

Wage Rigidity in West Germany: A Comparison With the U.S. Experience

Even though inflation seems to be well under control in West Germany, many policymakers and economists continue to be pessimistic about the ability of the economy to sustain a substantial domestic demand expansion. To a large extent, such pessimism is based on the view that the German economy is afflicted by severe labor market rigidities which leave virtually no scope for expansionary policies. Presumably the concern is that any demand expansion, even at today's record high unemployment levels, would simply rekindle inflation without significant gains in output and employment.¹

This article provides some fresh evidence on labor market rigidities in West Germany, focusing on one of the most important aspects of these rigidities, namely the behavior of wages. Specifically, using both aggregate and disaggregate (industry level) data, this article examines the flexibility of wages in West Germany. Although other sources of rigidity may be potentially important, the relatively narrow approach of this article is appropriate, given that the behavior of wages is

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¹Several arguments are believed to be relevant, the most common of which rests on the view that wages respond asymmetrically to conditions of excess demand and supply in the labor market. If wage structures are rigid, then wages are unresponsive to unemployment and unlikely to fall in the appropriate market-clearing way. If unemployment is classical (resulting from already too high wage levels) and wages are rigid, then a demand expansion could perversely result in higher wages (and prices) with little or no gain to output and employment. Wage flexibility prevents this scenario from occurring because unemployment exerts continued downward pressure on wages at the same time that the economy is expanding

widely believed to be the driving force for most other labor market rigidities.²

Because it is difficult to gauge precisely what flexibility implies for wage responsiveness, we evaluate wage behavior in West Germany, and wherever possible contrast it with wage performance in the United States. We begin with the assumption, inspired by the literature in this area, that real wages in the United States through the 1970s and 1980s have been flexible and that the pattern of U.S. real wage response has aided output and employment expansion.³

The analysis in this article extends the work of previous studies in its consideration of industry wage behavior and in the distinct way it treats pre- and post-OPEC aggregate wage behavior. The key finding of our analysis is that wages in West Germany, at both the aggregate and industry level, have been flexible in recent years. As a consequence, the pace of real wage growth in West Germany has moderated, and unit labor costs have grown at about two-thirds the U.S. rate since 1980.

The industry patterns offer new and additional evidence of wage flexibility. Industry wages were highly responsive to industry-specific performance in West German manufacturing, particularly in the short run. Over the long run the data indicate greater flexibility in

²This article does not evaluate, to any significant extent, more microeconomic aspects of labor market rigidities, such as minimum wage laws, unemployment insurance rules, labor mobility, and the costs of hiring and dismissing workers.

³There are many studies which characterize real wages in the U.S. as flexible. The most comprehensive study, and reference to other work in this area, may be found in M. Bruno and J. Sachs, *The Economics of Worldwide Stagflation* (Cambridge: Harvard University Press, 1985).

the United States, although to a degree not statistically distinguishable from West Germany. Taken as a whole, the data offer convincing evidence that industry wages were flexible in West Germany.

The next section of this article compares aggregate wage, productivity, and cost trends in the United States and West Germany, and evaluates the labor demand and supply pressures influencing equilibrium wages in each country. The following sections explore aggregate and industry wage flexibility in West Germany, drawing comparisons with the U.S. experience. A brief summary of the main findings and their implications for macroeconomic policy are presented in the final section.

The aggregate data: labor supply and demand in wage responsiveness

West German unemployment, unlike unemployment in the United States, has increased since 1982 (Table 1, top panel). Most analysts attribute this divergence to the behavior of aggregate wages and conclude that wages on average in West Germany have been more inflexible downward, preventing labor markets from clearing and resulting in relatively high unemployment.

Since we evaluate wage responsiveness in both the United States and West Germany, it is useful to compare labor market behavior in the two countries. The first question is whether there is anything in the trend of labor supply or demand growth that can explain differences in output and employment growth in West Germany, independent of wage flexibility.

On the supply side, labor market demographic trends do not explain the pattern of West German unemployment. While an influx of female, part-time, youth, or foreign workers could conceivably lead to greater unemployment for any given level of aggregate demand, the evidence suggests that these changes have not been the leading cause of unemployment in West Germany.

Consider for example women in the labor force. While female labor force participation grew rapidly over the 1970s in the United States (increasing from 49 percent in 1970 to 65 percent in 1984), in West Germany over the same period it increased just one percentage point. With only 49 percent of women in the labor force, West Germany has one of the lowest female participation rates in the major European OECD countries.⁴

In the same way that the entry of women may affect the shape or position of the labor supply curve, changes in the mix of part-time and foreign workers may alter aggregate supply. This suggests that the employment data should be adjusted for these workers, to see if the employment record of either country is qualitatively altered. While this adjustment results in a stronger trend decline in West German employment, it has only modest effects on the pattern of employment growth in the United States (Chart 1). As a tool either for smoothing employment or for minimizing employer costs, West German firms have employed considerably more part-time workers than U.S. firms.⁵ Excluding teenagers and older workers from the employment analysis, so that we consider the unemployment patterns of prime age male workers only, leads to the same conclusion—the core of the West German unemployed are permanent labor force members (Table 1, bottom panel).

