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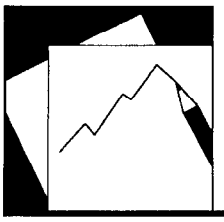

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On Sand and the Role of Grease in Labor Markets: How Does Germany Compare?

Anja Decressin and Jörg Decressin

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On Sand and the Role of Grease in Labor Markets: How Does Germany Compare?

Prepared by Anja Decressin and Jörg Decressin [1]

Authorized for distribution by Robert J. Corker

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Abstract

This paper investigates wage setting in (west) Germany using the German Socioeconomic Panel dataset on individuals and compares the findings with those available for the United Kingdom and the United States. The fraction of job stayers in (west) Germany who suffer unchanged wages or wage cuts compares with that in similar data for the Anglo-American countries, even after various adjustments for potential reporting errors. While nominal wages of job stayers are rigid downward, real wages are not. Nevertheless, the macroeconomic effects of the nominal rigidity are limited and cannot be weakened substantially by raising inflation.

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Author's E-Mail Address: anja.decressin@census.gov , jdecressin@imf.org

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[1] The U.S. Census Bureau and European I Department, IMF, respectively. This paper was written while Anja Decressin was working on her Ph.D. thesis at Georgetown University and before she took up her position at the U.S. Census Bureau. The views expressed in this paper are her own and do not necessarily represent those of the U.S. Census Bureau. No U.S. Code Title 13 confidential data were used in the production of this paper. We would like to thank Jim Albrecht, Bob Corker, Albert Jaeger, Steve Olley, Eswar Prasad, Axel Schimmelpfennig, Susan Vroman, and seminar participants at the International Monetary Fund, Georgetown University, Humboldt University, and the 2002 International GSOEP User Conference for their comments. All remaining errors are our own.

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I. INTRODUCTION

During the 1990s, euro-area countries have managed to more than halve inflation relative to the previous decade, to about 3 percent on average. The objective of the European Central Bank (ECB) is to make further progress and bring inflation to under 2 percent. This begs the question whether nominal wages are flexible enough to achieve the real wage adjustments that might then be needed to avert rising unemployment in response to adverse shocks.

This paper investigates wage setting in Germany—the largest euro-area economy—using the German Socioeconomic Panel (GSOEP) on individuals and compares the results with those available for the United Kingdom and the United States.[2] One objective is to characterize rigidities—call them "sand"—in the wage-setting mechanism that could impede adjustments in response to shocks. Another objective is to reach a verdict on whether more inflation—call it "grease"—could improve the functioning of this mechanism. The results for Germany are compared with those available for the United Kingdom and the United States because: (i) the labor markets in the Anglo-American countries are often taken as benchmarks for efficiency, while those of many countries in the euro area—including Germany—are considered in need of structural reform (IMF, 1999); and (ii) various papers have analyzed the wage setting in these countries with micro data. Moreover, Germany is an interesting case study because it has a longer history of low inflation rates than the United Kingdom and United States.

Wages can be sticky for various reasons. Rigidities can, for example, stem from risk aversion to wage changes (Azariades, 1975), menu costs (Mankiw, 1985), or from multiperiod nominal wage contracts (Fischer, 1977). Empirical evidence for the United States on wage rigidities is split. McLaughlin (1994) uses household (Panel Study of Income Dynamics—PSID) data on wages and finds considerable wage flexibility, with many individuals experiencing nominal wage cuts. Using the same data, Kahn (1997) and Altonji and Devereux (1999) advance evidence for nominal wage rigidities at the zero mark. But, Kahn establishes that these rigidities are generally of the symmetric, menu-cost type and not of the downward type except for the subsample of wage (as opposed to salary) earners. Furthermore, studies working with payroll data from specific firms find virtually no nominal wage cuts and argue that the PSID data are spoiled by measurement error.[3] Altonji and Devereux (1999), who work with both household (PSID) and payroll data, estimate that the bulk of observed nominal wage cuts in the PSID data reflect measurement error.

On the relation between inflation and wage rigidities in the United States, McLaughlin (1994) finds that nominal wage growth moves one for one with anticipated inflation but less

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[2] The data used in this publication were made available by the German Socio-Economic Panel Study (GSOEP) of the German Institute for Economic Research (DIW), Berlin.

[3] For a survey of the relevant papers see Howitt (2002) and Kramarz (2002).

than one for one with unanticipated inflation. This is consistent with nominal contracting effects in the short run and neoclassical wage determination in the long run. Similarly, Card and Hyslop (1996) find no compelling evidence for faster real wage adjustment in response to unemployment during high-inflation periods. By contrast, Groshen and Schweitzer (1999) establish that the distribution of real wage changes is not neutral with respect to inflation: higher inflation raises the size of wage increases at the top end of the wage change distribution but not at the low end.

For the United Kingdom, the evidence on wages from household (British Household Panel Study—BHPS) and firm-provided social security data (British New Earnings Survey—BNES) is similar to that available for U.S. household data (PSID). Smith (2000) finds a large proportion of nominal wage cuts in the BHPS data but also rigidity at the zero mark. She argues that this rigidity is symmetric, reflecting either menu costs or annual pay contracts, and thus has no serious macroeconomic consequences. Nickell and Quintini (2000) document a large proportion of wage cuts and rigidities at the zero mark in the BNES firm panel. On the relation between wages and inflation in the United Kingdom, they show that a one percentage point increase in the inflation rate raises the fraction of employees experiencing real wage declines by about 0.5 percentage point. In their view, this is too little to make a strong case for a higher inflation target in the United Kingdom.

Several studies have analyzed wages in German data but only one paper has focused on potential rigidities in wage setting.[4] Beissinger and Knoppik (2001) document a large proportion of wage cuts—affecting up to 20–30 percent of the blue collar workers—in the IAB-enterprise panel. They follow the method of Kahn (1997) to establish that in comparison with the United States, pay in west Germany is less downward sticky for blue collar workers but more downward sticky for white collar workers (salaried employees). However, their earnings data are not very comparable to the PSID data used by Kahn (1997); their sample is not representative of the German labor market, as it omits women and the young, contains relatively few white collar workers; and does not feature high income earners; and their wage data is in "rounded" numbers. As one objective is to obtain internationally comparable results, this paper uses household data from the GSOEP to study wage setting. It follows methods similar to those of McLaughlin (1994), Kahn (1997), and Altonji and Devereux (1999) for the United States; and to those of Smith (2000) and Nickell and Quintini (2001) for the United Kingdom.

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[4] Among these papers, many have used the GSOEP. For example, Wagner (1994) finds evidence for a Blanchflower-Oswald (1994) wage curve in west Germany; Haisken-DeNew and Schmidt (1999) establish similar inter-industry wage differentials in west Germany and the US over 1984–96, using the PSID (Panel Study of Income Dynamics); Prasad (2000) detects a remarkable stability in the German wage structure, with little change in inequality within or between groups over 1984–97; and Grund (1999) and Burda and Mertens (2001) find that job displacement has much smaller effects on wages than in the US.

This paper extends the work on the United States and the United Kingdom as well as Beissinger and Knoppik (2001) in several respects. First, the quality of the wage data is assessed by studying separately the wages of civil servants: holding constant demographic characteristics, the wage data, if reliable, should confirm that only few civil servants suffer pay cuts. Previous work has not taken advantage of the public pay scale to validate wage data on individuals. Second, various definitions of wages are considered, by distinguishing between the setting of base pay, hourly base pay, and hourly total pay. Such a distinction between wage measures is important for understanding the mechanism of wage rigidities. Third, the setting of wages of the less well paid is studied separately. Studying the wages of the less well paid is particularly interesting because legal minimum wages do not exist in Germany, unlike in the United Kingdom and the United States. However, collective wage bargaining can introduce wage floors that affect the less well paid disproportionately. Fourth, the paper investigates nominal—including both general downward and menu-cost type rigidities—and real wage rigidities. And fifth, it extends existing tests for the relation between wages and inflation by considering the roles of demographic characteristics and the macroeconomic environment.

The main finding from a descriptive analysis is that the dispersion of annual wage changes is large, about one fifth of job stayers experience nominal cuts in wages, and the most frequent nominal wage change is a zero change. In these respects, the GSOEP data on wage changes resemble those for the Anglo-American countries in the PSID, BHPS, and BNES. The result holds even after various adjustments for potential reporting errors in the GSOEP data. While many civil servants report wage cuts, the bulk of these cuts can be attributed to individuals reporting highly "rounded" wage data; in addition, some cutbacks relate to changes in demographic characteristics (e.g., children, marriage) and job-specific characteristics (e.g., changes in the distribution of work hours across the day that trigger changes in a specific allowance). Adjusting the data reported by non-civil servants for "rounding" and demographic characteristics reduces the fractions reporting unchanged wages or cutbacks by up to one third. Formal tests for wage rigidities reveal that nominal wages of non-civil servant job stayers are rigid downwards but real wages are not. However, the macroeconomic effects of the nominal rigidity are limited and cannot be weakened substantially by raising inflation. Furthermore, there is no compelling evidence for wage floors that constrain the adjustment of wages of the less well paid.

The paper is structured as follows: Section II describes the key institutional features of Germany's labor market that have a bearing on the setting of wages. Section III provides a brief description of the data; establishes various stylized facts on annual changes in the wages of job stayers; and analyzes wage rigidities and their interaction with inflation; and Section IV concludes.

II. Institutional Background

Determining the role of institutions in creating wage rigidities in Germany and making comparisons with the United Kingdom and the United States is difficult without empirical work. Wages in Germany can be set (i) in individual negotiations, between an employee and a firm; (ii) in firm-level negotiations, between a trade union and a firm; or (iii) in collective

negotiations—at the sectoral, regional level—between trade unions and employer associations. In 2000, some 33,357 collective wage agreements existed at the sectoral, regional levels. A contract can be declared universally valid for a sector in a region, if the employers at the negotiations employ more than 50 percent of the employees in that sector. In practice, such declarations are rare and extend coverage only to a limited part of the economy.[5] Kohaut and Schnabel (2001) use the 2000 IAB firm panel and establish that collective wage agreements cover 45 percent of the firms in the west and 23 percent in the east. These firms employ an estimated 63 percent of all dependent workers in the west and 45 percent in the east. In addition, some 21,538 firm-level union contracts covered some 7 percent of employees in the west and 10 percent in the east. About 6,000-7,000 contracts are renewed annually.

Wage bargaining in Germany is thus neither fully centralized nor fully decentralized. In a sample of 19 advanced economies, Calmfors and Driffill (1988) rank the United States second in terms of the degree of decentralization, the United Kingdom sixth, and Germany fourteenth. In terms of delivering low wage growth and unemployment, Calmfors and Driffill argue that intermediate levels of centralization deliver less well than high levels or low levels: on that basis, they rank the United States fifth, Germany ninth, and the United Kingdom twelfth. Notice that unlike in the United Kingdom and the United States, legally binding minimum wages do not exist in Germany.

