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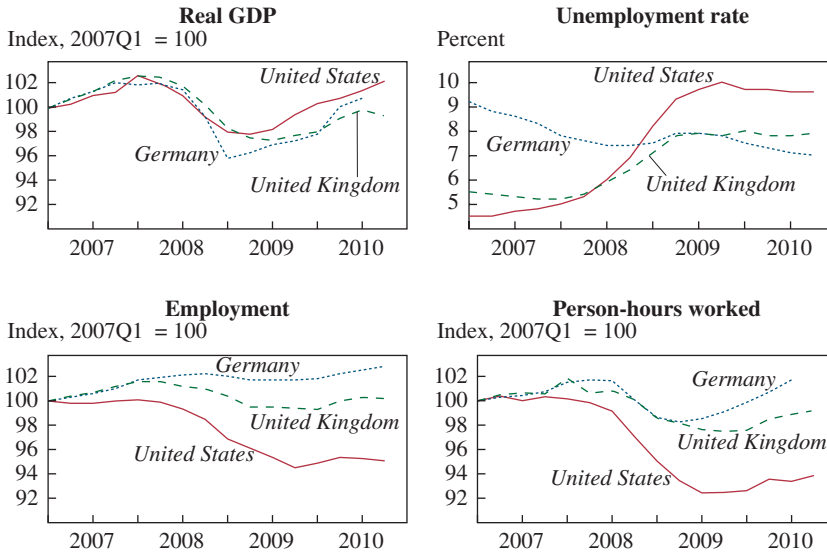
What Explains the German Labor Market Miracle in the Great Recession?

ABSTRACT Germany experienced an even deeper fall in GDP in the Great Recession than the United States, with little employment loss. Employers' reticence to hire in the preceding expansion, associated in part with a lack of confidence it would last, contributed to an employment shortfall equivalent to 40 percent of the missing employment decline in the recession. Another 20 percent may be explained by wage moderation. A third important element was the widespread adoption of working time accounts, which permit employers to avoid overtime pay if hours per worker average to standard hours over a window of time. We find that this provided disincentives for employers to lay off workers in the downturn. Although the overall cuts in hours per worker were consistent with the severity of the Great Recession, reduction of working time account balances substituted for traditional government-sponsored short-time work.

Like the United States, Germany recently experienced a recession of a magnitude not seen since the Great Depression. German GDP fell 6.6 percent from its peak in 2008Q1, exceeding the 4.1 percent peak-to-trough decline in the United States from 2007Q4 (figure 1, top left). Yet the labor market experiences of the two countries could hardly have been more different. As the top right panel of figure 1 shows, the U.S. unemployment rate soared from 4.5 percent in the first quarter of 2007 to a high of 10.0 percent by the end of 2009, while the German unemployment rate actually declined over the period, only briefly rising from 7.4 percent to 7.9 percent in late 2008 and early 2009. The contrast is mirrored in the path of employment (figure 1, bottom left): while U.S. employment fell 5.6 percent, German employment fell a mere 0.5 percent before resuming an upward path. Germany's 3.4 percent reduction in person-hours worked was larger

Figure 1. The Great Recession in Germany, the United States, and the United Kingdom, 2007–10[a]



Sources: U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, German Federal Statistical Office, and Bart Hobijn, Federal Reserve Bank of San Francisco.

a. Data are quarterly and seasonally adjusted.

than its decline in employment, yet still much smaller than the 7.6 percent fall in the United States (figure 1, bottom right). These key changes and the peak and trough quarters in each country are summarized in table 1.

The German and U.S. labor market experiences during this period are almost polar opposites in the international context. Among pre-1990 members of the Organisation for Economic Co-operation and Development (OECD), only Spain and Ireland had larger percentage reductions in employment in 2008–09 than the United States, and only Australia, which experienced no recession, fared better than Germany in terms of employment (U.S. Bureau of Labor Statistics 2010). Figure 1 also plots outcomes for the United Kingdom, a more representative country: its GDP decline was similar to that of the United States, but its recovery has been slower, and its increase in unemployment and reduction in employment lie in between the trajectories of the United States and Germany.

The German experience in 2008–09 contrasts not merely with that of the United States, but also with previous German recessions, as figure 2 illustrates. In terms of the output decline (top panel), the 2008–09 recession

Table 1. Changes in Output and the Labor Market in the Great Recession, United States and Germany[a]
Percent except where noted otherwise

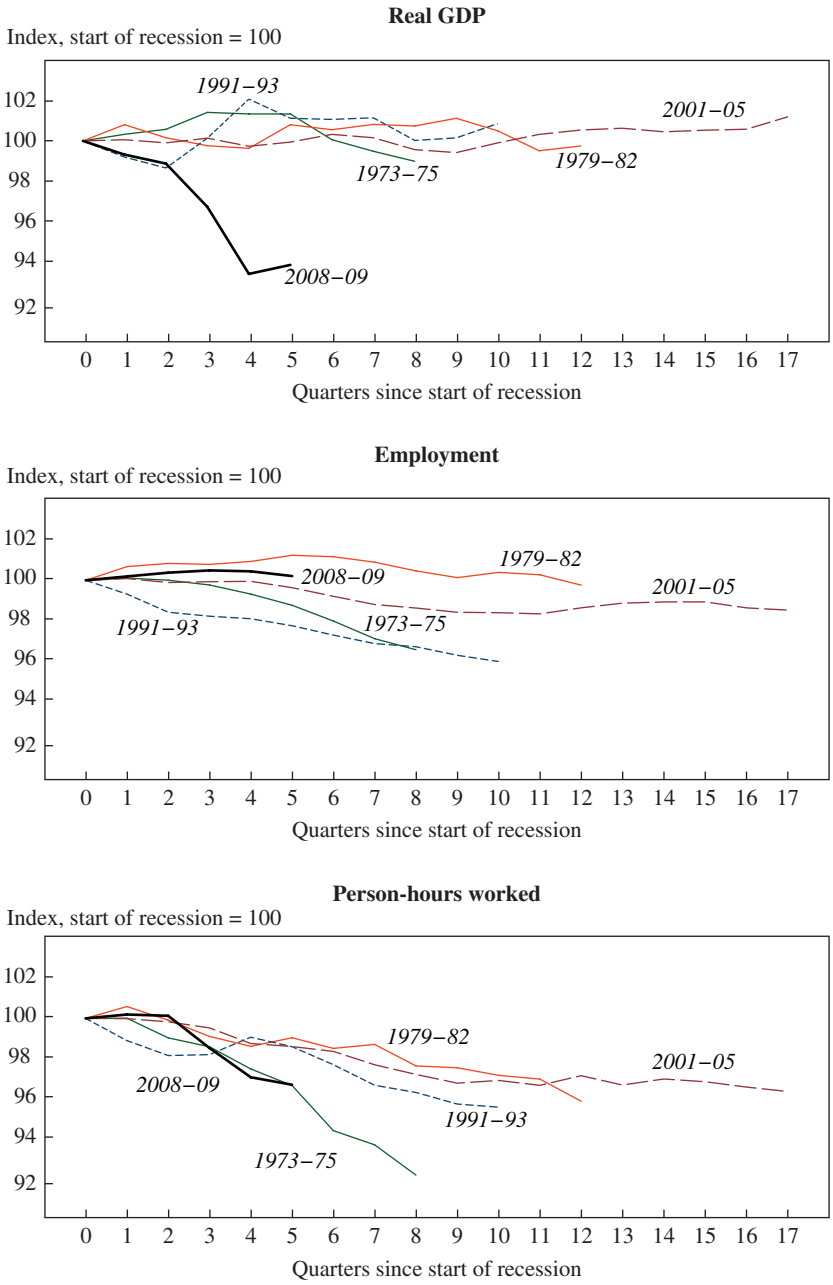
	United States			*Germany*		
Measure	*Peak*	*Trough*	*Change*	*Peak*	*Trough*	*Change*
Real GDP	2007Q4	2009Q2	–4.1	2008Q1	2009Q1	–6.6
Unemployment rate[b]	2007Q1	2009Q4	5.5	2008Q4	2009Q2	0.5
Employment	2008Q1	2009Q4	–5.6	2008Q4	2009Q2	–0.5
Person-hours worked	2007Q4	2009Q4	–7.6	2008Q2	2009Q2	–3.4

Sources: U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, German Federal Statistical Office, and Bart Hobijn, Federal Reserve Bank of San Francisco.
a. Data used in the calculations are seasonally adjusted.
b. In percentage points.

was unusually severe. By comparison, GDP declined by only 2.4 percent from peak to trough in the 1973–75 recession, little more than a third of the 2008–09 decline; the peak-to-trough declines in the other three recessions depicted were even smaller. The virtual absence of any employment decline in 2008–09 is also unprecedented among recent recessions, as the middle panel shows. In the 1973–75 recession, employment fell 4.3 percent from its peak to its trough 11 quarters later. The 2008–09 decline in person-hours seems less remarkable (bottom panel): person-hours fell rapidly, retracing the early path of the 1973–75 decline. Considering the much greater decline in GDP in the Great Recession, however, the similarity of the declines in person-hours is a surprise.

In this paper we investigate the reasons for this significant deviation from historical experience in the German labor market response to the 2008–09 recession. We highlight the fact that employment rose less than expected in the preceding expansion, given changes in GDP and labor costs, and that half of this shortfall can be explained using data on employers' business expectations. Employers lacked confidence that the boom would last, or were perhaps uncertain about how long it would last, and therefore they hired less than would have been predicted given contemporaneous conditions. Consequently, they were able to avoid costly layoffs when the recession arrived. Our survey of reporting by the *Handelsblatt* business newspaper confirms a general impression that firms downsized and restructured in the 2005–06 period, out of caution about the extent and persistence of the business upturn. The missing employment increase in the boom accounts for 41 percent of the missing employment decline in the recession, and

Figure 2. Output and Labor Market Outcomes in the Last Five German Recessions[a]



Source: German Federal Statistical Office.

a. Data are seasonally adjusted. Recession dates are from the Sachverständigenrat (2010): 1973Q2–1975Q2, 1979Q4–1982Q4, 1991Q1–1993Q3, 2001Q1–2005Q2, 2008Q1–2009Q2.

23 percent of that missing decline can be linked to pessimistic expectations in the expansion.

If labor costs had responded more flexibly than in the past, this could also have contributed to explaining the unusually mild labor market response to the recession. In fact, labor costs continued to show little flexibility, responding too late to stem employment losses. Some previous analysts (Boysen-Hogrefe and Groll 2010, Gartner and Klinger 2010) have instead suggested a role for the stagnation of wages beginning in 2001, coinciding with a decline in the power of labor unions. We find that wage moderation may explain 20 percent of the missing employment decline in the recession.

Although we cannot account for about 40 percent of the missing decline in employment, we believe that a personnel management tool known as working time accounts, which became increasingly common in labor union contracts over time, played a role in moderating the labor market downturn. Working time accounts permit employers to use overtime for free as long as working time is cut by an equal amount within a defined window of time. When the recession arrived, workers had built up large surpluses in these accounts, which would have had to be compensated at the overtime premium if the workers were then laid off. Alternatively, employers could have kept these workers employed at low hours until the accounts were drawn down to zero, and then laid them off, but by then the time until the expected upswing might not have been long enough to amortize the normal layoff and hiring costs that would have been incurred. Employers therefore laid off fewer workers in the 2008–09 recession than in earlier recessions when working time accounts were less widespread, preferring to draw down the surpluses by cutting workers' hours (at unchanged pay).

Many analysts have assumed that these cuts came in addition to the cuts that would have occurred in the absence of the accounts, and that the additional flexibility in hours per worker thus played a key role in moderating employment losses.[1] However, use of the accounts largely substituted for other methods of reducing hours per worker, including the traditional government short-time work scheme. Overall, although the decline in hours per worker was very large, it was consistent with expectations based on historical experience and the depth of the recession. The unexpected development in the recession was the number of workers able to retain their job and experience this decline in hours per worker.

1. These analysts include Schneider and Graef (2010), Klös and Schäfer (2010), Möller (2010), and Sachverständigenrat (2010); a less decisive role is attributed by Schaz and Spitznagel (2010). Boysen-Hogrefe and Groll (2010) are more skeptical.

We believe that the 2003–05 labor market reforms helped reduce unemployment, possibly with a lag that meant the reforms acted as a brake on rising unemployment in the recession (as argued by Gartner and Klinger 2010), and that they may therefore also have acted as a brake on employment losses. We present a simple model of dynamic labor demand with an intensive and an extensive margin that suggests why working time accounts and other recent reforms in German labor market institutions constitute a regime change that is consistent with the labor market miracle. This model treats employment (the extensive margin) as a quasi-fixed factor, while the marginal cost of hours rises at the intensive margin. The model explains why regime change and expectations interact to affect the dynamic behavior of employment and hours per worker. Reforms and other changes in the labor market caused the quasi-fixity of employment to increase, and employers to react more slowly to changes in economic conditions, effectively attaching more weight to future expected changes in forcing variables such as wages or demand conditions.

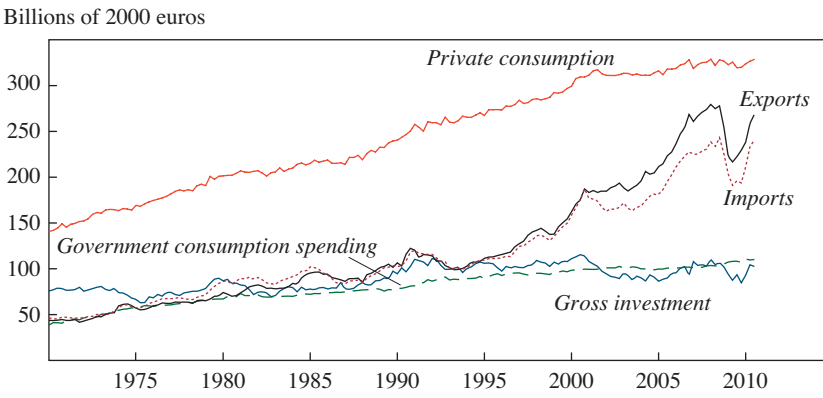
We cannot evaluate whether employers correctly expected a shorter recession than usual, and hence hoarded more labor than usual, as available expectations data refer only to 6 months ahead. Reporting in *Handelsblatt* did suggest that, especially by 2009, firms were concerned about losing skilled workers, who are becoming increasingly specialized and difficult to replace over time. It is plausible that employers are increasingly reluctant to part with a greater share of their workers because of the increasing cost of refilling specialized vacancies.