The broad demographic data do not suggest major differences in aggregate labor supply behavior and therefore probably do not explain relatively higher unemployment in West Germany than in the United States. However, other supply-related factors are relevant. One obvious source of difference could be the unemployment insurance system. In West Germany, income replacement ratios from unemployment insurance are, on average, about two times greater, and the period of entitlement is about three times longer⁶ than

Table 1

Unemployment Statistics

The Civilian Unemployment Rate (annual averages)

	1965-85	1965-73	1974-79	1980-85	1986*
United States	6.2	4.5	6.8	8.1	7.0
West Germany	3.8	1.1	4.1	7.5	9.0

Share of Unemployed Prime Age Male Workers†

(calculated as a percentage of total unemployed)

	1965-85	1965-73	1974-79	1980-85	1986
United States	23.6	20.5	22.3	28.7	30.1‡
West Germany	26.6	22.3	27.6	30.7	32.2§

*Averages include the first ten months of 1986

†Male workers aged 25-54

‡Includes first ten months of 1986

§1985 figure

⁴In the United Kingdom and France, for example, female participation rates in 1984 were 59 and 55 percent, respectively.

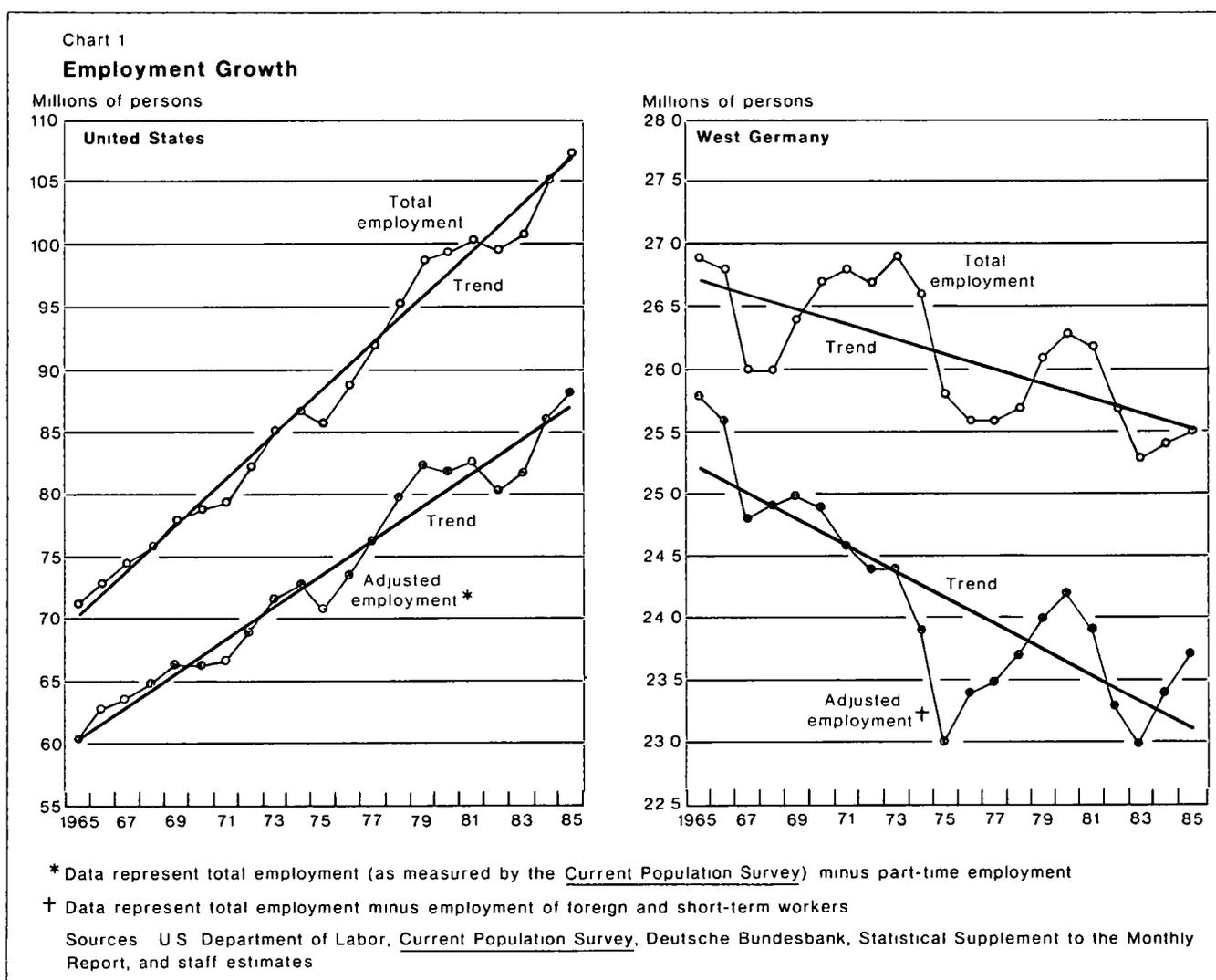
⁵Part-time workers typically are paid less than full-time workers and have fewer fringe benefit provisions. In addition, certain payroll tax exemptions are associated with part-time workers.

⁶The replacement ratio in West Germany for a single worker with average earnings is approximately 65 percent of previous earnings, and benefits last at this rate for three years. By contrast, the same worker in the United States receives an average first-year replacement ratio equal to 35 percent of his base earnings, and benefits are exhausted, on average in the United States, after 52 weeks.

in the United States. As a consequence, costs to the unemployed worker are lower in West Germany than in the United States, and the incentive to remain unemployed is therefore much greater. While the West German unemployment system might account for a higher overall level of unemployment at any point in time, it can not explain the trend through time. West German benefits have traditionally been generous, and the current law has been in effect, roughly without change, since 1969. Therefore, unless a significant change has occurred in the attitude of West German workers toward work, higher unemployment must reflect either lower expected benefits of seeking work or greater inability of the unemployed to find suitable jobs. Statistics on unemployment duration support the view

that there is chronic excess supply in West German labor markets. While only 8.5 percent of West German workers were unemployed for one year or more in 1973, by 1985, 31 percent were unemployed for longer than one year. By contrast, only about 15 percent of unemployed workers in the United States were idle for longer than six months in 1985.