Collective wage agreements provide room for wage flexibility in Germany because settlements differ between sectors, roughly one-fifth of all contracts allow—under specific conditions—for lower pay or longer hours than agreed, and contracts determine only minimum wage levels. Employers usually pay more than the contractually agreed minima and the excess plays an important role in providing room for pay flexibility. According to evidence by Bellman, Kohaut, and Schnabel (1998), in the 1997 IAB enterprise panel west German enterprises paid roughly 11.4 percent more than the prevailing contractual wage minima. However, the contractually specified minimum wage levels can introduce binding wage floors for the less skilled.

A key determinant for the existence of a collective or firm-level wage contract is union membership and thus bargaining power. Over time, membership has declined, from 35.3 percent of the west German workforce in 1985, to some 25.7 percent in 1998 (26.1 percent in all of Germany). While employers are legally free to pay the non-unionized less than unionized workers, few choose to do so. Thus, trade union membership is lower than contract coverage.

Bargaining takes place somewhat irregularly and over several dimensions, including wages, hours, and general working conditions. The length of contracts varies but typically

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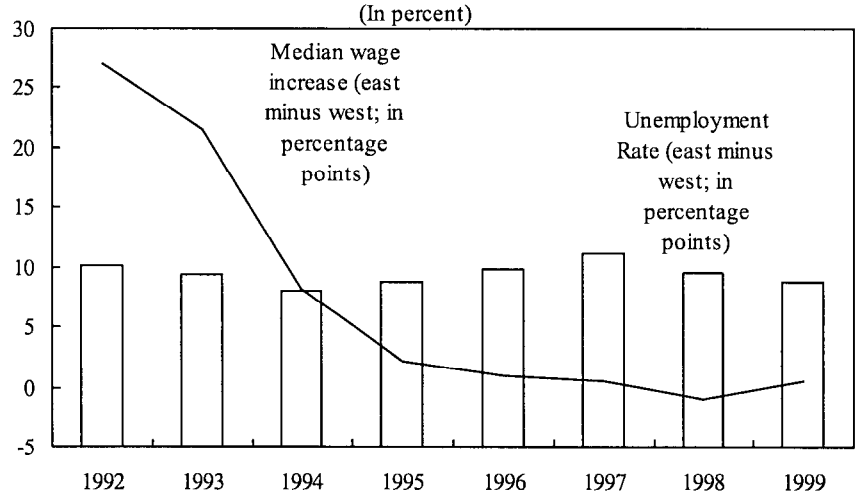
[5] According to Franz (1999), during the 1990s contracts that were declared universally valid extended the coverage of existing wage contracts to another 1.2 million employees (outside the public sector), or less than 5 percent of the workforce.

amounts to one or two years. If a 12-month contract lapses and, following several months of negotiations, is replaced with another 12-month contract, the new contract can provide for a retroactive pay increase, a single compensatory payment, or no payment at all for the months that passed during the negotiations. Over the past two decades, trade unions pursued two key objectives: (i) during the 1980s, the gradual reduction in the length of the workweek to 35 hours, a process which is still ongoing at varying speeds in different sectors; and (ii) during the 1990s, covering east Germany under the west German wage bargaining system and agreements ("Tarifeinheit in Ost und West").[6] The reduction in work hours has been flanked with greater flexibility in working time. For example, during certain periods hours can exceed the weekly 35 hour limit but rather than being compensated with overtime pay, they are credited toward future work time.

Figure 1. Wages and Unemployment: East Versus West
(In percent)



Sources: Authors' calculations and, for regional unemployment rates, Eurostat.

In effect, it is unification that may have given rise to the one obvious instance of a collectively negotiated wage distortion of macroeconomic proportions. Notice that unemployment rates in the east exceeded those in the west by about 10 percentage points during 1992–94, but the median wage of job stayers in the GSOEP data grew considerably faster than in the west (Figure 1). This may have reflected the influence of western unions and the former make-up of the east German entrepreneurship, which conceded high wage growth until an employers' revolt in 1993. Since then, however, union membership along with membership in employers' associations has declined; wage agreements are increasingly struck outside the collective wage bargaining framework; wage growth has slowed sharply; and the wage structure has become remarkably similar to that in the west (Burda and Hunt, 2001).

[6] For further information on wage bargaining in Germany see the website of the Hans Böckler Stiftung, http://www.boeckler.de/wsi/tarchiv/ as well as Franz (1999).

Overall, the collective wage-bargaining system does not rule out flexibility with respect to the determination of pay and working conditions. Also, more than half of the companies in the west and three quarters in the east do not even participate in collective bargaining. The degree of wage flexibility in Germany is thus fundamentally an empirical question.

III. Wage Rigidities

A. A Brief Description of the Data

This work is based on the 2000 wave of the German Socio-Economic Panel (GSOEP) covering individuals over 1984–99. The GSOEP is the 95 percent version of the Socio-Economic Panel (SOEP) that is made available to researchers outside Germany. The SOEP is a wide-ranging representative longitudinal study of private households in Germany. It is similar to the PSID in that it provides information for the whole household. However, unlike in the PSID, person-level information, such as wage income and employment status, is not provided by the household head but by each individual who is at least 16 years old. Interviews normally take place during spring of each year. However, the time that has passed between interviews can be somewhat more or less than one year—incidentally, the same can hold for the time that lapses between an old and a new collectively-negotiated wage contract. The SOEP panel started in 1984 with 5,921 households and 16,160 persons. All persons, whether from the initial household or coming into the household due to birth or marriage, are followed over the years and some measures are taken to follow-up on dropouts. The most recent wave of the data (2000) includes 4,060 households with 7,623 people for the SOEP west sample, and 3,678 people in 1,879 households in the SOEP east sample.[7]

The analysis focuses on the wages of west German workers (job stayers) because their experience is more representative for job holders in a market economy operating in a steady state.[8] The focus on job stayers is motivated by the objective to compare "like with like" wages to the extent possible, as in the studies for the United Kingdom and the United States. Job stayers are individuals who stay with the same employer, continue to perform the same job, and remain in the same position. Only full-time employees are considered. Employees with jobs in farming as well as civil servants, apprentices, and the self-employed are excluded, as has typically been done in the other studies. Furthermore, individuals without two consecutive years of data are omitted, because wage changes cannot be computed for them.[9]

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[7] For further information, see http://www.diw.de/.

[8] The few figures and statistics for all German workers include wage changes for east Germans during 1992–99. See Hunt (2001) for an analysis of developments in wages of east German workers since unification.

[9] See Appendix, Table A1 for sample means.

Three different measures of wages—defined here to encompass both weekly wages and monthly salaries of the primary job—of full-time workers are investigated:

- *Hourly base wage*: wage income excluding overtime compensation, bonuses and other irregular pay in the month prior to the interview divided by regular contractual hours during the week prior to the interview (multiplied by 52/12). This measure is obtained by dropping from the analysis all employees who receive pay for overtime. Since information on paid overtime is not available for 1987, wage changes can be computed only for 1985–86 and 1989–99. For west Germany, the number of observations is 7,505, of which 3,019 are for blue-collar workers ("Arbeiter") and the remainder white collar employees ("Angestellte"). Low skilled job stayers comprise (i) untrained blue-collar workers and white-collar employees; (ii) semi-trained blue-collar workers and white-collar employees; and (iii) trained white-collar employees with simple tasks. The low skilled account for 2,304 observations.

- *Raw base wage*: wage income in the month prior to the interview as defined above but not normalized by contractual hours. The total number of observations and their breakdown into categories is the same as that for hourly base pay.

- *Hourly total pay*: annual labor income including bonuses, overtime, and other irregular pay over the previous year, divided by annual hours worked. For this measure no years of data are missing and workers performing paid overtime are included. For west Germany, the number of observations is 21,332 of which 12,279 are for blue-collar workers. Observations for the low skilled amount to 7,149.

The base wage and total pay measures have advantages and disadvantages. Since collective bargaining takes place over both wages and hours worked, it is highly desirable to compute a measure of hourly remuneration. The measure of hourly total pay is the most comprehensive but arguably the least precise. The reason is that the variable for total pay includes the annual total work compensation, which is generated from separate questions about the labor income from the primary job, bonuses, overtime, and profit-sharing. Furthermore, these income questions are asked for the year prior to the interview. Similarly, no direct question about the annual work hours of the individual exists in the GSOEP and hence, the variable for annual work hours was also constructed by the GSOEP team.[10] The data for base wages are more precise but omit overtime compensation and bonuses. Individuals are asked about their base wage for the primary job in the month prior to the interview and their contracted and usual weekly hours. A fairly precise measure of hourly base wages can be obtained by excluding workers who performed paid overtime and dividing monthly wages by

[10] The variable for annual work hours was constructed using information on the employment status in the survey year, on the average number of hours worked per week in the survey year, and on the number of months worked in the previous year (Lillard, 2002).

contractual hours. The price, however, is a loss of observations because of missing data on overtime.

The data sets on wage and total pay changes are adjusted to improve their reliability. First, the 1 percent highest and the 1 percent lowest pay or wage changes in each year are removed from the analysis to minimize the potential effect of reporting errors, as has been done in other studies.[11] Second, white collar employees are dropped for 1991 because it was not possible, owing to a change in skill categories, to ascertain whether they might have switched jobs. Third, the regional data coincide with the west German Länder (states), except that the city-states are merged into the surrounding states (Hamburg into Schleswig-Holstein and Bremen into Niedersachsen); in addition, the small states Rheinland-Pfalz and Saarland are merged and Berlin is excluded.

