

NBER WORKING PAPER SERIES

INSTITUTIONAL ASPECTS OF  
HIGH UNEMPLOYMENT IN THE  
FEDERAL REPUBLIC OF GERMANY

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Working Paper No. 2241

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
May 1987

We thank Ulrich Cramer of the Bundesanstalt für Arbeit, Janet Norwood of the US Bureau of Labor Statistics, and Wolfgang Pege of the Institut der Deutschen Wirtschaft for providing us with data. The research reported here is part of the NBER's research program in International Studies and project in Research Initiatives. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

The sustained rise in German unemployment since 1973 poses a problem of critical importance for the world economy. Fewer than two decades ago, Germany boasted an average unemployment rate of under 1% and imported labor to relieve chronic labor shortages. By the mid-1980s, unemployment had risen to over 8 percent of the labor force. This paper investigates some of the reasons for the secular rise in unemployment. We find that while deficient aggregate demand can probably explain some of the current joblessness, the secular rise in unemployment has consisted primarily of an increase in the equilibrium rate of unemployment. We also find little evidence that this increase is due to changes in frictional unemployment. Rather, after reviewing institutional details of the labor market in Germany, we identify various impediments to the kinds of structural adjustments that have operated to maintain a fairly constant equilibrium rate of unemployment in the United States.

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The sustained rise in German unemployment since 1973 poses a problem of critical importance for the world economy. Fewer than two decades ago, this country boasted an average unemployment rate of under 1% and imported labor to relieve chronic labor shortages. By the mid-1980s, unemployment had risen to between 8 and 9 percent of the labor force--levels not observed since the early years of the Marshall Plan. These developments are even more striking when compared with the United States, where average unemployment rates have been higher but have also recovered from the last two recessions (see Table 1). Furthermore, much of the secular increase in West German unemployment took place during periods of relatively high economic growth.

This paper investigates some of the reasons for the secular rise in West German unemployment. We find that while deficient aggregate demand can certainly explain some of the current joblessness in the country, the secular rise in unemployment has consisted primarily of an increase in the equilibrium rate of unemployment. We find little evidence that this increase is due to changes in so-called "frictional" unemployment, such as increased job search due to lower costs of search or an increase in the variance of economic shocks impinging on the economy. Rather, we find more convincing evidence of institutional forces impeding labor market adjustments, most importantly, the inability of labor markets to adjust and reallocate labor through wage changes. For example, it is widely recognized that large adverse shocks to

Table 1  
Inflation and Unemployment in West Germany  
and the US, 1960-1986

	FRG		US	
	$\pi$	U	$\pi$	U
60-64	2.4	0.6	1.2	5.5
65-69	2.4	0.8	3.4	3.7
1970	3.3	0.8	5.9	4.8
1971	5.4	0.9	4.3	5.8
1972	5.5	0.8	3.3	5.5
1973	6.9	0.8	6.3	4.8
1974	7.0	1.6	10.0	5.5
1975	5.9	3.6	9.2	8.2
1976	4.3	3.7	5.8	7.6
1977	3.6	3.6	6.5	6.9
1978	2.8	3.5	7.5	6.0
1979	4.0	3.2	11.3	5.8
1980	5.5	3.0	13.5	7.0
1981	6.3	4.4	10.2	7.5
1982	5.3	6.1	6.0	9.5
1983	3.3	8.0	3.1	9.5
1984	2.4	8.5	3.4	7.4
1985	2.2	8.6	3.5	7.1
1986	-0.2	8.3	1.5	6.9

Source: OECD Main Economic Indicators.

manufacturing labor demand in the 1970s occurred in most of the industrial economies. In the United States, these shocks were mediated in part by falling manufacturing sector wages (especially in nonunion firms) and by an expansion of employment in the lower-wage service (or tertiary) sectors. After reviewing the institutional detail of labor markets in the Federal Republic of Germany, we find strong evidence of impediments to the kinds of structural adjustments that have taken place in the US over the past fifteen years.

We begin our analysis in Section 3 by considering the response of a two sector economy that sustains an adverse shock to its manufacturing sector, in the presence of a lower-wage service sector. Following the literature, we presume that wages in the manufacturing sector are set by unions, introducing some degree of real wage rigidity. We assume alternatively that the low wage service sector is characterized by market clearing, or by rigid wages as in manufacturing. The rigid wages in the service sector may be due to the presence of unions, to legal restrictions on wage reductions, or to an effective floor on wages determined by the level of unemployment benefits.

We then present evidence that the US is more like the economy characterized by labor market clearing in services, whereas the Federal Republic of Germany resembles more nearly the case of rigid wages. This is most obviously reflected in the absolute and relative growth of the service-producing sectors in the two countries. An increase in the extent of wage dispersion across the sectors, which is predicted for the first economy, only

obtains in the US. Additionally, labor productivity in the service sectors has grown at considerably lower rates in the US, as would be expected with rigid wages in services in Germany and flexible wages in services in the US. The differential productivity performance is mirrored (as predicted by the model) by the differing paths of capital-labor ratios in the service sectors of the two economies.

While we cannot make an exact apportionment of the reasons for non market-clearing in West German service sectors, we suspect that two primary factors block a US-style expansion of the tertiary industries in West Germany. First, the remarkable growth of unionism in the service branches in Germany has resulted in significantly better wage outcomes than in the corresponding US sectors. Furthermore, institutions peculiar to West Germany increase the impact of collective bargaining agreements on costs: union agreements are implicitly or explicitly extended to cover nonunion workers, and increasingly in those sectors that would be expected to absorb redundant labor released by the production sectors. Second, there is evidence that the unemployment insurance system may preclude wage reduction in the West German service sector, since compensation in these sectors would often be dominated by unemployment benefits as has been argued by Minford (1985).

#### 1. The Rise in the NAIRU in the Federal Republic of Germany

The recent experience in Western Europe and West Germany in particular pose a serious challenge to the conventional "natural

rate of unemployment" (or "non-accelerating inflation rate of unemployment," the NAIRU) paradigm first proposed by Milton Friedman (1968), which is widely considered an important point of agreement among macroeconomists. Since the natural rate of unemployment is normally regarded as relatively stable and determined by factors that evolve only slowly over time, advocates of the typical natural rate view must view the rise in European unemployment as the outcome of "depression" conditions induced by sharp declines in aggregate demand, in conjunction with the presence of nominal rigidities or expectational error. Several arguments, however, suggest that this view is incorrect; rather, the secular rise in unemployment rates in the Federal Republic of Germany has largely represented movements in the natural rate itself.

This conclusion is generally supported by analysts who have attempted to estimate the West German NAIRU directly. Layard et.al. (1984) report an increase of the natural rate in Germany from 1.3% in the late 1960s to 6.2% over 1981-1983; Coe and Gagliardi (1985) find an increase from 0.9 to 8.0%; Franz (1985) estimates a NAIRU as high as 8.9% if obsolescence effects of the capital stock are included. In contrast, estimates of the equilibrium unemployment rate in the US has remained fairly stable over the past decade, increasing by no more than 2% between the late 1960s and the early 1980s (Coe and Gagliardi 1985).

Using two different techniques, we estimated the path of the NAIRU in the US and West Germany over the past twenty-five years. The first simply uses estimates of the barebones "accelerationist

equation," which relates the rate of acceleration of the price level to the deviation of current unemployment from the NAIRU, with the latter proxied by a constant plus a fourth order polynomial in time. Specifically, we use OLS to estimate

$$\pi_t^c = \beta_0 + \beta_1 \pi_{t-1}^c + (1-\beta_1) \pi_{t-2}^c + \beta_2 U_t + \Omega_t \quad (1)$$

where  $\Omega_t = \alpha_1 t + \alpha_2 t^2 + \alpha_3 t^3 + \alpha_4 t^4$ ,  $U_t$  is the OECD standardized unemployment rate,  $t$  is time, and  $\pi_t^c$  is the rate of change in the consumer price indices. If inflationary expectations are formed via a weighted average of past inflation rates with weights summing to unity, this equation may be derived from an expectations-augmented Phillips curve relation. An estimate of the NAIRU can be obtained each period by setting  $\pi_t^c = \pi_{t-1}^c = \pi_{t-2}^c$  and calculating

$$-(\hat{\beta}_0 + \hat{\Omega}_t) / \hat{\beta}_2,$$

where hats denote estimates.

As a more conservative alternative, we used a frequency domain procedure that assumes that deviations of actual from equilibrium unemployment only occur in the context of the business cycle. Movements of unemployment at low frequencies represent equilibrium movements, and at high frequencies, movements in the cyclical unemployment rate. We first difference the standardized unemployment rate series, decompose the data into its frequency components via Fourier transform, and then mask all components at periodicities of eight years or lower. An inverse Fourier transform was then applied to the data, which are then summed

Table 2  
OECD Standardized Unemployment Rates  
and estimates of NAIRU, US and FRG†

	65-69	70-74	75-79	80-85	81	82	83	84	85
FR Germany									
NAIRU1	0.8	1.8	3.0	6.1	4.8	5.5	6.4	7.4	8.6
NAIRU2	1.3	1.6	2.7	4.5	3.6	4.2	4.8	5.3	5.7
SU	0.8	1.0	3.5	6.4	4.4	6.1	8.0	8.5	8.6
United States									
NAIRU1	4.5	5.6	6.9	7.4	7.4	7.5	7.4	7.4	7.2
NAIRU2	4.5	5.4	6.0	6.6	6.6	6.7	6.8	6.7	6.6
SU	3.7	5.3	6.9	8.0	7.5	9.5	9.5	7.4	7.1

†SU is the OECD standardized unemployment rate; NAIRU1 is estimated using estimates of (1); NAIRU2 is the cumulative sum of the low frequency components in first differenced SU. See the text for details.

from some base year, here 1960. The results of both procedures using OECD standardized unemployment rates are displayed in Table 2.<sup>1</sup>

The results obtained by the two procedures are similar, and support the results of other studies cited above. Whereas unemployment in the United States has returned frequently to the neighborhood of 6-7%, there is strong evidence that the equilibrium rate in the Federal Republic of Germany continues to rise. Our NAIRU estimates for Germany, which range from 5.7 to 8.6% in 1985, also suggest the existence of some "Keynesian" unemployment that might be vitiated by a demand expansion (in that the actual unemployment rate exceeds the NAIRU); nonetheless, in both cases this represents a deviation around a secularly rising equilibrium rate. Unless the paradigm of an "equilibrium rate" is completely abandoned, deficient aggregate demand explanations of European unemployment proposed by Tobin (1984) are only capable of explaining a fraction of the fifteen year secular rise in West German unemployment.

Our assessment of the NAIRU is consistent with evidence on capacity utilization rates, total capacity, and the evolution of

<sup>1</sup>These procedures are of course not without important econometric and conceptual problems. Sargent (1971) has correctly criticized constraining the sum of weights on lagged inflation rates to unity as a potentially suboptimal forecast. The first procedure ignores simultaneous equations bias that arises if the inflation rate and the unemployment rate are jointly determined. It is also inconsistent with strong forms of rational expectations; clearly, if policies inducing a constantly increasing inflation rate over time were fully anticipated by agents, the economy would not systematically deviate from the NAIRU. The second procedure may underestimate the NAIRU if some of its movements occur over the business cycle itself, i.e., if "hysteresis" considerations are operative.

the capital stock. As Modigliani (1986) et.al. have noted, the EC countries in general have sustained a severe reduction of productive capacity, and Burda (1987) has documented a large cumulative reduction in the size of manufacturing capital stocks relative to trend in these countries. As is evident from Table 3, the aggregate capacity utilization rate in West German manufacturing in 1986 is equal to its 1979 value, whereas US plant utilization remains significantly below its previous peak. This suggests that despite high unemployment rates in Germany, firms are operating at full capacity. Moreover, if we estimate equation (1) and using a capacity utilization rate rather than the unemployment rate, we find a stable relationship (insignificance of time shift variables) between German inflation and German capacity utilization, instead of the unstable relationship between inflation and unemployment. The results presented in Table 4 imply that unemployment rates in Germany, in contrast to capacity utilization rates, contain relatively little information about the overall state of unused resources in the economy. They also suggest that firms have adjusted their long-run capacity to levels consistent with a high equilibrium level of unemployment.