Finally, the relationship between unemployment rates and job vacancies in West Germany (the so-called Beveridge Curve, Chart 2), suggests that the historically high recent rates of unemployment in West Germany are not supply-side induced. Shifts of this curve are associated with structural changes and structural unemployment and are taken to reflect a mismatch of jobs and worker skills, movements along the curve reflect



demand-induced changes. While the curve appears to have shifted in the United States, it is more stable in West Germany. However, the labor market situation in West Germany, as reflected by the position on the Beveridge Curve in the most recent years, has substantially worsened. In 1962, for example, there were more than two vacant jobs for every unemployed West German worker, but by 1985, for every two vacant jobs there were roughly 50 unemployed workers.⁷

Because supply-side developments do not explain why the employment situation is relatively worse in West Germany than in the United States, we next consider the degree to which wages, productivity, and costs may have adversely influenced West German labor demand.

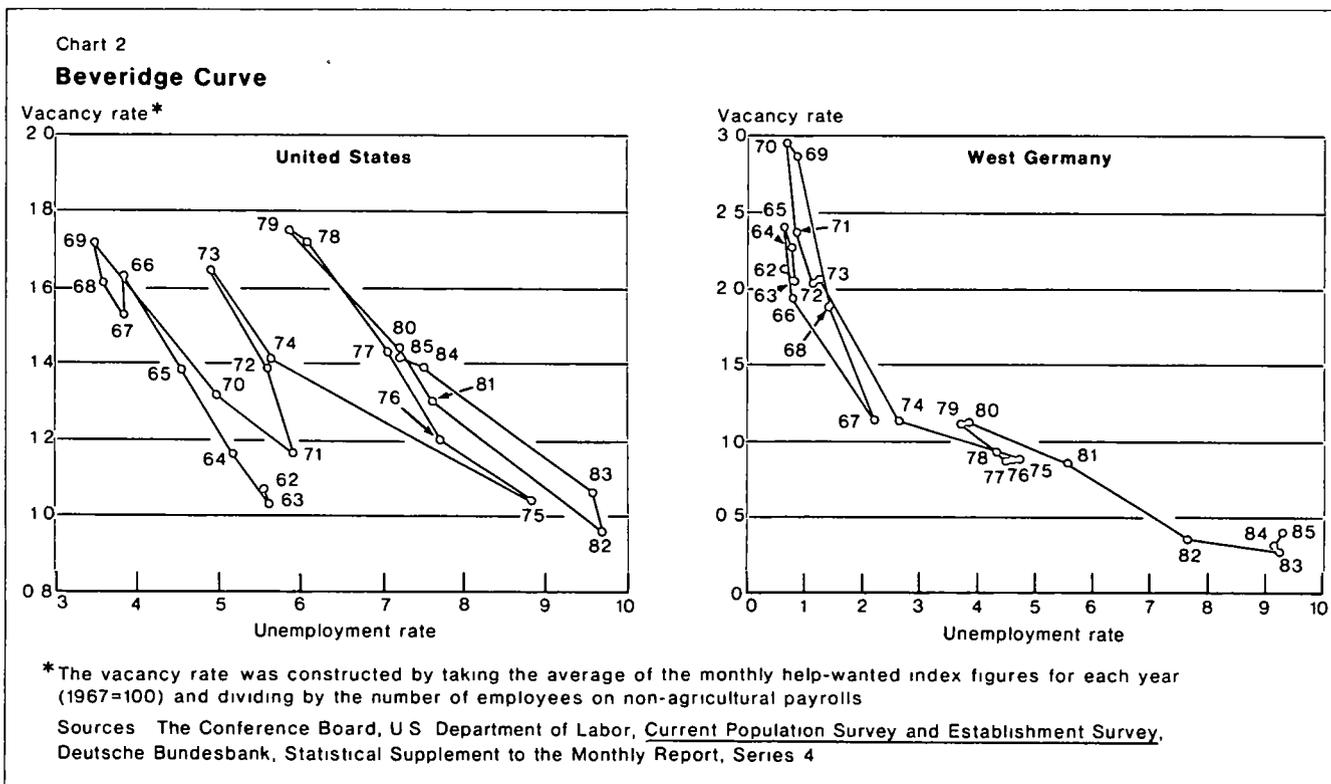
Since the mid-1960s real wages in West Germany have grown at nearly four times the U.S. rate. More moderate

nominal wage settlements in West Germany since 1980 have caused the pace of change in real wages to be more equal in the two countries (Table 2), although the latest available data indicate some change in early 1986. Despite the recent slowdown of real wage growth in West German manufacturing, rapid acceleration in the mid-1960s and early 1970s led to real wages that are now, on average, twice their 1965 level. By contrast, U.S. manufacturing workers now earn wages only about 20 percent higher than their 1965 level.⁸

While the acceleration of wages through the 1970s suggests real wage levels that are both relatively and absolutely high in West Germany, focusing exclusively on the behavior of the wage series masks more important labor market trends. The growth of unit labor costs represents the excess of wage over productivity growth and probably is a better measure of the pressures on

⁷Vacancy data are unreliable and need to be interpreted with care. In the U.S., no vacancy series exists as a time series, so we have used the Medoff technique of adjusting the help-wanted advertising data as a proxy for vacancy rates. In West Germany, vacancies are registered through the German central agency. It is likely that more vacant jobs will go unreported when unemployment is high, since available openings are filled immediately and with ease by employers. For a discussion of the stability of the U.S. Beveridge Curve, see J. Medoff, "U.S. Labor Markets: Imbalance, Wage Growth, and Productivity in the 1970s," *Brookings Papers on Economic Activity*, Vol. 1 (1973), pp. 87-128.