B. A Descriptive Analysis

West Germany compared with the United Kingdom and the United States

The evidence on wage setting for west Germany (Figure 2) resembles that for the United Kingdom and the United States in that the dispersion of annual wage changes is large, about one fifth of job stayers experience nominal cuts in wages, and the most frequent nominal wage change is a zero change (Table 1). The most comparable data are those for base wages from the GSOEP and for wages from the BHPS and PSID, as they all draw the wage data from

Table 1. Nominal Wage Growth Statistics
(In percent, unless otherwise noted)

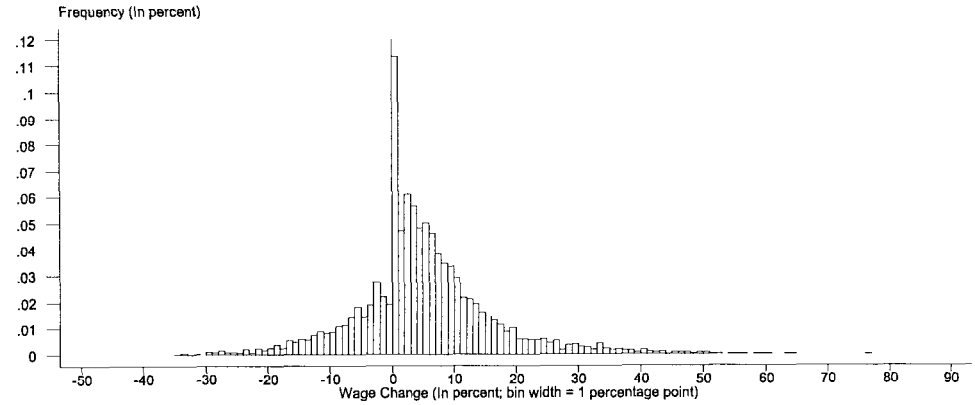
	Coverage 1/	Wage data	Median or Mean (*)	Standard deviation	Zero wage growth (Percent of all job stayers)	Wage decline (Percent of all job stayers)	Inflation rate	Unemployment rate
United States								
Mc Laughlin (1994)	1976-1986, PSID	Hourly rate	7.7 *	14.1	7.2	17.3	6.8	7.5
Card and Hyslop (1996)	1992-93, CPS	Hourly rate	3.6	...	17.1	20.3	3.0	6.9
Kahn (1997)	1976-1988, PSID	Hourly rate	...	...	7.5	17.8	6.3	7.2
United Kingdom								
Smith (2000)	1995-96, BHPS	Raw	3.7	...	7.8	23.4	2.4	8.2
	1991-92, BHPS	Raw	5.9	...	8.1	20.9	3.7	9.7
Nickell and Quintini (2000)	1995-99, BNES	Hourly rate	1.8	...	2.8	19.0	2.6	6.9
	1991-95, BNES	Hourly rate	2.0	...	6.0	17.0	2.9	9.6
	1995-96, BNES	Hourly rate	0.1	...	1.3	18.2	2.4	8.2
West Germany								
	1984-99, GSOEP	Base, hourly	3.9	10.9	8.9	22.9	2.0	6.4
Job stayers	1984-99, GSOEP	Base, raw	3.5	10.2	14.2	20.0	2.0	6.4
	1984-99, GSOEP	Total hourly	4.1	16.6	1.4	34.6	2.0	6.4
Firm stayers, excluding job stayers	1984-99, GSOEP	Base, hourly	4.5	13.3	8.3	22.8	2.0	6.4
	1984-99, GSOEP	Base, raw	4.0	12.4	12.6	21.3	2.0	6.4
	1984-99, GSOEP	Total hourly	4.5	18.2	1.2	35.1	2.0	6.4

Sources: Authors' calculations for Germany and studies referenced in the table. For inflation and unemployment rates the source is Eurostat.
1/ Coverage comprises employees that stay in their firm or job, except under the CPS. Under the CPS, workers reporting the same (2-digit) industry and occupation in two consecutive years are considered. Notice that PSID data users consider only household heads.

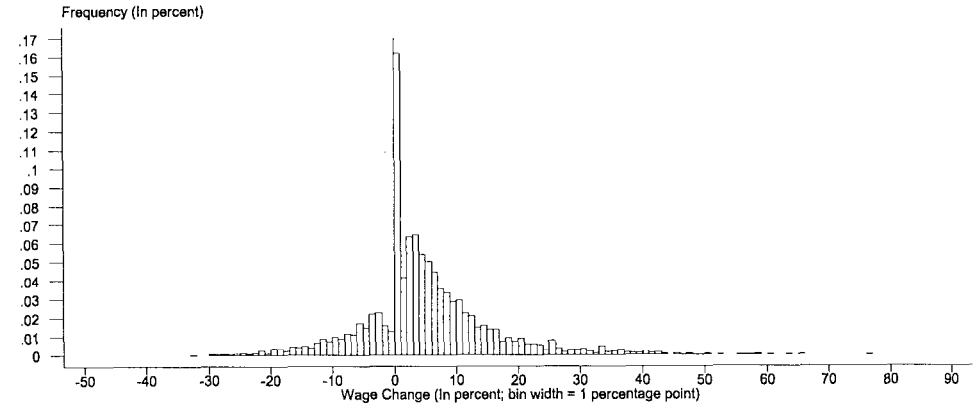
[11] For example, for total hourly pay changes, the removed pay changes imply a wage decrease of on average more than 40% or a wage increase of on average more than 81%.

Figure 2. West Germany: Annual Wage Changes

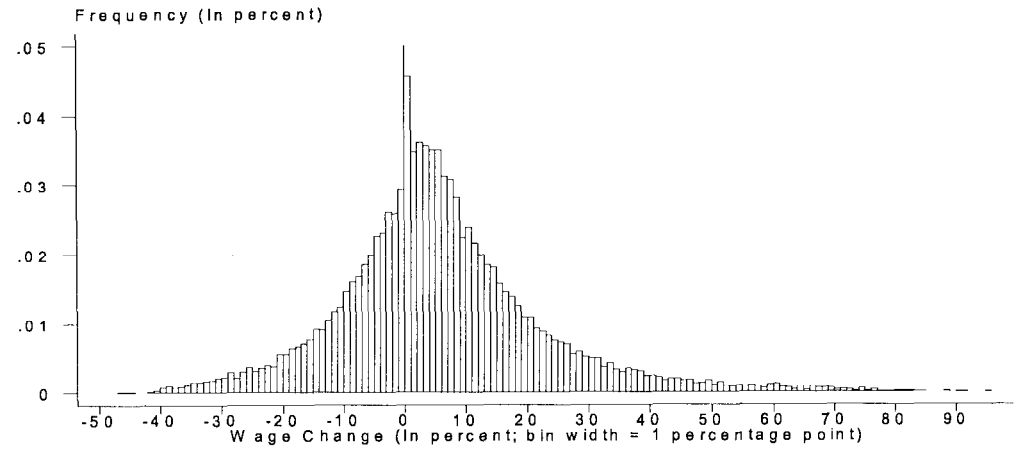
(i) Hourly Base Wage



(ii) Raw base Wage



(iii) Average Hourly Total Pay



households.[12] On the basis of these data sets, the fraction of job holders with unchanged nominal wages is at least as large in Germany as in the United Kingdom and United States.[13] Moreover, the wage rigidity at the zero mark diminishes over time and fewer employees suffer wage declines (Table 2). In both respects, the evidence for Germany resembles that of other countries.

Table 2. Wage Changes at Various Time Horizons
(In percent of total workforce)

	Zero wage growth				Wage decline		
	West Germany Base wages		UK	US	West Germany Base wages		UK
	Raw GSOEP	Hourly GSOEP	Raw BHPS	Hourly PSID	Raw GSOEP	Hourly GSOEP	Hourly BNES
After 1 year	14.2	8.9	9	16.0	20.0	22.9	19.0
After 2 years	7.1	3.6	6	8.4	13.6	15.6	13.7
After 3 years	4.7	1.9	4	4.7	8.1	9.8	...
After 4 years	3.5	1.6	3	...	5.7	5.6	

Sources: Authors' calculations for Germany. UK raw data are eyeballed from Smith (2000), Figure 2; UK hourly data are from Nickell and Quintini (2001), Table 4; and US data are from Card and Hyslop (1996), Table 2 (PSID data; covering hourly wages and comprising only workers reporting hourly pay).

Scrutinizing developments year-by-year and over the same time periods across the countries does not fundamentally alter these conclusions (Table 3). Relative to the United Kingdom, a larger fraction of job stayers experienced unchanged wages but a smaller fraction suffered a decline during 1991–96. However, the wage measure used by Smith (2000) for the United Kingdom is for "usual" total pay. Accordingly, it includes "usual" overtime pay and "usual" bonuses: in a subsample of job stayers who reported no changes in hours worked and no overtime pay and bonuses, the fraction suffering pay cuts reached only 19 percent over 1991–96, relative to 23 percent for the full sample. The comparable fraction for Germany would be for hourly base wages and also amounts to 19 percent over 1991–96. In comparison with the United States, the fraction of job stayers experiencing unchanged hourly base wages is only half

[12] The BNES draws the wage data from employers and the CPS study has a very different definition of job stayers: it defines job stayers as individuals remaining in the same 2-digit industry/occupation, rather than with same employer or on the same job.

[13] This result is not affected by slight differences in the characterization of job stayers across studies, as the distinction between job stayers (the definition used in the BHPS study) and firm stayers (the definition used in the PSID and BNES studies) does not matter in the GSOEP data for the frequency of unchanged remuneration or cuts. However, intra-firm movers experience slightly larger average remuneration increases, consistent with promotions exceeding demotions. Notice that inter-employer moves are not frequent. In the GSOEP, they account for 4.3 percent (5.6 percent) of all consecutive observations of base wages (total hourly pay); in McLaughlin's PSID data, they account for 12 percent of all consecutive wage observations.

as large in Germany over 1984–93. However, the combination of the fractions without a nominal wage change or with a cutback is only some 15 percent (or 5 percentage points) lower.

Table 3. Nominal Wage Statistics Over Time: West Germany Versus the United Kingdom and the United States
(In percent , unless otherwise noted)

Year	Percent of job holders with				Median wage growth		Inflation rate		Unemployment rate	
	Zero wage growth		Wage decline							
Raw base wages										
	West Germany	UK	West Germany	UK	West Germany	UK	West Germany	UK	West Germany	UK
1991-92	12.0	8.1	11.2	20.9	6.4	5.9	4.0	3.7	4.4	9.7
1992-93	9.6	9.7	15.1	25.1	5.3	3.4	3.6	1.6	5.8	10.4
1993-94	15.1	10.0	19.9	22.9	3.0	3.2	2.7	2.5	7.0	9.7
1994-95	13.3	9.4	18.6	22.5	3.4	3.8	1.8	3.4	6.7	8.7
1995-96	11.9	7.8	14.1	23.4	4.5	3.7	1.5	2.4	7.2	8.2
Average	12.4	9.0	15.8	23.0	4.5	4.0	2.7	2.7	6.2	9.4
Hourly base wages										
	West Germany	US	West Germany	US	West Germany	US	West Germany	US	West Germany	US
1984-85	10.0	16.4	26.3	18.4	3.8	4.4	2.2	3.6	7.2	7.2
1985-86	10.9	17.1	25.2	19.1	3.7	4.2	-0.1	1.9	6.6	7.0
1986-87	...	17.3	...	19.1	...	4.1	0.2	3.7	6.3	6.2
1987-88	...	16.4	...	18.0	...	4.5	1.3	4.1	6.3	5.5
1988-89	9.4	15.5	19.0	17.2	4.8	4.7	2.8	4.8	5.7	5.3
1989-90	4.3	14.3	17.4	17.3	5.9	5.1	2.7	5.4	4.9	5.6
1990-91	10.9	14.9	27.8	18.2	2.6	4.9	3.6	4.2	4.2	6.9
1991-92	6.6	17.4	15.2	18.9	6.7	3.9	4.0	3.0	4.4	7.5
1992-93	4.8	17.1	18.4	20.3	5.6	3.6	3.6	3.0	5.8	6.9
Average	8.1	16.3	21.3	18.5	4.7	4.4	2.3	3.7	5.7	6.4

Sources: GSOEP and authors' calculations for Germany; Smith (2000) Table 1 for the UK; and Card and Hyslop (1996) Table 1 for the US. The data for the US are from the CPS (hourly workers). PSID data for annual wage changes during 1985-88 are shown in Card and Hyslop (1996), Table 2. These data suggest that in each of the years, respectively, 15.6 percent, 16.5 percent, and 16.0 percent of the workers that are paid hourly experienced a zero wage change. Inflation and unemployment data are from Eurostat.