Despite the role of weak hiring in the 2005–07 expansion in explaining the resilience of the labor market in the recession, the moniker "labor market miracle" may still be appropriate, given the amount of the puzzle left unquantified and possibly due to private and public labor market reforms. We deemphasize flexibility in cutting hours per worker only because it played an equally important role in moderating the employment decline in previous, "nonmiraculous" recessions. Such flexibility could be beneficial for the United States, but it would be premature to endorse this approach without considering all the institutions governing U.S. labor relations (see Abraham and Houseman 1993, Boeri and Brückner 2011).

I. Background to the 2008–09 Recession in Germany

The nature of the Great Recession in Germany was quite different from that of its U.S. counterpart. Whereas the United States suffered a decline in domestic demand driven by falling net wealth of the household sector,

Figure 3. Components of GDP, Germany, 1970–2010[a]



Source: German Federal Statistical Office.
a. Data are quarterly and seasonally adjusted and chained to avoid a break at unification.

Germany had experienced no housing bubble, and instead the German output decline was driven by the collapse of world trade. Figure 3, which plots the major components of GDP since 1970, contrasts the stability of German consumption in the 2000s with the large swings in imports and, particularly, exports in that decade. The government did have to bail out several banks, brought down by their international and, especially, U.S. investments, and there was concern that German banks remained undercapitalized in 2010 (OECD 2010b). German exporters saw world trade as overreacting to events in the United States, and they may have expected a recovery of favorable demand conditions in export-oriented sectors and regions of Germany that had been booming previously. In the event, the BRIC countries (Brazil, Russia, India, and China) and many key export markets in Eastern Europe did recover rapidly.

The 2008–09 recession should be put in the context of the recent history of the German economy and labor market. The economy performed sluggishly, in terms of both growth and unemployment, from the end of the unification boom in 1993 until the expansion that began in 2005. Unification with the former East Germany may have played a role: the resulting increase in government debt could have led consumers to revise their estimates of future wealth downward, depressing consumption, and higher payroll taxes may have increased unemployment (Carlin and Soskice 2009). The central bank reduced money supply growth to deal with postunification inflation, leaving annual inflation below 2 percent from 1995 through 2010;

Germany is thought to have entered the European monetary union in 1999 at an exchange rate that overvalued the deutsche mark (Sinn 1999).

An important labor market development was the stagnation of wages from 2001 until 2008, after decades of growth. This wage moderation is related to the decline in the power of labor unions in Germany since the mid-1990s (Dustmann and others 2009). Between 1996 and 2008, union coverage shrank from 70 percent to 55 percent in the western part of the country and from 57 percent to 40 percent in the east (Ellguth and Kohaut 2009); wage drift (payment of wages above the collectively bargained rate) also declined in the 2000s (Lesch 2010). Pressure on wages in the 2000s, and hence on union bargaining power, may have come initially from the need for a real devaluation after European monetary union; it was sustained by the increased attractiveness of offshoring as the European Union expanded eastward in 2004 (Sinn 2005). Another contributing factor may have been the 2003–05 labor market reforms, which we discuss in detail below.

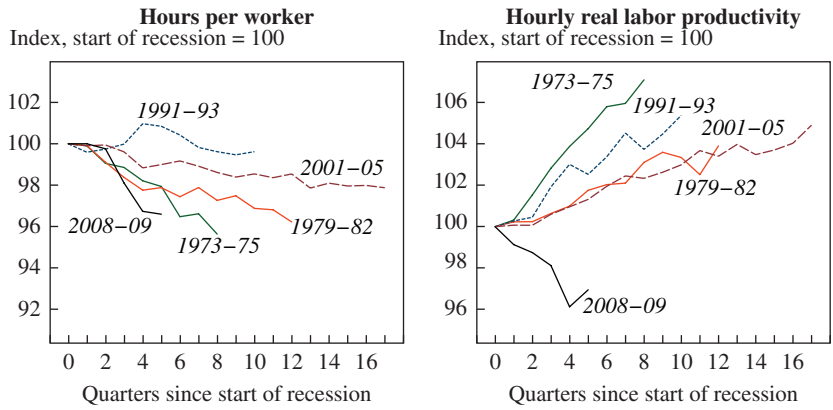
The upturn of 2005–07 marked a return to growth and a significant reduction in unemployment. German firms restructured their arrangements with labor to improve efficiency, especially through increasing the flexibility of working hours and decentralizing the determination of pay. Whereas unions had conceded greater flexibility in the 1980s and 1990s in return for a shorter work week (Hunt 1999), in the 2000s they did so in return for employment security (reduced outsourcing of production abroad) and more training (Carlin and Soskice 2009). Many of these initiatives originated in eastern Germany, where firms struggled in the 1990s to achieve competitiveness. German firms are generally considered to have been in good financial condition on the eve of the Great Recession.

II. Decomposing the Miracle

We begin the analysis by quantifying the contributions of productivity and person-hours to the downturn in output in 2008–09, and by further splitting person-hours into its components: hours per worker, unemployment, and labor force participation.

Two facts implicit in figure 2 will be useful for our decomposition, and we make them explicit in figure 4. First, the left panel of figure 4 shows that hours per worker fell rapidly in the Great Recession. However, their path is roughly comparable to that in the shallower 1973–75 recession. Second, the right panel shows that hourly labor productivity declined substantially. From a historical perspective, this is the true anomaly: the

Figure 4. Hours per Worker and Productivity in the Last Five German Recessions[a]



Source: German Federal Statistical Office.

a. Data are seasonally adjusted. Recession dates are those listed in figure 2 and are from the Sachverständigenrat (2010).

4 percent reduction in productivity in the 2008–09 recession contrasts with strong *increases* in productivity in the four previous recessions.

II.A. Lessons from a Simple Decomposition

To quantify the contributions of the various components, we start with the following decomposition of the change in output:

$$
\begin{aligned}
(1) \qquad \Delta Y/Y &= \Delta(Y/H)/(Y/H) + \Delta H/H \\
&= \Delta(Y/H)/(Y/H) + \Delta(H/L)/(H/L) \\
&\quad + \Delta(L/LF)/(L/LF) + \Delta LF/LF,
\end{aligned}
$$

where Y is real GDP, H is person-hours, L is the number of persons employed, and LF is the labor force. This relationship comes from log differentiation of an expression of output as the product of output per hour and person-hours, with the latter in turn written as the product of hours per worker, 1 minus the unemployment rate, and the labor force.

Using equation 1, table 2 decomposes (in logarithms) the drop in output from peak to trough in both Germany and the United States, as well as for the

Table 2. Accounting for Output in the Great Recession, United States and Germany
Log points

	Change in[a]					
Country and period	*Output*[b] $\Delta Y/Y$	*Productivity*[c] $\Delta(Y/H)/(Y/H)$	*Person-hours*[d] $\Delta H/H$	*Hours per worker*[e] $\Delta(H/L)/(H/L)$	*Workers as share of labor force* $\Delta(L/LF)/(L/LF)$	*Labor force* $\Delta LF/LF$
United States						
2007Q4–2009Q2	−4.2	+2.5	−6.7	−2.1	−5.3	+0.7
2008Q1–2009Q4	−2.4	+6.0	−8.4	−2.2	−6.1	−0.1
Germany						
2008Q1–2009Q1	−6.8	−4.0	−2.9	−3.3	+0.4	+0.1
2008Q1–2009Q4	−5.4	−3.0	−2.4	−2.6	+0.4	−0.2

Sources: U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, German Federal Statistical Office, and authors' calculations.
a. For the United States, the third and fifth columns sum by construction. Figures for Germany may not sum because of rounding.
b. Sum of second and third columns.
c. In the United States, nonfarm business productivity.
d. Sum of last three columns.
e. In the United States, private sector only.

longer period 2008Q1–2009Q4 in both countries, which is more relevant for employment adjustment.[2] The results are quantitatively similar when a Hodrick-Prescott (HP) trend ($\lambda = 1600$) calculated over 1970Q1–2010Q3 is removed (not shown). The table shows two striking differences between the two countries. First, the behavior of hourly productivity over the recession is qualitatively different, rising in the United States but falling in Germany, and the implied adjustment in person-hours is much smaller in Germany. Second, the decline in person-hours in the United States is associated with an increase in unemployment, whereas in Germany it is principally due to a reduction in hours per worker. In neither country did a change in the labor force contribute significantly to the output decline.

The Great Recession in Germany represents a significant departure from Okun's Law, the statistical relationship between real GDP growth and the change in the unemployment rate, as can be seen in table 1. Since $\Delta(L/LF)/(L/LF)$ is approximately equal to the change in the unemployment rate with an opposite sign, Okun's relationship becomes a "law" when elements of the right-hand side of equation 1 exhibit a stable correlation structure. A priori, hours per worker and labor force participation should fluctuate procyclically, but the evidence on the cyclicality of hourly productivity is less clear-cut.[3] Evidently, an already unstable Okun's relationship became untethered in Germany during the Great Recession.[4] We now turn to the factors responsible for its shift.

II.B. Hours per Worker versus Number of Workers, Given Person-Hours

Although Germany and the United States experienced comparable recessions and little change in the labor force, German firms in the aggregate reduced person-hours worked by less than U.S. firms did. But given person-hours, did German firms exploit the intensive versus the extensive

2. German employment rises in this table, unlike in table 1, because the focus on the peak-to-trough period for GDP misses the employment decline.

3. The real business cycle research agenda is predicated on a procyclical correlation of labor productivity with output, albeit a weak one (see, for example, Cooley 1995). In annual data for the period 1947–2009, we compute a correlation of growth in real GDP per hour and real GDP growth of 0.49; for the period 1990–2009 the correlation declines to 0.03, and it falls further, to −0.05, in the last decade. See Galí and van Rens (2010) and www.econ.upenn.edu/~manovski, accessed March 6, 2011.

4. Regressions of changes in unemployment on changes in log output and a constant for the period 1970Q1–2010Q3 show that the Okun relationship accounts for only 7 percent of the variance in Germany, as opposed to almost 50 percent in the United States, with an Okun coefficient in Germany that is one-fifth the corresponding U.S. estimate.

Table 3. Decomposition of Reductions in Person-Hours in Last Five Recessions[a]

Recession	Change in (log points)			Share of change in person-hours due to change in hours per worker (percent)
	Person-hours	Hours per worker	Employment	
1973Q2–1975Q2				
Not detrended	−7.9	−4.5	−3.4	57
Detrended[b]	−4.4	−1.8	−2.6	41
1979Q4–1982Q4				
Not detrended	−4.1	−3.9	−0.2	94
Detrended	−2.7	−1.2	−1.5	44
1991Q1–1993Q3				
Not detrended	−4.4	−0.4	−4.0	9
Detrended	−3.1	+0.9	−4.0	−29
2001Q1–2005Q2				
Not detrended	−3.6	−2.2	−1.5	60
Detrended	−2.1	+0.1	−2.2	−5
2008Q1–2009Q2				
Not detrended	−3.3	−3.5	+0.2	106
Detrended	−3.6	−2.8	−0.8	78

Sources: German Federal Statistical Office and authors' calculations.

a. Calculated from seasonally adjusted data. Recession dates are from the Sachverständigenrat. Second and third columns may not sum to the first column because of rounding.

b. After removing a Hodrick-Prescott trend (λ=1600) calculated over 1970Q1–2010Q3.

margin of hours reduction differently from U.S. firms, or differently from their own behavior in past recessions? That the United States and Germany adjust hours differently over the cycle has been well established since Katharine Abraham and Susan Houseman (1993) showed that, relative to the United States, cyclical adjustment in the German labor market occurs more in terms of hours per worker than in terms of the number of workers ("bodies").[5] In the United States, one-third of the adjustment to a reduction in person-hours typically comes about through reductions in hours per worker, and two-thirds through reductions in the number of workers. Michael Elsby, Bart Hobijn, and Ayşegül Şahin (2010) confirm that the Great Recession was little different, with a 30–70 split.

The extensive-versus-intensive margin decomposition for recent German recessions is displayed in table 3 for both the raw data and their

5. Their data were for manufacturing only. See also Schaz and Spitznagel (2010).

HP-detrended counterparts. With the exception of the 1991–93 episode, at least half of the raw hours reduction can be accounted for by reductions in hours per worker (last column). Although all the person-hours adjustment in the 2008–09 recession occurred through hours per worker, this was not unprecedented and is comparable to what happened in the 1979–82 downturn. With an adjustment share for hours per worker of only 9 percent, the 1991–93 recession is an outlier, associated, we believe, with the expiry of reunification-related policies that kept hours per worker low in the former East Germany (Will 2010). The reduction in hours per worker was smaller in 2008–09 than in the 1973–75 and 1979–82 recessions.

The raw results thus confirm that Germany adjusts more along the intensive margin than does the United States. Because of a downward trend in hours per worker that ended in the 2000s, HP detrending reduces the share of adjustment due to hours per worker and increases this share in 2008–09 relative to other recessions. The 2008–09 recession was unusual in that employers could not benefit from an ongoing trend-related reduction in hours per worker in order to adjust.

III. The German Puzzle: More Detail

We have shown that German labor market performance in the Great Recession derives from a relatively standard reduction in hours per worker and a remarkably small reduction in employment. But to what extent is this outcome itself unusual, given the sharp drop in GDP and a moderation of labor costs? Does the recent period represent a deviation from standard operating procedure in German labor markets, and if so, for which sectors? In this section we explore this question in more detail.

III.A. Hours per Worker

The German labor market outcome that has attracted the most attention from both German and U.S. analysts is the reduction in working hours per worker. We have shown that the 2008–09 decline in hours per worker was similar to the 1973–75 fall despite a much larger reduction in GDP. The question that naturally arises is, how different was the decline in hours per worker, conditioning on output and labor costs? We formalize our analysis using out-of-sample forecasts based on reduced-form regressions of hours per worker (H/L) on GDP (Y) and labor costs per worker (w), the

latter including all social security contributions.[6] Since our focus is on the business cycle, we favor a regression in one-quarter differences to capture cyclical fluctuations in *H*/*L*:[7]

$$\Delta\log\left(H/L\right)_t = \delta_0 + \delta_1\Delta\log Y_t + \delta_2\Delta\log w_t + \Delta\mu_t. \tag{2}$$

We also extend this to estimate an error correction model:

$$\Delta\log\left(H/L\right)_t = \delta_3 + \delta_4\Delta\log Y_t + \delta_5\Delta\log w_t + \delta_6\log\left(H/L\right)_{t-1} + \delta_7\log Y_{t-1} + \delta_8\log w_{t-1} + \Delta\omega_t. \tag{3}$$

It is important to include information on the major recessions of the 1970s and 1980s as well as the mild recession of the early 2000s and the atypical postunification slump, and therefore we chain the West German and the unified German time series using overlapping 1991 data (specifically the first quarter). We begin estimation with the first year available, 1970, and continue through 2003. We stop at 2003 because of the introduction that year of the Hartz labor market reforms, which we describe in detail below. Standard errors are Newey-West based on four lags.