⁸Another potential source of difference between real wage patterns in the two countries results from the importance of minimum wages in influencing the pattern of real wage movement. In West Germany, the union-legislated minimum wage sets an effective floor on real wages at a relatively high level which is binding on the employer. In the United States, by contrast, the legislated minimum wage has been allowed to erode considerably in real terms and nearly all full-time workers in manufacturing currently receive wages well in excess of this level. As a consequence, the U.S. minimum wage is, in practice, not binding on the employer.



prices stemming from labor market conditions. From an employer's perspective, faster real wage growth does not matter nearly as much if it is offset by labor productivity advance. This appears to be the longer run trend supported by the growth pattern of unit labor costs in West Germany (Table 3) While wages accelerated rapidly in West Germany in the late 1960s and early 1970s, and unit labor costs grew somewhat faster than in the United States, by the mid-1970s more modest wage gains in West Germany had reversed the earlier trend. As a result, the cumulative growth of unit labor costs since 1965 has been slower in West Germany than in the United States.

Finally the evidence on wage growth in the non-manufacturing sector is also inconsistent with wages being the key determinant of employment trends in West Germany. Although nonmanufacturing wage growth was somewhat faster in West Germany than in the United States until the late 1970s, it has been more modest in West Germany than in the United States since 1980 (Table 4). Moreover, the pace of nonmanufacturing relative to manufacturing wage growth has been consistently slower in West Germany (Table 4) Despite these trends, nonmanufacturing employment in West Germany has grown at a far weaker pace than in the United States

In sum, the data do not reveal radically different changes in labor market conditions in the United States and West Germany since the 1970s. We next examine whether differences in wage flexibility may lie behind West Germany's poorer output performance and employment growth record

The flexibility of aggregate wages

In this section, we apply some standard measures of wage flexibility to the U.S. and West German data to gauge wage responsiveness in each country. Despite the continuing debate about the relationship between wage flexibility and employment performance, most analysts assume that a more flexible wage system will allow faster and more complete adjustment to economic shocks and will therefore permit faster economic growth and greater levels of employment.

We consider first the simplest and most straightforward measure of wage flexibility. In a flexible real wage system, wages adjust freely to shifts in labor supply or demand, with the result that markets equilibrate quickly. This implies that during periods of labor market flux wages should be more variable in a flexible than in an inflexible system. Given this description, one test of wage flexibility is to calculate the variance of real wage growth around trend. A flexible system should produce high variation generally, with increasing variation during periods of unstable aggregate demand or supply behavior.

Two measures of real wages are used: (a) the real consumption wage, measured as the ratio of nominal wages to the personal consumption deflator and (b) the real product wage, measured as the ratio of nominal wages to the producer price index. These measures show that the variability of real consumption and product wage changes in manufacturing has been generally greater in West Germany than in the United States; the clearest difference between the two countries results from the relative long-run stability of real wage changes

Table 2

Wages in Manufacturing

Nominal Wage Growth in Manufacturing

(average annual rates of change in average hourly earnings)

	1965-85	1965-73	1974-79	1980-85	1986*
United States	6.5	5.5	8.7	5.9	2.1
West Germany	8.5	10.3	8.9	5.4	4.5

Real Wage Growth in Manufacturing†

(average annual rates of change)

	1965-85	1965-73	1974-79	1980-85	1986*
United States	0.7	1.2	0.6	0.1	0.2
West Germany	4.3	6.3	4.1	1.6	5.3

*For the U.S. the figure represents 1986-III/1985-III, for West Germany the figure represents 1986-II/1985-II

†Real wage is calculated by deflating the average hourly earnings index in manufacturing by the implicit PCE deflator

Table 3

Unit Labor Costs in Manufacturing

Growth in Unit Labor Costs

(average annual rates of change in unit labor costs in manufacturing)

	1965-85	1965-73	1974-79	1980-85	1986*
United States	4.7	3.5	8.2	3.2	0.1
West Germany	4.2	5.3	4.2	2.4	3.7

Cumulative Unit Labor Cost Growth

(1965 = 100)

	1972	1975	1979	1986
United States	129.5	164.7	210.0	261.0†
West Germany	136.0	175.1	189.3	224.4‡

*For the U.S. the figure represents 1986-III/1985-III, for West Germany the figure represents 1986-II/1985-II

†Three-quarter average

‡Two-quarter average

Table 4

Wage Growth in Non-Manufacturing Industries

	Wage Growth				Relative Wage Levels*			
	1971-73	1974-79	1980-85	1985	1971-73	1974-79	1980-85	1985
United States†								
Wholesale trade	5.8	7.8	6.5	4.6	0.9	0.9	1.0	1.0
Retail trade	5.3	6.6	4.9	1.5	1.4	1.5	1.7	1.8
Banking	4.8	7.2	8.1	5.7	1.2	1.2	1.2	1.2
Insurance	5.0	6.5	6.6	3.6	0.8	0.9	0.9	0.9
West Germany‡								
Wholesale trade	10.8	7.4	4.2	3.2	1.3	1.3	1.3	1.3
Retail trade	10.5	7.2	3.5	2.7	1.4	1.4	1.5	1.5
Banking	10.4	7.2	4.7	4.5	1.1	1.2	1.2	1.2
Insurance	10.6	8.4	5.1	5.2	1.2	1.1	1.1	1.1

*Relative wages calculated by dividing the wage level in manufacturing by the wage level in each non-manufacturing industry.

†Wage and salary workers

‡Data represent a weighted average of male and female earnings

in the United States (Table 5). This is true generally, both before and after the OPEC oil shocks.