The typical wage cut in west Germany tends to be lower than in the United States and probably also lower than in the United Kingdom. For hourly base wages, the median annual cut in the entire sample amounted to 5.6 percent for all employees; it varies between 4–8 percent in any particular year. For raw wages in the United Kingdom, Smith (2000) finds a median annual cut of 7.6 percent during 1991–96; for the same years, the comparable figure for west Germany is 5.5 percent; inclusive of overtime pay, bonuses, and other irregular pay and normalized by hours it would be 7.5 percent. For hourly wages in the United States, McLaughlin (1994) reports an average annual cut of 12 percent for 1976–86. The average cut in hourly total pay in west Germany is 10.0 percent; for the hourly base wage it is 7.5 percent.

Table 4. Germany: Nominal and Real Hourly Wage Changes, 1985-99
(In percent, unless otherwise noted)

	Percent of job holders with				Median pay growth	
	Zero wage growth		Wage decline			
	Base wage		Base wage		Base wage	
	Nominal	Real	Nominal	Real	Nominal	Real
All job holders	9.5	0.0	21.6	39.0	4.3	2.0
West German	9.0	0.0	22.7	40.8	3.9	1.5
Low skilled	8.6	0.0	28.0	45.1	3.4	1.2
Blue collar	8.5	0.0	29.3	45.3	3.3	1.0
White collar	9.4	0.0	18.3	37.7	4.2	1.8
Lowest quartile	9.9	0.0	18.4	35.0	6.1	3.6

Sources: GSOEP data set and authors' calculations.

The behavior of the wages of low-income earners is less suggestive of downward rigidities in Germany than in the United States (Table 4). Relative to other job stayers, the low-income earners benefit from higher wage growth in both countries, but more so in Germany than in the United States. For the United States, McLaughlin reports that the average annual wage increase of minimum wage earners amounted to 8.39 percent over 1976–86, relative to 7.72 percent for all job stayers. In Germany, the comparable figure (hourly base wages) of the lowest quartile of earners is 6.3 percent, by comparison to 3.9 percent for the entire sample over 1985–99.This could reflect a relatively lower starting wage for low-income earners in Germany. Furthermore, these earners typically suffer larger wage cuts in Germany but lower wage cuts in the United States than all job stayers. In the United States, the average wage cut for minimum wage earners is 6.1 percent; in west Germany, it is the median wage cut that amounts to 6.1 percent for the lowest quartile. Perhaps this is due to the absence of legal floors in Germany.

Similarly, wages of blue collar workers and the less skilled record more wage cuts than those of white collar workers in Germany, despite being lower on average. Kahn (1997) finds the opposite for the United States. Lastly, a glance at real rather than nominal base wage changes suggests no accumulation at the zero mark (Table 4).

Scrutinizing the data on total pay, which includes base wages and supplementary pay (overtime, bonuses and other extraordinary pay), suggests that supplementary pay introduces considerable wage flexibility (Table 1, Figure 2). Comparing base wages and total pay (both not adjusted for hours) reveals that less than 4 percent of all job stayers report nominal cuts in both measures (Table 5). Accordingly, individuals who suffer cutbacks in base wages might be offered opportunities, through overtime and other irregular pay, to maintain their incomes. Alternatively, cutbacks in total pay are acceptable, provided they are achieved through changes in overtime, bonuses, or other extraordinary pay. But these observations need to be heavily caveated. First, the base wages included in the total pay data refer to a whole year, not the preceding month, as the monthly base wage data (see Section A above). Second, the total pay data are likely to be considerably more polluted by measurement error than the base wage data, as they are constructed from the responses to questions about various components of pay in the

Table 5. West Germany: Agreement Among Wage Measures, 1985-99
(In percent of all jobstayers in the sample)

	Base wage, raw			
Total pay, raw	Zero wage growth	Wage decline	Wage increase	Sum
Zero wage growth	0.9	0.4	1.5	2.8
Wage decline	2.7	5.9	20.4	29.1
Wage increase	7.3	16.5	36.2	60.0
Sum	10.9	22.8	58.1	91.9

Sources: GSOEP and authors' calculations. For 8.1 percent of jobstayers data are not available for both base and total hourly wages.

preceding year. As is shown below, measurement error stemming from "rounding" considerably increases the variance of reported wage changes. And third, developments in hours worked are not considered.

The preliminary evidence thus suggests that wage flexibility in west Germany does not compare unfavorably to that in the United Kingdom and United States. This finding is consistent with a labor market that until the beginning of the second half of the 1990s usually produced lower unemployment. Furthermore, econometric tests in Section C below substantiate that this preliminary result is not driven by Germany's lower inflation rate, which averaged only 2 percent over the sample.

Measurement error

Measurement error considerably raises the variance of reported wage changes but most of the observed downward flexibility in wages is unaffected. One concern in the empirical literature on wage flexibility is that the high variance in wage changes and the large proportion of wage cuts in the countries reviewed could reflect reporting errors. To determine the likely extent of such errors in the GSOEP data this section further analyses the behaviour of wages. In particular, it (i) scrutinizes the wage change data for job stayers who do not report wages in "rounded" numbers; (ii) focuses on the subset of job stayers for whom certain covariates that might affect remuneration (marital status, disability, interview month, and children) remain unchanged; and (iii) uses statistics on wage changes of civil servants (*Beamte*)—which are otherwise excluded from this analysis of wage flexibility—as a benchmark for data quality, as the determination of their wages is well-known. The wage data, if reliable, should confirm that only few civil servants suffer cuts in base wages, provided certain covariates do not change.

The exclusion of "rounders" appreciably reduces the fraction of job stayers with nominally unchanged or declining raw base wages but the general results—a high variability in

Table 6. West Germany: Rounding in Nominal Wage Statistics, 1985-99
(In percent , unless otherwise note)

	Percent of job holders with		Sample size
	Zero wage growth	Wage decline	
Wage changes over one year			
Base wage, raw			
All	14.2	20.0	7,505
Eliminate rounders to nearest 10	8.2	13.2	523
Eliminate rounders to nearest 100	9.4	16.6	1,231
Eliminate rounders to nearest 1000	14.2	19.7	6,010
Eliminate rounders and same covariates 1/ 2/	10.6	14.5	179
Wage changes over two years			
Base wage, raw			
All	7.1	13.6	5,019
Eliminate rounders to nearest 10	1.7	5.8	360
Eliminate rounders to nearest 100	2.4	8.2	806
Eliminate rounders to nearest 1000	6.9	12.9	3,994

Sources: GSOEP and authors' calculations. Data eliminate individuals who round in both years.

1/ No children, unchanged marital status, degree of disability, job content, region of work, interview month, as well as no decline in contracted hours.
2/ Excludes those who round to nearest 100.

wage changes, many wage cuts, and an accumulation of wage changes at the zero mark—carry through (Table 6).[14] More specifically, excluding "rounders" to the nearest DM100, lowers the fraction of job stayers with unchanged nominal base wages from 14.2 percent to 9.4 percent, or by about one third. The frequency of wage cutbacks drops much less, from 20 percent to 16.6 percent of all job stayers, or by about 15 percent. Meanwhile, the average base wage change declines from 4.8 percent to 4.3 percent and the standard deviation from 10.2 percent to 7.8 percent, or by almost 25 percent. Focusing, among the "non-rounders", on the subset for whom certain covariates do not change (marital status, degree of disability, interview month, children, no fall in contractual hours) alters the fractions of unchanged wages and cutbacks to 10.6 percent and 14.5 percent, respectively. These fractions are roughly one third lower than those that do not reflect adjustments for rounding or covariates.

[14] Notice that isolating "rounders" for the total pay measure is not a sensible proposition, as that measure is constructed by summing the data from responses to separate questions about base wages and other pay. Furthermore, for obvious reasons, the wage data used here are not hourly.

Wage data on civil servants constitute a useful benchmark to assess measurement error. The average annual wage increase for civil servants reached only 1.5 percent during 1992-99.[15] At the same time, the underlying wage of a civil servant could fall only because of disciplinary action but this affected less than 1 percent of civil servants annually. "True" base wage cuts should thus be much less frequent for civil servants than for non-civil servants and the data bear

Table 7. West Germany: Civil Servants, Nominal Base Wage Statistics, 1985-99
(In percent of civil servant job stayers)

	All		Same covariates 1/	
		No rounders 2/	All	No rounders 2/
All civil servants				
Zero wage growth	10.2	6.1	12.3	8.8
Wage decline	15.1	8.0	17.3	8.8
Sample size	1,820	425	220	57
Administrators				
Zero wage growth	6.4	3.9	9.3	0.0
Wage decline	14.0	5.1	11.6	0.0
Sample size	314	78	43	13

Sources: GSOEP and authors' calculations.
1/ No children, unchanged marital status, degree of disability, job content, region of work, interview month, as well as no decline in contracted hours.
2/ Excludes those who round to nearest 100.

this out once "rounding" is taken into account (Table 7). The data that do not adjust for rounding suggest that about 15 percent of civil servants suffer base wage cuts. This is equivalent to about three quarters of the fraction of the non-civil servants that suffer cuts, a large number. It is similarly large for those for whom various covariates are constrained. However, excluding individuals who round to the nearest DM100 alters the result considerably: while the standard deviation of wage changes falls only from 8.4 percent to 7.1 percent, or by about 15 percent, the fraction of nominal wage declines among civil servants is almost cut in half, to about 8 percent.

While wage cuts are clearly much less frequent among civil servants than other job stayers, the evidence of some 8 percent cuts amongst them still needs to be reconciled with a civil servant pay system that, in principle, did not impose any cuts in underlying wages. In this regard, it is important to realize that certain allowances—these are paid in addition to the underlying wage for civil servants—can decline. Many respondents might factor those

[15] See the website of the German union of civil servants, www.dbb.de. There was no round stipulating a general wage cut, although in 1996 there was a zero increase. In the GSOEP data, the median hourly wage increase for civil servants for whom certain covariates do not change (marital status, degree of disability, interview month, children, no fall in contractual hours) was 2.3 percent over 1992-99 and 2.6 percent over 1984-99.

allowances into their base wage that are paid regularly every month. Allowances that relate to demographic characteristics (for example, the allowance for children) have been considered by holding various covariates constant: this had little bearing on the fraction of reported wage cuts among civil servants. However, other allowances relate to changes in working conditions that cannot be identified in the data. More specifically, additional compensation is paid for work under severe conditions or outside regular hours (*Erschwernisszulage*), which can be routine for the police, prison staff, health sector workers, and the fire brigade. Unobservable changes in the distribution of hours across the day or week can thus lead to changes in compensation. Among civil servants, however, such allowances are not available to general administrators (ISCO code 310). For these administrators, the fraction suffering base wage cuts is only 5.1 percent. Moreover, considering only those administrators for whom the aforementioned covariates remain unchanged reduces the fraction with cutbacks to nil, relative to 14.5 percent for non-civil servants with similarly constrained covariates.

