	10.43	10.55	10.42	10.45	10.29
share of										
female	20%	20%	23%	28%	28%	6%	11%	20%	15%	29%
unskilled	24%	11%	24%	16%	25%	17%	14%	21%	16%	28%
semi-skilled	19%	39%	42%	37%	33%	11%	22%	25%	27%	42%
skilled	38%	37%	18%	31%	34%	51%	33%	31%	28%	24%
high skilled	20%	13%	16%	16%	7%	21%	30%	23%	29%	6%
working time wage	68%	79%	87%	75%	79%	87%	78%	75%	83%	77%
premium wage	10%	15%	7%	12%	5%	4%	4%	12%	10%	7%
piecework wage	18%	1%	2%	7%	9%	1%	9%	10%	1%	7%
working on Sundays	7%	43%	20%	16%	7%	20%	26%	20%	22%	9%
working during night	30%	61%	41%	32%	20%	23%	39%	44%	44%	29%
married	65%	64%	66%	64%	63%	66%	64%	65%	62%	63%
firm size 100 – 199 employees	19%	24%	12%	17%	37%	35%	33%	16%	5%	33%
firm size 200 – 499 employees	30%	37%	28%	19%	45%	42%	32%	25%	14%	49%
firm size 500 – 999 employees	27%	31%	37%	33%	14%	15%	17%	16%	62%	8%
firm size 1000 and more employees	25%	8%	23%	30%	4%	8%	18%	43%	18%	10%

Table 6: Regression analysis of individual log gross hourly wage in the blue-collar workers' group in the manufacturing sector, Baden-Wuerttemberg, 1995 and 2001.
Source: GSES 1995, 2001; own calcualations.

	individual wage			firm-specific mean		firm-specific standard deviation	
ln($wage$)	(1)	(2)	(3)	(1[μ])	(3[μ])	(1[σ])	(3[σ])
Dummy year 2001	0.099	0.104	0.101	0.11	0.097	0.009	0.011
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.040)**	(0.012)**
CBA w/o oc	0.152	0.05	0.047	0.139	0.034	-0.022	-0.024
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
dummy working time oc	0.148	0.029	0.027	0.143	0.027	0.007	-0.018
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.121)	(0.247)	(0.024)**
dummy wage-related oc	0.107	0.076	0.069	0.1	0.064	-0.035	-0.038
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
dummy firm-specific agreement	0.128	0.063	0.063	0.128	0.058	-0.018	-0.027
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.002)***	(0.008)***	(0.000)***
d_2001timeoc	0.104	0.091	0.092	0.106	0.095	-0.012	0.003
	(0.000)***	(0.000)***	(0.000)***	(0.003)***	(0.000)***	(0.279)	(0.783)
d_2001wageoc	0.084	-0.015	-0.009	0.073	-0.006	0.012	0.01
	(0.000)***	(0.000)***	(0.013)**	(0.001)***	(0.688)	(0.050)*	(0.193)
age/10		0.002	0.1		0.125		0.08
		(0.001)***	(0.000)***		(0.127)		(0.001)***
$(age/10)^2$			-0.012		-0.013		-0.007
			(0.000)***		(0.157)		(0.020)**
tenure/10		0.039	0.086		0.147		0.017
		(0.000)***	(0.000)***		(0.000)***		(0.238)
$(tenure/10)^2$			-0.014		-0.027		-0.001
			(0.000)***		(0.000)***		(0.791)
years of schooling		0.015	0.016		0.036		0.012
		(0.000)***	(0.000)***		(0.000)***		(0.004)***
dummy or share of female		-0.109	-0.114		-0.181		0.036
		(0.000)***	(0.000)***		(0.000)***		(0.000)***
unskilled (reference category)							
dummy or share of high skilled		0.249	0.238		0.205		0.02
		(0.000)***	(0.000)***		(0.000)***		(0.002)***
dummy or share of skilled		0.182	0.175		0.208		0.001
		(0.000)***	(0.000)***		(0.000)***		(0.857)
dummy or share of semi-skilled		0.068	0.064		0.061		-0.012
		(0.000)***	(0.000)***		(0.000)***		(0.062)*
time wage (reference category)							
dummy or share of bonus wage		0.055	0.052		0.037		-0.011
		(0.000)***	(0.000)***		(0.001)***		(0.011)**
dummy or share of piecework wage		0.109	0.105		0.117		-0.01
		(0.000)***	(0.000)***		(0.000)***		(0.084)*
dummy or share of piece rate plus bonuses		0.086	0.082		0.076		-0.022
		(0.000)***	(0.000)***		(0.003)***		(0.191)
dummy or share of mixed wage		0.033	0.031		0.012		-0.007
		(0.000)***	(0.000)***		(0.432)		(0.136)
dummy Sunday working		0.084	0.081		0.085		0.008
		(0.000)***	(0.000)***		(0.000)***		(0.154)
dummy night work		0.073	0.071		0.069		-0.001
		(0.000)***	(0.000)***		(0.000)***		(0.708)
firm size 100 to 199 employees (reference category)							
dummy firm size 200 to 499 employees			0.022		0.029		0.004
			(0.000)***		(0.000)***		(0.094)*
dummy firm size 500 to 999 employees		0.035	0.046		0.049		0.005
		(0.000)***	(0.000)***		(0.000)***		(0.105)
dummy firm size over 1000 employees		0.062	0.074		0.07		0.008
		(0.000)***	(0.000)***		(0.000)***		(0.013)**
Industry dummies	no	yes	yes	no	yes	no	yes
Constant	2.444	2.208	1.987	2.432	1.656	0.163	0.1
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Observations	66075	66075	66075	1934	1934	1919	1919
R-squared	0.127	0.628	0.639	0.223	0.733	0.07	0.184
Adj R-squared	0.127	0.628	0.639	0.22	0.727	0.067	0.167