The results of these regressions are reported in the first two columns of table 4, and the predicted values of *H*/*L*, formed from cumulating predicted changes in *H*/*L*, are plotted in figure 5. It is evident that actual hours per worker were in secular decline from 1990 to 2003 before flattening out in 2004, then falling sharply in the 2008–09 recession, and snapping back in the recovery. (An alternative version of this figure in the online appendix, at www.brookings.edu/economics/bpea/past-editions.aspx, shows that the trend in hours per worker goes back to at least 1970.) As already revealed by the HP detrending in table 3, a large component of the declines observed in the 1970s recessions reflected the secular trend in hours per worker.

6. We use aggregate, quarterly, seasonally adjusted data from the German Federal Statistical Office. The labor cost statistics provided in the national income accounts do not reflect the savings to employers from using short-time work, because both the benefits to the workers and the full social security payments are initially made by the employer and only subsequently rebated. However, throughout our analysis we use labor cost numbers adjusted to reflect these rebates. We use data from the *Statistische Jahrbücher* on the accounts of the Bundesagentur für Arbeit and its predecessor, transforming these yearly data into quarterly data according to the distribution over the year of hours lost to short-time work. This adjustment is trivial in magnitude at the aggregate level except in the 1973–75 and 2008–09 recessions, and even in these recessions it is very small.

7. A regression in levels, which picks up low-frequency fluctuations, yields a statistically insignificant coefficient on GDP.

Table 4. Regressions Explaining Changes in Hours per Worker, Employment, and Changes in Employment[a]

	Dependent variable			
	Change in hours per worker (ΔH/L)			
Independent variable	*Simple one-quarter-differences model*	*Error correction model*	*Employment (L_t)*	*Change in employment[b] (ΔL)*
ΔGDP	0.18	0.17		0.18
	(0.05)	(0.05)		(0.05)
ΔLabor costs per worker[c]	0.09	0.13		–0.05
	(0.05)	(0.05)		(0.04)
Hours per worker$_{t-1}$		–0.07		–0.09
		(0.02)		(0.04)
GDP$_{t-1}$		–0.03	0.69	0.05
		(0.01)	(0.06)	(0.02)
Labor costs per worker$_{t-1}$[c]		0.01	–0.51	–0.05
		(0.01)	(0.04)	(0.02)
Trend			–0.0035	
			(0.0011)	
Constant	–0.0036	0.4118	18.4279	1.0784
	(0.0004)	(0.2003)	(2.0600)	(0.4663)
R^2	0.23	0.31	0.97	0.25
No. of observations	135	135	135	135

Source: Authors' regressions.

a. All variables except the trend are in logarithms. Newey-West standard errors based on four lags are in parentheses. Data are quarterly data from 1970 to 2003, seasonally adjusted.

b. Estimated using error correction model.

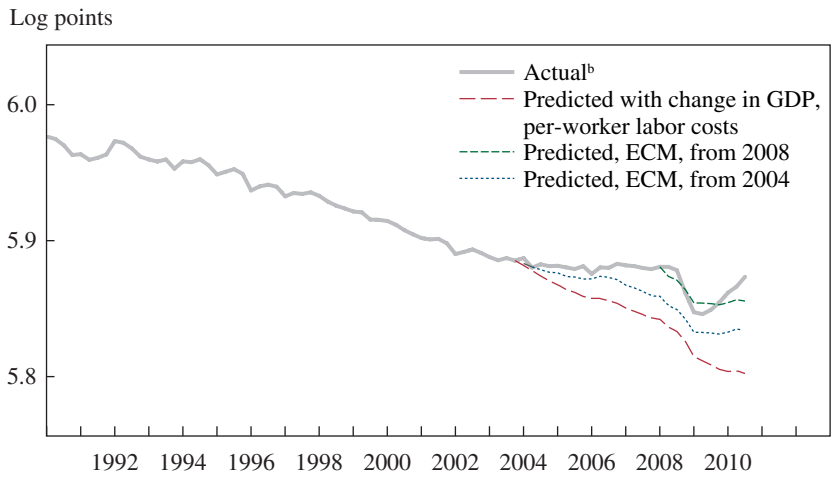
c. Adjusted for reimbursements for short-time payments and short-time-related social security payments.

Both regression models predict a fall in hours per worker similar to the actual fall, as is seen most clearly when the predicted changes are cumulated from 2008Q1, when GDP peaked. What is different in 2008–09 is not the magnitude of the reduction in hours per worker, but that it occurred in the absence of an existing trend. We interpret this finding as evidence that methods of adjustment have changed, a topic to which we return below.

III.B. Employment

To analyze employment, we begin by estimating the error correction model in equation 3 for employment. Again, our aim is to analyze fluctuations over the cycle. Because employment fluctuates less than hours per worker at high frequency, the coefficient on GDP is considerably higher in levels regressions, which capture low-frequency variation. Our preferred

Figure 5. Hours per Worker, Actual 1990–2010 and Predicted 2004–10[a]



Source: German Federal Statistical Office and authors' calculations.

a. Hours per worker are per quarter. Predicted values are calculated using the regression results reported in the first two columns of table 4. ECM = error correction model.

b. Seasonally adjusted and chained to avoid a break at reunification.

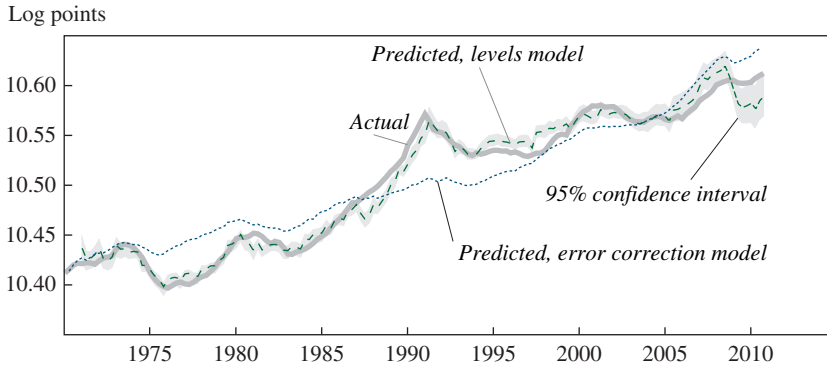
specification is therefore that in levels, with a trend included and with the covariates lagged to avoid endogeneity. We include four lags of GDP for consistency with later regressions, although only the first has a statistically significant coefficient here (higher-order lags of labor costs generally have insignificant coefficients):

$$\log L_t = \delta_9 + \delta_{10} \log Y_{t-1} + \delta_{11} \log Y_{t-2} + \delta_{12} \log Y_{t-3} + \delta_{13} \log Y_{t-4} + \delta_{14} \log w_{t-1} + \delta_{15} t + \mu_t. \quad (4)$$

The regression results are reported in the last two columns of table 4, and the actual and predicted values are plotted in figure 6. As already seen in figures 1 and 2, actual employment rises in the boom of 2005–07, but instead of plunging in 2008–09, as in previous recessions, it merely levels off. The figure shows that, according to our preferred specification, employment would have been expected to fall by a large amount, similar to that in the 1973–74 recession, given the movements in GDP and labor costs per worker. The error correction model fits the data poorly and suggests that the modest downturn was not very surprising. We do not find this specification convincing.

Interestingly, according to both specifications, employment should have risen *more* than it did in the upturn that immediately preceded the 2008–09

Figure 6. Employment, Actual and Predicted, 1970–2010[a]



Source: German Federal Statistical Office and authors' calculations.

a. Employment is in thousands of workers. Actual data are quarterly and seasonally adjusted and chained to avoid a break at unification. Predicted values are calculated using the regression results reported in the third and fourth columns of table 4. Shading indicates 95 percent confidence interval on the predicted series using the levels model.

recession, even though the upturn was unconditionally large.[8] This suggests the possibility that fewer workers than expected were laid off in the recession because they had not been hired in the boom, a possibility that figures prominently in our analysis later on.[9]

III.C. Composition Effects: Where Are the Missing Job Losses?

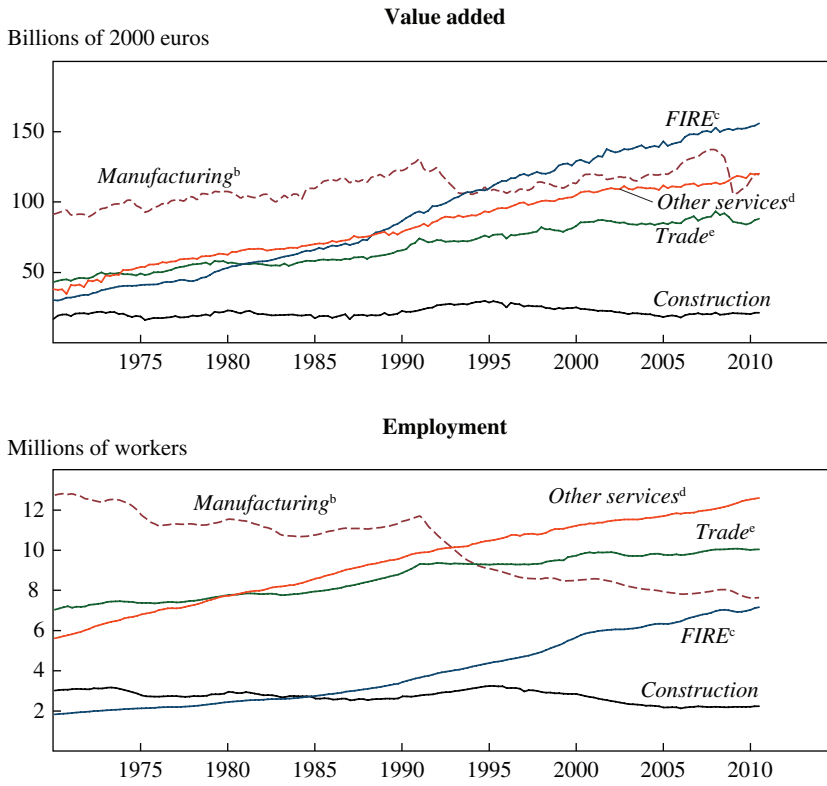
In order to understand the behavior of labor markets in the Great Recession, it is important to know which industries behaved unusually. Discussion of the U.S. recession has focused on the financial, construction, durable consumption goods, and retail services industries, which had swelled in the previous two decades. In the case of Germany, we look for patterns in the sectoral structure of employment declines. Can we find sectors in which person-hours and employment should have contracted, given the drop in demand and past behavior, but in fact did not?

The upper panel of figure 7 traces value added by sector (omitting agriculture) from 1970 to 2010 (as before, the data are chained to remove the jump at unification). The 2008 slump in value added in manufacturing is striking in the historical context: the fall of 23 percent between 2007Q4

8. Logeay and Zwiener (2008) also make this observation by comparing this expansion with the previous one.

9. We have verified that no similar pattern of prediction errors occurs when the 1970s and 1980s boom-and-bust cycles are predicted out of sample.

Figure 7. Value Added and Employment by Sector, 1970–2010[a]



Source: German Federal Statistical Office and authors' calculations.
a. Data are quarterly and seasonally adjusted and chained to avoid a break at unification.
b. Includes mining.
c. Finance, insurance, real estate, and other business services.
d. Health, education, and other public and personal services.
e. Includes the hospitality industry and transportation.

and 2009Q1 is considerably larger even than the loss in value added that accompanied the postunification recession and the collapse of eastern German manufacturing in the early 1990s. By contrast, employment in this sector fell by a modest amount in 2008–09 by historical standards, as the lower panel shows. The figure also shows that the manufacturing boom beginning in 2005 was large by historical standards (upper panel) but was not accompanied by a historically large employment increase (lower panel).

Construction is also a cyclical sector, in terms of both value added and employment. The unification-related boom and bust in both series are evident, and the partial recovery in 2006 may also be seen. The trade

sector, which includes wholesale and retail trade as well as the hospitality industry and transportation, shows signs of a small boom, bust, and recovery in both series from 2006 to 2010. The FIRE (finance, insurance, real estate, and other business services) and other services (health, education, and other public or personal services) sectors are not cyclical and display upward trends throughout the period. There has been a significant increase in employment in temporary agencies in Germany since their deregulation in 2003 (Burda and Kvasnicka 2006). Despite their name, temporary help workers work under the same contractual conditions as other employees, including employment protection. Regardless of where they are actually working, their employment and value added are attributed to the FIRE category in the national income accounts. Manufacturing generally accounts for a large share of the use of temporary workers (Burda and Kvasnicka 2006), but the distribution of its use over time is unknown.