## 2. The Role of Frictional Unemployment

One explanation for the marked rise in equilibrium unemployment in the Federal Republic of Germany is predicated on the view that most unemployment is frictional; the rise in unemployment is posited to involve prolonged job search or greater

Table 3  
Capacity Utilization Rates (%)

	1975-79	1979	1985	1986
FR Germany				
OECD	80.5	84.7	84.3	84.7
Kiel	97.0	99.8	97.5	99.1
US (OECD)	81.0	86.0	80.3	79.8

OECD: Main Economic Indicators; Kiel- Institut für Weltwirtschaft,  
Kiel.

Table 4  
Phillips Curve Estimates<sup>a</sup>  
(1960-85)

	FR Germany		USA	
constant	0.030 (3.4)	-0.214 (-5.0)	0.116 (3.9)	-0.252 (-4.3)
$\pi_{t-1}^c$	0.807	1.301	1.153	1.287
$\pi_{t-2}^c$	0.193 (1.2)	-0.301 (-2.3)	-0.153 (-1.0)	-0.287 (-1.9)
SU	-1.351 (-5.7)	-	-1.521 (-4.6)	-
CAP	-	0.003 (5.5)	-	0.004 (4.8)
t	-0.010 (2.5)	-0.001 (-0.3)	-0.017 (-1.8)	-0.024 (-2.5)
t <sup>2</sup>	0.001 (2.4)	6.824D-05 (0.1)	0.002 (1.4)	0.003 (-2.3)
t <sup>3</sup>	-7.693D-05 (-2.3)	7.580D-06 (0.2)	-6.930D-05 (-0.9)	-1.579D-04 (-2.1)
t <sup>4</sup>	1.517D-06 (2.4)	-3.114D-07 (-0.5)	7.981D-07 (0.6)	2.596D-06 (1.9)
$\bar{R}^2$	0.614	0.595	0.482	0.508
S.E.	0.007	0.007	0.015	0.015
D-W	2.32	2.72	1.90	2.34

SU = OECD Standardized Unemployment Rate  
CAP = OECD Capacity Utilization Rate

<sup>a</sup>Equation (1) is estimated in the form

$$\pi_t^c - \pi_{t-1}^c = \beta_0 - (1 - \beta_1)(\pi_{t-1}^c - \pi_{t-2}^c) + \beta_2 U_t + \Omega_t$$

See text for definitions.

job mismatch. In this section we attempt to examine the plausibility of theories of frictional unemployment in accounting for the path of official unemployment, vacancies and employment growth in West Germany, relying on comparisons of West German and US labor market experiences.

The preponderance of evidence on the provision of unemployment benefits (Layard, et. al, 1984, Burtless 1986) indicates little significant increase in replacement ratios over the past two decades. Thus the simple hypothesis that a reduction in search costs is responsible for increased joblessness seems unlikely. A more plausible model of frictional unemployment first proposed by Lucas and Prescott (1974) emphasizes the role of sectoral shifts in the determination of the NAIRU for given preferences of agents, and has been recently investigated by Lilien (1982) using US data. He considers an economy consisting of several sectors, each buffeted by idiosyncratic disturbances. Since agents require time to move, retrain, and learn about new opportunities, the natural rate is a function of the variance of sectoral shocks, and thus sectoral hiring rates. Not only is the "churning" view of unemployment theoretically appealing, but seems at first glance a plausible characterization of the facts. Employment in Germany's industrial sectors (construction, energy, and manufacturing) has declined significantly since the first OPEC shock. Moreover, these shocks have fallen asymmetrically on the country, affecting the coastal and Ruhr regions more adversely than Bavaria and Baden-Württemberg.

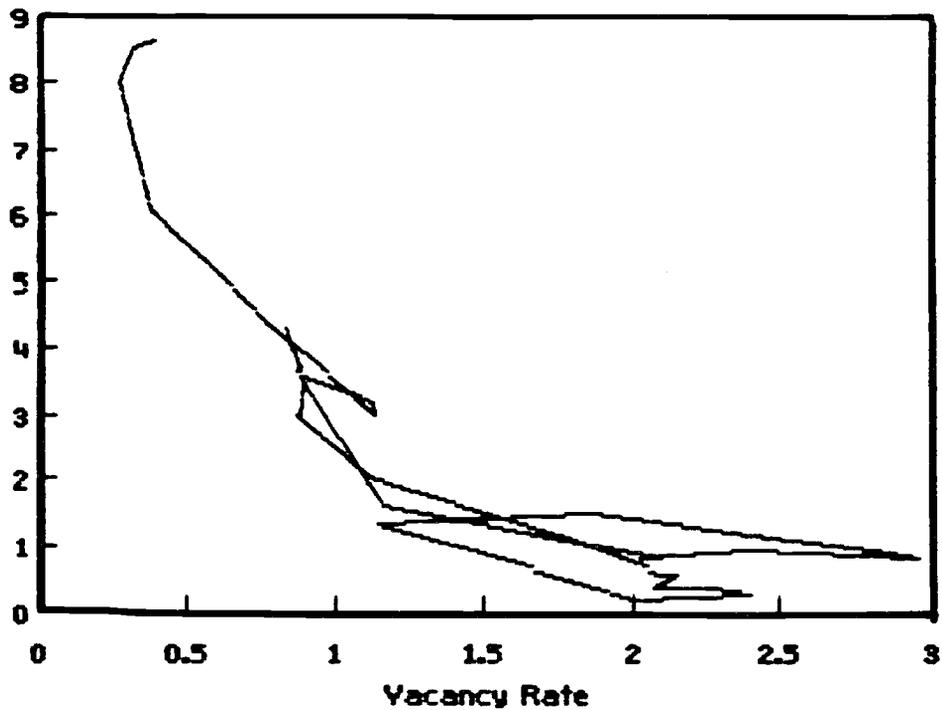
The wealth of macroeconomic evidence, however, provides little support for job mismatch explanations of the rise in the West German NAIRU. At the most cursory level, the shift in the so-called "Beveridge curve" that several analysts have identified in the US is not evident in Germany.<sup>2</sup> To recall, the Beveridge curve is the hypothesized inverse relationship between vacancies and unemployment for a given set of structural, taste, and institutional parameters. This association might be due to shifts in aggregate demand with nominal rigidities or to labor cost conditions impinging on the demand for labor, shifts of which presumably would move the number of unemployed individuals and available jobs in opposite directions. On the other hand, shifts in tastes for leisure versus consumption, institutionally or technologically determined search and opportunity costs, unemployment insurance, as well as the sectoral composition of the economy, will shift the entire Beveridge curve inward or outward. Figure 1 graphs vacancy and unemployment rates in West Germany and the US over the period 1960-1984. The U-V locus in the Federal Republic appears far more stable than its US counterpart! While the Beveridge curve itself has only modest theoretical foundations (see Jackman, Layard, and Pissarides 1984), movements in the curve in Germany provide no support for the hypothesis that at given unemployment rates the number of jobs unfilled has risen substantially.

If, as suggested by Lilien (1982), the source of increased

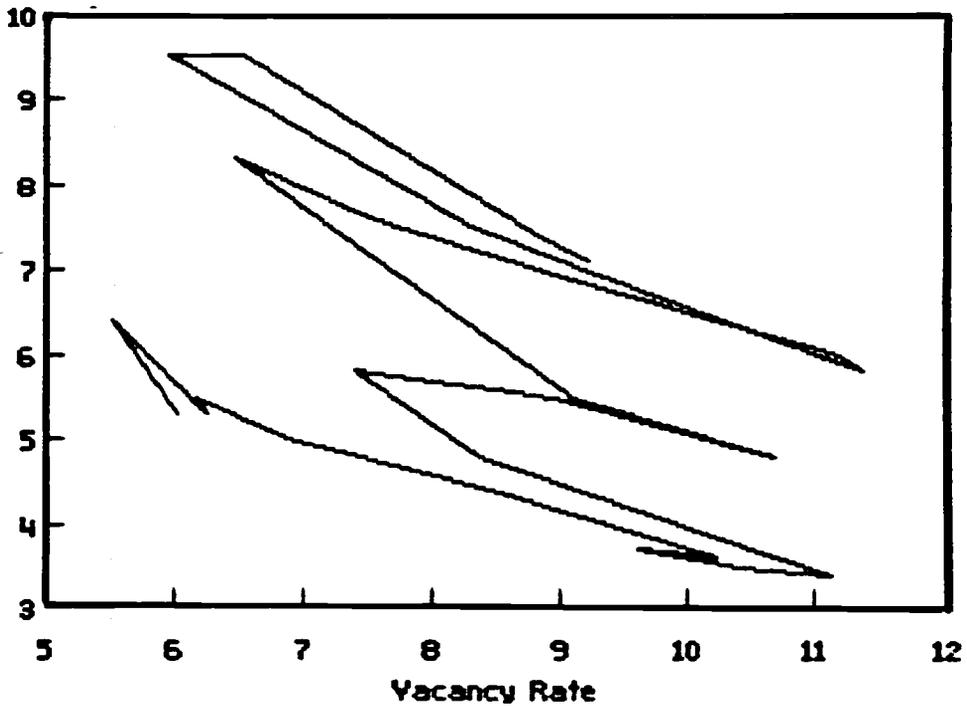
<sup>2</sup>See Medoff and Abraham (1982) and Summers (1986) for evidence on the US; for corroborating evidence on Germany, see Bell (1986).