While the variability of wage changes in the United States and West Germany is relatively unaffected by the choice of deflator, the consumption and product wage measures offer independent information about the institutional behavior of wages. Product wages more accurately measure employer costs, high variability in this series may indicate greater flexibility on the part of employers in setting wages. The real wage series deflates nominal wage growth by the personal consumption deflator in each country and therefore reflects the purchasing power gains of nominal wage settlements. If, as many economic models suggest, workers desire a constant stream of real earnings over the course of their working lives,⁹ then variation in this series may be a signal of weakness on the part of workers or unions in securing real wage gains. In any case, the substantial degree of variability in the pattern of West German wage growth is consistent with there being some flexibility in wage setting.

Variation in real wage growth does not necessarily imply that wages were flexible in any economically meaningful way. Evidence of wage responsiveness requires a systematic link between movements in wages and key economic variables. Real wage variability alone does not explain the source of wage movements and therefore cannot provide evidence of any such link.

⁹Implicit contract models of the labor market are based on this assumption. While these models have been criticized on many grounds, including their failure to make an adequate distinction between real and nominal wages, most subsequent work has assumed that it is constancy in real earnings that workers seek in their bargaining demands.

However, our efforts at evaluating the source of wage movements reveal a uniform increase in real wage flexibility in West German manufacturing in recent years.

To demonstrate this flexibility, we estimate equations linking growth rates of average hourly earnings in manufacturing to inflation and unemployment rates. Real wage flexibility is measured by comparing the responsiveness of wages to expected price inflation and the unemployment rate; in a flexible real wage structure, nominal wages react weakly and with a lag to expected price movements but strongly to movements in the unemployment rate. This measure combines the standard view that real wage flexibility results from inertia in the response of nominal wages to prices and the view that wages should be responsive to excess demand or supply in the labor market. In addition, combining the two flexibility criteria in a single equation yields a measure of the degree of accommodation necessary to keep the inflation rate constant.¹⁰

According to this flexibility measure, real wages have been increasingly responsive in West Germany in recent years (Box 1). The main reason is the lack of any strong response of wage growth to prices in West Germany over the recent period, most likely reflecting the deterioration of real wage growth. In general, the largest difference between the pattern of wage response in the

¹⁰The standard framework for evaluating real wage responsiveness, based on the concept of nominal wage inertia, is discussed in J. Sachs, "Wages, Profits, and Macroeconomic Adjustment: A Comparative Study," *Brookings Papers on Economic Activity*, Vol. 2 (1979), pp. 269-319. An alternative approach, which stresses the role of unemployment, is discussed in D. Grubb, R. Jackman, and R. Layard, "Wage Rigidity and Unemployment in the OECD Countries," *European Economic Review*, Vol. 2 (1983), pp. 11-40.

two countries is in the reaction of nominal wages to expected price movements, not in the overall responsiveness of real wage changes to the unemployment rate. In fact, the response of wages to unemployment in the two countries is similar.

Additional tests of aggregate wage flexibility, based on commonly used variants of the general specification reported here, broadly confirmed these results.¹¹ Our analysis shows that wages in West Germany, while more rigid than in the United States in the early 1970s, were quite flexible by the late 1970s. Previous studies may have failed to isolate this tendency because they did not distinguish the pattern of wages in West Germany in the most recent years.¹²

The flexibility of industry wages

There is no straightforward relationship between aggregate and industry wage flexibility. Aggregate wage flexibility does not necessarily imply that industry wages are free to vary; aggregate wages may be flexible at the same time that institutional restraints prevent industry wages from moving to equilibrate labor markets.

¹¹Including both a productivity growth variable and a dummy variable to serve as a proxy for shifts in the structural Phillips Curve relation did not significantly affect the coefficient estimates on inflation and unemployment in either country. While the productivity term did figure significantly in the West German equations and did raise the explanatory power of the equation, it did not affect the size or significance of either the price expectations or the unemployment variable.

¹²More recent work has concluded that greater wage flexibility characterizes the West German economy today. See F. Klau and A. Mittelstädt, "Labour Market Flexibility," *OECD/IESD Working Papers*, No. 24 (July 1985).

Table 5

Variation* in Manufacturing Wage Growth

	Real Product Wages†		Real Consumption Wages‡	
	United States	West Germany	United States	West Germany
1965-85	2.8	3.5	1.2	3.4
1965-78	3.2	2.8	1.1	3.3
1979-85	2.1	2.4	0.8	1.7
1965-73	2.6	2.6	1.3	3.5
1974-85	3.0	2.6	1.0	2.5
Mean wage growth (1965-85)	0.9	4.6	0.7	4.3

*Calculated as the standard deviation in the arithmetic annual growth rate of average hourly earnings in manufacture

†Deflated by producer price index

‡Deflated by the personal consumption deflator in manufacture

Box 1: Flexibility of Aggregate Wages

Data from 1966-I to 1985-IV were used to analyze wage flexibility in the United States and West Germany. The full period data were analyzed over subperiods chosen to capture the recent changes in nominal wage patterns. Alternative specifications were estimated over each subperiod; the results presented here were chosen for general fit. The equations are specified in four-quarter growth rates of both the dependent and independent variables. The dependent variable in all equations is the change in the natural log (ln) of average hourly earnings in manufacturing. The price expectations variable in all equations is estimated as a fitted lag on past price changes (see A.S. Englander and C. Los, *Federal Reserve Bank of New York Research Paper*, No. 8305, August 1983), and the unemployment rate is the rate for the economy as a whole. All equations have been corrected for fourth-order serial correlation. Standard errors appear in parentheses below the estimated coefficients.