Robust p values in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Regression analysis of individual log gross hourly wage using instrumental variables, blue-collar workers' group in the manufacturing sector, Baden-Wuerttemberg, 1995 and 2001. Source: GSES 1995, 2001; own calcualtions.

	firm-specific mean			firm-specific standard deviation		
	(1[μ])	(2[μ])	(3[μ])	(1[σ])	(2[σ])	(3[σ])
Instrumental variables	employ.	l2.(cba w/o cc)	employ. l2.(cba w/o cc)	employ.	l2.(cba w/o cc)	employ. l2.(cba w/o cc)
Dummy year 2001	0.203	0.076	0.076	0.025	0.019	0.019
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.003)***	(0.003)***
CBA w/o oc (i)	0.259	-0.078	-0.069	0.006	-0.009	-0.007
	(0.000)***	(0.000)***	(0.000)***	(0.509)	(0.365)	(0.46)
dummy working time oc	0.168	-0.083	-0.076	0.001		
	(0.000)***	(0.000)***	(0.000)***	(0.875)		
dummy wage-related oc	0.212			-0.019	-0.023	-0.021
	(0.000)***			(0.023)**	(0.028)**	(0.039)**
dummy firm-specific agreement			*dropped due to collineariy*			
d_2001timeoc	0.026	0.116	0.117	-0.006	-0.006	-0.004
	(0.291)	(0.000)***	(0.000)***	(0.536)	(0.616)	(0.703)
d_2001wageoc	-0.081	-0.027	-0.02	0.001	0	0
	(0.000)***	(0.231)	(0.387)	(0.918)	(0.997)	(0.986)
age/10	0.11	0.134	0.133	0.088	0.058	0.058
	(0.143)	(0.050)*	(0.052)*	(0.000)***	(0.007)***	(0.007)***
$(age/10)^2$	-0.012	-0.016	-0.016	-0.007	-0.005	-0.005
	(0.197)	(0.055)*	(0.057)*	(0.001)***	(0.039)**	(0.039)**
tenure/10	0.119	0.138	0.139	0.02	0.017	0.017
	(0.000)***	(0.000)***	(0.000)***	(0.1)	(0.195)	(0.195)
$(tenure/10)^2$	-0.025	-0.025	-0.025	-0.002	-0.001	-0.001
	(0.002)***	(0.001)***	(0.001)***	(0.327)	(0.837)	(0.836)
years of schooling	0.038	0.02	0.019	0.011	0.013	0.013
	(0.000)***	(0.026)**	(0.028)**	(0.002)***	(0.001)***	(0.001)***
dummy or share of female	-0.156	-0.175	-0.175	0.04	0.036	0.036
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
unskilled (reference category)						
dummy or share of high skilled	0.185	0.206	0.207	0.015	0.018	0.019
	(0.000)***	(0.000)***	(0.000)***	(0.018)**	(0.007)***	(0.007)***
dummy or share of skilled	0.211	0.214	0.214	0.001	0.002	0.002
	(0.000)***	(0.000)***	(0.000)***	(0.902)	(0.773)	(0.766)
dummy or share of semi-skilled	0.125	0.031	0.031	-0.003	-0.007	-0.007
	(0.000)***	(0.063)*	(0.059)*	(0.591)	(0.327)	(0.338)
time wage (reference category)						
dummy or share of bonus wage	0.02	0.04	0.039	-0.014	-0.015	-0.015
	(0.142)	(0.001)***	(0.001)***	(0.005)***	(0.002)***	(0.002)***
dummy or share of piecework wage	0.09	0.121	0.121	-0.014	-0.015	-0.015
	(0.000)***	(0.000)***	(0.000)***	(0.011)**	(0.006)***	(0.006)***
dummy or share of piece rate plus bonuses	0.119	0.066	0.068	-0.017	-0.051	-0.051
	(0.045)**	(0.3)	(0.285)	(0.41)	(0.052)*	(0.053)*
dummy or share of mixed wage	0.016	-0.005	-0.005	-0.006	-0.013	-0.013
	(0.341)	(0.755)	(0.739)	(0.322)	(0.035)**	(0.034)**
dummy Sunday working	0.086	0.094	0.094	0.008	0.005	0.005
	(0.000)***	(0.000)***	(0.000)***	(0.153)	(0.372)	(0.367)
dummy night work	0.05	0.074	0.074	-0.004	0.004	0.004
	(0.000)***	(0.000)***	(0.000)***	(0.296)	(0.285)	(0.287)
firmsize 100 to 199 employees (reference category)						
dummy firmsize 200 to 499 employees	0.03	0.042	0.043	0.003	0.005	0.005
	(0.001)***	(0.000)***	(0.000)***	(0.338)	(0.112)	(0.111)
dummy firmsize 500 to 999 employees	0.053	0.067	0.067	0.007	0.007	0.007
	(0.000)***	(0.000)***	(0.000)***	(0.063)*	(0.049)**	(0.049)**
dummy firmsize over 1000 employees	0.023	0.031	0.031	0.003	0.002	0.002
	(0.001)***	(0.000)***	(0.000)***	(0.197)	(0.522)	(0.527)
Industry dummies	yes	yes	yes	yes	yes	yes
Constant	1.508	1.953	1.951	0.077	0.092	0.09
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Observations	1882	1509	1509	1868	1502	1502
Sargan statistic			(0.000)***			(0.006)***
Hausman statistic	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***

Robust p values in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

(i) = instrumented variable

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