Figure 1  
Beveridge Curves in FR Germany and the US.  
1960-1984

Unemployment Rate



Unemployment Rate

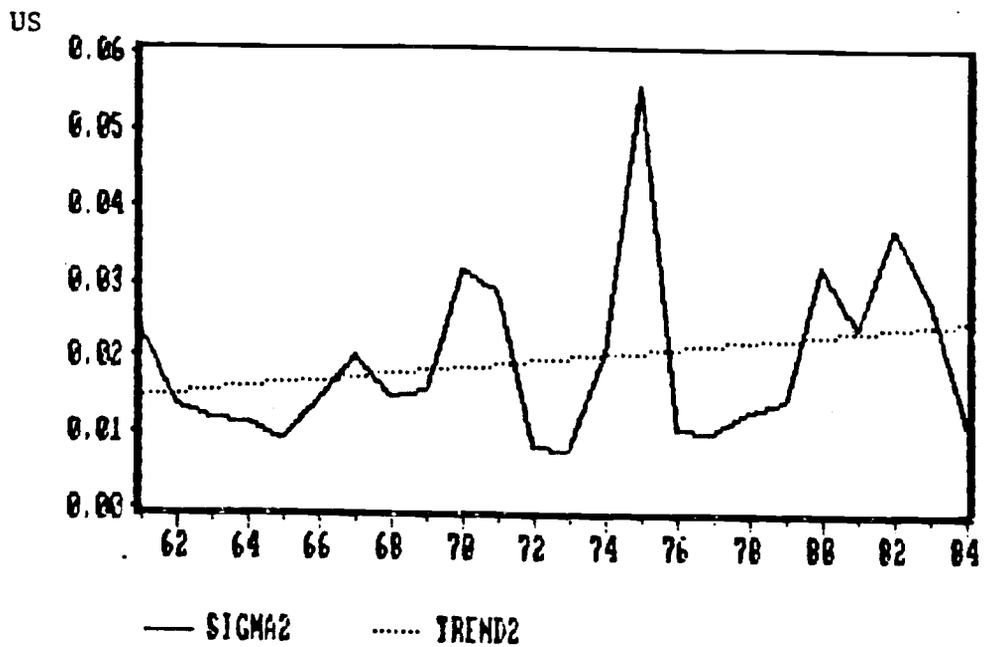
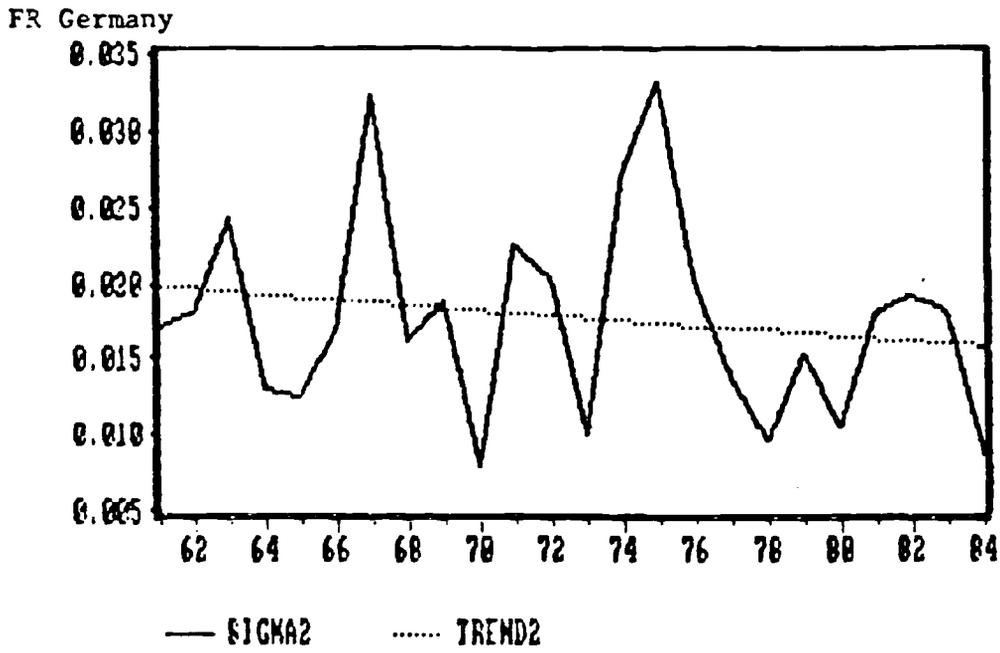


frictional unemployment is an increase in variability of sectoral economic activity, it may be poorly detected in aggregate data (and Figure 1). A necessary condition for the "increased churning" hypothesis to hold, however, is an increase in the sectoral variability of hiring rates. For each year in the period 1961-1984, we computed the standard deviation of sectoral employment growth rates for the following group of seven private one-digit industry groups: energy/gas/mining, manufacturing, construction, wholesale and retail trade, transport and communication, finance, and other private services.<sup>3</sup> The results are plotted in Figure 2. While rising volatility of sectoral employment in the US seems to support Lilien's hypothesis, this volatility has been declining in West Germany, suggesting if anything a lack of sufficiently offsetting growth in expanding sectors. We shall return to this important point below.

This conclusion is supported by evidence on regional and occupational mismatch. If the Lilien hypothesis were true, the recent decade should have been characterized by an increase in the imbalance across regions and occupations as agents wait, retrain, or search. Applying a measure suggested by Jackman, Layard and Pissarides (1984) to unemployment and vacancy data from the Federal Employment Office (Bundesanstalt für Arbeit), we examined the change over time in "mismatch." The relevant statistic is

<sup>3</sup>As Lilien (1982) notes, employment growth rates are an appropriate proxy for hiring rates if layoff and quit rates are stable.

Figure 2  
Sectoral Variability of Employment Growth,  
FR Germany and US, 1961-1984



$$.5 \sum_i |u_i - v_i|$$

where  $u_i$  and  $v_i$  are the share of total unemployment and vacancies of the  $i$ th state, occupation, or industry. The mismatch measure may be interpreted as the percentage of workers who must move, change occupations, or change industry to equalize the ratio of unemployment to vacancies in groupings. Time profiles of occupational (39 categories), regional (10 Länder), and industrial (10 sectors) mismatch are displayed in Table 5. Our results on occupational mismatch are similar to those of Layard, et.al. (1984) for the UK; we find a significant decline (roughly 50%) in occupational mismatch over the period 1979-1984. We do find a significant increase in regional mismatch over the past decade. This supports generally anecdotal evidence on regional immobility attributed to unemployment insurance, restrictive mortgage contracts, and strong aversion to changing residence. For a country not much larger than the state of Oregon, this may be surprising; nonetheless, even if 20% of all unemployed Germans did move to high-vacancy Länder, they would still face an official vacancy-unemployment ratio of nearly 1:25!

Clearly, these numbers should be considered with some caution. First, unemployment data from West Germany are reported unemployment only and neglect unemployed individuals not registered at the local employment offices. Second, vacancy data cannot capture all offers made, and many offers are made directly to job seekers without assistance of the state-provided matching services. Nonetheless, if the link between reported vacancies and

Table 5  
Occupational, Regional, and Industrial  
Mismatch, 1975-1984

Year	By:		
	Region (10)	Occupation (39)	Industry (10)
1975	9.4	—	—
1976	10.0	—	—
1977	12.3	—	—
1978	13.7	—	—
1979	15.9	35.4	10.9
1980	15.8	23.7	8.7
1981	16.2	23.1	12.6
1982	16.4	22.8	16.2
1983	17.1	19.2	12.4
1984	21.0	18.2	7.3

Source: Arbeitsstatistik für 1984, Bundesanstalt für Arbeit (Federal Labor Office). Index is  $.5\sum |u_i - v_i|$ , where  $u_i$  and  $v_i$  are the  $i$ th region, occupation or industry percentage share in total unemployment and official vacancies, respectively.

actual offers is stable, we can learn something about the preferences of and opportunities available to job searchers.

If one dismisses changes in worker preferences as the primary cause of the rise in the natural rate of unemployment in West Germany, the culprit must be an insufficient number of jobs to employ the labor force normally willing to work at the current constellation of factor prices. This suggests a malfunctioning of the labor market, i.e., wages are not adjusting sufficiently to equilibrate demand and supply of labor and are above their market clearing levels for some or all sectors in the Federal Republic of Germany.

### 3. The Non-Adjustment of Wages: Theory

It is widely recognized that the 1970s were characterized by a series of adverse shocks to the demand for labor in all advanced industrialized countries: two oil price increases and a still largely unexplained productivity slowdown. In Europe, this was compounded by a well-documented increase in labor taxes. The "wage-gap" literature has uncovered important linkages between the post-shock performance of the Western industrial economies and the response of their labor market institutions (and real wages) to these developments. Moreover, the literature has rediscovered the real wage-employment relationship in European economies and a central role for aggregate supply in the

evolution of European output and employment in the 1970s.<sup>4</sup>

What is the response of an economy to a decline in its terms of trade, an adverse shift in total factor productivity, or some other adverse shift to the demand for labor in its manufacturing sector? Under such circumstances, the scope is limited for real wage increases in manufacturing without negative effects on employment, and the level of wages consistent with high employment may actually decline. If, however, the manufacturing sector is unionized, these wage reductions may not be forthcoming. It is well-recognized that under a wide range of conditions, models of monopoly union behavior imply a rigid real consumption wage, or at least a rigid markup over the best alternative available in the uncovered sector or the level of unemployment benefits.<sup>5</sup> The union may be willing to accept some unemployment among its members in return for preserving a high real wage. Labor will be released from the manufacturing sector.

Barring wage reductions in the sector that sustain the shock, either through direct concessions or an increase in the fraction of nonunionized employees in manufacturing, there will be a contraction of manufacturing employment. Redundant labor will be absorbed by the nonunion or uncovered sector, where wages will

<sup>4</sup>See Sachs (1983), Artus (1984), Bruno and Sachs (1985), Newell and Symons (1985), Adams, Fenton, and Larsen (1986).

<sup>5</sup>The seminal articles are McDonald and Solow (1981) and Oswald (1982); see also Bruno and Sachs (1985), chapter 9 and Oswald's 1985 survey article. In the benchmark case, if utility of the representative member has constant relative risk aversion and the elasticity of labor demand is constant, the optimal union wage is a fixed markup over the non union alternative wage or the unemployment benefit.

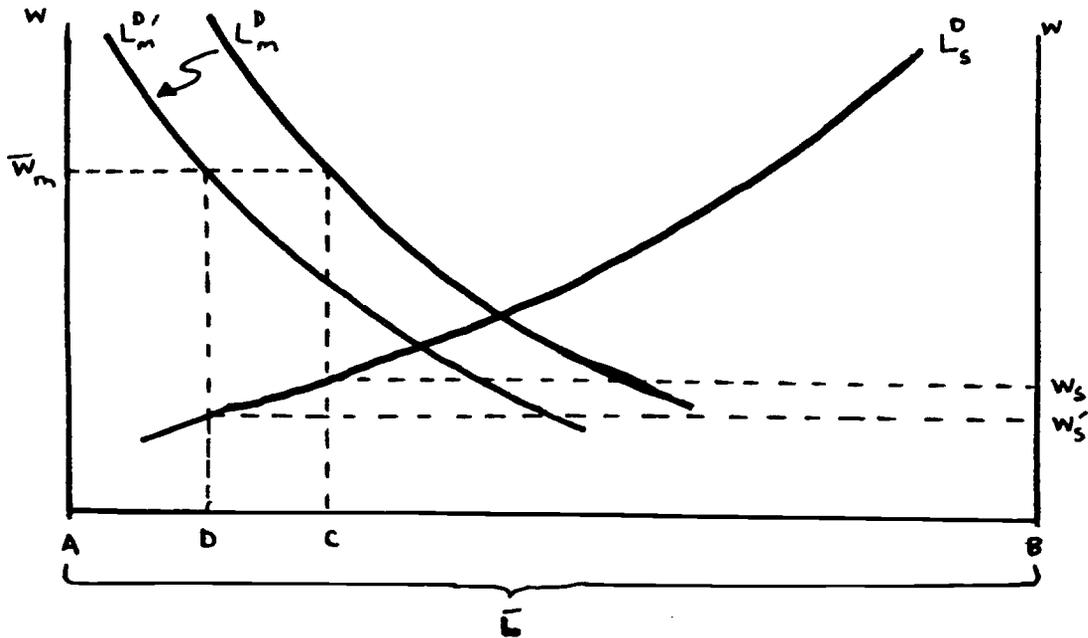
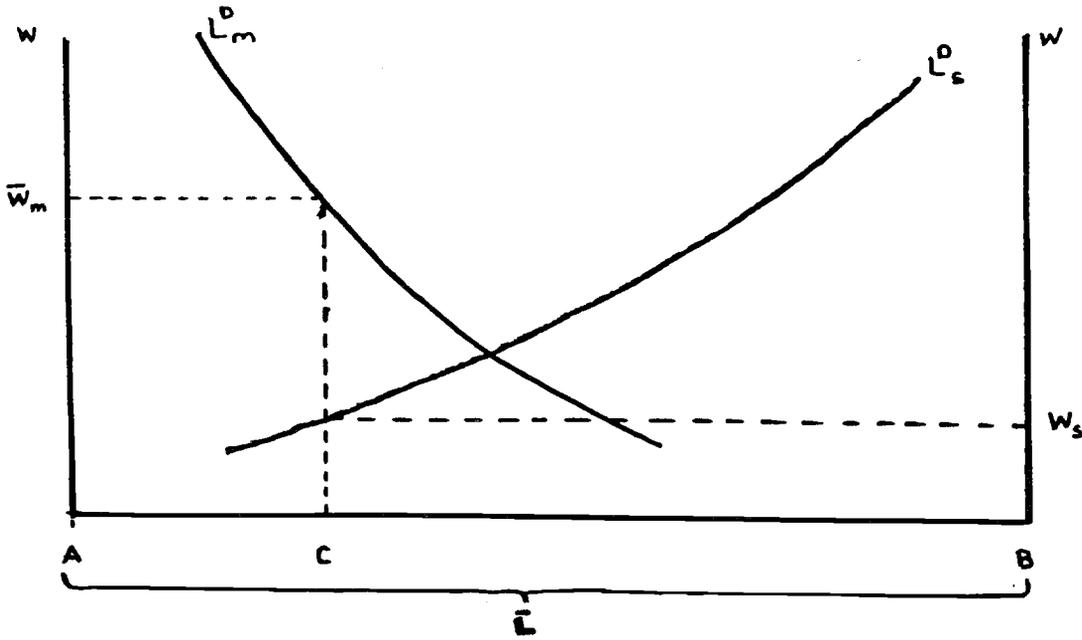
adjust downward to clear the labor market. In the US, the service sector, which is little unionized, is a likely place to absorb much of the surplus labor. It is significant that all net US employment growth has occurred in the service sectors, where trade unions are of negligible importance.<sup>6</sup>