Table A

Dependent Variable: Change in AHE (ln AHE_t - ln AHE_{t-4})

	United States			West Germany		
	(1)	(2)	(3)	(4)	(5)	(6)
	1966-85	1974-85	1979-85	1966-85	1974-85	1979-85
\dot{p}_t^e	813 (158)	949 (232)	954 (031)	118 (335)	761 (193)	392 (215)
$\ln U_t$	-034 (011)	-050 (016)	-052 (005)	-034 (005)	-046 (006)	-047 (005)
Flexibility coefficient	23.91	18.98	18.35	34.71	16.54	8.34
R ²	255	387	980	351	700	760
SSE	003	001	0002	017	005	003
DW	1.95	1.97	2.23	1.73	1.89	2.01

The wage flexibility coefficient listed in Table A above is calculated by taking the ratio of the long-run elasticity of wages with respect to past price inflation and the elasticity of wages with respect to the unemployment rate. This statistic may be interpreted for any given price change as the change in the ln of unemployment necessary to keep the nominal wage constant (i.e., to ensure a fall in the real wage). It is similar to the measure adopted in D. Coe, "Nominal Wages, the NAIRU and Wage Flexibility," *OECD Economic Studies*, No. 5 (Autumn 1986).

The economic shocks of the 1970s affected specific industries differently. The ones that relied to a large extent on oil as an input to production were made particularly vulnerable. In a well functioning competitive economy, the response of industry wages to short-term disturbances should reflect specific performance—in industries particularly affected by the OPEC oil shocks, wages should have fallen.

There are good reasons to suppose that the industrial wage structure of West Germany might be rigid. While collective bargaining is highly decentralized in the United States (with thousands of individual establishments setting wages), it is highly centralized in West Germany (with nearly all bargaining taking place at the industry and regional levels). While unions are a minority presence in the U.S. workplace (with less than 25 percent of U.S. workers covered by a union contract), they are a powerful majority presence in West Germany (where more than 90 percent of workers are employed in sectors covered by collective bargaining agreements).¹³ The combination of these two facts implies, all else the same, that the structure of wages among industries is more likely to be rigid in West Germany than in the United States.

To test for wage rigidity among West German industries, we have assembled manufacturing data at the two-digit level for the United States and West Germany on wages, prices, productivity, and employment.¹⁴ These data allow for a new analysis of wage flexibility within the economy that yields independent and more detailed information about the behavior of labor markets than can be learned from the aggregate data. To the extent that industry wages are flexible, structural labor market problems are more likely to be short-lived, since wages help to allocate labor appropriately among industries in the long run.

Industrial wage flexibility is defined as the responsiveness of industry wages to industry-specific performance. A rigid industrial wage structure has fixed

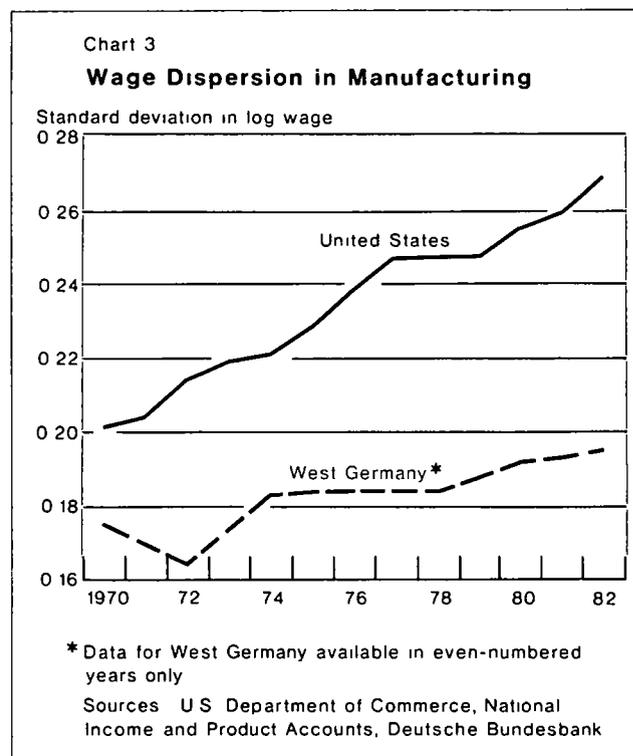
¹³For the statistics on union coverage and membership, see the chapter on West German collective bargaining in OECD, *Collective Bargaining and Government Policies in Ten OECD Countries* (Paris, 1979). In West Germany there is a statistically large difference between the number of workers who are union members (which for years has been slightly greater than one-third of all workers) and those who are covered by union contracts. By contrast, the difference between union coverage and union membership is modest in the United States.

¹⁴Data for West Germany were kindly provided by the West German Bundesbank for 29 manufacturing industries over the period 1970-82. The U.S. data, except where otherwise noted, cover 22 manufacturing industries at the two-digit level and are from the National Income and Products Accounts Series. We focus on industry wage patterns over the period 1970-82 in this section because more recent data for West German industries are not available.

relative wages, so that existing wage differences are preserved across industries through time. In the most rigid structure, wages among industries would respond equally to economy-wide productivity shocks but would show little or no response to industry-specific productivity movements. As a consequence, wages, on average, would grow equally among industries through time.

One obvious indicator of a country's industrial wage flexibility is the degree of dispersion, a statistical measure of the inequality of wages among industries, adjusted for the mean wage level. One way of deriving this measure is to calculate the standard deviation of the natural log of wages among industries in each year; a more flexible system should produce greater variation generally, with a trend of rising dispersion during periods of economic flux. Higher levels of wage dispersion imply greater industry wage flexibility because wages reflect the specific circumstances of each industry. By contrast, modest and constant levels of dispersion signal equality in wage response characteristic of an inflexible system.