To predict where job losses would have been expected based on past experience, we employ the sector-specific analogue of equation 4:

$$\log L_{it} = \gamma_{0i} + \beta_{1i} \log V_{it-1} + \beta_{2i} \log V_{it-2} + \beta_{3i} \log V_{it-3} + \beta_{4i} \log V_{it-4} + \gamma_{1i} \log w_{t-1} + \gamma_{2i} t + \eta_{it}, \tag{5}$$

where V is value added and i indicates the sector. Value added, in turn, is a function of the components of GDP (GDP alone is a poor predictor of sectoral value added) and a linear trend:

$$\log V_{it} = \alpha_{0i} + \alpha_{1i} \log C_t + \alpha_{2i} \log I_t + \alpha_{3i} \log G_t + \alpha_{4i} \log X_t + \alpha_{5i} \log Z_t + \alpha_{6i} t + \varepsilon_{it}, \tag{6}$$

where C is consumption, I investment, G government spending, X exports, and Z imports. Using these equations, we can judge how much of an unpredictable employment change is due to a surprise in how employment reacted to a change in value added (the change in the residual from equation 5, $\Delta\eta_{it}$) and how much is due to unexpected developments in value added itself (β_{1i} times the change in the lagged residual from equation 6, $\Delta\varepsilon_{it-1}$, plus the terms corresponding to the other three lags, $\Sigma_j \beta_{ji} \Delta\varepsilon_{it-j}$). We focus on the three more cyclical sectors, since prediction errors in employment for FIRE and other services stem principally from the slowing of upward trends, which means we are examining employment of core, nontemporary workers. We also estimate equation 5 for the whole economy (including

Table 5. Sources of Unexpected Changes in Employment in the 2008–09 Recession and the Preceding Expansion

	Change in employment[a]			*Change in lagged value added*		*Sum of weighted residuals*[c]
Industry	*Actual* ΔL_i	*Predicted* $\Delta\hat{L}_i \mid V_i, w$	*Residual* $\Delta\hat{\eta}_{it}$	*Actual* ΔV_{it-1}	*Predicted* $\Delta\hat{V}_{it-1} \mid GDP_{t-1}$[b]	$\Sigma_j(\beta_j\Delta\hat{\varepsilon}_{it-j})$
Recession (2008Q3–2009Q3)						
All industries	–0.002	–0.042	0.039			
Manufacturing[d]	–0.038	–0.176	0.137	–0.236	–0.164	–0.057
Construction	0.009	0.004	0.005	0.046	0.040	0.001
Trade[e]	0.002	–0.020	0.021	–0.062	–0.039	–0.001
Expansion (2005Q2–2008Q3)						
All industries	0.039	0.055	–0.016			
Manufacturing[d]	0.017	0.083	–0.066	0.112	0.098	0.022
Construction	0.003	0.026	–0.023	0.086	–0.062	0.080
Trade[e]	0.029	0.057	–0.027	0.066	0.018	0.018

Source: Authors' calculations.

a. Numbers may not sum because of rounding.

b. "GDP" here refers to the components of GDP. See equation 6 in the text.

c. Reflects the change in employment due to unexpected changes in lagged value added terms (see text).

d. Includes mining.

e. Includes the hospitality industry and transportation.

temporary workers). As before, we estimate the equations using data from 1970 to 2003. Table 5 presents key numbers for the 2008–09 recession and the preceding expansion, and the underlying regression results are reported in table 6.

The first row in the top panel of table 5 shows that whereas aggregate employment was almost unchanged in the recession, it would have been expected to fall by 4.2 log points given value added and labor costs, implying a 3.9-log-point prediction error. The second row shows that employment in manufacturing fell only 3.8 log points in the bust, compared with an expected fall of 17.6 log points given value added and labor costs, for a prediction error of 13.7 log points. This 13.7-log-point gap may be considered the missing employment decline in manufacturing. To relate manufacturing to the missing aggregate employment decline (given GDP), it is necessary to consider the unexpected change in value added in manufacturing. In the next two columns of table 5, we present information on the first lag, which is generally the most influential: value added plunged 23.6 log points, considerably more than would have been predicted given the components of GDP (16.4 log points) when all four lags of value added

Table 6. Regressions Explaining Employment and Value Added, by Sector[a]

	Dependent variable					
	Manufacturing[b]		*Construction*		*Trade*[c]	
Independent variable	*Employment*	*Value added*	*Employment*	*Value added*	*Employment*	*Value added*
Value added$_{t-1}$	0.437		0.258		0.301	
	(0.104)		(0.043)		(0.113)	
Value added$_{t-2}$	0.148		0.134		0.099	
	(0.060)		(0.029)		(0.057)	
Value added$_{t-3}$	0.098		0.121		0.026	
	(0.061)		(0.030)		(0.070)	
Value added$_{t-4}$	0.280		0.160		–0.008	
	(0.092)		(0.051)		(0.118)	
Labor costs per worker$_{t-1}$[d]	–0.511		–0.171		–0.332	
	(0.091)		(0.084)		(0.076)	
Consumption$_t$		–0.120		1.723		1.323
		(0.510)		(0.596)		(0.208)
Investment$_t$		0.292		0.688		0.168
		(0.089)		(0.109)		(0.039)
Government spending$_t$		0.442		–0.011		–0.180
		(0.221)		(0.235)		(0.061)
Exports$_t$		0.754		–0.320		0.282
		(0.225)		(0.255)		(0.073)
Imports$_t$		–0.358		–0.399		–0.303
		(0.170)		(0.198)		(0.075)
Trend	–0.013	–0.023	–0.006	–0.011	0.007	–0.009
	(0.001)	(0.009)	(0.001)	(0.010)	(0.002)	(0.004)
R^2	0.98	0.77	0.93	0.87	0.97	0.99
No. of observations	132	136	132	136	132	136

Source: Authors' regressions.

a. All variables are measured using quarterly, seasonally adjusted data for 1970–2003 and (except the trend variable) are expressed in logarithms. All independent variables except value added refer to the aggregate economy. Newey-West standard errors based on four lags are in parentheses.

b. Includes mining.

c. Includes the hospitality industry and transportation.

d. Includes employer and employee social security payments and is adjusted for reimbursements related to short-time work.

are considered, offsetting by 5.7 log points the error that would have been made in predicting the change in employment based on the components of GDP and labor costs. Summing the components of the third and sixth columns, based on the components of GDP and labor costs, we find that manufacturing employment would have been expected to fall by 8.0 log points more than it did.

There was a slight increase in employment in construction during the recession (by 0.9 log point), close to the predicted increase of 0.4 log point based on value added and labor costs. For construction, all lags of value added play a significant role, and so the fourth and fifth columns are less informative than for other sectors; the last column shows that when all lags are taken into account, there was no surprise in the evolution of value added given the components of GDP. The statistical stability of construction employment is not a surprise, for two reasons: first, Germany experienced no real estate boom in the run-up to the recession, and second, a large component of the stimulus program was directed to government construction projects.

Our findings for the trade sector show excess hires of 2.1 log points, with no offsetting effect from value added, which is well predicted. The missing cyclical job losses (of core workers) appear, therefore, to be from manufacturing.

We observed in figure 6 that the 2005–07 expansion created fewer jobs than expected, and in figure 7 that the expansion in manufacturing did not appear to generate many jobs in the sector. We examine this more formally in the bottom panel of table 5. Aggregate employment rose 3.9 log points but would have been predicted to rise by 5.5 log points based on value added and labor costs, for a shortfall of 1.6 log points. Did the expected decline in employment during the bust not materialize because the workers had not been hired in the boom? If so, the magnitude of the hiring shortfall is 1.6/3.9 = 41 percent of the layoff shortfall in the recession. The last three rows of the table indicate that the missing employment increase (in core workers) was concentrated in manufacturing.

IV. Economic and Institutional Explanations

We have established that GDP in the Great Recession fell more in Germany than in the United States, while person-hours fell less. Yet in that downturn as well as in the preceding boom, German employment responded less than usual to changes in GDP and labor costs, and so the putative miracle lies in the muted response of employment, in particular in manufacturing (at least

for core, nontemporary workers). We now turn to some possible economic and institutional explanations for these statistical findings.

IV.A. A Simple Model of Dynamic Labor Demand

Employment would respond less to changes in GDP and labor costs if costs of changing the workforce have risen, or if employers doubt the persistence of those changes. To help organize our thinking about possible causes of changing firm behavior, we use a standard model of dynamic labor demand to study the impact of changing costs of labor input as well as that of expectations.[10] For simplicity, we study a representative firm that acts competitively in both product and labor markets and has no capital investment decision to make, allowing us to focus on the extensive and intensive margins of hours adjustment. In period $t = 0$, the representative firm chooses plans for employment $\{L_t\}$ and hours per worker $\{\theta_t\}$ so as to maximize real expected discounted profits:

$$\mathrm{E}_0\left\{\sum\nolimits_{t=0}^{\infty}\beta^t\left[P_tY_t - W_t\Omega(\theta_t)L_t\theta_t - \Phi L_t - \frac{c}{2}\left(L_t - L_{t-1}\right)^2\right]\right\},$$

subject to the production function $Y_t = \mathrm{f}(H_t)$, where $H_t = \theta_t L_t$ plus an initial condition L_0, taking the sequences of hourly base wages $\{W_t\}$ and prices $\{P_t\}$, both measured in terms of a numeraire good, as given. (E_0 denotes the expectation conditional on information available in period 0.) Costs of changing the level of core employment L_t from the past period's value L_{t-1} are quadratic in the change and parametrized by c. An hour of a worker's time who is already working θ_t hours costs $W_t\Omega(\theta_t)$, with $\Omega' > 0$ and constant elasticity $\eta_{\Omega\theta}$.[11] There is a fixed per worker employment charge Φ.

Optimal behavior of the firm is straightforward to derive and is presented in the online appendix. It is important to distinguish between long-run

10. See Treadway (1970) and Sargent (1978). Other models of labor demand involving lumpy costs of adjustment may also be employed (Hamermesh 1989, Hamermesh and Pfann 1996), but in aggregation their implications are difficult to distinguish from conventional models with convex costs of adjustment (Khan and Thomas 2003).

11. A more realistic formal model would relate overtime in working time accounts (sustained cumulated deviations of θ from its normal value) to employment adjustment costs directly by carrying the latter as a state variable, so that the more extensive the use made of such accounts in a boom, the more costly the adjustment downward in the aftermath. Such a model is formally more difficult to handle, and so we have taken the shortcut of treating employment adjustment costs as parametric and studying the differential behavior of employment across different parameter values.

steady-state and short-run dynamic behavior. In the long run, two equations govern the intensive and extensive margins (dropping subscripts):

$$W\Omega(\theta)\eta_{\Omega\theta} = \frac{\Phi}{\theta} \tag{7}$$

$$\frac{Pf'(\theta L)}{W\Omega(\theta)} = 1 + \eta_{\Omega\theta}. \tag{8}$$

Given W, P, Φ, and the function Ω, steady-state hours per worker (θ) are determined by equation 7. Given θ, equation 8 determines employment L and total hours $H = \theta L$. It is straightforward to show that the base wage W reduces, while the fixed cost Φ increases, steady-state hours per worker. An increase in $\eta_{\Omega\theta}$, holding all else constant, will reduce hours per worker but have an ambiguous effect on L.

Although these long-run implications are well understood, the model also contains predictions for high-frequency changes in optimal allocation of hours across the intensive and the extensive margins, given current and expected future wages W_t and output prices P_t (the latter being a proxy for aggregate demand). Using carets to denote percentage deviations from the steady state, we can describe optimal employment and hours per worker by the following two recursive equations:

$$\hat{L}_t = \lambda\hat{L}_{t-1} + \frac{\lambda\Phi}{c\beta L}\sum\nolimits_{\tau=0}^{\infty}(\lambda\beta)^{\tau}\left[\varphi_P\hat{P}_{t+\tau} - \varphi_W\left(\hat{W}_{t+\tau} - \hat{P}_{t+\tau}\right)\right] \tag{9}$$

$$\hat{\theta}_t = -\eta_{\theta L}\hat{L}_t - \eta_{\theta W}\left(\hat{W}_t - \hat{P}_t\right), \tag{10}$$

where the elasticities φ_P, φ_W, $\eta_{\theta L}$, and $\eta_{\theta W}$ are all positive and λ is the stable root ($0 < \lambda < 1$) of the difference equation governing optimal employment. Details can be found in the online appendix.

The above equations characterize optimal labor demand as a short-term reaction via hours per worker and a longer-term reaction via employment, which depends on its own past value with persistence determined by λ. This crucial parameter not only summarizes the sluggishness of employment but also represents the weight applied to expected values of the future output price and wages as determinants of employment. Expectations of future demand and factor prices play a central role in shaping the reaction of employment to current shocks. Analogous to the permanent income

theory of consumption, the model predicts that for given model parameters, employment reacts more strongly to changes in current aggregate demand and wages when these are expected to be permanent rather than temporary. From equation 9, the larger is λ, the greater the weight applied to future versus present determinants of labor demand. Crucially for what follows, an increase in the persistence parameter λ could be attributed to an increase in the adjustment cost parameter c or to a decrease in $\eta_{\Omega\theta}$, the steepness with which the cost of using the intensive margin rises, or to both. In the following sections, we search for specific institutional and economic changes in German labor markets that relate to these theoretical implications.

IV.B. Flexibility in Reducing Hours per Worker

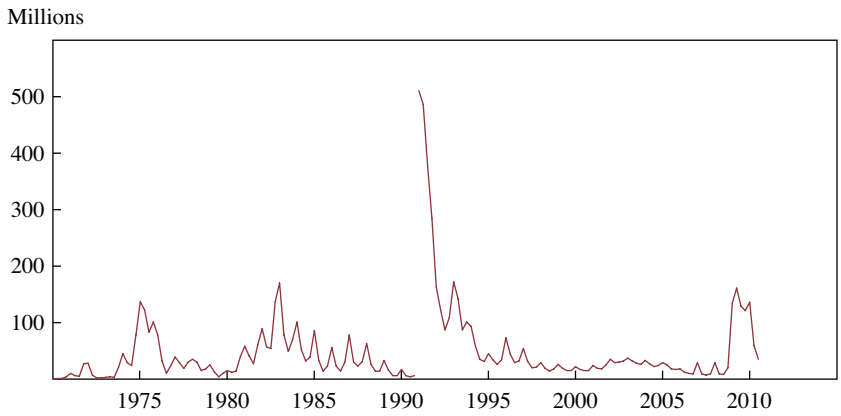
Although our analysis suggests that the decline in hours per worker in the 2008–09 recession was not surprising given the depth of the recession, it makes sense to start where so much attention has been directed in both the United States and Germany. In this section we explain why, despite the availability of new tools to adjust hours per worker, there was no surprise.

SHORT-TIME WORK (*KURZARBEIT*). One central reason often adduced for U.S.-German labor market differences is the differing systems of compensation in the two countries: the German system combines high firing costs, lengthy severance notice periods, and selective access to short-time compensation subsidies from the government, all of which encourage employers to cut hours per worker rather than bodies. In contrast, firing in the United States is a low-cost means of employment reduction; short-time pay is rarely used and designed only to insure very low earners against hours reductions. Yet it is noteworthy that the use of short-time work did not prevent large rises in unemployment in previous German recessions. The highly regarded German short-time work system (*Kurzarbeit*) is frequently cited in the business press as a central factor mitigating sharp rises in unemployment in Germany.[12]

Short-time work has existed in Germany for a century. The underlying idea is that a firm in "unavoidable" financial difficulties due to a documented shortfall of orders can apply in writing to the employment office, which administers the unemployment insurance program and active labor market policies, for short-time support. The firm then refrains from

12. Ralph Atkins, "Europe Reaps the Rewards of State-Sponsored Short-Time Jobs," *Financial Times,* October 28, 2009. OECD (2010a) evaluates short-time programs in different countries.