We depict this two sector adjustment in the panels of Figure 3. Labor is homogenous and supplied inelastically by households in quantity  $\bar{L}$ , the length of the segment AB, which can be employed in either sector. In the absence of market restrictions, a single wage would clear the labor market. Suppose, however, that a union sets wages in the manufacturing sector at  $\bar{W}_m$ ; consequently employment in manufacturing is AC. Excess labor is absorbed by the other sector, so employment in the tertiary sectors is BC, at wage  $W_s$ . The response of this economy to a leftward shift of  $L_m^D$  is displayed in the second panel of Figure 3. Employment in services increases from BC to BD, manufacturing employment declines from AC to AD and the service sector wage declines from  $W_s$  to  $W'_s$ . In practice in the US,  $W_m$  itself is not fully rigid, especially due to the presence of a non-union manufacturing sector, so that adjustment takes place through a reduction in  $W_m$  and  $W_s$ .<sup>7</sup>

<sup>6</sup>Freeman and Medoff (1984) report unionization rates of 34% and 48% in US manufacturing and transport/communications/public utilities, respectively, compared with 10% in trade, 4% in FIRE (finance, insurance, and real estate), and 7% in other services.

<sup>7</sup>If the service sector wage comprises an important component of the alternative wage available to union members, the decline in the service sector wage may lead to a reduction of union wage demands in manufacturing, even if there is no non-union manufacturing subsector. This would reduce, but not wholly eliminate, the reduction in manufacturing employment and the decline in  $W_s$ .

**Figure 3**  
The Two Sector Model with Wage Rigidity in Manufacturing  
and Wage Flexibility in Services

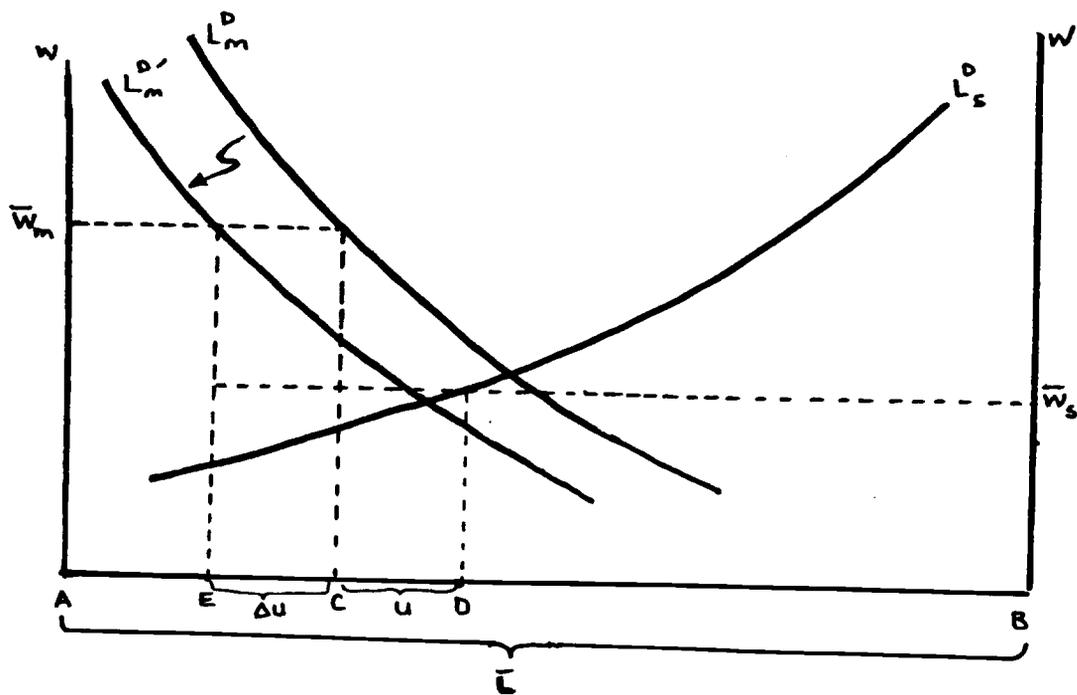
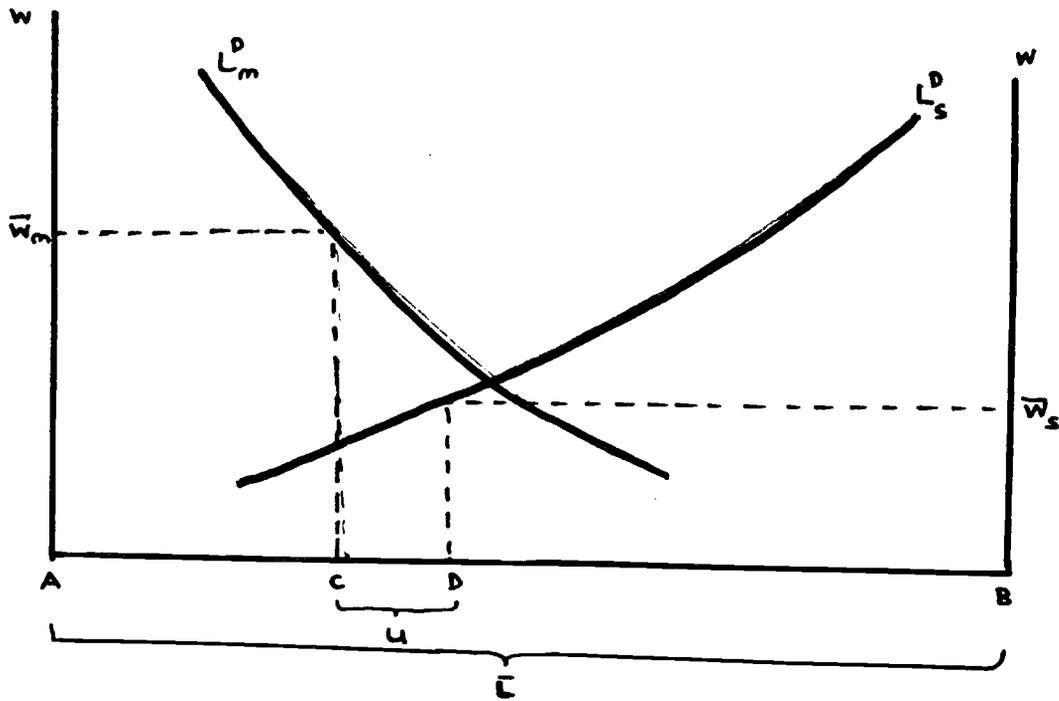


The labor markets in the Federal Republic of Germany will in general adjust with less flexibility to labor demand shocks. First, wages in the manufacturing (unionized) sector will likely decline less to increased unemployment than in the US. Second, the sectors considered uncovered in the US may also be unionized, or may for institutional reasons be required to pay some minimum wage. Third, even if these sectors are not unionized, unemployment insurance or welfare assistance may set a floor on the extent to which wages in these sectors can fall. These impediments prevent sufficient adjustment of nonunion, nonmanufacturing wages to absorb displaced workers.

Consider the panels of Figure 4, which depict the initial equilibrium of such an economy and its response to an adverse labor demand shift in manufacturing. In contrast to the wage-adjusting economy, the economy in Figure 4 does not possess an absorbing service sector. Instead, real wages are prevented from adjusting, and there is an emergence of unemployment, given by the segment CD in the first panel. In this economy, the unemployment rate, rather than the relative wage differential, responds to disturbances. When  $L_m^D$  shifts leftward to  $L_m^{D'}$ , unemployment increases from CD to ED. By assumption, relative wages across the two sectors remain the same.

Even if there is no union in the other sector, the provision of unemployment insurance (UI) can have a similar impact on the response of an economy to a shock to its higher wage manufacturing sector. A sufficiently high unemployment benefit for newly unemployed workers released from the manufacturing sector could

Figure 4  
 The Two Sector Model with Wage Rigidity in both Sectors



introduce a lower bound on wages in the nonunionized service sector. In one sense, this unemployment is voluntary, since unemployed individuals are indifferent between working in the service sector and collecting UI benefits; if there is some probability of ultimate recall, their expected utility may be higher in the latter state. On the other hand, actual positions are never offered and would never appear in official vacancy data.

Our simple model contains several strong predictions. In an economy with labor market clearing in services and a rigid wage in manufacturing, one should expect service sector employment to rise both absolutely and relative to manufacturing. In an economy with restricted adjustment in services, service sector employment will increase only in relative terms. The size of the service sector in terms of value added will respond similarly. Second, wage rigidity in manufacturing will imply an increase in nominal wage dispersion in the economy with market clearing. This follows from the fact that the uncovered sector wage must fall to clear the labor market. In the second economy, unemployment rises, but relative wage dispersion by assumption is unchanged. Third, service sector labor productivity in the first economy should decline in tandem with the service sector wage, as should the capital-labor ratio. Capital intensity in services will be higher in the second economy. In the next section, we will show that both institutional and labor market evidence strongly suggest that the US is well-characterized by the market clearing version of the model, while the Federal Republic of Germany is closer to the rigid wage version.

#### 4. Evidence for the Model

##### 4.1. Institutional Evidence

An understanding of institutions is a sine qua non for meaningful analysis of the evolution of wages and employment in the Federal Republic of Germany, since the institutions are quite different from their counterparts in the US. To begin with, collective bargaining process in Germany is highly regularized and legally circumscribed. Wage negotiations take place on an industry rather than craft level through seventeen national labor unions of the umbrella organization, the Deutscher Gewerkschaftsbund (DGB), which at yearend 1985 had roughly 7,720,000 members. Representing the employer's side is a collection of about 1000 "employer associations" organized as the BDA (Bundesvereinigung der Deutschen Arbeitgeberverbände). While agreements are ultimately concluded at the regional and sometimes at the plant level, the constituent national unions publicize a wage demand at the outset of the annual bargaining round that serves as a standard for subsequent negotiations.

Perhaps the most significant (and most frequently ignored) feature of collective bargaining in West Germany that distinguishes it from the US is the possibility for wage agreements to be declared "generally binding" for all employees and all enterprises in a sector, regardless of union membership or whether the firm is a member of the employers'

confederation (Allgemeinverbindlichkeitserklärung).<sup>8</sup> Although closed shop is expressly forbidden by law, either side of a wage contract can petition the state (Land) labor minister for an extension of the contract terms to all workers and enterprises, as long as more than 50% of all workers in the relevant sector are employed by firms that were a party to the original agreement.