Industrial wage dispersion has risen in the United States and West Germany since 1970 (Chart 3). While the rise is far more pronounced in both level and trend in the United States, the rise in West Germany stands out, particularly in light of its highly centralized system of collective bargaining. The trend in the West German



series is also unusual in comparison with other major European countries, where industry wage dispersion has either remained roughly stable or declined somewhat¹⁵

While rising wage dispersion is consistent with wages being flexible, it does not indicate that wages are flexible in responding to economic events. Rising dispersion can occur due either to a mixing of industries within the wage ranking, or to an increase in the differential between wages paid to workers in high and low wage sectors. It may reflect institutional changes in union concentration or bargaining power within industries, or it may be economically motivated by structural changes in industry-specific productivity performance. Therefore, we measure the responsiveness of industry wages to evaluate the importance of economic factors in determining industry wage patterns.

Industry wage movements are important in labor markets because they send signals to workers about where and how to supply their labor. If workers have complete information about wages in other industries and can move freely among industries to higher paying jobs, then wages will be responsive to specific productivity developments in the short term but will respond only to economy-wide productivity shifts over longer periods. This pattern results because over the long run the mobility of workers should be sufficient to equalize inter-industry wage differences

With this basic model of labor market behavior as a guide, we measure statistically the responsiveness of industry wages to specific performance using data on wages, productivity, and output prices at roughly the two-digit level for both U.S. and West German manufacturing industries. Equations linking annual changes in industrial wages to annual changes in industrial productivity and output prices show that wages in West Germany were very responsive to short-run shifts in industrial performance (Box 2). While the magnitude of this effect may appear larger in West Germany than in the United States (based on the productivity estimates), these differences are not statistically significant. In any case, the U.S. and West German regressions are not strictly comparable—the industry samples differ, and the periodicity of the data is not the same.¹⁶ For each

country, analysis reveals that short-run movements in industry wages were highly responsive to industry performance, suggesting that industry labor markets functioned efficiently in both West Germany and the United States in the short term.

If workers are not free to move across industries, then industry wages should be correlated with specific productivity and price movements over the long- as well as the short-run. For example, in a labor market with many barriers to switching jobs and obtaining training, labor mobility will be constrained. Thus in institutional settings where union rules govern the workplace, industry wage patterns may reflect both short- and long-term industry productivity trends

A second test of industrial wage flexibility confirms the view that industrial performance influences wages over longer periods of time (Box 2). Over the period 1970-82, we found that long-run industry wage movements were related to long-run industry productivity movements in both the United States and West Germany. To the extent that industrial productivity movements reflect inter-industry changes in the skill mix, sex mix, or occupational structure, the link between productivity and wages can be understood as a competitive labor market revaluation of the rewards to work. If instead productivity movements reflect long-run labor demand shifts or movements along the demand schedule, then the explanation must be either that worker mobility is imperfect across sectors or that wage patterns reflect at least some noncompetitive factors.

If worker mobility is limited across industries, then any shift in the industry labor demand curve must result in wage movement in the same direction—thus wage and employment growth should be positively associated among industries. In the United States, this does not seem to be the case, suggesting that the pattern of industry wage response is unlikely to be driven by long-run constraints to worker mobility. In West Germany, by contrast, industries with above average wage growth over the period 1970-82 exhibited above average employment growth. Although suggestive at best, these results imply that workers may, in fact, be inhibited from moving freely across industries in West Germany.¹⁷

While both disaggregate tests reveal that industry wages in West Germany were flexible over the 1970s

¹⁵See L. Bell and R. Freeman, "Does a Flexible Industry Wage Structure Increase Employment? The U.S. Experience," *National Bureau of Economic Research Working Paper*, No. 1604 (April 1984). The analysis in this section for the U.S. replicates the Bell-Freeman tests and methodology.

¹⁶Because West German industry wage, productivity, and price data were available for even-numbered years only, we report two-year changes in wages and sectoral performance in Box 2. While statistical tests may be unreliable due to lack of comparability in data and specification across countries, standard tests reject the notion that wage response was different across countries, largely due to the relative imprecision of the West German estimates.

¹⁷To evaluate the relationship between wage and employment response, we correlated long-run changes among the 22 U.S. manufacturing industries over the period 1970-82, and performed the same analysis among the 29 West German industries. The correlation statistics in these tests were equal to -0.09 for the United States and 0.24 for West Germany. More complete analysis of the implications of these tests for labor market performance can be found in L. Bell, "Essays in Labor Market Efficiency and Comparative Macroeconomic Performance," Ph.D. dissertation, Harvard University (June 1986).

Box 2: Flexibility of Industry Wages

Industry-specific data for manufacturing industries from 1970-82 were used to analyze industrial wage flexibility in the United States and West Germany. The data were estimated linking both short-run changes in wages by industries (a panel study of 29 industries for West Germany and 22 U.S. industries) and long-run 13-year changes in wages among industries (a cross-sectional study of wage behavior). Annual data were used for the analysis in all cases. The dependent variable is the change in the natural log of the wage in the manufacturing industry, and the independent variables include industrial productivity and output price changes, which serve as proxies for industrial performance. The generally lower explanatory power of each test is standard to cross-sectional wage regression. Standard errors appear in parentheses below the estimated coefficients.

Short-run flexibility

Standard competitive theory requires that industry wages be responsive to short-run movements in industrial performance, as a means of allocating labor efficiently across sectors. To test for short-run industry wage flexibility, we link annual changes in industry wages to annual changes in industry value productivity (two-year changes for West Germany due to data limitations), which we decompose into industry productivity per worker and output prices. Our results (Table B) indicate a statistically significant degree of wage responsiveness in both West Germany and the United States.