Figure 8. Hours of Work Lost through Short-Time Work, 1970–2010[a]



Source: Institut für Arbeitsmarkt- und Berufsforschung.
a. Data are quarterly; no adjustment is made to avoid a break at German unification.

layoffs but reduces workers' hours and variable pay in proportion. Workers receive between 60 and 67 percent of the net pay they would have received for the hours not demanded. Firms pay workers this *Kurzarbeitergeld* ("short-time money") and are later reimbursed by the employment agency through the unemployment insurance fund. In previous recessions, firms were expected to pay social security and other contributions of workers in full, causing average labor costs to rise with the reduction of hours. Implementation of short-time work at the firm level must be agreed to and is monitored by the works council (the establishment-level organization charged with representing workers' interests), which may help protect workers from potential abuse of the system by management.

The short-time work scheme was expanded aggressively in several ways in the course of the Great Recession. Firms could claim subsidies for up to 24 months instead of 6, and the required minimum number of affected workers was reduced. In late 2008 and early 2009, the Federal Employment Agency (Bundesagentur für Arbeit) took out newspaper advertisements encouraging firms to apply for short-time subsidies. In addition, the government assumed half the social insurance costs of the affected workers under a number of specific conditions. Even temporary help workers in Germany, who work on regular contracts for their agencies, were eligible for short-time subsidies from March 2009 onward and remain eligible until March 2012. Figure 8 shows that despite the intensity of these efforts, the number of

person-hours lost to short-time work was comparable to that in the shallower 1973–75 recession.[13] On the basis of the volume of reduced time, the use of short-time work represented the equivalent of about 400,000 jobs in 2009 (Schneider and Graef 2010), or 1 percent of total employment. Tito Boeri and Herbert Bruecker (2011) point out, however, that such calculations overstate the number of jobs saved.[14]

WORKING TIME ACCOUNTS. Some analysts attribute the small magnitude of the fall in employment to reductions in hours per worker of another type. The system of working time accounts (*Arbeitszeitkonten*) allows employers the freedom to increase hours above standard hours with no immediate payment, as long as hours are reduced at some future time with no cut in take-home pay, leaving hours at the standard when averaged over a window of time. The number of hours the employer owes the worker, which may be negative, is tracked in the worker's working time account. The share of workers with such an account rose from 33 percent in 1998 to 48 percent in 2005, and the average window in 2005 was 30 weeks (Gross and Schwarz 2007).[15]

The model of the previous section predicts that working time accounts would reduce labor costs and increase labor demand, inducing a positive scale effect and substitution from the extensive to the intensive labor margin.[16] The last effect occurs because the accounts reduce overtime premia and the sensitivity of wage costs to the intensive margin, possibly to zero. Person-hours should increase, but the effect on employment is ambiguous. Over the firm's cycle, working time accounts reduce overtime pay and the cost of adjusting hours per worker, so hours per worker should fluctuate more, while employment should adjust more sluggishly.[17]

Table 7 shows exactly what accounted for the decline in hours per worker between 2008 and 2009 (analysis is difficult at quarterly frequency

13. This has already been noted by Herzog-Stein and Seifert (2010).

14. There is a special short-time work scheme for firms that are restructuring, which involves employees "working" zero hours. Although this scheme was used massively in the east in the early 1990s, in 2009 it accounted for only 8.6 percent of short-time payments (and therefore of short-time hours).

15. Gross and Schwarz (2007) also document that employers sometimes violate some provisions of the agreements, and it is possible that in practice the windows are longer than 30 weeks. Still, working time accounts would have waned in importance compared with short-time work as 2009 wore on.

16. In a model with physical capital, substitution from capital to labor would also occur.

17. The lower reallocation of labor in a recession brought about by working time accounts may lower the economy's productivity, but this is offset by firms' higher productivity during periods of smaller fluctuations.

Table 7. Sources of Changes in Hours per Worker, 2008–09[a]

Source of change	*Change, 2008–09*		
	Hours per worker	*As percent of annual hours per worker*	*As percent of total decline in hours*
Short-time work	−13.4	−1.0	32
Standard weekly hours	−10.1	−0.8	24
Overtime	−7.9	−0.6	19
Part-time share	−7.5	−0.6	18
Working time accounts	−7.0	−0.5	17
Calendar effect[b]	−0.7	−0.1	2
Sick days	0.1	0.0	0
Second jobs	0.6	0.0	−1
Vacation days	4.6	0.3	−11
Sum: annual hours per worker	−41.3	−3.1	100

Source: IAB (Institut für Arbeitsmarkt- und Berufsforschung) Working Time Calculation and authors' calculations.

a. Calculations are based on the change in the yearly average from 2008 to 2009.

b. Reflects the different number of working days in the two years.

and impossible by sector). Annual hours per worker fell by 41.3 hours, or 3.1 percent. The largest contributing factor was short-time work, which accounted for 13.4 hours, or 32 percent of the total decline. A reduction in standard weekly hours was the next biggest factor (accounting for about one-quarter of the reduction), followed by approximately equal contributions from reductions in overtime, reductions in working time account balances, and the increase in the share of workers who are part-time (17 to 19 percent each). Previous authors (Schneider and Graef 2010, Klös and Schäfer 2010, Möller 2010, Sachverständigenrat 2010) have pointed to the contribution of working time accounts as evidence that hours per worker fell more than in previous recessions thanks to this newly expanded institution (presumably 17 percent more), thus allowing more jobs to be saved. Mechanically, the drawing down of working time accounts corresponds to 0.5 percent of annual hours and hence could be considered to have "saved" 0.5 percent of employment. The second column of table 7 confirms the number cited above of a "savings" equivalent to 1 percent of jobs through short-time work.

Firms do not immediately save money by reducing surpluses in working time accounts, so it is not immediately obvious why firms would do so in a severe downturn rather than lay off workers. However, a worker's account must be paid off if the worker is laid off, either as a severance payment including the overtime premium, or in the form of low hours at full pay

before the layoff takes effect.[18] All things equal, firms using working time accounts will have an incentive to postpone layoffs at the start of a recession, instead drawing down workers' surplus time in their accounts. Once a worker's account is at zero, the worker may be laid off, but by then the upturn may be sufficiently near that it is no longer worthwhile incurring the normal firing and hiring costs that apply to all workers. In November 2007 a ruling of the Federal Labor Court (Bundesarbeitsgericht 2010) strengthened the layoff disincentive by holding that an employer could not lay off a worker if any co-worker doing the same job had a surplus in his or her account.[19] The analysis is more complex when the availability of the government short-time scheme is taken into account. It is no longer unambiguous that firms using working time accounts lay off less, but they will lay off less if the accumulated surplus hours are sufficiently large, a condition likely to have been fulfilled in 2008.

A different consideration is that a firm that has workers with working time account surpluses has less incentive to use the short-time work scheme than a firm that does not, because using short-time work does not draw down the working time accounts. A surplus firm that uses short-time work during a recession will have to buy out its workers' surplus hours, because the window within which the working time accounts must be in balance will expire. If the surpluses are very large, the firm will prefer to draw them down rather than use short-time work, as the short-time compensation will not outweigh the excess hours compensation the firm would have to pay the workers. Thus, it is theoretically possible, as well as consistent with the fact that short-time work was not used more than in the milder 1973–75 recession, that the increased use of working time accounts crowded out short-time work in the 2008–09 recession. Reductions in hours per worker through working time accounts may not have come entirely at the expense of short-time work. In previous recessions, the downward trend in hours per worker contributed to the reduction in hours per worker, and working time accounts may also have compensated for the lack of such a trend in the Great Recession. However, the first column of table 4 shows that this trend was −0.36 log point per quarter, which is large compared with

18. When a worker with a working time account works an hour of overtime, she gets paid nothing for that hour, but one hour is credited to her account. The balance reverts to zero if she is given an hour off with pay within the window. If she is laid off with an hour's balance in her account, she must be compensated at the normal hourly wage plus the overtime premium.

19. For more details on how working accounts worked in the Great Recession, see Zapf and Brehmer (2010). For a detailed description in English of working time accounts, see Seifert (2004).

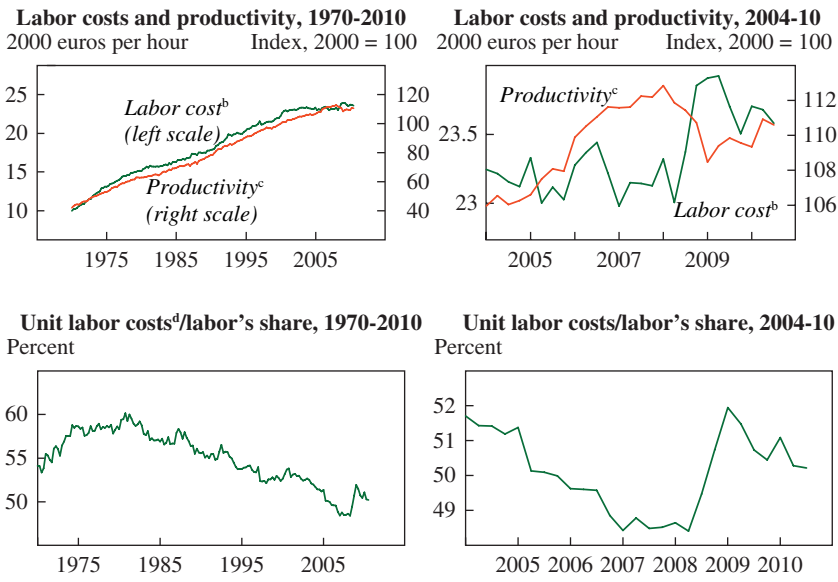
the 0.5 percent yearly reduction in hours due to working time accounts (second column of table 7). Hours per worker must have adjusted along other margins in the recession to compensate for the cessation of the trend.

UNCOMPENSATED HOURS REDUCTIONS: WORKING TIME CORRIDORS. Another relatively new, but less frequently used, option for firms wishing to reduce hours per worker involves the so-called working time corridors (*Arbeitszeitkorridore*). These are commonly included in the "opening clauses" conceded by unions in negotiations with employers as their bargaining power has continued to weaken in the past decade. Opening clauses permit firms to take extraordinary measures in extraordinary times, subject to agreement by the works council. A firm invoking an opening clause with a working time corridor provision may reduce total working hours, reducing its labor costs proportionately. This option is inferior to short-time work for the worker, because the lost income is not replaced by a government benefit. It is superior to short-time work for the firm in one important respect: unlike in the case of short-time work, all fixed costs (such as annual vacation and Christmas pay) and social security contributions are reduced proportionately, as well as wages (Hoff 2009). However, the hours reductions permitted are typically on the order of 15 percent, much less than is possible with short-time work. Perhaps for this reason, opening clauses appear to have been used little to reduce working time in the 2008–09 recession. A 2009 survey of works councils indicated that only 8 percent of firms were using this measure, compared with 30 percent that were drawing down surpluses or building up deficits in working time accounts, 20 percent that were using short-time work, and 13 percent that were adjusting through vacation time (Bogedan and others 2009). The data behind the decomposition of table 7 do not allow cuts through working time corridors to be identified, but they would appear under changes in standard weekly hours.

IV.C. Labor Costs

The small magnitude of the employment decline in the 2008–09 recession could be explained if labor costs had become more flexible and the adjustment to the drop in labor demand came through a decline in labor costs, rather than a decline in employment as in the past. Such a decline could have occurred through the use of opening clauses in union contracts, which, in addition to permitting the working time corridors mentioned above, sometimes allow employers to cut hourly wages in a downturn. Perhaps surprisingly, this option appears to have been used infrequently: the 2009 survey of works councils indicates that only 11 percent of firms did so (Bogedan and others 2009). A decline in labor costs could also have

Figure 9. Labor Costs and Productivity, 1970–2010[a]



Sources: German Federal Statistical Office.

a. All values are in real terms. Data are quarterly and seasonally adjusted and chained to avoid a break at unification.

b. Include employer and employee social security payments and are adjusted for reimbursements related to short-time work.

c. Output divided by hours worked.

d. Labor costs divided by productivity.

occurred through the introduction of subsidies to offset payroll taxes for employers using short-time work; such subsidies were introduced for the first time in July 2009. However, the amount paid out in short-time payments and social security refunds in 2009 was a mere 0.3 percent of the wage bill.[20]

The top left panel of figure 9 plots hourly labor costs for the period 1970–2010Q3 (again chained to eliminate a jump at unification); the top right panel focuses on the period 2004–10. Labor cost growth fell to zero in 2001 but then surged just as the recession began in 2008, as contracts negotiated in the previous year came into force. Labor's share dropped sharply from 1982 to the recession (bottom two panels). Labor costs did fall

20. Payroll taxation is significant in Germany, at about 35 percent of aggregate gross pay currently, compared with only about 12 to 13 percent in the United States, and it has a tendency to rise in recessions (Burda and Weder 2010), for two reasons. First, there is a fixed upper bound on contributions, as in the United States, and second, payroll taxes tend to be raised during recessions to keep the social insurance funds that they finance operating in the black.

in 2009, but only from the second quarter onward, after GDP had ceased to decline, and therefore too late to stem job losses, since our regressions suggest that aggregate employment does not respond faster to labor costs than to GDP.

Certain authors, particularly Jens Boysen-Hogrefe and Dominik Groll (2010) and Hermann Gartner and Sabine Klinger (2011), stress instead the importance of the wage moderation that has occurred since 2001 as providing the conditions under which a recession would lead to only moderate employment losses. To get a sense of the magnitudes that might be involved, we examine the counterfactual that labor costs per worker had resumed growth at the rate that had prevailed from 1995 to 2000, 1.12 log points per year, but that GDP followed its actual course. Our own estimate of the compensated elasticity of labor demand is –0.5 (see third column of table 4); a value closer to the consensus in the literature is –0.7 (Peichl and Siegloch 2010). GDP fell for 4 quarters beginning in 2008Q1, and over this length of time, wages in the counterfactual would have risen 1.12 log points, reducing employment by $0.7 \times 1.12 = 0.8$ log point (assuming an elasticity of –0.7). Wage moderation could thus account for $0.8/3.9 = 21$ percent of the missing employment decline. Wage moderation appears to deepen the puzzle of sluggish employment growth in the expansion, but it may have had a muted effect if employers did not expect this moderation to last, as would be implied by a dynamic labor demand model.