The extension of wage agreements is an important element of the West German collective bargaining landscape. While in a given year only 10% of all agreements are declared generally binding, they are often nationwide contracts, representing about 20% of all employees in recent years.<sup>9</sup> Schatz (1984) argues that even if agreements are not declared generally binding, the high membership rates of employers in employers' confederations (80-90% in manufacturing) enforces the wage agreement as the de facto minimum wage, since member employers are legally bound by any negotiated wage contract. Insofar as this action serves to "level the playing field" on the labor cost side, there is generally little objection from management of existing firms. It is often suggested that declining industries request extension as a flanking maneuver.

It follows that union membership figures severely

<sup>8</sup>The provision is found in Section 5 of the Tarifvertragsgesetz (Wage Contract Law) of 1969. For references see the OECD (1979) and Boedler and Keiser (1979); Schatz (1984) and Soltwedel (1984) have written on the economic effects of "extension."

<sup>9</sup>See Schatz (1984), p. 25. Moreover, the number of contracts "extended" has risen rapidly, from 173 contracts in 1968, to 448 in 1975, to 563 in 1986.

underestimate the power of West Germany's industrial unions. Although the percentage of union membership hovers between 30 and 40% of dependent-status employment, more than 90% of all German workers are employed in sectors covered by collective wage agreements!<sup>10</sup> In contrast, the choice of union representation in collective bargaining in the United States is resolved in establishment level elections. Since union shop generally applies, there are few free riders and organization levels closely approximate coverage by wage contracts.

Significantly, collective bargaining and its "minimum wage" characteristics extend to occupations and sectors which are generally nonunion in the US. While blue collar membership in DGB affiliated unions has remained constant over the past 15 years, white collar union membership has risen by more than 35%.<sup>11</sup> The fastest growing DGB affiliate, Gewerkschaft Handel, Bank, und Versicherung (HBV), represents dependent status employees in the trade and finance sectors. Although its membership of 370,000 (yearend 1985) represented only about 10% percent of all dependent employees in those sectors, it bargains on behalf of the nationwide workforce in both banking and insurance, and has been able to conclude state-wide wage agreements in the wholesale and retail trade sectors. The DBG union Nahrung, Genuß, Gaststätte (NGG), has extended its traditionally manufacturing orientation

<sup>10</sup>OECD (1979), and "Tarifvertragliche Arbeitsbedingungen im Jahr 1985," Bundesminister für Arbeit und Sozialordnung, Release IIIa1-31205-2. (January 1986), p.2.

<sup>11</sup>Source: EUROSTAT, Trade Union Membership: Methods and Measurement in the EC, 1985.

towards employment in the eating and lodging establishments, although these contain large numbers of family businesses and foreign workers. Moreover, because the tertiary sectors are characterized by greater numbers of smaller firms and lower membership rates in the employers' associations, the likelihood of an extension is higher; 23% of all "extended" wage agreements, for example, are in wholesale and retail trade.<sup>12</sup> The German Federal Labor Office reports extensions in such diverse service occupations as beauticians, transport workers, employees in the eating and lodging trades, janitors, and security guards.<sup>13</sup>

An important implication of the strong industrial unionism observed in West Germany is that wage agreements tend not to reflect differences in regional labor market conditions. Table 6 documents contractual wages for most highly skilled metal workers in four West German regions with markedly different labor market conditions. Schleswig-Holstein, Hamburg, Bremen, and Lower Saxony have suffered from a decline of shipbuilding and steel industries. In contrast, unemployment in Bavaria and Baden-Württemberg has been significantly lower than the national average, reflecting steady demand for machine tools, automobiles, and high-tech products. Despite widely disparate economic circumstances, IG Metall settlements have varied little across bargaining regions over the past decade. The

<sup>12</sup>See Schatz (1984), p. 26.

<sup>13</sup>See Bundesanstalt für Arbeit, op.cit.,p.3. It should be noted that not all provisions of a wage contract need be extended; nonetheless, wage provisions are the predominant object of extension when the entire contract is not extended.

Table 6  
Metal Workers Contractual Wage Settlements and  
Unemployment Rates, Selected Years, 1975-1984

	1975		1980		1984	
	U	w*	U	w*	U	w*
Baden-Württemberg	3.5	9.49	2.3	11.73	5.6	14.12
Bavaria	5.2	8.83	3.5	12.44	7.8	14.03
Lower Saxony/ Bremen	5.4	9.43	4.7	12.44	12.1	14.03
Schleswig-Holstein/ Hamburg	4.6	9.43	3.8	12.44	10.9	14.03

\* is the contractual hourly wage as per IG Metall regional agreements (DM/hour). U is regional unemployment rate. Source: Bundesanstalt für Arbeit, and Statistisches Bundesamt.

disappearance of significant wage drift over the same period documented by Grundlach (1986) indicates that these wages probably represent binding minima.

We have argued above that another institutional factor that potentially limits the extent to which wages in the tertiary sectors can fall is the provision of unemployment insurance (UI) and related benefits. By creating a floor on wages paid by service-producing industries, the UI system may function much like a union. In Germany this certainly seems feasible: assuming they qualify, unemployed workers receive 63% of their last wage for one year (Arbeitslosengeld), and about 52% for the next year (Arbeitslosenhilfe), followed by a similar rate thereafter (Sozialhilfe). For a comparative overview of the extent and duration of coverage for an average married breadwinner, see Table 7, which we have taken from Burtless (1986). Not only is the West German statutory replacement ratio considerably higher (66 versus 37% of last wage) but the period of coverage is considerably longer (one year with indefinite extension versus 26 weeks). Moreover, Minford (1985) suggests that in Germany actual replacement ratios--the fraction of net take-home pay received by unemployed individuals--normally exceed the official statutory ratios. This is due to fixed components and nonlinearities in the benefit schedules, social welfare supplements, and the tax treatment of the benefit.

We have cited a litany of striking institutional differences between the two economies that have the potential to block salutary labor market adjustments in the service-producing

- Table 7  
A Comparison of Unemployment Insurance  
Benefits in the FR Germany and the US†

	Coverage Ratio <sup>a</sup>	Replacement Rate <sup>b</sup>		Duration of Benefits <sup>c</sup>
		Year 1	Year 2	
Germany	.74 -.80	66%	56%	1 year to indefinite
US	.41 -.50	37%	none	26 weeks

†From Table 9 in Burtless (1986).

<sup>a</sup>Average number of recipients of UI divided by total number of unemployed, 1979-1981.

<sup>b</sup>Net replacement rate in first and second years of unemployment for average age worker who is married to dependent spouse and is without children.

<sup>c</sup>Potential duration of unemployment insurance and follow-up unemployment assistance.

industries. We now proceed to examine actual evidence from the respective labor markets. Specifically, we will focus on (1) the level of real wages in manufacturing and (2) the comparative response of the two economies in the tertiary sectors.

#### 4.2. Evidence from Labor Markets

##### The Nonadjustment of Wages in Manufacturing: The Wage Gap Revisited

The last decade witnessed a resurgence of interest in the role of supply-related factors on growth and employment, and a large literature now exists on the role of labor costs in aggregate supply and the demand for employment.<sup>14</sup> A central theme of these comparative studies is the failure of real wages in manufacturing to moderate sufficiently after a series of inward shifts in the demand for labor. These shifts include the two OPEC shocks, which may be likened to a one-time productivity regress, the secular decline in manufacturing terms of trade brought about by competition from newly industrializing economies, and the worldwide productivity slowdown.

In the last five years, however, the "disequilibrium wage hypothesis" as applied to the European economies has been subjected to increasing criticism. That unemployment continued to rise in recent years despite apparent wage moderation has prompted many analysts to dismiss the relevance of wage levels for the current labor market imbalance.<sup>15</sup> Often cited is the fact that the

<sup>14</sup>See Sachs (1979,1983), Artus (1984), Bruno and Sachs (1985), and Newell and Symons (1985).

<sup>15</sup>See for example Tobin (1984), Bruno (1986), and Gordon (1986).

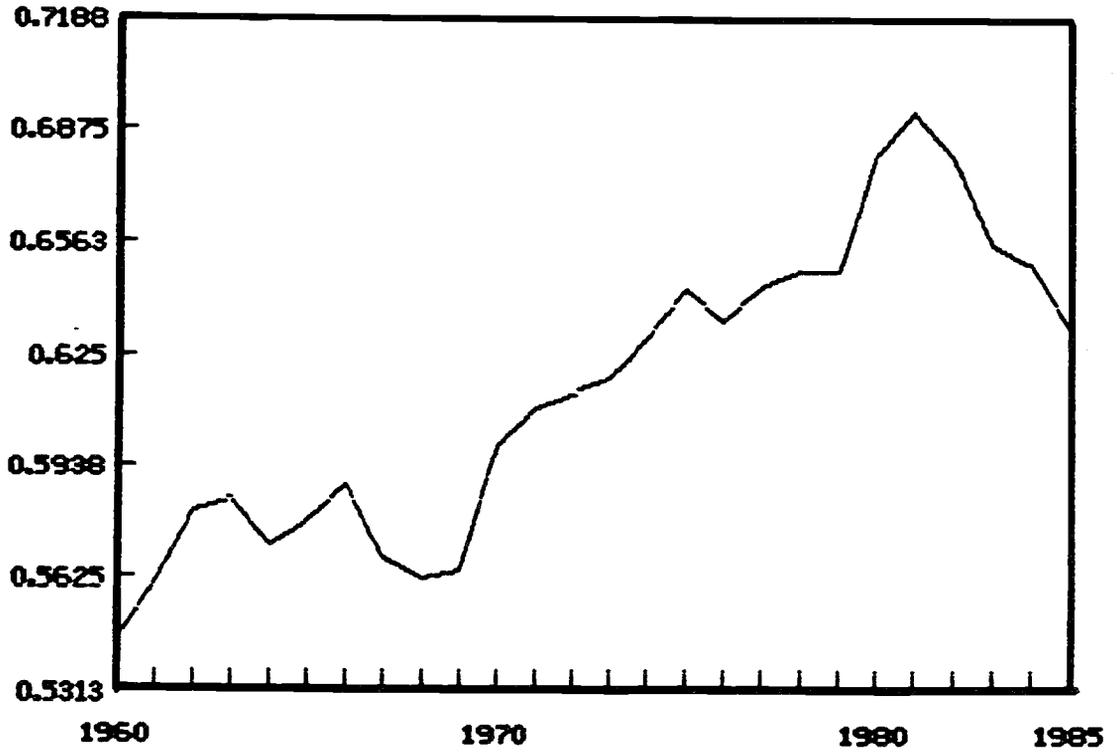
1985 labor share of manufacturing in West Germany --tautologically the ratio of aggregate product wages to average productivity-- has fallen to levels of the early 1970s (see Figure 5). It is important to note that any account of the rise in the NAIRU in the Federal Republic of Germany that stresses the failure of labor market clearing requires a demonstration that real product wages remain above levels consistent with high employment.<sup>16</sup>

It is widely understood, however, that the wage share itself contains no information about the consistency of wages with full employment, since labor's current average product will generally differ from average product at full employment.<sup>17</sup> Some form of adjustment is necessary for effects that additional employment will have on the marginal, and average, product of labor. This correction may have a neoclassical justification; an increase in employment will reduce marginal product, and thereby the corresponding wage at high employment. An alternative correction, suggested among others by Gordon (1986), is motivated by labor hoarding or increasing returns to labor; it implies average productivity may increase with labor input. These adjustments have led to the "wage-gap" measure--defined as the percentage deviation of real product compensation levels from the (estimated) marginal product of labor at high employment. Despite problems involving

<sup>16</sup>This includes the rigid real wage cum terms of trade and productivity slowdown (Sachs 1979 and Bruno-Sachs 1985) as well as membership induced hysteresis (Blanchard and Summers 1986) and the capital shortage (Giersch 1981, Modigliani et.al.1986).