Taken together, this evidence suggests that rounding might be responsible for the bulk of measurement error. Furthermore, the evidence for civil servants suggests that some of the observed wage cuts might be related to unobservable changes in job attributes, such as changes in the distribution of work hours across the work day. Among the civil servants in particular, this may reflect deliberate changes in the distribution of perquisites—work outside regular hours is compensated at a higher rate—across employees in a compensation system that, until very recently, did not allow for performance-related pay.[16]

How does the evidence on measurement error in the GSOEP wage change data compare to that in other data sets? The evidence on the PSID data is split. McLaughlin (1994) argues that the PSID earnings data are surprisingly reliable and concludes that the standard deviation of annual wage growth rates would be at least 9.5 percent after correction for possible measurement error, compared to 14 percent in the absence of any correction. Lebow and others (1996), and—for the CPS data—Bound and Krueger (1991) reach similar conclusions on variance induced by measurement error. By contrast, Akerlof and others (1996)—based on evidence from a telephone survey—and Altonji and Devereux (1999) argue that virtually all negative pay changes in the PSID data reflect measurement error, with the fraction of unchanged wages considerably larger than the data suggest. Regarding the BHPS, Smith (2000) finds that of the respondents who had checked their pay slip 17.8 percent reported pay cuts and 5.6 percent unchanged pay. The same figures for those who had not checked their pay slip are, respectively, 25.2 percent and 10.4 percent. Thus, the "cleaner" data make even less of a case for a barrier at the zero mark, according to Smith. Lastly, studies using data provided by employers drawn from social security files (e.g., the BNES or the IAB-enterprise panel) find a fraction of wage cuts that does not differ much from that observed in household panels.

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[16] Performance related pay was allowed in mid-1997 but has not started in earnest until 1999.

Measurement error and wage changes for various groups of workers

Less skilled or blue collar workers as well as employees of smaller firms are more likely to report unchanged wages or wage cuts (Table 8). Adjusting for rounding does not alter the result that a larger fraction of blue collar and less-skilled workers suffers wage cuts. However, removing rounders reveals that union members are not more likely than other employees to suffer wage cuts. And wages appear more flexible downward in small rather than large firms.

Table 8. West Germany: Nominal Wage Growth Statistics for Various Groups, 1985-99
(Percent of job holders experiencing unchanged or declining nominal wages)

	Germany			
	Zero growth		Decline	
	all (1)	Base wage raw without 2-digit rounders (2)	all (3)	Base wage raw without 2-digit rounders (4)
West German	14.2	9.4	20.0	16.6
Low skilled	15.2	11.6	25.1	23.3
Skilled, blue collar	14.6	6.2	25.6	24.8
Professional, Managerial	13.7	9.5	13.2	12.4
Other, white collar	13.5	9.0	16.0	11.4
Blue collar	14.6	9.2	26.9	26.2
White collar	14.0	9.6	15.3	12.1
Men	14.5	9.2	20.7	16.2
Women	13.8	9.7	19.0	17.0
Union member	13.4	12.5	26.0	15.6
Nonmember	15.1	10.6	19.7	15.9
Firm<2000 employees	15.6	10.6	19.8	17.9
Firm >2000 employees	11.4	6.4	20.4	12.8

Sources: GSOEP data set and authors' calculations.

Furthermore, the large fraction of wage cuts in the sample does not appear to be due to a large number of job stayers that trade job security for pay. For raw base wages, the fraction of individuals in the full sample without an inter-employer or intra-employer move after 3 years is 67 percent. They account for 62 percent of the zero wage changes and 66 percent of the wage cuts. Omitting "rounders" to the nearest DM100 changes these figures to 65 percent and 66 percent, respectively. Moreover, the median wage growth of those who stay longer than 3 years is 1–1.25 percentage points higher than that of those who do not, depending on whether rounding is adjusted for.

C. Estimation

Wage rigidities and inflation

The key issues in testing for wage rigidities and their relation with inflation is to compare actual wage changes against counterfactual wage changes in the absence of rigidities. Specifying such counterfactual changes can be accomplished in various ways but generally requires using the characteristics of wage changes in some years as a counterfactual for others. For ease of exposition and in a slight abuse of statistical terminology, the approaches followed here are called (i) the "nonparametric" approach, (ii) the "semi-parametric" approach, and (iii) the "structural" approach to specifying the counterfactual wage change distribution.

The "nonparametric" approach focuses on rigidities in nominal wages, while the "semi-parametric" and "structural" approaches study the relation between real wages and inflation. Obviously, the two sets of approaches are related: absent any rigidity in nominal wages, there can be no relation between inflation and real wages. Put alternatively, if no "sand" is present in the wage setting mechanism, adding "grease" will not make it work better.[17]

All further analysis uses only the *hourly base wage data* for non-civil servants, either in nominal terms (for the "nonparametric" approach) or in real terms. The focus on hourly base wages is motivated by the objectives to (i) obtain results that can be compared to existing evidence for other countries; (ii) to substantiate the preliminary evidence for important rigidities in changes of base wages; and (iii) to work with data that are as less polluted by measurement error.

A "nonparametric" approach

The "nonparametric" approach can be used to test for the econometric significance of the nominal wage change barrier at the zero mark, and thus for the presence of significant "sand." This approach, which has been proposed by Kahn (1997), does not explicitly specify a counterfactual wage change distribution. Instead, it uses the average wage change distribution over time as the benchmark against which to evaluate the significance of spikes in the wage change distribution at the zero mark.

Specifically, the proportion $prop_{rt}$ of wage changes that fall into each "bar" of a histogram centered around the annual median wage change are regressed on a set of dummy variables:

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[17] Measurement error in the wage data should not raise major concerns, as the wage data figure on the left hand side of the various regressions run below. However, it lowers the precision of the parameter estimates of the various regressors, the t-statistics, and the R^2 (Hausman, 2001).

$$prop_{rt} = \alpha_r(1 + \beta_1 DN_{rt} + \beta_2 DN1_{rt} + \beta_4 D1_{rt} + \beta_5 D2_{rt} + \beta_6 D3_{rt}) + \gamma D0_{rt} + \varepsilon_{rt}, \qquad \text{(K)}$$

where

$$\gamma = \beta_3 - [\beta_1 \sum_{j>r} \alpha_j + \beta_2 \alpha_{r+1} + \beta_4 \alpha_{r-1} + \beta_5 \alpha_{r-2} + \beta_6 \alpha_{r-3}], \quad \forall r = 0,...,6. \qquad \text{(KR)}$$

Notice that $prop_{rt}$ stands for the proportion of *nominal hourly base wage* changes in year t in range r, for which these changes fall in the range between "the median wage change minus r percentage points" and "the median wage change minus $r+1$ percentage points." Thus, all ranges (or histogram "bars") are 1 percentage point wide. Only 7 of these ranges are estimated, because wage changes that are 7 percentage points below the median change are always negative over the sample period. DO_{rt} is a dummy variable that takes on the value of one if the nominal zero wage change falls in the rth percentage range during year t; DN_{rt} does the same for negative wage changes; and $DN1_{rt}$ and $D1_{rt}$, $D2_{rt}$, $D3_{rt}$ do the same for negative or positive wage changes of 1-3 percent, respectively. α_r is the constant for the rth equation.

The counterfactual wage change distribution implicit in the nonparametric approach assumes that the group of "type r" should always contain the same fraction of employees if no rigidities are present. Assume that these "type r" individuals are semi-skilled blue-collar workers with 5 years of experience. The "nonparametric" approach assumes (i) that these workers account for a constant fraction of all workers over time; and (ii) that each year their wage increase should be the same relative to the median wage increase, regardless of the size of the median wage increase. Thus, the approach does not consider, for example, the effect of skill-biased technological change. Specifically, these workers should always receive a wage change between "the median wage change minus r percentage points" and "the median wage change minus $r+1$ percentage points."

Variance in the median wage change from year to year is crucial to obtain powerful results. The wage change of "type r" workers can be positive in some years and negative in others, depending on the median. The regression tests whether the fraction of "type r" workers indeed stays constant over time or whether it rises in years when it includes zero wage changes, as opposed to in years where it includes small wage increases. Under this approach, the latter finding would be interpreted as indicative of a nominal rigidity at zero.

The specification of the model (K) differs slightly from that of Kahn (1997), as it includes a dummy D3. Akerlof, Dickens, and Perry (1996) argue that wages in the United States are downwardly rigid: pushing inflation under 3 percent would lead to insufficient real wage cuts and higher unemployment. If the parameter estimate for D3 is significantly positive with west German data, it could be argued that the 3 percent inflation level, as opposed to a lower level, really represents a meaningful threshold below which there would be a significant decline in warranted real wage cuts.

The restriction (KR) ensures that the predicted proportions of observations in all categories sum to 100 percent. Removing mass from one range of wage changes must increase

the mass in the other 6 ranges of wage changes. More precisely, the fraction of job stayers with zero wage changes can be thought of as two groups: (i) those who would not have experienced a wage change regardless of the presence of a rigidity, for example because their wages would not have undergone an annual review; and (ii) those who otherwise would have experienced a 1 percentage point or larger increase/decrease in their wage. In the equation for γ, the former are captured in β_3 and the latter in the pile-up term in square brackets. A crucial assumption is that all wage changes that are not enacted because of the rigidity are allocated to zero wage changes.

Equation (K) is fitted to the data for hourly base wage changes. As in Kahn (1997), the method for fitting the data is a seemingly unrelated regression SUR (that allows for cross-equation restrictions) to account for heteroscedasticity and contemporaneous correlation in the errors across equations.

Table 9. Dependent Variable: Proportion of Nominal Hourly Base Wage Changes Below the Median

Dummy	West Germany				US		West Germany Lowest quartile	
	Model K without KR		Model K with KR				Model K with KR	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
DN	0.01	0.10	-0.24*	0.05	0.04	0.03	-0.05	0.08
DN1	-0.45*	0.10	-0.21*	0.07	-0.34*	0.06	-0.12	0.18
D1	-0.06	0.08	-0.03	0.06	-0.28*	0.03	0.98*	0.18
D2	-0.09	0.08	-0.16*	0.05	-0.21*	0.03	0.64*	0.18
D3	0.17	0.09	0.14*	0.07	...	...	-0.07	0.13
D0	14.68*	0.68	7.19*	1.73	5.15*	0.22	7.29*	0.72
N*T	91		91		216		130	
Sample	1985-86/89-99		1985-86/89-99		1971-88		1985-86/89-99	

Sources: GSOE data and authors' calculations and, for the US results, Kahn (1997). A * indicates significance at the 5-percent level. DN, DN1, D0, D1, D2, D3 are the dummies indicating, respectively, ranges that include only negative pay changes; a pay decline by 1 percent; no pay change; or a 1 percent, 2 percent, or 3 percent wage increase (the latter was not included by Kahn). The parameter estimate for D0 is the estimate for β_3 in equation K. The models include intercept dummies for all wage change ranges. Model K is the regression model and KR is the restriction that the predicted proportion of observations in all categories must sum to 100 percent.