IV.D. Labor Market Efficiency

A set of landmark labor reforms was passed in the twilight of the left-of-center government led by Chancellor Gerhard Schröder. In March 2003 Schröder put forward the "Agenda 2010," which sought to increase flexibility in German labor markets. A commission headed by Peter Hartz, a top Volkswagen executive, and consisting of representatives of unions, management, and government, put forward a number of proposals, many of which were passed by the federal parliament and put into effect in 2003–05. The reforms may loosely be grouped into those reducing reservation wages (and therefore reducing wages), those increasing the efficiency of the job search process (and therefore increasing wages), and those allowing employers more flexibility (probably reducing wages). We focus initially on the first two categories.[21]

21. An excellent source in German for information on the reforms is "Die Hartz Reformen" (www.hartz-iv-iii-ii-i.de/, accessed March 4, 2011). For a discussion in English, see Ochel (2005).

The Hartz IV law, which reformed unemployment benefits, is particularly likely to have reduced reservation wages. The amount of recent work experience required for eligibility was increased, the duration of the benefits cut, and the onus of finding a job put for the first time on the unemployed person rather than the employment agency. Sanctions for refusing job offers were increased and applied more frequently. The follow-on unemployment assistance program, which provided means-tested benefits potentially indefinitely, was merged with the less generous social welfare program. The reforms most likely to have improved job search efficiency were Hartz I, which enlisted private firms to help workers search for jobs, and Hartz III, which reorganized the employment agency.

Theoretically, these reforms should have reduced unemployment, and there is some evidence that they did. For example, the unemployment rate of 50- to 54-year-olds, the group experiencing the largest reduction in benefit duration, began falling in 2005 relative to the rate for 25- to 49-year-olds and continued to do so throughout the recession (graph available from the authors on request). The long-term unemployed (workers with unemployment spells of 1 year or more) peaked as a share of the unemployed in 2006 and fell through the recession to 45.5 percent in 2009.[22] René Fahr and Uwe Sunde (2009) and Klinger and Thomas Rothe (2010) find that the efficiency of the job matching function increased, and Gartner and Klinger (2011) observe that the Beveridge curve shifted inward and continues to do so. Overall, the hypothesis that the Hartz reforms reduced unemployment by increasing employment, possibly with a lag that led their effect to continue into the recession, is plausible. The potential magnitude is difficult to judge, however.

The third set of reforms sought to provide more flexibility to employers. In 2003 the threshold size for firms subject to layoff rules was raised from 5 workers to 10. Hartz II introduced so-called mini-jobs, or part-time forms of employment involving monthly income of no greater than €400, which were exempt from most social security taxes. Hartz I significantly deregulated the temporary agency sector, leading to more competition for regular employment from temporary workers. These last two reforms are likely to have contributed to wage moderation.

How much additional flexibility did the Hartz reforms afford employers? The deregulation of the temporary agency sector is considered the most important of the reforms in this respect. It gave individual employers

22. See OECD, "Employment and Labour Markets: Key Tables from the OECD," dx.doi.org/10.1787/20752342-2010.

flexibility to vary employment without incurring hiring or firing costs, and the share of temporary workers rose from 1.3 percent of employment in 2005 to 2.6 percent in 2007–08 (Bundesagentur für Arbeit 2011). But the effect on the flexibility of the aggregate economy was smaller, as most temporary agency workers have permanent contracts with their agency. Employment of temporary workers did fall as soon as the recession hit, well before permanent employment responded (Bundesagentur für Arbeit 2011). Because temporary workers are less attached to the labor force, it is easier for temporary agencies to reduce employment by attrition, and it is becoming more common for them to hire workers initially on temporary contracts (Burda and Kvasnicka 2006). But the magnitude of the adjustment should be put in perspective. The total employment decline among temporary workers, at 205,000 (Bundesagentur für Arbeit 2011), represents only 0.5 percent of total employment at its 2008 peak. The extra flexibility for the aggregate economy appears small, making it plausible that the moderating effect of working time accounts on employment fluctuations was more important.

IV.E. The Role of Expectations in the Boom and the Bust

Employment could have responded more inertially to the 2008–09 recession because employers expected it to be shorter than usual. This recession, although deep, was in fact of shorter duration than other postwar recessions, with the possible exception of the 1973–75 episode, which had a faster recovery. Employers may have expected a short downturn, based on the expectation that world trade would recover quickly. We also hypothesize that employers expected the 2005–07 boom to be short-lived. We investigate these possibilities using data on firms' expectations and an analysis of the business press, before considering variants of the expectations-based hypotheses.

EMPLOYER EXPECTATIONS DATA. We make use of indexes of the current business situation and business expectations derived from surveys conducted by the Ifo Institute for Economic Research. Ifo surveys about 7,000 firms each month, asking whether the current situation in the firm is good, satisfactory, or poor, and whether the firm expects the next 6 months to be more favorable than, unchanged from, or less favorable than today. Ifo calculates the expectations "balance" as the difference between the percentage shares of positive and negative responses. These indexes are available for the whole German economy, and separately for manufacturing, construction, wholesale trade, and retail trade. There is no obvious way to deal with unification, and so we simply join the series (for most series there is no jump at unification).

Figure 10 presents these two monthly series for the above four sectors, along with quarterly value added in the corresponding sector, normalized to equal 100 at the start of the 2005 boom. The top left panel shows that changes in value added in manufacturing are clearly reflected in both the Ifo series. The current situation generally tracks expectations fairly closely, with a lag. The trough for 6-month expectations in manufacturing was in December 2008, which was indeed about 6 months before the trough for the current situation series for manufacturing, although less than 6 months before the trough of value added in manufacturing in 2009Q1. We can say that employers were not surprised by the end of the recession, but without data on expectations further into the future than 6 months, we cannot tell what employers expected at the start of the recession, when layoff decisions had to be made.[23]

Examination of the preceding expansion proves more fruitful. As the boom began in 2005, the current situation and expectations in manufacturing initially rose together, but then expectations ceased to rise and remained much lower than the current situation until the recession hit. The only precedent for such a gap between the current situation and expectations is the unusual postunification boom, and the gap points to a lack of confidence on manufacturing employers' part that dovetails with the econometric evidence found above. There is a hint of a similar pattern for construction (top right panel), but expectations track the current situation closely throughout for retail and wholesale trade (bottom panels).

We can use the expectations data to quantify the role of expectations in hiring in the 2005–07 expansion. We focus on expectations and employment for the aggregate economy, since we cannot track true total employment in manufacturing in the boom, which would include temporary workers. Expectations refer to a change in the firm's fortunes, and because they fluctuate at high frequency, a 1-quarter-differenced regression, with expectations themselves (EXP) in levels (converted to quarterly frequency by averaging), is the appropriate specification:[24]

$$(10) \qquad \Delta \log L_t = \phi_0 + \phi_1 \Delta \log \mathrm{GDP}_t + \phi_2 \Delta \log w_t + \phi_3 \mathrm{EXP}_{t-2} + \Delta \mu_t .$$

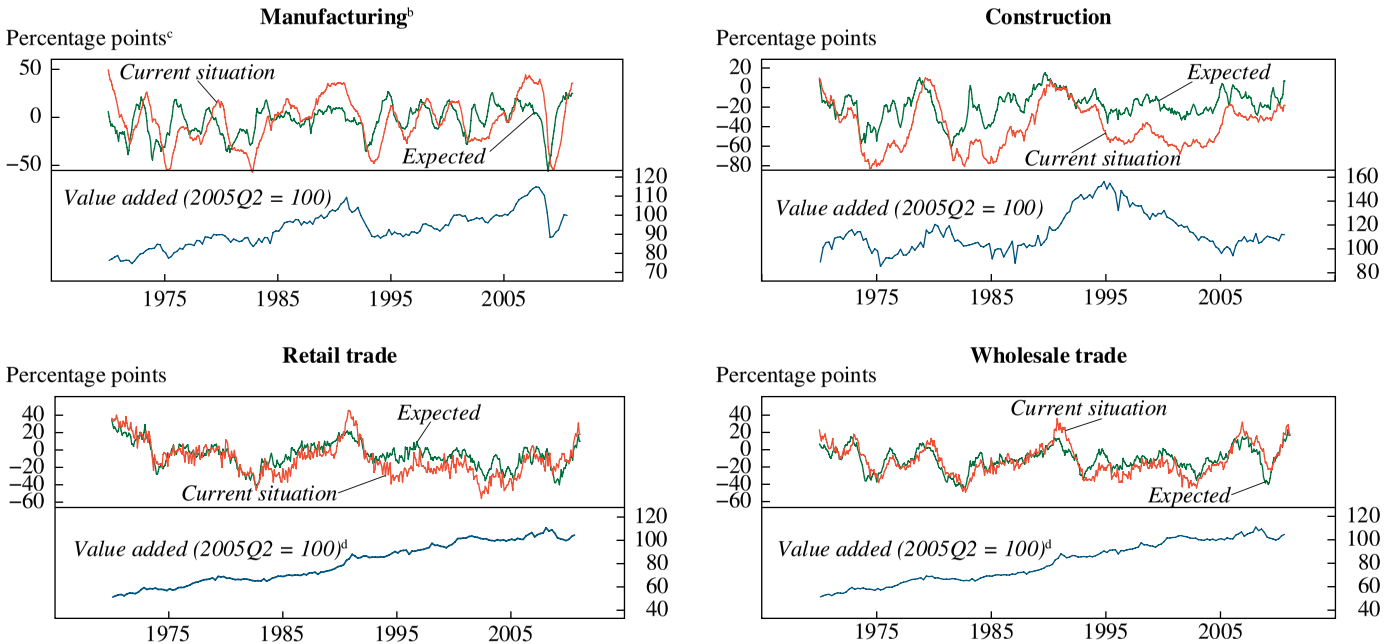
As table 8 shows, ϕ_3 is positive and highly statistically significant, and the inclusion of the EXP variable increases the R^2 of the regression considerably.[25]

23. We attempted to use data from the IAB-Betriebspanel on expected employment a year ahead, but these data proved unreliable.

24. The expectations variable is neither differenced nor expressed in logs: expectations can have a zero value, and converting to an index involves arbitrariness.

25. Surprisingly, the interactions of expectations with the other covariates have statistically insignificant coefficients, and so we do not include them.

Figure 10. Business Expectations and Value Added, by Sector, 1970–2010[a]



Sources: Ifo Institute for Economic Research and German Federal Statistical Office.

a. Series are not adjusted to avoid a break at German unification.

b. Includes mining; excludes food industry.

c. Difference between shares of positive ("good" current situation, "more favorable" expected) and negative ("poor" current situation, "less favorable" expected) responses in the Ifo business climate survey. "Expected" refers to the outlook for the coming 6 months. Data are monthly and not seasonally adjusted.

d. Includes both retail and wholesale trade as well as the hospitality industry and transportation.

Table 8. Regressions Estimating the Role of Expectations in Employment Adjustment[a]

	Dependent variable: change in log employment	
Independent variable	*8-1*	*8-2*
ΔGDP	0.170	0.163
	(0.047)	(0.038)
Δ Labor costs per worker[b] (Δ*w*)	–0.038	–0.049
	(0.035)	(0.031)
Expectations balance[c] EXP_{t-2}		0.00013
		(0.00003)
Constant	0.0002	0.0014
	(0.0006)	(0.0006)
R^2	0.18	0.38
No. of observations	135	134

Source: Authors' regressions.

a. All variables are measured using quarterly, seasonally adjusted data for 1970–2003 and (except the expectations balance) are expressed in logarithms. Newey-West standard errors based on four lags are in parentheses.

b. Includes employer and employee social security payments and is adjusted for reimbursements related to short-time work.

c. Difference between the share of firms expecting business conditions to be better in 6 months and the share expecting them to be worse.

We next construct counterfactual expectations for the boom period based on the historical relationship between expectations and the current situation (CUR), to assess the extent to which pessimistic expectations dampened hiring. The fit is similar whether CUR enters in levels or in differences, and we construct counterfactual expectations for 2005Q3 onward using the coefficient from the following regression for the usual 1970–2003 period:

$$\Delta EXP_t = \rho_0 + \rho_1 \Delta CUR_t + \Delta\xi_t.$$

We estimate $\hat{\rho}_1$ to be 0.61. The counterfactual expectations during the 2003–05 boom are much higher than the actual expectations.

Table 9 summarizes the effect of the pessimistic expectations in the boom. Actual employment growth in the expansion was 3.7 log points. Estimating equation 9 without controlling for expectations leads to the inaccurate prediction of a mere 1.4-log-point employment increase. Adding expectations to the specification significantly improves the accuracy of the prediction to a 3.2-log-point increase. The key is to know how much higher employment growth would have been predicted to be had expectations been higher: with counterfactual expectations, employment growth is predicted to be 4.1 log points. The difference between the last two estimates shows the role of

Table 9. Role of Expectations in Employment in the 2005–08 Expansion[a]

	Log points
Actual change in employment	3.7
Predicted change in employment	
Without expectations controls	1.4
With expectations controls	3.2
With counterfactual expectations	4.1
Effect of changed expectations[b]	0.9

Source: Authors' calculations.

a. Values are reported for the period 2005Q3–2008Q3. Predictions are based on the 1-quarter-differenced regressions reported in table 8.

b. "With counterfactual expectations" minus "With expectations controls."

expectations: if expectations had behaved in the boom as they had historically, instead of having been unusually pessimistic, employment growth would have been 0.9 log point higher. This confirms that employers hesitated to hire in the 2005–07 boom for lack of confidence that it would last and cognizant of the high firing costs in Germany; thus, when the recession they feared indeed arrived, they had less need to fire. The effect of this pessimism is sufficiently large to account for 0.9/1.6 = 56 percent of the missing employment increase in the boom, and 0.9/3.9 = 23 percent of the missing employment decline in the downturn.

EVIDENCE FROM THE BUSINESS PRESS. Our narrative characterizing the 2005–07 expansion as one of pessimistic expectations and unexpectedly low (conditional) employment growth is corroborated by our own survey of business cycle reporting by the leading daily German business newspaper, *Handelsblatt,* for the period 2005–09. Reports in the first 2 years of the expansion were remarkably downbeat, despite the fact that GDP growth was robust and (unconditional) employment growth unusually positive. A string of bad showings of the Ifo index of the overall business climate (a geometric average of the two indicators discussed above, namely, the current situation and expectations indexes) established a relatively pessimistic outlook at the outset.[26] The expansion was seen as driven by buoyant exports and not at all by internal demand (domestic investment and consumption).