<sup>17</sup>See Sachs (1983), Klodt (1986).

Figure 5  
The Wage Share in Manufacturing.  
FR Germany, 1960-1985



estimation of full employment labor supply, the specification and estimation of an aggregate production function, and the possibility of firm disequilibrium behavior, the use of the wage gap concept by many analysts and the acceptance by the OECD and the IMF of its "diagnostic function" (Bruno 1985) indicates its utility in policy circles.

In his original investigation, Sachs (1983) assumed a Cobb-Douglas technology with Harrod-neutral technical progress. While many have criticized the Cobb-Douglas assumption, which implies constant factor shares in equilibrium, this criticism seems largely unjustified. If the true technology is CES with substitution elasticity less than unity, a Cobb-Douglas assumption actually biases estimated wage gaps downward, or against the conclusion that wages are excessive.<sup>18</sup> The constancy of wage shares throughout the period of capital deepening in the 1960s is well-documented and difficult to explain jointly with the runup of wage shares in the 1970s unless (1) the production technology is Cobb-Douglas with slow adjustment or (2) parameters of technology are themselves changing over time. While both Artus (1984) and McCallum (1985) have estimated low labor-capital substitution elasticities, these estimates may be criticized for not adequately considering disequilibrium firm behavior, since departures from long run equilibrium may involve both Keynesian (labor hoarding) and neoclassical (costs of

<sup>18</sup>Recall that the local elasticity of labor demand when production is CES with fixed capital stock is  $\sigma/s_K$ , where  $\sigma$  and  $s_K$  are the capital-labor substitution elasticity and capital's value-added share; the wage gap is approximately  $w-w^* = s_K/\sigma(n^*-n)$ , where the asterisks denote high or full employment values.

adjustment) aspects. In the Appendix, we employ an error correction model applied to nonstationary time series, (see for example Granger and Engle 1987) to estimate the capital-labor elasticity of substitution from the firm's first order condition for profit maximization. The error correction model has the virtue of imposing the estimated relationship only in the long run, while allowing for short run deviations which are left relatively unconstrained. We find strong evidence for the Cobb-Douglas specification in aggregate West German manufacturing.

Given a Cobb-Douglas specification of technology, how does one estimate the marginal product of labor at "high" employment? Sachs (1983) assumed that employment in 1960, 1973 and 1979 equalled full employment, and interpolated peak-to-peak growth in average productivity as its underlying trend at full employment, which under Cobb-Douglas technology equals marginal productivity up to a multiplicative constant. Since unemployment rates in Germany have failed to fall significantly over the past recovery, it would be incorrect to consider average productivity in the 1980s as deviations around "high employment" levels, just as it is incorrect to consider the unadjusted wage share alone as an indication of real wage levels.<sup>19</sup>

One approach, then, is to compute wage gaps using standard neoclassical assumptions and estimates of relevant Cobb-Douglas parameters, using capital stocks, imputed technical progress and some estimate of "high employment hours." On the other hand, Gordon (1986) has argued that there is a productivity dividend to

<sup>19</sup>Klodt (1986) makes a forceful case along these lines.

increased employment, which has been widely documented in the US data, suggesting a potential upward bias in wage gaps computed under the above procedure. One solution to this problem is to estimate the unconstrained response of average productivity to an increase in labor input. From these estimates the high employment average (and under Cobb-Douglas assumptions, marginal) product can be recovered. This procedure will identify and incorporate a productivity dividend if it exists.

We recomputed wage gaps in manufacturing employing both procedures, under the assumption that high employment labor supply is simply equal to its average value over the 1970s.<sup>20</sup> Both sets of wage gaps are displayed in Table 8. Our results for West German manufacturing continue to indicate a substantial wage gap, and a striking absence of one in the US. We find no evidence of a productivity dividend in West Germany, despite considerable evidence of one in the US, belying Gordon's (1986) recent claim of no difference in the productivity behavior between the US and Europe. Our results thus corroborate those of Artus (1984), Bruno (1986), and Sachs (1986) for West Germany and represent evidence for a number of wage-related theories of unemployment.

A decomposition of the change in the estimated wage gap since 1970 can shed some light on the sources of the persistent wage problem in West German manufacturing. In Table 9, it is clear that while consumption wage growth has slowed considerably, the relative price of manufactures continues to deteriorate, despite a respite of falling oil prices and dollar appreciation. In

<sup>20</sup>For details see the Appendix.

Table 8  
Manufacturing Wage Gaps in the US and West Germany†

	1965-69	1970-74	1975-79	1980-84	1985
FR Germany					
I	0.0	6.0	18.5	25.0	24.9
II	0.0	6.6	15.0	21.5	20.0
US					
I	0.0	4.6	4.9	5.6	3.6
II	0.0	2.3	3.3	-2.9	3.8

† I: Neoclassical wage gaps described in text. II: Wage Gaps with unconstrained adjustment of average productivity at high employment. High employment labor supply is assumed to equal average manufacturing employment (hours), 1970-1979.

Table 9  
Decomposition of Change in the Manufacturing  
Wage Gap (I), West Germany, 1970-1985

	1970-75	75-80	80-85
Total Change:	+9.6	+11.0	+0.6
Due to:			
$+\Delta w/p^c$	+18.5	+17.8	+4.7
$+\Delta p^c/p^v$	+3.4	+4.6	+3.9
$-\Delta(v/l)^f$	-12.3	-11.4	-8.0
of which:			
$\Delta A$	-19.0	-12.9	-18.7
$\Delta(K/L)^f$	+ 6.7	+1.5	+10.7

Source: US Office of Technology and Productivity and OECD, authors' calculations.

addition, growth of estimated productivity at high employment is still lagging, although the imputed rate of technical progress has actually recovered its earlier trend growth; as the table makes clear, the culprit has been the cumulative effects of an investment slowdown over the past decade.<sup>21</sup> Not reflected in Table 9 is yet another important "supply shock." The tax wedge--the component of total compensation represented by indirect taxes, social insurance contributions, and other employee compensation not counted as wages and salaries--has increased from 51.6% in 1975 to 78% in 1984. When all these factors are taken into consideration, the much-touted Reallohnpause (wage pause) of the early 1980s remains insufficient to allow significant new job creation in manufacturing.

#### Services: Where are the Jobs?

We have argued that a variety of mechanisms operating in Germany may have prevented a US style adjustment to the adverse shocks of the 1970s. Considerable support exists for this interpretation of the divergent job creation performance of US and West Germany service economies. Growth in the broadly defined services in the US is widely recognized, and often called the "economic miracle" of the past decade. In a comparison of US and West European employment growth, Wegner (1983) found while that the composition of European employment has shifted towards

<sup>21</sup>See Burda (1987) and Bruno and Sachs (1985). Bruno (1986) presents convincing evidence on the response of investment to the high real wages of the 1970s.

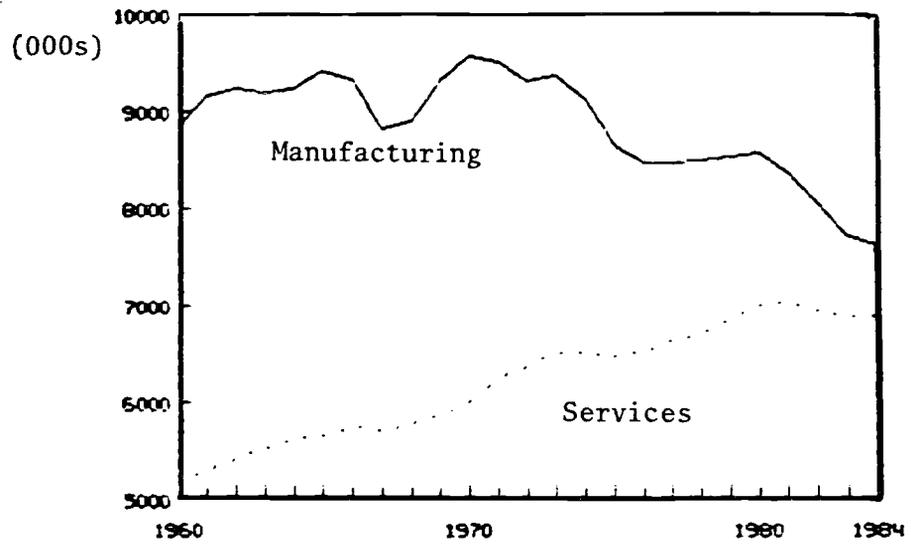
services, the shift has proceeded at a much a much slower rate than in the US, in both absolute and relative terms. For evidence on Germany, consider Figure 6, which compares total private dependent status employment in manufacturing and private service-producing industries. It could be claimed that the sluggish performance of service employment merely reflects lower overall growth. This view is rejected in Table 10, which compares the percentage point change in the share of total dependent-status employment in broadly defined services in the two countries since 1960. It is noteworthy that until the middle of the last decade these shifts were roughly of the same magnitude in the two countries; in the last decade the process in Germany has been brought to a virtual standstill. To get an idea of the magnitudes involved, had Germany sustained the same compositional shifts as the US, holding other employment constant, tertiary sector employment would have exceeded current levels by another 950,000 jobs, or roughly 3.5% of the 1985 labor force!<sup>22</sup>

In Table 11 we compare average growth rates in per employee real compensation in the Federal Republic of Germany and the US. In real terms, compensation growth in West German tertiary sectors has clearly outpaced its American counterparts, and has until recently kept pace with the manufacturing sector. In the most salient example, the average employee in the finance and insurance

<sup>22</sup>In 1975, tertiary dependent status employment in the FRG was 6,485 million or  $.251/.749 = .33$  times all other dependent employment. Increasing this share by 5 percentage points over the subsequent decade makes it  $.301/.699 = .42$  times all other private dependent employment in 1984 (18,272 million) = 7,868 million, compared to the actual 1984 figure of 6,904 million.