Table B

Dependent Variable:

Short-run change in wage by industry ($\ln w_{it} - \ln w_{it-1}$)

	United States		West Germany	
	(1)	(2)	(3)	(4)
$\Delta \ln (VA/L)_t$	101 (017)		238 (031)	
$\Delta \ln (Q/L)_t$		039 (019)		334 (044)
$\Delta \ln P_t$		191 (021)		184 (035)
R ²	118	235	262	299
N	252	252	174	174
Mean ($\Delta \ln w$)	077	077	155	155
S D ($\Delta \ln w$)	021	021	049	049

Long-run flexibility

Although the standard competitive model assumes that industrial wages will be linked only to aggregate performance in the long term, industrial performance may in fact influence industrial wages over longer periods of time. To test the extent to which industrial performance matters for industry wages over the long run, we link long-run changes in industry wages over the period

1970-82 to long-run changes in specific performance, measured in the same way as above. This test shows that value productivity movements by industry influenced industry wages in both countries. Decomposing these effects, we find that while industrial output prices influenced wages in the United States (column 2), they were insignificant in determining wage patterns in West Germany (column 4). In both countries, industry wage movements were positively associated with industry productivity movements.

Table C

Dependent Variable:

Change in wage by industry ($\ln w_{i,1982} - \ln w_{i,1970}$)

	United States		West Germany	
	(1)	(2)	(3)	(4)
$\Delta \ln (VA/I)_i$	384 (113)		143 (078)	
$\Delta \ln (Q/L)_i$		338 (142)		206 (081)
$\Delta \ln P_i$		411 (125)		083 (080)
R ²	378	388	110	230
N	21	21	29	29
Mean ($\Delta \ln \text{wage}$)	077	077	078	078
S D ($\Delta \ln \text{wage}$)	009	009	006	006

Pooled analysis

The equations listed below test for the statistical equivalence of the industry wage-productivity link in the United States and West Germany by pooling data from the two countries. The equations are estimated using Weighted Least Squares (with the assigned weights equal to the standard errors from each of the individual regressions), and the relevant explanatory statistics have been recalculated to conform with the scaling procedure. We cannot reject, based on the pooled regression results below (data are from equations 2 and 4, Table C above), the hypothesis that the relationship between industry wages and industry-specific performance is statistically the same in the United States and West Germany over this period. The implication of this test is that industry wages were equally flexible in the two countries.

Pooled U.S.-W.G. (R² = .234)

$$(1a) \Delta \ln (w_i) = 277 \Delta \ln (Q_i/L_i) + 209 \Delta \ln (P_i) \\ (075) \qquad \qquad \qquad (072)$$

Individual U.S.-W.G. (R² = .322)

$$(1b) \Delta \ln (w_i) = 206 \Delta \ln (Q_i/L_i)_{wg} + 338 \Delta \ln (Q_i/L_i)_{us} \\ (090) \qquad \qquad \qquad (125) \\ + 083 \Delta \ln (P_i)_{wg} + 411 \Delta \ln (P_i)_{us} \\ (089) \qquad \qquad \qquad (110)$$

The F-statistic for this test is 2.85

and early 1980s, they do not explore the *relative* flexibility of the U.S. and West German industrial wage structures. To make this comparison, it is necessary to pool the data for West Germany and the United States and estimate a single equation. In fact, the link between industry wage and value productivity movements was statistically indistinguishable in the two countries (Box 2). Even though industry output price movements had a stronger impact on wages in the United States, the combined impact of the industry performance variables in influencing wages was the same in the two countries.¹⁸ Therefore, the response of industry wages to industry performance was, on average, just as strong in West Germany as in the United States. In sum, the industrial wage structures in both countries were flexible.¹⁹

¹⁸This test is not perfect. Missing variables may be of greater significance in determining wage behavior in one country than in another and therefore may bias the coefficient estimates and the statistical tests. For example, changes in the inter-industry mix of skill, sex, or age that are correlated with both industry wages and industry productivity will bias the point estimates on the industry performance variables. If the omission of these controls is more important in one country, then the pooled results will be biased as well.

¹⁹This section explores inter-industry wage patterns, but does not evaluate *intra*-industry wage flexibility. There is reason to believe that the pattern of wages within industries among establishments is far more rigid in West Germany than in the United States. While firms in the United States vary their wages according to size, with large firms paying 25 to 30% more than small ones, firms in West Germany are generally forced to pay the union scale wage, and there is no sizeable difference between what small and large firms pay their workers. For a comprehensive discussion of firm size effect, see *OECD Economic Outlook* (September 1985).

Conclusion

The key finding of our analysis is that wages, at both aggregate and industry levels, have been flexible in West Germany, at least since the late 1970s.

There appear to be strong similarities in both real and nominal aggregate wage flexibility in the United States and West Germany. While real wages responded equally to unemployment rates in both countries, nominal wages responded to prices differently. Although price inflation was an important influence on nominal wage growth in West Germany through the late 1970s, it has been relatively unimportant recently.

At the industry level, wages were flexible in the United States and West Germany as well. In the two countries, over both the short- and long-run, industry wage movements reflected changing industrial performance and showed some variation. Despite major differences in industrial structure and collective bargaining institutions in the United States and West Germany, the degree of wage responsiveness at the industry level was similar.

Since wages in the United States and West Germany have behaved similarly in recent years, wage rigidity seems unlikely to be the dominant cause of persistently high West German unemployment. Even more importantly, with reduced wage rigidity since the late 1970s the West German economy may be able to sustain a faster demand expansion over the next year or two without risking a resurgence of inflation.

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