26. "Wolken am europäischen Konjunkturhimmel" (Clouds on the European business cycle horizon), February 22, 2005; "Ifo spricht von chronischer Schwäche" (Ifo [Institute] cites chronic weakness), February 28, 2005; "Weniger Jobs trotz hoher Gewinne" (Fewer jobs despite higher profits), March 24, 2005. Journalist Olaf Storbeck noted that despite the conditions for a healthy expansion, consumers and employers were not cooperating: "1,2,3,4 . . . Aufschwung!" (1,2,3,4 . . . Boom!), April 25, 2005, and "Reformvorsprung für Deutschland" (A jump ahead with reforms for Germany), September 9, 2005. All citations in this subsection are from *Handelsblatt.*

A commonly held view was that consumers were holding back spending in light of a continuing string of layoffs and restructuring measures by large firms, despite significant declines in the unemployment rate in 2005 heralded by major policymakers.[27]

The mood was further depressed by a general expectation that taxes—especially the value-added tax—would be increased after the elections in fall 2005. Household income was seen as dented by flat wages, the Hartz reforms, and increases in social security contributions and energy prices.[28] An expansion of consumer demand is thought to have kicked in only after the summer of 2006, when Germany hosted the World Cup soccer championship.[29] Yet this view is not supported by the data; from 2005Q1 to 2006Q2, annualized real consumption growth averaged 0.5 percent, compared with 0.3 percent over the following 6 quarters. Even in July 2006 there was a perception that firms were not creating enough jobs despite a return to profitability and that the expansion would soon grind to a halt.[30]

By January 2007 the pessimistic mood had reversed completely, despite a 3 percent increase in the value-added tax which took effect that month. The first half of the year was characterized by remarkably positive news reporting, despite a perceived weak showing for the labor market.[31] By summer 2007 the first signs were appearing that the slowdown in the United States had arrived in Germany, yet forecasts by the major economic research institutes warned of only modest spillovers, citing the effect of the reforms and shortages of skilled workers.[32] Positive reports continued into the summer of 2008, and a survey of 500 managers of medium-size companies revealed that 76 percent believed they would not be affected by the

27. "Clement sieht Arbeitslosigkeit auf Zenit" ([Economics Minister Wolfgang] Clement sees unemployment at its peak), March 31, 2005.

28. "Wirtschaft nimmt Fahrt auf—Konsum bleibt Hemmschuh" (The economy is taking off—consumer spending remains the bottleneck), November 15, 2005.

29. "Der kleine Luxus" (Small luxury), August 4, 2006.

30. "Der Aufwartstrend stockt" (The upward trend is sputtering), June 20, 2006; "Konzerne bauen in Deutschland ab" (Corporations are retrenching in Germany), July 18, 2006; "Die Jobwende bleibt aus" (The job turnaround isn't materializing), July 18, 2006. As late as summer 2006, Chancellor Angela Merkel criticized a series of high-profile layoffs by Allianz and Volkswagen: "Merkel ermahnt die Unternehmen" (Merkel admonishes businesses [for continuing layoffs]), August 24, 2006.

31. See "Experten streiten über Aufschwung am Arbeitsmarkt" (Experts disagree over the boom for the labor market), August 2, 2007.

32. "Herbstgutachten Analyse: Neue Besen kehren gut" (Analysis of the fall [economic] forecasts: New brooms sweep well), October 17, 2007. The article "Ohne die USA mutig voraus" (Bravely forward without the United States), December 30, 2007, describes a strong positive sentiment that despite problems in the United States, export demand would continue and that firms were unlikely to lay off workers, given difficulties finding skilled workers.

ensuing economic crisis.[33] By July 2008, however, the Ifo composite index had turned sharply downward, and by August the judgment was unanimous that the boom was over.[34]

Toward the end of the phase of negative growth (2008Q1–2009Q1), news reports began to suggest that employers were reluctant to fire workers, instead using short-time work and reducing working time balances and earned vacation time to protect core workers.[35] By July 2009, rising order books and recovery of the world economy contributed to a general recovery, which was mirrored in consumer optimism.[36] By the end of 2009, the consensus view was that the recession was over.

IV.F. Competing and Complementary Explanations of the Labor Market Miracle

We can explain about 60 percent of the labor market miracle in Germany with wage moderation and slow employment growth in the previous boom. Only about half of the latter can be attributed to pessimistic employer expectations, however. Christine Franz and Steffen Lehndorff (2010) hypothesize that layoffs were low in the recession because of a lack of hiring in the expansion, as working time accounts reduced the long-run marginal cost of an extra hour per worker, leading to a permanent increase in hours per worker at the expense of employment.[37] To assess the possible magnitude of this effect, we compute difference-in-differences comparing changes in hours per worker in 1996–2004, when they were still falling rapidly, and 2004–07, when they leveled out. Before 1996, reductions in hours per worker were associated with reductions in usual hours for full-time workers and appear to reflect the success of unions in translating increased

33. "Deutsche Wirtschaft überraschend stark" (German economy is surprisingly strong), May 15, 2008; "Wirtschaft hat vielversprechend Pläne" (Promising outlook for the economy), June 4, 2008; "Finanzkrise? Kein Thema" (Financial crisis? Not an issue), June 7, 2008.

34. See "Der Aufschwung ist vorbei" (The boom is over), August 14, 2008, which details the negative GDP growth results for the second quarter; "Ifo: 'Abwärtstrend mit Riesenschritten'" (Ifo: Negative trend with giant steps), September 24, 2008.

35. In February, *Handelsblatt* reported that burgeoning working time account balances and administrative extension of short-time work had made machine tool producers better prepared to deal with the crisis in comparison with previous recessions: "Erfahrene Zyklikler" (Experienced 'cyclists'), February 11, 2009. In particular, mention is made of businesses holding onto trained personnel as long as possible; see "Trotz Krise gibt es sie—die Jobwunder" (Despite the crisis—there are job miracles), March 4, 2009.

36. "Die Industrie meldet sich zurück" (Industry is back), July 7, 2009; "Deutsche Tugend" (German virtue), September 2, 2009; "Deutsches Mini-Jobwunder macht Hoffnung" (German mini-job miracle creates hope), October 15, 2009. For a note on consumer sentiment, see "Verkehrte Welt" (Topsy-turvy world), October 8, 2009.

37. In terms of the model in section IV.A, this is a decrease in the parameter $\eta_{\Omega\theta}$.

Table 10. Sources of Changes in Hours per Worker, 1996–2007[a]

Source of change	Change per year (hours)		Difference in differences (hours)[b]
	1996–2004	2004–07	
Short-time work	0.3	0.5	0.2
Standard weekly hours	−2.0	3.3	5.3
Overtime	−1.0	−0.8	0.2
Part-time share	−13.4	−7.1	6.3
Working time accounts	−0.1	1.2	1.3
Calendar effect[c]	1.1	−3.6	−4.7
Sick days	2.8	1.0	−1.8
Second jobs	1.0	1.2	0.2
Vacation days	2.1	0.6	−1.5
Sum: annual hours per worker	−9.3	−3.6	5.7

Source: IAB Working Time Calculation and authors' calculations.
a. Annual data.
b. Second column minus first column.
c. Reflects the different numbers of working days across years.

wealth into increased leisure.[38] Table 10 shows that the regime change between 1996–2004 and 2004–07 was driven by a slowing increase in the share of workers working part-time and *rising* standard weekly hours. Even in the latter period, chosen so as to maximize the buildup of working time accounts in the expansion, we find that their overall contribution appears small. However, estimates of working time accounts may not be reliable, especially when standard weekly hours are changing, and so part of the low hiring in the expansion could well be due to a permanent shift in hours conditional on GDP and labor costs.

The model presented at the beginning of this section would attribute the remaining 40 percent of the miracle to a regime shift, that is, changing model parameters that would increase the quasi-fixity of labor. We have focused on working time accounts and the disincentives they create for layoffs, yet a number of alternative explanations can also be explored in light of our empirical findings and the predictions of the model. An explanation frequently cited for the low employment growth in the 2005–07 expansion is a higher incidence of skilled worker "shortages" than in previous expansions, or a reluctance to lay off workers when the recession arrived, fearing difficulties in rehiring them in the recovery.[39] Although firms reporting shortages in the boom were not less likely to lay off in the recession

38. See Hunt (1998), Alesina, Glaeser, and Sacerdote (2005), and Burda, Hamermesh, and Weil (2008).

39. Sachverständigenrat (2010), Schaz and Spitznagel (2010), and Schütt (2010). In the business press, this factor was mentioned frequently after the onset of the Great Recession.

(Klinger and others 2011), and although the vacancies-to-employment ratio and the share of firms reporting shortages were similar in the 2005–07 expansion and in its predecessor (Gartner and Klinger 2010), it is possible that increasing specialization of the workforce and slow labor force growth have made firms more reluctant to part with their skilled workers in recessions.[40]

An explanation that competes with pessimistic employer expectations is that output-constrained firms experienced a positive productivity shock at the beginning of the expansion.[41] A priori, this would seem less plausible for Germany, an open economy facing a competitive international market. Under these conditions, a productivity shock would more likely be represented as a fall, not a rise, in prices. In any case, comparison of labor productivity (output per hour) across expansions shows that whereas output increased in 2005–07 by an amount to similar to that in the previous three booms, labor productivity rose by not much more than half of the corresponding value. There is no evidence that this mechanism was responsible for the sluggish expansion.[42]

V. Conclusion

Like the United States, Germany suffered its worst postwar recession in 2008–09. Yet employment barely fell and unemployment hardly rose. Germany generally accommodates reductions in labor demand more along the intensive margin than does the United States, and we have shown that the large reductions in hours per worker in Germany were largely consistent with the magnitude of the recession and recent wage moderation. The lack of a decline in employment was a historical anomaly, however. One partial explanation for the "labor market miracle" is pessimistic expectations leading to low hiring in the previous expansion, with the result that fewer workers were laid off when the recession arrived. Weak employment growth in the boom accounts for 41 percent of the missing employment decline in the recession. Our account is thus broadly consistent with the narrative in the business press.

Although part of Germany's labor market response to the Great Recession is directly related to expectations, another component is related to changes in labor market institutions since the mid-1990s. The increased use of privately negotiated working time accounts appears to have cheapened private

40. In terms of the model in section IV.A, this would correspond to an increase in the parameter *c*.

41. A firm that cannot sell more of its output at the given price will react to an exogenous increase in productivity by cutting labor (or hiring less).

42. Using the recessions defined in table 3, output increased in the 2005–07 boom by 6.2 log points (versus 6.6 log points in the three previous recessions), but output per hour increased by only 3.8 log points (6.8 log points in the three previous recessions).

adjustment along the intensive margin and substituted for the more traditional government short-time work—a potentially interesting lesson for the United States. However, incentives inherent in the working time accounts, which allow employers to avoid the overtime premium in good times, are likely to have reduced layoffs in the recession. For any desired change in total hours, lower sensitivity of costs of hours per worker also increased the effective cost of layoffs. Thus, while the change in hours per worker in the recession was not unusual, the unexpected development was the larger number of workers able to retain their job and experience this decline in hours per worker.

Although it may be tempting to consider working time accounts for the United States, it is important to be circumspect when comparing labor markets across countries. Their functioning is conditioned by the system of labor relations and their interaction with the whole spectrum of labor market institutions. It is noteworthy that working time accounts in Germany are more prevalent in large firms, which have more resources to manage the complex task of human resources planning, and which are overseen by works councils.

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Comments and Discussion

COMMENT BY

MICHAEL W. L. ELSBY[1] Michael Burda and Jennifer Hunt have produced a very interesting and informative exploration of the Great Recession and its propagation through the German labor market. Their paper displays a deep knowledge of the institutional context in which the recession evolved, and it brings to bear a strikingly broad range of data given the almost real-time nature of the analysis.

The puzzle that Burda and Hunt address is the following: although German GDP and labor productivity fell precipitously during the recession, and hours per worker fell by as much as one would expect from past behavior, employment barely fell at all. That last fact is remarkable relative to both the recent experience of the United States and, as Burda and Hunt show, the cyclical behavior of German employment in previous recessions.

At the risk of oversimplification: Burda and Hunt consider two broad classes of explanation. The first is real wage flexibility. If the decline in labor demand that accompanied the recession led to significant wage moderation, then employment did not need to fall. The second is the possibility that profound labor hoarding prevented the steep decline in contemporaneous labor productivity from translating into a commensurate decline in firms' labor demand.

The emphasis of the paper is on the second of these two explanations. In particular, Burda and Hunt draw attention to two sources of labor hoarding that, they argue, may have had an important bearing on Germany's experience in the Great Recession. First, they suggest that surpluses in working

1. I am very grateful to Heiko Stüber for valuable discussions and for his help and advice with the Beschäftigten-Historik microdata for Germany. Thanks also to Rudi Bachmann, Steffen Elstner, and Eric Sims for sharing their data.

time accounts, accumulated in the boom that preceded the recession, may have been perceived by firms as a firing cost during the recession. Second, they contend that lackluster expectations in the boom, together with optimistic expectations of a short recession, moderated firms' incentives to lay off workers in the recession.

I will touch on a number of questions that arise in my mind that challenge the conclusion that labor hoarding was at the heart of the German labor market puzzle in the Great Recession. On some of these questions, it will turn out that available data allow me to prove myself wrong. On others, however, the data do provide some suggestive, although not conclusive, evidence that questions the significance of labor hoarding.

My first question relates to real wage flexibility. Burda and Hunt suggest that aggregate measures of labor cost per hour show little evidence of wage moderation during the recession. A long and distinguished literature on estimating real wage cyclicality, however, argues that such aggregate measures are potentially misleading. Reductions in labor input that accompany recessions are typically borne disproportionately by the low skilled, and this compositional shift biases one toward finding little wage moderation in aggregate data in times of recession. This countercyclical composition bias has been shown to be substantial in data for the United States: see Gary Solon, Robert Barsky, and Jonathan Parker (1994) and the references cited therein.

As Solon, Barsky, and Parker demonstrate, a sense of the magnitude of this composition bias can be obtained by looking at changes in individual real wages across time using longitudinal microdata. By happy coincidence, I was able to access a particularly rich source of such data from German social security records. The Beschäftigten-Historik (BeH) is the employee history file of the Institute for Employment Research (Institut für Arbeitsmarkt- und Berufsforschung, or IAB) of the German Federal Employment Agency. It includes the total population gainfully employed and covered by the social security system.[2] The data include a measure of the daily earnings of workers employed on June 30 of each year from 1977 to 2009.[3] The results reported in what follows are based on a 10 percent sample of full-time workers aged 16 to 65.