Figure 6  
Employment in the Manufacturing and Services-Producing  
Sectors, FR Germany and US, 1960-1984

FR Germany



US

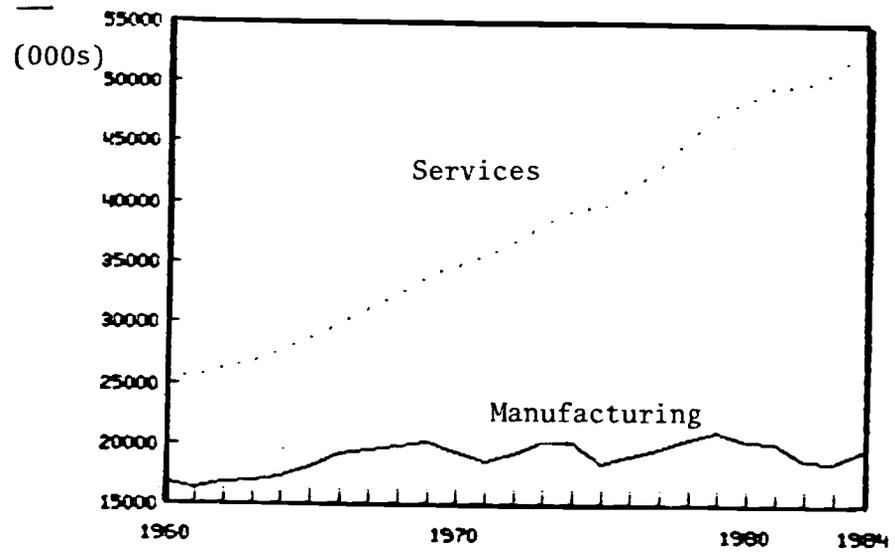


Table 10  
Change in Relative Share of Dependent Status  
Employment in Tertiary Sectors as a Fraction of Total  
1960-1984 (percentage points)

	FR Germany	US
1960-65	0.3	0.5
1965-70	0.9	1.7
1970-75	2.5	2.5
1975-80	1.0	2.1
1980-84	0.8	2.9

Table 11  
Average Real Compensation Growth, FRG & US (%)

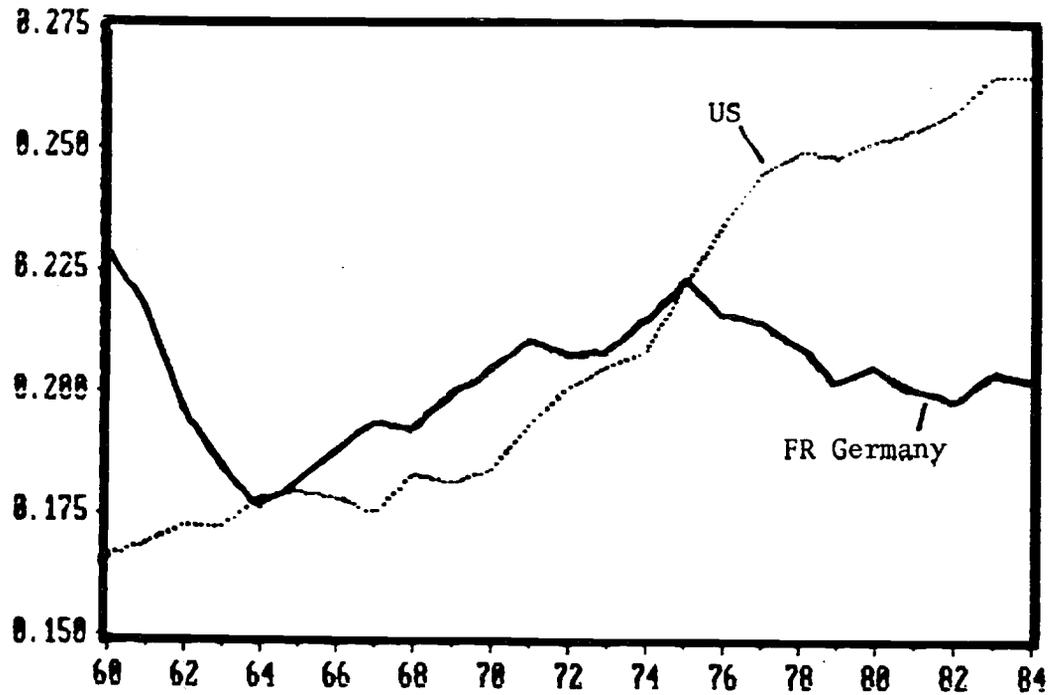
	1965-69	1970-74	1975-79	1980-84
US:				
MAN	1.6	0.8	1.1	0.3
WRT	1.3	0.1	-0.9	-0.9
TPU	1.9	2.4	1.1	0.5
FIR	2.4	0.5	0.2	2.1
SER	2.1	1.0	-0.5	0.9
FRG:				
MAN	4.9	5.9	3.5	0.8
WRT	4.8	5.5	2.9	1.0
TPU	5.5	5.6	1.4	-0.6
FIR	4.5	6.3	2.3	0.8
SER	3.2	5.3	2.6	0.3

sector in Germany receives 1.21 times the average compensation in manufacturing; in the US the comparable figure is 0.84. This significant differential seems to be a direct outcome of HBV and DAG (Deutsche Angestellte Gewerkschaft) nationwide collective bargaining, as discussed in the last section. In wholesale and retail trade, the average German receives compensation amounting to .79 of the manufacturing average; in the US, the figure is 0.59. Only in private services are the ratios closer (0.68 in FR Germany, 0.65 in the US).<sup>23</sup>

Recall that a key prediction of the model involved the evolution of the wage differential between the more unionized manufacturing and the uncovered service sector. In the model with an absorbing service sector, one would expect the differential to increase; in the nonadjusting economy, the adjustment takes place through higher unemployment. Figure 7, which plots the standard deviation of log average compensation in the manufacturing, trade, transport and communication, finance and private service sectors, suggests that the US experience is characterized by a marked increase in relative wage dispersion, confirming results of Bell and Freeman (1985) and Lawrence and Lawrence (1985). Until 1975, relative wages in West Germany also followed this pattern. In the past ten years, however, intersectoral wage dispersion in West Germany has actually fallen. While conflicting results have been reported within the industrial sector

<sup>23</sup> Interestingly, in the finance and trade sectors, US employment growth has been very strong. Over the period 1980-84, dependent status employment in FIRE and trade sectors increased 9.8 and 7.3% respectively in the US; in FR Germany, employment in the financial sector grew by only 3.1%, and in trade actually declined by 6.8%.

Figure 7  
Wage Dispersion Across Manufacturing and Four  
One-Digit Tertiary Sectors, 1960-1984†



†Measured as the standard deviation each year of the log of total nominal per worker compensation.

(Breithaupt and Soltwedel 1980 and Grundlach 1986 find decreases in wage dispersion, where Blanchard et al. 1985 and Bell and Freeman 1985 report slight increases), our results shows an unequivocal tightening of wage dispersion at the one-digit level. It is not implausible that increasing unionization of the service sectors has contributed to wage demands in these sectors linked to those in dominant metal and chemical workers unions, an outcome predicted by simple union models. Table 12 charts the variability of compensation in the wholesale and retail trade, finance, and services sectors relative to aggregate manufacturing in the two countries over the past quarter decade. It depicts a significant decrease in variability in West Germany compared with the United States. Note that this decrease began in the mid-1970s, when the economy was growing rapidly.

Trends in labor productivity in the tertiary industries provide additional support for our thesis. In a recent survey of the two countries, Wegner (1985) identified value-added per hour as the most salient feature distinguishing the performance of tertiary sectors in the US and West Germany. We reproduce his findings in Table 13. It seems unlikely that these striking productivity differences are solely attributable to different production techniques available in the two economies. Rather, the behavior of capital-labor ratios in these sectors support the contention that producers of services in the two countries are responding to differing relative prices. Figure 8 documents a secular pace of capital deepening in aggregate services in West Germany that is largely absent in the US; moreover, this trend is

Table 12  
Variability of Relative Wages†

		60-69	70-79	80-84
FR	Germany			
	Trade	0.040	0.021	0.005
	Finance	0.031	0.025	0.003
	Services	0.033	0.022	0.009
US				
	Trade	0.010	0.053	0.014
	Finance	0.019	0.027	0.045
	Services	0.010	0.044	0.018

†Measured as the standard deviation of log annual compensation divided by annual compensation in manufacturing. Sources: US: Unpublished sectoral value-added data, Commerce Department and Economic Report of the President 1985. FR Germany: Statistisches Bundesamt, Fachserie 18, (Volkswirtschaftliche Gesamtrechnung), Revidierte Ergebnisse, 1984.

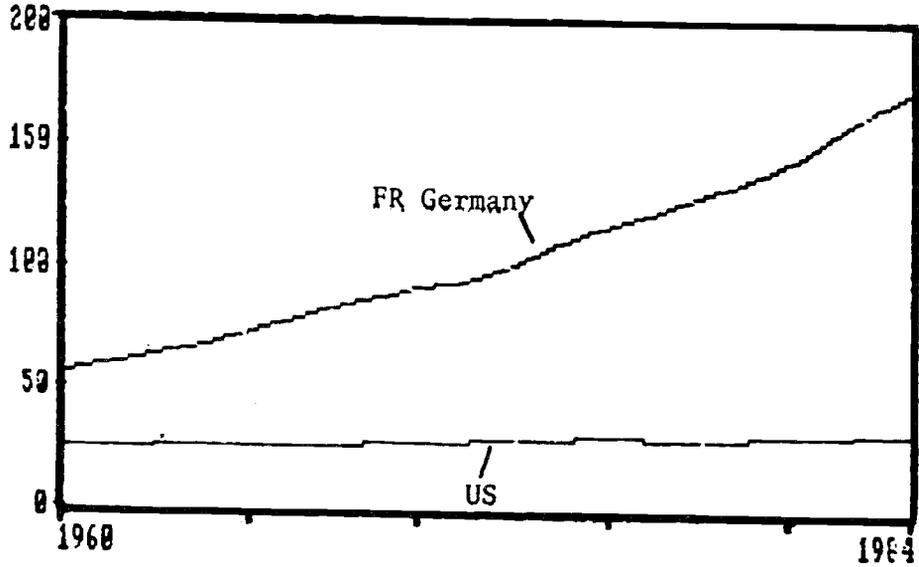
Table 13  
Labor Productivity Growth in the Service Sectors, 1960-83†

	1960-73	1973-83
FR	Germany	
	Total Private Services	5.8      3.5
	Trade	4.4      3.0
	Transport/Communication	4.5      2.2
	Finance	4.9      5.2
	Other Private Services	5.1      3.6
	Government	1.8      1.0
US		
	Total Private Services	1.7      0.5
	Trade	1.9      0.3
	Transport/Communication	4.1      1.9
	Finance	0.9      0.4
	Other Private Services	0.8      0.1
	Government	0.3      0.4

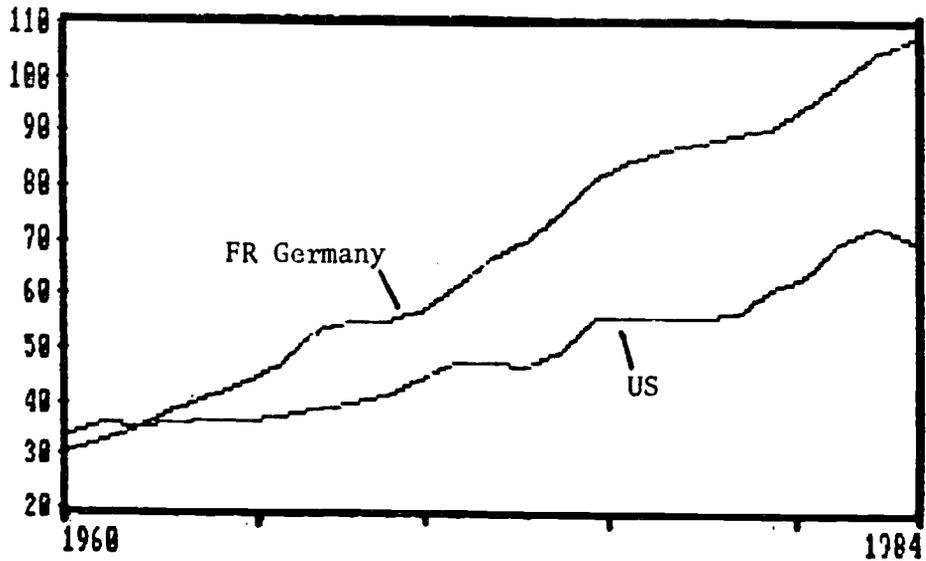
†Source: Wegner (1985). Growth rates are annual rates of change in constant value added per worker-hour.

**Figure 8**  
**Capital-Labor Ratios in Services and Manufacturing,**  
**1961-1984**

Service-Producing Industries†



Manufacturing Industries†



†Thousands of 1980 DM and 1972 \$ of gross capital stock for West Germany and the US, respectively.

sharply different in manufacturing. If technology is the same across countries, this outcome is predicted directly by West Germany service industries facing a higher real price of labor. Table 14, which displays average growth in capital-labor ratios at the one-digit level service sectors, gives clear evidence of higher capital intensity in Germany, and more importantly, a break in the mid-1970s.