The results for the model with the restriction (KR) suggest significant rigidities at the zero mark for Germany, as in the United States (Table 9). For Germany, the point estimate of the parameter β_1 for *DN* suggests that some 24 percent of job stayers that would have experienced a cut in base wages given their distance from the median did not because of general downward rigidities. Based on the average median wage and the estimates for α_r, some 2.55 percent of all German job stayers (i.e., of those that would have experienced a wage cut as well as of all others) did not suffer a cut because of downward nominal wage rigidities. For the United States, this estimate is not significant in the results for the full sample. However, for the sample of wage earners rather than salaried employees (not shown here), Kahn (1997) finds an estimate of 47 percent, implying that 9.4 percent of wage earners did not suffer cuts because of rigidities.

The results for Germany do not lend strong support to symmetric menu cost-type rigidities, unlike in the United States. On the one hand, the estimate for β_2— the parameter of the dummy *DN1* for ranges that include a 1-percentage point negative wage change in a year—is significantly negative, as could be expected with menu costs. On the other hand, the estimate for β_4—the parameter of the dummy *D1* for ranges that include a 1-percentage point positive wage change in a year—is not significantly negative, unlike for the United States. In a model for Germany that omits *D3*, to be fully consistent with the specification of Kahn (1997), all coefficient estimates barely change, except that for *D1*: this estimate becomes more negative (rising from -0.03 to -0.08) but is significant only at the 11 percent level. Thus, in the German sample, evidence for a symmetric menu-cost type rigidity at the zero mark is not compelling. Instead, employers appear reluctant to enact small negative wage changes, perhaps to avoid discouraging their workers in return for small savings on labor costs.

Turning to the Akerlof, Dickens, and Perry (1996) argument, there appears to be an accumulation of individuals in the 3 percent wage change category. The parameter estimate for β_6—the parameter of the dummy *D3* for ranges that include a 3-percentage point positive wage change in a year—is significantly positive: the fraction of job stayers that experienced a 3 percent wage increase is some 15 percent higher than could have been expected given their distance from the median. Based on the average median wage and the estimates for α_r, the fraction of German job stayers that obtained a 3 percent wage increase was some 0.9 percentage points higher than could have been expected. However, virtually the same fraction of individuals is "missing" from the 2 percent wage increase, as evidenced by the significantly negative estimate for β_5, the parameter of the dummy *D2* for ranges that include a 2-percentage point positive wage change in a year. While a barrier clearly exists at the zero mark, there is no meaningful threshold at a 3 percent inflation rate in Germany.

The next step is to relax the crucial assumption that all wage changes that are not enacted because of the rigidity are allocated to the zero wage change category. Estimating γ without the restriction—thus, the predicted proportions of observations in all categories are no longer constrained to sum to 100 percent—reveals a small (positive) insignificant estimate for β_1, the parameter for *DN*, and a much larger negative estimate for β_2, the parameter for *DN1*. Thus, abandoning the restriction suggests that the downward rigidity is only of the asymmetric menu-cost type: some 45 percent of job stayers that would have experienced a 1-percentage point wage cut based on their distance from the median did not because of asymmetric menu costs. This is equivalent to roughly 1.7 percent of all job stayers, considering the median wage change over the sample and the estimates for α_r.

Thus, imposing the restriction (KR) makes a major difference for interpreting the wage rigidity. An attractive feature of the restriction is that it ensures that the predicted proportions sum to 100 percent. But imposing this comes at a cost, namely the assumption that all wage changes that are not enacted because of the rigidity are allocated to the zero wage changes. Accordingly, the non-parametric approach might be best suited for assessing whether there is a nominal rigidity at the zero mark. However, its power to distinguish between general downward rigidities and asymmetric menu costs is limited.

For the sample comprising the nominal wage changes of the 25 percent of job stayers with the lowest hourly wages in any particular year, downward rigidities appear less evident. The parameter estimate for the *DN* dummy is insignificant. The preliminary analysis revealed a smaller fraction of wage cuts among these job stayers. For this sample, 10 ranges *r* or histogram "bars" are estimated, because wage changes that are 10 percentage points below the median are always negative over the sample period. The larger number of ranges reflects the higher median wage increase for this group. The evidence suggests that the smaller fraction of cuts is not related to downward rigidities, which is consistent with the finding that low-income earners do not suffer smaller wage cuts than other job stayers.

Table 10. Dependent Variable: Proportion of Hourly Base Wage Changes Below the Median

	West Germany			
Dummy	Model K without KR		Model K with KR	
	Coefficient	S.E.	Coefficient	S.E.
DN	0.21 *	0.10	0.12	0.13
D0	4.48	1.14	6.45	3.51
N*T	52		52	
Sample	1985-86/89-99		1985-86/89-99	

Sources: GSOEP data and authors' calculations. A * indicates significance at the 5-percent level. DN is a dummy indicating a range that includes only negative pay changes in real terms. The parameter estimate for D0 is the estimate for β3 in equation K. The models include intercept dummies for all wage change ranges. Model K is the regression model and KR is the restriction that the predicted proportion of observations in all categories must sum to to 100 percent.

Returning to the results for the full sample of job stayers, the pile-up of individuals in the 3 percent wage change category raises the question whether a real rigidity might be present, as inflation has averaged about 2 percent over the sample period. Testing for such rigidity is simple: all that needs to be done is to reset the dummies for *hourly real base wage* changes (for example, the dummy *DN* would be 1 for ranges that include negative wage changes in real terms[18]). The real wage change is defined as the nominal change less the inflation rate during the year. As it makes little sense to think about menu costs in this context, the equation (K) is reestimated without the dummies *DN1*, *D1*, *D2*, and *D3*. The parameter estimate for *DN* turns out positive, regardless of whether the restriction (KR) is imposed (Table 10). Thus the data do not reveal real rigidities.

[18] As a result, only the top 4 of the original 7 wage change ranges are estimated, because nominal wage changes that are 4 percentage points below the median change are always negative in real terms over the sample period.

A "semi-parametric" approach

The "semi-parametric" approach specifies a few, key characteristics of the wage change distribution in the absence of rigidities. These include the median real wage change and a measure of dispersion of real wage changes. Moreover, it allows these characteristics to vary each year. The approach then investigates the relation between the fraction of employees suffering real wage declines in any given year and the inflation rate, holding constant the distribution of wage changes as specified for each year.

Relative to the "nonparametric" approach the "semi-parametric" approach differs in three respects. First, it does a better job at holding the dispersion of the wage change distribution constant. The Kahn approach makes no assumption about the shape of the counterfactual wage change distribution; however, it does assume that the shape remains unchanged over time. Second, the "semi-parametric" approach examines the relation between real wages and inflation and thus the potential role for inflation as "grease" in the wage setting mechanism. Third, the approach focuses on the fraction of individuals experiencing real wage cuts. Accordingly, it examines whether "unusual" pile-ups of individuals exist at points on the nominal wage change distribution that span wage growth rates near the typical inflation rate over the sample. These would be the areas picked up by the *D1*, *D2*, and *D3* dummies in the "non-parametric" estimation, as inflation has been below 1 percent in only 4 years over 1985–99.

Under the "semi-parametric" approach, the fraction (*frct*) of individuals experiencing negative or zero *hourly real base wage* growth in each region i is regressed on several variables: inflation (Δp) and its change ($\Delta^2 p$), the median real wage change (Δw^m), and some measure of dispersion of the real wage change distribution, such as the percentage point difference between the real wage change for the 75th percentile and the 35th percentile ($d^{75-35}\Delta w$).

$$frct^{i}{}_{t,\Delta w\le 0} = \alpha_i + \beta_1 \Delta p_t + \beta_2 \Delta^2 p_t + \beta_3 \Delta w_t^{i,m} + \beta_4 d^{75-35}\Delta w_t^{i} + \varepsilon_{it}, \quad \forall i = 1,...,7. \qquad \text{(NQ)}$$

This regression, which has been run for the United Kingdom by Nickell and Quintini (2001), does not identify a structural relationship. The reasoning for this specification is that, holding inflation constant, the fraction of individuals experiencing negative or zero real wage growth varies from year to year as the distribution of wages is shifted, for example by (skill-biased) technological progress. If inflation raises the proportion of individuals with real base wage cuts significantly and sizably, it "greases" the wage setting mechanism and thus raises employment.

The results from running (NQ) suggest that adding more "grease" would have a small effect on the fraction of job stayers in (west) Germany who experience real wage cuts, in line with evidence for the United Kingdom and United States. Using the SUR method, the equation

is fitted to data on base wage changes for seven west German regions, covering all of west Germany, excluding Berlin.[19] The results are shown in Table 11: a one percentage point increase in inflation raises the fraction of job stayers experiencing real base wage cuts significantly, by almost a full percentage point. For the sample of U.K. men,[20] the results of Nickell and Quintini (2001) suggest an increase by 0.45 percentage points. In both countries, only sustained changes in inflation have significant effects, as suggested by the insignificant parameter (β_2) estimates for the change in inflation ($\Delta^2 p$). Turning to low-income earners, the results for Germany confirm those obtained previously: higher inflation does not appear to raise significantly the fraction of job-stayers suffering real wage cuts.

Table 11. Real Hourly Base Wage Cut Frequency and Inflation

Variable	West Germany		UK		West Germany Lowest quartile	
	Fraction with Real Wage Cut (SUR)					
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Δp	0.95*	0.28	0.45*	0.08	-0.42	0.91
$\Delta^2 p$	0.33	0.36	-0.09	-0.06	2.09	1.21
Δw^m	-6.27*	0.16	-5.24*	0.16	-4.91*	0.52
$d^{75-35}\Delta w$	1.08*	0.13	0.49*	0.13	0.31	0.40
N*T	91		230		91	
Sample	1985-86/89-99		1976-99		1985-86/89-99	
R^2	0.81		0.93		0.43	

Sources: Authors' calculations and, for the UK, Nickell and Quintini (2001), Table 7, regional data for men (combined results are not reported in the article). A * indicates a 5-percent significance level; p denotes the log price level; w^m the log median wage; and d^{75-35} the difference between the 75th and 35th percentile of the wage change distribution.

In a broadly similar set-up for the United States, McLaughlin (1994) investigates the fraction of employees suffering nominal and real wage cuts and their relation to inflation, using national rather than regional data. His results suggest that a one percentage point increase in inflation lowers the fraction of workers suffering nominal cuts significantly, by 1.92 percentage points; however, for real wage cuts the number is an insignificant increase by 1.02 percentage points.[21] The same regressions for west Germany suggest a significant drop in the fraction of

[19] Notice that the national CPI inflation rate is used; regional indices are not available.

[20] Nickell and Quintini (2001) do not show results for men and women combined; for the sample of women, their point estimate suggests that a one percentage point increase in inflation raises the fraction suffering real pay cuts by an statistically significant 0.25 percentage points.