To summarize, Germany has not experienced the strong growth of service employment observed in the US. This might seem puzzling, since output growth in these sectors has not been insignificant.<sup>24</sup> Clearly, some of this differential is due to slower growth rates of labor force participation in the Germany; nonetheless, until the mid-1970s the shift to a service economy was taking place at the same proportionate rate, while the past ten years have witnessed a departure from the trend shared with the US. Given the evidence on lower wage dispersion, markedly higher rates of labor productivity growth, and capital-labor ratios, we suspect that the "wage problem" has manifested itself in the German service sector.

## 5. Conclusion

High unemployment in West Germany has become an accepted and conspicuous feature of the world economic picture. The paths of

<sup>24</sup>Over the period 1980-1984, real output of transport and communication sector grew by 7.5%, (7.3% in transport and public utilities in the US); banking and insurance 8.7% (9.6% in US); and personal services 8.6% (15.7% in US). Less impressive were the trade sector with 4.7% growth (20.9% in US) and, of course, manufacturing with a paltry 0.9% real growth (11.4% in US).

Table 14  
Average Growth in Sectoral Capital-Labor Ratios,  
1961-84

	1961-73	1974-80	1981-84
FR Germany			
Manufacturing	6.3	3.6	4.3
Trade	5.3	3.3	4.1
Transport/Communication	4.3	4.6	3.6
Finance	2.5	4.1	3.8
Other Private Services	6.7	5.5	7.2
US			
Manufacturing	1.6	3.8	3.9
Trade	2.8	3.3	2.7
Transport/Communication	2.2	2.1	3.1
Finance	2.0	0.2	2.3
Other Private Services	2.4	-1.0	1.5

Source: US Department of Commerce, Bureau of Economic Analysis and German Statistical Office.

unemployment and inflation, however, suggest that aggregate demand factors can only go part of the way in explaining the secular rise of joblessness in this country. We conclude that underlying real factors have raised the NAIRU, or equilibrium rate.

We were unable to find any evidence that the rise in the NAIRU in West Germany is due to an increase in "frictional" unemployment. Rather, in comparing the relative labor market performance of Germany and the US, we suggest that nonadjustment of wages to adverse shocks and to unemployment itself should bear the brunt of blame. Whereas the US economy has responded to the adverse supply shocks of the 1970s with the creation of 20 million jobs in services, job creation in the tertiary sectors of West Germany was grossly insufficient to offset the reduction of employment in manufacturing. We find the data highly consistent with the hypothesis that wage rigidity in services--due to unionization, minimum wage provisions, or overly generous unemployment benefits--has obstructed rapid labor intensive growth in these sectors and can help to explain the continuing rise in West German unemployment.

**Appendix I**  
**Estimation of Capital/Labor Substitution Elasticities**  
**in an Error Correction Model**

The firm we model selects labor input  $L$  to maximize one-period profits or solve

$$\max pV - wL$$

subject to the the constant returns, CES production function

$$V = A_1 [\alpha K^{-\rho} + (1-\alpha)(A_2 L)^{-\rho}]^{-1/\rho}, \quad -1 \leq \rho.$$

$V$  is value added,  $K$  is the (fixed) capital stock,  $A_1$  and  $A_2$  represent Hicks and Harrod neutral technical progress, respectively, and  $w$  and  $p$  are the wage rate and the price of output. Define the elasticity of substitution  $\sigma = (1+\rho)^{-1}$ .

It is easy to rewrite the first order condition as:

$$s_K = \alpha (V/K)^\rho \quad (A1)$$

where  $s_K$  is capital's share in value-added. If  $K$  is not fixed, the condition will continue to hold, but the level of output is indeterminate and must be fixed elsewhere. Note how (A1) does not involve either  $A_1$  or  $A_2$ . Taking logs, we obtain

$$\ln s_{Kt} = \ln \alpha + \rho \ln (V/K)_t \quad (A2)$$

If firms were always on the production function, one could regard (A2) as a regression equation. Generally, firms will be off the production for a variety of reasons. Costs of adjusting labor input may retard the reaction of firms to changes in relative factor prices. If there are fixed costs to hiring and firing, firms may hoard labor over the cycle. Clearly if (A2) is estimated directly, ignoring these phenomena, a left-out variable bias will

arise. If the omitted adjustment term is negatively correlated with V/K and makes a negative contribution to capital share, it will tend to bias estimates of  $\rho$  upward, and thus of  $\sigma$  downward.

The model presents an ideal application of an error correction model, which effectively only imposes the estimated relationship at the lowest frequencies.<sup>25</sup> If  $\ln(V/K)$  and  $\ln s_K$  are cointegrated with cointegrating vector  $[1 \ -\ln\alpha \ -\rho]$ , then although the individual series are nonstationary, the linear combination

$$\ln s_{Kt} - \ln\alpha - \rho \ln(V/K)_t$$

is stationary. One error correction model that incorporates this restriction is

$$\begin{aligned} \Delta \ln s_{Kt} = & \gamma_1 \Delta \ln s_{Kt-1} + \gamma_2 \Delta \ln(V/K)_{t-1} + \\ & \gamma_3 [\ln s_{Kt-1} - \ln\alpha - \rho \ln(V/K)_{t-1}] + \epsilon_t , \end{aligned}$$

where  $\epsilon$  is an i.i.d. random variable. This model may be estimated in the levels as

$$\begin{aligned} \ln s_{Kt} = & \alpha_0 + \alpha_1 \ln s_{Kt-1} + \alpha_2 \ln s_{Kt-2} \\ & + \alpha_3 \ln(V/K)_{t-1} + \alpha_4 \ln(V/K)_{t-2} + \epsilon_t , \end{aligned} \tag{A3}$$

and given estimates of the  $\alpha$ 's, the parameter of interest here,  $\rho$  (which is exactly identified), may be solved as  $-(\hat{\alpha}_3 + \hat{\alpha}_4) / (\hat{\alpha}_1 + \hat{\alpha}_2)$ .<sup>26</sup>

The regression results of estimating (A3) are presented in Table A1. The estimated value of  $\rho$  is  $-(-0.7581 + 0.7878) / (1.3971 - .4892) = -.0327$ ; implying a value of  $\sigma$  of 1.034. The US results imply  $\rho = 0.1775$  and  $\sigma = 0.849$ . The estimates appear in Table A1.

<sup>25</sup> A good reference is Engle and Granger (1987).

<sup>26</sup> Recent work of Stock (1986) has shown that estimates of cointegrating vectors to converge at high rates to their true values, but are subject to small sample bias.

Table A1  
OLS Estimates of Equation (A3)

FR Germany Aggregate Manufacturing

	Estimate	Std. Error	t-stat.	Pr(>t)
$\alpha_0$	0.329	0.753	0.437	0.668
$\alpha_1$	1.397	0.202	6.909	0.000
$\alpha_2$	-0.492	0.285	-1.724	0.104
$\alpha_3$	-0.758	0.292	-2.593	0.020
$\alpha_4$	0.788	0.203	3.881	0.001

$\bar{R}^2 = 0.908049$   
S.E. of regression = 0.037494  
Q(15) = 4.44.  
21 Observations (1963-1983)

US Aggregate Manufacturing

	Estimate	Std. Error	t-stat.	Pr(>t)
$\alpha_0$	-0.403	1.752	-0.230	0.668
$\alpha_1$	1.055	0.296	3.565	0.000
$\alpha_2$	0.002	0.408	0.005	0.996
$\alpha_3$	-0.521	0.463	-1.125	0.277
$\alpha_4$	0.333	0.328	1.013	0.326

$\bar{R}^2 = 0.459$   
S.E. of regression = 0.0701  
Q(15) = 12.73  
21 Observations (1962-1982)

Appendix II  
Computation of Wage Gaps

The wage gap is defined as the difference between actual wage and that which clears the market when  $L=L^f$  (at high employment). By the national income identity, technical progress may be estimated using Solow's method (see Bruno and Sachs 1985). That is, we approximate the continuous time full employment relationship under Harrod neutral technical progress:

$$\dot{v}_t = s_{Lt}(\dot{l}_t + \dot{a}_t) + s_{Kt}\dot{k}_t$$

with

$$\Delta v_t = s_{Lt-1}(\Delta l_t + \Delta a_t) + s_{Kt-1} \Delta k_t$$

so

$$\Delta a_t = \Delta l_t + s_{Lt-1}^{-1}(\Delta v_t - s_{Kt-1} \Delta k_t) \quad (A4)$$

The resulting series was then projected on a constant and a fourth order polynomial in time. The fitted series were used as the imputed technical progress. They are presented in Table A2. If production is given by  $V=K^\alpha(AL)^{1-\alpha}=A^{1-\alpha}K^\alpha L^{1-\alpha}$ , then the average product of labor at high employment  $V/L^f$  is given by  $A^{1-\alpha}(1-\alpha)(K/L^f)^\alpha$ . To compute this we used employment, gross constant-price capital stocks, and the imputed technical progress series. The high employment labor supply  $L^f$  was taken to be average of annual manufacturing man-hours in the 1970s. Given that US manufacturing employment is roughly at its 1970s average this may be the appropriate benchmark.

Alternatively, we estimated the following equation using

manufacturing data, using both OLS and instrumental variables:

$$l_t = a_1 + a_2 l_{t-1} + a_3 k_t + a_4 v_t + a_5 t + a_6 t_{73} + a_7 t_{80}$$

where lower case letters indicate logarithms. Next, one can solve this equation for steady state output:

$$v_t = (1/a_4)[-a_3 k_t + (1-a_2)l_t - (a_1 + a_4 v_t + a_5 t + a_6 t_{73} + a_7 t_{80})]$$

Now subtract  $l_t$  from both sides:

$$v_t - l_t = (1/a_4)[-a_3 k_t + (1-a_2-a_4)l_t - (a_1 + a_4 v_t + a_5 t + a_6 t_{73} + a_7 t_{80})]$$

Substituting  $l^f$  for  $l$ , we have the average product at full employment:

$$v_t - l_t^f = (1/a_4)[-a_3 k_t + (1-a_2-a_4)l_t^f - (a_1 + a_4 v_t + a_5 t + a_6 t_{73} + a_7 t_{80})]$$

If there is a productivity dividend,  $(1-a_2-a_4)/a_4$  will be greater than unity. Note that we do not impose the constant returns restriction at estimation, which is  $a_4 = 1-a_2-a_3$ .

Table A2  
Levels and Growth rates of  
Imputed Harrod Technical Progress

Germany	US			
	logA	%Δ A	logA	%Δ A
1965	0.162304	4.826861	0.197749	3.288920
1966	0.212715	5.041130	0.226876	2.912751
1967	0.263900	5.118529	0.252814	2.593790
1968	0.314685	5.078429	0.276096	2.328190
1969	0.364087	4.940200	0.297217	2.112040
1970	0.411319	4.723221	0.316631	1.941469
1971	0.455788	4.446879	0.334757	1.812571
1972	0.497093	4.130521	0.351972	1.721489
1973	0.535028	3.793550	0.368615	1.664299
1974	0.569582	3.455341	0.384986	1.637152
1975	0.600934	3.135228	0.401347	1.636118
1976	0.629461	2.852643	0.417921	1.657340
1977	0.655730	2.626926	0.434890	1.696941
1978	0.680504	2.477461	0.452400	1.750991
1979	0.704741	2.423644	0.470557	1.815650
1980	0.729589	2.484798	0.489427	1.886991
1981	0.756392	2.680337	0.509038	1.961160
1982	0.786689	3.029645	0.529381	2.034241
1983	0.822209	3.552079	0.550404	2.102381
1984	0.864879	4.267001	0.572021	2.161646
1985	0.916818	5.193818	0.594103	2.208191

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