[21] In particular, he regresses the fraction of wage cuts in the whole country on inflation and productivity growth, not on the median wage change or a measure of dispersion. Productivity growth enters insignificantly in his regressions and he mentions that the parameter estimates

nominal cuts by 3.1 percentage points and a wholly insignificant decline in the fraction of real wage cuts by 0.9 percentage points.

The "semi-parametric" approach has some important weaknesses. In particular, it does not consider the role of demographic characteristics in wage changes. Nor does it allow a structural interpretation because the factors that are shifting the wage curve or raising its dispersion are not known. The next approach attempts to overcome these drawbacks.

A "structural" approach

The "structural" approach explicitly models the setting of *hourly real base wages*, holding constant individual characteristics and the macroeconomic environment. To do so, the approach first specifies the wage setting mechanism in the absence of rigidities i.e., the warranted real wage. In particular, it models the warranted wage as a function of individual characteristics and the macroeconomic environment, as in Altonji and Devereux (1999). Then the approach examines the relation between the fraction of employees that experience lower-than-warranted changes in real wages and inflation.

The warranted wage $\hat{w}$ is the wage predicted by the following standard log-earnings equation:

$$w_{ijt} = \sum_{i}^{I} \alpha_{it} D_{1i} + \sum_{k}^{K} \beta_{kt} x_{kijt} + \varepsilon_{ijt}, \quad \forall\, t = 1,...,13 \qquad \text{(S1)}$$

where w stands for the logarithm of the real wage; the D_i represent region dummies; and K variables x_{kijt} stand for the characteristics of individual j in region i in year t: age, age squared, gender, disability, nationality, education, occupation, sector, firm size, and tenure in years. Many of theses variables significantly affect wages in Germany according to the wage equations estimated by Wagner (1994) for west Germany and by Hunt (2001) for east and west Germany. Notice that regressions are run separately for each year and only for the set of individuals for whom at least two consecutive years of data are available. All parameter estimates are allowed to vary between years to capture, for example, changes in the returns to education and occupation due to skill-biased technological progress. The regional dummies pick up the effects on wages of regional macroeconomic conditions, including the regional unemployment rate, productivity, and price levels. The parameter estimates generally have the expected signs and many are significant (Appendix Table A2).[22]

The interaction between wage rigidities and inflation can be evaluated by scrutinizing the residuals of the estimated equation (S1). Specifically, if for job stayer j in region i the

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change little in specifications that exclude productivity. The comparable regressions for west Germany discussed here do not include productivity.

[22] The structural approach is not applied to low-income earners because the sample is too small.

residuals in times t and (t-1) are such that $\varepsilon_{ijt} \leq \varepsilon_{ijt-1}$, or $\Delta \varepsilon_{ijt} \leq 0$, then the percentage change of the actual real wage fell short of the change suggested by the warranted wages in (t-1) and t. The natural question to ask is whether the fraction of shortfalls of actual wage changes from changes in the warranted wage are related to inflation. To that effect, the following regression can be run:

$$frct^{i}{}_{t,\Delta\varepsilon_{ijt}\leq 0} = \alpha_i + \beta_1 \Delta p_t + \beta_2 \Delta^2 p_t + \eta_{it}, \text{ for all i=1, .., 7} \qquad \text{(S2)}$$

where frct denotes the fraction of individuals in region i for whom the actual real wage change fell short of the change in the warranted wage. If the parameter estimate for β_1 is significantly positive, then more shortfalls are observed in high inflation years rather than in low inflation years. Similarly, if the parameter estimate for β_2 is positive, more shortfalls are observed in years of rising inflation, independently of the level of inflation.[23]

Table 12. Fraction with Real Cut in Adjusted Hourly Base Wages

Variable	West Germany Fraction with Real Cut in Adjusted Pay (SUR)			
	Coefficient	S.E.	Coefficient	S.E.
Δp	0.03	0.25	0.13	0.60
$\Delta^2 p$	-0.54	0.34	-0.66*	0.27
Δw^m	-0.16	0.19	...	...
$d^{75-35}\Delta w$	0.12	0.13	...	...
N*T	91		91	
Sample	1985-86/89-99		1985-86/89-99	
R^2	0.08		0.08	

Sources: Authors' calculations. A * indicates a 5-percent significance level; p denotes the log price level; w^m the log median wage; d^{75-35} the difference between the 75th and 35th percentile of the wage change distribution; ur the unemployment rate; and prod the log of nominal GDP per employed.

The results suggest that if demographic characteristics and macroeconomic developments are held constant, inflation no longer greases the wage setting mechanism. Table 12 shows the estimates from running (S2). The variables Δw^m and $d^{75-35}\Delta w$ are included

[23] Notice that in any given year the sum of shortfalls taken over individuals always must equal the sum of excesses. Moreover, in the absence of nominal wage rigidities, as the inflation rate varies, the fraction of individuals with shortfalls should roughly be equal to the fraction of individuals with excesses. By contrast, in the presence of nominal rigidities, the fraction of individuals with shortfalls should be positively related to the inflation rate. Across time and regions that fraction varies between about 35 percent and about 72 percent.

among the regressors to demonstrate that the adjustment for demographic characteristics and the macroeconomic environment has been successful. Notice that both no longer enter significantly. Moreover, higher inflation is no longer associated with a significant increase in the proportion of job stayers suffering real wage cuts. Similar results for the United Kingdom or United States are not available.

IV. Conclusion

This paper has investigated wage setting in Germany with two objectives: first, to characterize potential rigidities; and second, to check whether the effects of these rigidities can be weakened with higher inflation.

A descriptive evaluation of wage changes reveals similarities between the wage changes in west Germany, the United Kingdom, and the United States. First, a large proportion of job stayers experience nominal wage declines in a year: for hourly base wages—the preferred measure—some 22 percent of the workforce suffer nominal cuts. This compares to figures of some 19 percent for the United Kingdom (Smith, 2000) and 17–20 percent for the United States (McLaughlin, 1994 and Card and Hyslop, 1996). Second, the most frequent nominal change in base wages is a zero percent change: some 9 percent of the employees experience no change in hourly base wages and some 14 percent no change in raw base wages. The most comparable figures for the United Kingdom and the United States span 7–17 percent of job stayers. This observation is indicative of a nominal rigidity at the zero mark. Third, zero change in wages, or cutbacks, become increasingly less frequent for job stayers over horizons that are longer than one year, as in the United Kingdom and the United States. However, the typical wage cut in west Germany is smaller than in the United States and probably also than in the United Kingdom.

The large fraction of unchanged wages and wage cutbacks in Germany is only partly driven by measurement error. The quality of reported wage data and potential sources of reporting errors are gauged by analyzing civil servant wages, as their determination is well-known: cuts in a civil servant's underlying pay were not possible over the sample period. While many civil servants do report wage cuts in the GSOEP data, the bulk of reported cuts can be attributed to individuals reporting highly "rounded" wage data; in addition, some cuts also relate to changes in demographic characteristics (e.g., children, marriage) and job-specific characteristics, e.g., changes in the distribution of work hours across the day that trigger changes in a specific allowance. This may reflect deliberate changes in the distribution of perquisites across employees—work outside regular hours is compensated at a higher rate—in a compensation system that did not allow for performance-related remuneration. Adjusting the data reported by non-civil servants for "rounding" and constraining various covariates (notably demographic characteristics) that are not directly related to job content but could affect compensation reduces the fraction of job stayers with unchanged base wages by one third, leaving this still by far the most frequent nominal wage change; the fraction with nominal base wage cuts falls by almost the same amount.

Various econometric models shed light on the nature of the nominal rigidities and the relation between real wages and inflation for non-civil servant job stayers. They suggest that nominal wages of job stayers are rigid downwards but real wages are not. Evidence on the relation between real wages and prices suggests that the macroeconomic effects of the nominal rigidity are limited and cannot be weakened substantially by raising inflation.

A test devised by Kahn (1997) suggests that the rigidity at the zero mark for nominal base wage changes is statistically significant. However, it is difficult to determine whether that rigidity is of a general, downward nature or of the asymmetric, menu-cost type. The latter would mean that employers are generally ready to cut wages but only if the cut is large enough to compensate motivational or other effects. Of course, a menu-cost type rigidity would have smaller macroeconomic effects than a general, downward rigidity. The Kahn test can also substantiate that a real—as opposed to nominal—rigidity at the zero mark is not present in the wage change data.

The relation between real hourly base wage changes and inflation is examined with two models. First, assume that the counterfactual distribution of real hourly base wage changes (the distribution in the absence of rigidities) in any given year can be proxied by the median real wage change and a measure of the dispersion of real wage changes during that year. Regressing the fraction of job stayers with real hourly base wage cuts on inflation and such measures of the counterfactual distribution reveals that a one percentage point increase in inflation raises the fraction of job stayers suffering real base wage cuts in Germany by about 1 percentage point, or by twice the amount in the United Kingdom. Second, if the counterfactual distribution is tied to demographic characteristics and adjusted for changes in the macroeconomic environment, inflation no longer raises that fraction significantly.

Overall, the results for Germany, which has experienced inflation at about 2 percent per year on average over then 1990s, suggest that insufficient wage flexibility does not make a compelling case for the ECB to adopt a higher inflation target. Nonetheless, some "sand" thwarts the functioning of the wage setting mechanism in Germany, as in the United Kingdom and the United States. Specifically, the presence of a nominal rigidity at the zero mark for base wages suggests that pushing inflation much below 2 percent could bear risks.

APPENDIX TABLE

Table A1. Germany: GSOEP Sample Statistics, 1985-1999

	Base wage sample		Total pay sample	
	Observations			
	Total	In percent	Total	In percent
Family status	7,505	100.0	21,332	100.0
Married	4,796	63.9	14,703	68.9
Single	1,952	26.0	4,803	22.5
Other	757	10.1	1,826	8.6
Gender	7,505	100.0	21,332	100.0
Men	4,402	58.7	15,348	71.9
Women	3,103	41.3	5,984	28.1
Age in years	7,505	100.0	21,332	100.0
Smaller 55 or older than 64	6,763	90.1	19,440	91.1
55-59	615	8.2	1,615	7.6
60-64	127	1.7	277	1.3
Schooling degree	7,505	100.0	21,332	100.0
Secondary	2,719	36.2	9,188	43.1
Intermediate	1,850	24.7	4,069	19.1
Technical	348	4.6	931	4.4
Upper	905	12.1	1,719	8.1
Dropout	612	8.2	1,842	8.6
Other	1,071	14.3	3,583	16.8
Sector	7,505	100.0	21,332	100.0
Agriculture&Energy&Mining	173	2.3	676	3.2
Manufacturing	3,079	41.0	11,106	52.1
Construction	367	4.9	1,950	9.1
Trade	668	8.9	1,526	7.2
Transport	323	4.3	931	4.4
Bank, Insurance	479	6.4	911	4.3
Services	2,281	30.4	3,831	18.0
Other	135	1.8	401	1.9
Firm size	7,505	100.0	21,332	100.0
More than 2000	2,342	31.2	6,245	29.3
Less or equal 2000	5,153	68.7	15,023	70.4
Other	10	0.1	64	0.3
Union membership	7,505	100.0	21,332	100.0
Yes	732	9.8	1,903	8.9
No	1,835	24.5	4,011	18.8
Other	4,938	65.8	15,418	72.3
Disabled	7,505	100.0	21,332	100.0
No	7,043	93.8	20,274	95.0
Yes	462	6.2	1,058	5.0
Blue collar type	3,019	40.2	12,279	57.6
Untrained	331	4.4	1,018	4.8
Semi-trained	1,401	18.7	5,064	23.7
Trained	1,151	15.3	5,343	25.0
Foreman	110	1.5	660	3.1
Master Craftsman	26	0.3	194	0.9
White collar type	4,486	59.8	9,053	42.4
Industry foreman	72	1.0	253	1.2
Untrained	348	4.6	732	3.4
Semi-trained	900	12.0	2,196	10.3
Trained	224	3.0	335	1.6
Professional&Managerial	2,942	39.2	5,537	26.0
Length of job stay				
One year	7,505	100.0	21,332	100.0
Two years	6,384	85.1	18,799	88.1
Three years	5,053	67.3	15,343	71.9
Four years	3,999	53.3	12,503	58.6

Sources: GSOEP and authors' calculations.

Table A1 continued. Germany: GSOEP Sample Statistics, 1985-1999

	Base wage sample		Total pay sample	
	Mean	Standard deviation	Mean	Standard deviation
Age in years	39.5	10.9	39.2	10.7
Contracted weekly hours	38.9	2.1	39.0	2.7
Annual hours worked	2141.0	240.3	2196.6	297.1
Gross income last month (raw base wage)	3919.6	1771.8	...	...
percent change	4.8	10.2	...	...
Hourly base wage	23.4	10.7	...	...
annual percent change	5.1	11.0	...	...
Annual total pay	...	...	51465.0	26257.2
per hour	...	...	23.3	10.5
annual percent change	...	...	5.6	16.6

Sources: GSOEP and authors' calculations.

APPENDIX TABLE

Appendix Table A2. Dependent Variable: Natural Logarithm of Real Hourly Base Wage 1/

	1985		1986		1989		1990		1991		1992	
Independent variables	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Age	0.040	0.008	0.045	0.006	0.035	0.006	0.036	0.007	0.023	0.015	0.023	0.008
Age^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Female	-0.142	0.026	-0.153	0.020	-0.202	0.021	-0.151	0.021	-0.263	0.042	-0.188	0.023
Disabled	-0.140	0.043	-0.060	0.035	-0.037	0.038	-0.059	0.035	-0.116	0.062	-0.061	0.037
Foreigner	0.008	0.038	-0.034	0.029	-0.018	0.031	-0.034	0.033	-0.021	0.047	-0.017	0.034
No degree	-0.230	0.057	-0.100	0.040	-0.083	0.047	-0.010	0.049	-0.036	0.060	-0.036	0.050
Vocational degree	0.008	0.033	0.021	0.025	-0.003	0.027	0.040	0.029	0.026	0.050	0.026	0.030
University degree	0.167	0.051	0.155	0.043	0.176	0.040	0.204	0.043	0.218	0.221	0.175	0.046
Low skill	-0.285	0.033	-0.295	0.025	-0.250	0.027	-0.263	0.027	-0.060	0.049	-0.308	0.032
Skilled, blue collar	-0.218	0.037	-0.185	0.028	-0.193	0.029	-0.208	0.032	(dropped)		-0.234	0.033
Professional, managerial	0.300	0.041	0.307	0.036	0.295	0.032	0.320	0.032	(dropped)		0.247	0.036
Agriculture	-0.045	0.174	0.035	0.144	-0.387	0.208	(dropped)		(dropped)		-0.046	0.202
Energy	0.003	0.089	-0.019	0.066	-0.033	0.071	0.076	0.085	0.126	0.154	0.036	0.061
Mining	0.266	0.175	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
Manufacturing	0.097	0.029	0.075	0.022	0.064	0.023	0.072	0.024	0.094	0.050	0.072	0.025
Construction	0.029	0.060	-0.016	0.045	0.024	0.058	0.054	0.056	0.109	0.091	0.115	0.063
Trade	-0.060	0.040	-0.056	0.032	-0.076	0.037	-0.086	0.034	0.047	0.085	-0.064	0.036
Transport	0.058	0.053	0.036	0.048	-0.024	0.049	0.003	0.049	0.046	0.086	0.141	0.055
Bank, insurance	0.071	0.055	0.106	0.041	0.090	0.035	0.106	0.035	0.328	0.226	0.101	0.041
Large firm	0.087	0.024	0.092	0.019	0.105	0.020	0.111	0.022	0.136	0.043	0.104	0.022
Tenure	0.002	0.002	0.001	0.001	0.003	0.001	0.004	0.001	0.008	0.003	0.003	0.001
Schleswig Holst.+Hamburg	0.025	0.053	-0.011	0.039	-0.031	0.042	-0.034	0.045	-0.229	0.102	0.001	0.045
Niedersachsen+Bremen	-0.011	0.039	-0.004	0.031	-0.005	0.034	-0.045	0.033	-0.076	0.073	-0.004	0.035
Hessen	0.021	0.039	0.021	0.032	-0.027	0.031	-0.021	0.033	0.030	0.075	0.039	0.036
Rheinland Pfalz+Saarland	-0.097	0.041	-0.054	0.034	-0.056	0.038	-0.079	0.039	-0.087	0.072	-0.077	0.041
Baden-Wuerttemberg	0.024	0.034	0.034	0.026	0.040	0.029	0.008	0.029	-0.014	0.054	0.069	0.032
Bayern	-0.066	0.032	-0.040	0.026	-0.001	0.026	-0.025	0.027	-0.185	0.053	-0.044	0.029
Constant	1.984	0.157	1.917	0.126	2.232	0.123	2.144	0.138	2.324	0.305	2.455	0.159
Adjusted R^2	0.61		0.69		0.66		0.68		0.48		0.68	

1/ Omitted categories: for degree, "high school degree;" for occupation, "other white collar;" for sector, "other services;" for region, Nordrhein Westfalen.

(continued)

	1993		1994		1995		1996		1997		1998		1999	
Independent variables	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Age	0.029	0.009	0.038	0.008	0.035	0.008	0.020	0.008	0.033	0.008	0.030	0.008	0.020	0.008
Age^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Female	-0.178	0.026	-0.164	0.024	-0.151	0.024	-0.153	0.023	-0.129	0.023	-0.134	0.022	-0.133	0.022
Disabled	-0.032	0.047	-0.060	0.045	-0.058	0.045	-0.007	0.050	-0.114	0.050	-0.054	0.041	-0.073	0.037
Foreigner	-0.055	0.040	-0.074	0.040	0.056	0.040	-0.052	0.038	-0.104	0.036	-0.063	0.034	-0.079	0.036
No degree	0.085	0.063	-0.090	0.064	-0.066	0.073	-0.023	0.077	0.039	0.084	-0.019	0.079	-0.197	0.083
Vocational degree	0.019	0.033	0.004	0.030	0.025	0.031	0.007	0.030	-0.012	0.028	0.007	0.027	-0.023	0.027
University degree	0.127	0.051	0.107	0.042	0.158	0.041	0.082	0.038	0.059	0.038	0.058	0.036	0.059	0.035
Low skill	-0.298	0.035	-0.219	0.033	-0.239	0.030	-0.222	0.031	-0.239	0.032	-0.230	0.028	-0.223	0.027
Skilled, blue collar	-0.222	0.040	-0.183	0.037	-0.170	0.036	-0.201	0.038	-0.170	0.035	-0.185	0.031	-0.160	0.029
Professional, managerial	0.292	0.039	0.292	0.035	0.293	0.033	0.366	0.033	0.345	0.033	0.353	0.032	0.332	0.030
Agriculture	0.049	0.235	(dropped)		-0.091	0.152	-0.329	0.167	-0.260	0.166	-0.108	0.223	-0.236	0.132
Energy	0.049	0.081	0.151	0.082	0.146	0.074	0.092	0.066	0.035	0.089	0.140	0.073	0.029	0.067
Mining	(dropped)		(dropped)		-0.003	0.213	(dropped)		(dropped)		0.026	0.157	0.014	0.114
Manufacturing	0.049	0.029	0.053	0.027	0.047	0.025	0.100	0.026	0.083	0.026	0.070	0.026	0.076	0.023
Construction	0.022	0.076	-0.008	0.069	0.009	0.061	0.052	0.057	0.063	0.048	0.034	0.049	0.030	0.046
Trade	-0.128	0.041	-0.188	0.046	-0.097	0.041	-0.082	0.037	-0.071	0.036	-0.104	0.033	-0.162	0.034
Transport	0.086	0.071	-0.065	0.054	-0.103	0.062	-0.082	0.061	0.017	0.054	-0.007	0.054	0.027	0.049
Bank, insurance	0.098	0.045	0.033	0.039	0.060	0.039	0.106	0.040	0.125	0.040	0.042	0.038	0.072	0.037
Large firm	0.107	0.026	0.119	0.024	0.105	0.023	0.134	0.023	0.138	0.023	0.095	0.023	0.103	0.021
Tenure	0.002	0.002	0.006	0.001	0.003	0.001	0.004	0.001	0.006	0.002	0.004	0.001	0.005	0.001
Schleswig Holst.+Hamburg	0.036	0.057	-0.055	0.058	0.031	0.047	-0.027	0.055	-0.030	0.047	-0.036	0.044	0.037	0.039
Niedersachsen+Bremen	-0.013	0.041	-0.011	0.036	-0.021	0.035	-0.051	0.038	-0.046	0.036	-0.039	0.035	0.027	0.032
Hessen	0.017	0.040	-0.003	0.038	0.030	0.037	0.000	0.037	0.015	0.038	0.002	0.034	0.072	0.034
Rheinland Pfalz+Saarland	-0.028	0.052	-0.046	0.045	-0.030	0.049	-0.065	0.044	-0.034	0.040	-0.105	0.040	-0.070	0.037
Baden-Wuerttemberg	0.109	0.037	0.020	0.034	0.033	0.031	0.022	0.031	0.010	0.031	0.000	0.029	0.013	0.030
Bayern	-0.011	0.034	-0.001	0.031	-0.010	0.030	-0.030	0.029	-0.027	0.029	-0.096	0.027	-0.018	0.027
Constant	2.331	0.184	2.221	0.167	2.184	0.162	2.537	0.166	2.265	0.164	2.380	0.166	2.564	0.160
Adjusted R^2	0.62		0.63		0.66		0.67		0.64		0.62		0.61	

1/ Omitted categories: for degree, "high school degree;" for occupation, "other white collar;" for sector, "other services;" for region, Nordrhein Westfalen.

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