2. Not covered are self-employed workers, family workers assisting in the operation of a family business, civil servants, and regular students. The earnings data are right censored at the contribution assessment ceiling. Only noncensored earnings spells are used in my analysis.

3. A drawback of the data is that they do not include a measure of workers' hours. Consequently, the results reported could reflect cyclicality in full-time workers' daily hours worked.

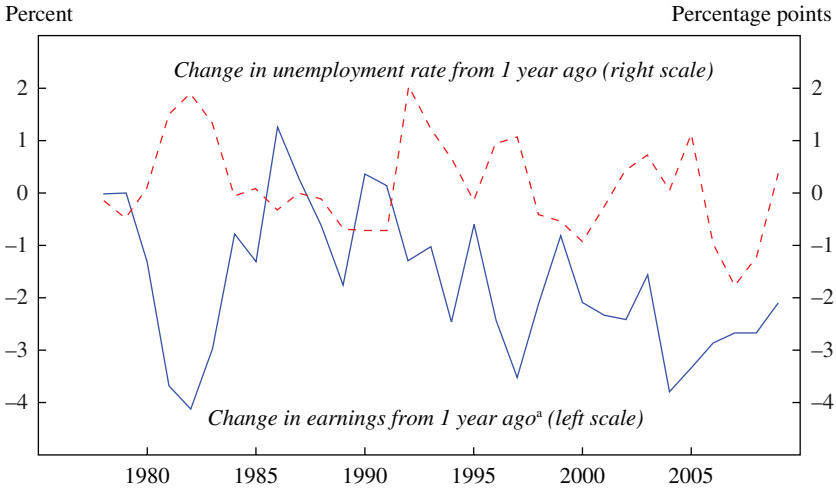
These data allow one to check whether a concern about composition bias is founded in aggregate German data. The answer turns out to be yes and no. On the one hand, over the whole sample period, adjusting for cyclical changes in the composition of labor input raises substantially the estimated cyclicality of real wages in Germany. The estimated semielasticity of real daily earnings with respect to the unemployment rate using unadjusted data is −0.34 (with a standard error of 0.33), compared with an estimate of −0.90 (with a standard error of 0.24) using the composition-adjusted data.[4] In other words, adjusting for composition nearly triples the estimated cyclicality of real daily earnings and suggests that a 1-percentage-point rise in the unemployment rate is associated with a 0.9 percent decline in real daily earnings. This semielasticity of close to 1 is strikingly close to the estimates found in the U.S. literature (see Solon, Barsky, and Parker 1994).

On the other hand, closer inspection of the estimates reveals little evidence of pervasive wage moderation during the recent recession in Germany, even in composition-adjusted estimates of the cyclicality of real wages. To show this, my figure 1 plots estimates of composition-adjusted real wage growth together with the change in the unemployment rate for each year in the BeH sample from 1977 to 2009. Reflecting the point estimates noted above, the two series clearly approximate mirror images of one another over the majority of the sample period. Despite this, composition-adjusted growth in real daily earnings exhibits no sharp decline during the recent recession.

My second reaction to Burda and Hunt's analysis is that although they do an admirable job of documenting and interpreting the behavior of labor market stocks, they do not analyze worker flows during the recession. In particular, I want to draw attention to the behavior of the exit rate from unemployment in Germany in recent years, which exhibits some curious properties.

4. These estimates are derived using the method suggested by Solon, Barsky, and Parker (1994). The first estimate (which is contaminated by cyclical changes in the composition of the workforce) is the outcome of a simple least squares regression of aggregate log real daily earnings for each year in the sample on the time series of the change in the unemployment rate, together with a linear time trend. The second estimate adjusts for composition using a two-step procedure. In the first stage, the change in an individual worker's log real daily earnings is regressed on a set of dummy variables for each year of the sample, as well as the worker's age. In the second stage, a simple least squares regression of the estimated year effects on the change in the unemployment rate and a linear time trend is performed. Because of a large outlier in the growth of average log real daily wages in 1991–92, I omit that observation in constructing both the unadjusted and the adjusted estimates.

Figure 1. Composition-Adjusted Real Daily Earnings Growth and Changes in the Unemployment Rate, Germany, 1977–2009



Source: IAB employee history file (Beschäftigten-Historik), 1977–2009.

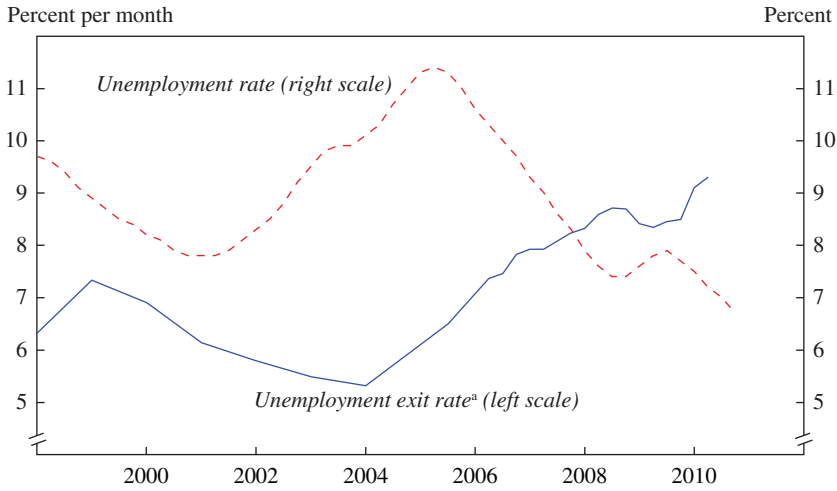
a. Earnings are noncensored daily earnings on June 30 of each year, estimated from a 10 percent sample of full-time employees aged 16 to 65 covered by social security and deflated by the Bundesbank consumer price index.

Since George Perry's seminal 1972 Brookings Paper, economists have known that it is possible to infer unemployment flows from the duration structure of unemployment. At the time of this writing, data on unemployment by duration for Germany were available from Eurostat annually from 1998 to 2004, and quarterly thereafter until the third quarter of 2010. These data therefore cover much of the recent recessionary period.

My figure 2 plots the time series of the unemployment rate together with the exit rate inferred from data on unemployment by duration in Germany.[5] As in the United States and many other developed economies, it is clear that the exit rate moves procyclically in Germany. A striking feature of these series, however, is that the exit rate began rising as early as 2004, about a year and a half before German unemployment eventually began declining

5. The unemployment exit rate is computed as follows. First, the probability of exiting unemployment within a quarter is calculated as $F_t = 1 - [(U_{t+1} - U_{t+1}^{<3m})/U_t]$, where U_t denotes the total number of unemployed workers, and $U_t^{<3m}$ the number unemployed for less than 3 months, in quarter t. This is then converted into a monthly unemployment exit hazard, $f_t = \ln(1 - F_t)/3$.

Figure 2. Exit Rate from Unemployment and the Unemployment Rate, Germany, 1998–2010



Source: Eurostat.

a. Inferred from unemployment by duration. Data are plotted annually from 1998 through 2005 and as a 4-quarter moving average of quarterly data thereafter.

at the end of 2005 during the boom that preceded the recent recession. This behavior of the exit rate is anomalous: in the majority of developed economies, unemployment exit rates are a lagging indicator, typically falling for some time after recessions are deemed to have ended (see Elsby, Hobijn, and Şahin 2008).

An intriguing aspect of this anomalous turnaround in the exit rate in the mid-2000s is that it coincided with a period of substantial German labor market reforms. A notable feature of these reforms was a significant reduction in unemployment benefit duration. Although this is not hard evidence, it is suggestive that the reforms may have had some influence on recent trends in the German labor market. That the recent buoyancy of German employment may in part be traced to persistent effects of these reforms therefore seems a possibility worthy of consideration.

A second striking feature of figure 2 is the behavior of the exit rate during the recent recession. In particular, one can see that an important reason why unemployment did not rise during the recession in Germany is that, after a small initial contraction, unemployed workers left the jobless pool at *increasing* rates. This casts a different hue on the message of the

paper, which speaks of the "missing job losses" in the recession in Germany. Rather, it seems possible that there might simply have been buoyant hiring throughout the recession. (I am careful to use the word "possible" because elevated exit rates do not necessarily imply elevated rates of hiring. It might be that the unemployed increasingly have flowed out of the labor force, although whether this is so cannot be gleaned from the duration structure of unemployment.) To the extent that these buoyant rates of exit from unemployment are indicative of the hiring behavior of firms, this poses a challenge to the view that increased labor hoarding muted the response of employment: labor hoarding would imply that firms neither fire nor hire in response to an adverse shock.

An important component of Burda and Hunt's explanation for the limited decline in German employment in the recession is the role of flexible working time accounts. The idea is that firms accumulated large surpluses in these accounts during the preceding boom and that these in turn acted as a liability when the recession came around. It was unclear to me, however, that simple economics would justify interpreting accumulated working time surpluses as a firing cost. For this to be the case, it would require that firms were viewing increases in hours during the boom as if they were getting them for free. In contrast, simple economics would argue that the shadow price of labor is unchanged by the introduction of flexible working time: firms that increased hours during the boom should have realized that there was a marginal cost of doing so. It is possible that German firms did not realize this, but it does highlight an alternative interpretation of these working time accounts, namely, as a means for firms to adjust hours precisely when it is profitable for them to do so, without altering the effective price of labor. Far from being an impediment to layoffs, working time accounts under this interpretation would act as a boon to labor demand and hiring, as they allow firms to time increases in labor input to match increases in their productivity or product demand.

The second prong of Burda and Hunt's story for why labor hoarding is prominent in explaining the German employment puzzle is that manufacturing employers lacked confidence during the boom preceding the recession, causing them to be cautious in hiring workers during the boom and obviating the need to lay off many workers when the recession came. It is worth noting that a few aspects of the data discussed above jar with the notion of widespread underconfidence before the recession. For example, the rise in unemployment exit rates during the boom in figure 2 may have been accounted for by robust hiring, something not usually associated with weak confidence. Similarly, it is hard to square the underconfidence

hypothesis with the rapid accumulation of surpluses in working time accounts documented by Burda and Hunt, especially if one interprets them as increasing firing costs in the recession. If firms were cautious during the boom, why would they accumulate such large surpluses in the knowledge that they would act as a liability in the upcoming recession that they were worried about?

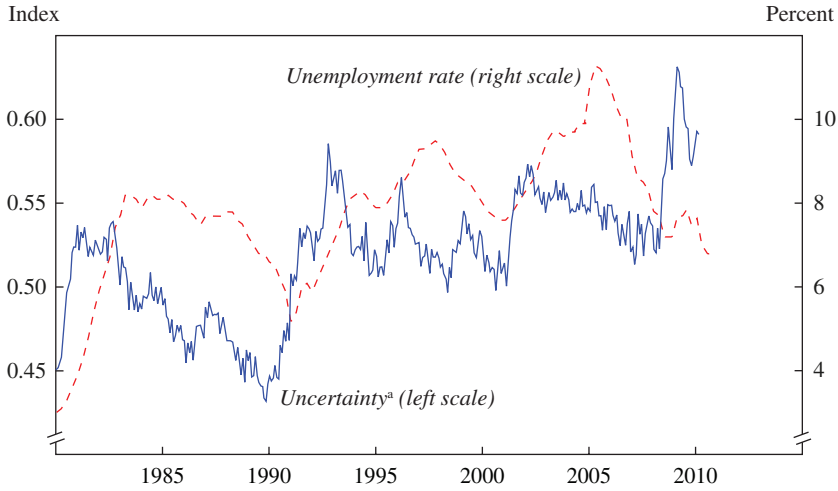
Two further issues come to mind. First, Burda and Hunt infer underconfidence among manufacturing employers in the boom from a discrepancy that emerged over the period 2005–07 between firms' reports of the contemporaneous business climate and their reported expectations for 6 months ahead. A concern with this comparison is that the former come from a question about levels (is the current situation "good, satisfactory or poor?") whereas the latter come from a question about changes (do you expect the next 6 months to be "more favorable, unchanged or less favorable?"). Thus, it is not clear that the deviation between the reported current *level* of activity and expected future *growth* in activity is necessarily indicative of lackluster confidence: for example, if expected growth were positive, that would be consistent with a rising level in the other series.

Second, the notion of underconfidence that Burda and Hunt emphasize is typically absent in simple models of labor hoarding, since these models often invoke rational expectations. One could argue, however, that the analogue of underconfidence in these models is the uncertainty that firms face about future productivity and demand conditions. If hiring and firing decisions are costly to reverse, increases in uncertainty lead to a wait-and-see effect whereby firms are more reluctant to hire and fire (Bloom 2009). So perhaps another way of getting a sense of firms' confidence in Germany in recent years is to consider measures of uncertainty.

One can use data on business expectations to get a sense of firms' uncertainty during the recession. Figure 3 plots a measure of uncertainty constructed by Ruediger Bachmann, Steffen Elstner, and Eric Sims (2010) from microdata from the Ifo Institute. This measure is computed as the cross-sectional standard deviation of responses to a question about whether the firm expects its domestic production to increase or decrease over the next quarter.

Figure 3 suggests that, measured in this way, uncertainty has risen in all recessions since 1980 in Germany, including the recent one. Particularly interesting for the question at hand, figure 3 shows that the rise in uncertainty surrounding the recent recession does not seem any greater than that witnessed in past downturns in Germany. Yet unemployment barely rose this time around, despite having risen substantially in the past. The impli-

Figure 3. Uncertainty and the Unemployment Rate, Germany, 1980–2010



Sources: Bachmann, Elstner, and Sims (2010), Ifo Institute, and OECD.

a. Cross-sectional standard deviation of responses to the following statement: "Expectations for the next three months: Our domestic production activities with respect to product XY will (without taking into account differences in the length of months or seasonal fluctuations) increase, roughly stay the same, decrease."

cation of figure 3, then, is that uncertainty-driven labor hoarding is not a plausible candidate for the recent German employment puzzle.

To summarize, Burda and Hunt have produced an interesting, informative, and thought-provoking analysis of the puzzle of robust German employment during the recent recession. Their analysis displays both a deep institutional knowledge and a remarkably detailed real-time analysis of a constellation of labor market outcomes in the recession. My own brief glimpse at the German data broadly supports their view that pervasive wage moderation was not at the root of the German employment puzzle. What is less clear to me is whether the view that labor hoarding was at the core of the puzzle is consistent with all aspects of the available evidence.

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COMMENT BY

JOHN HALTIWANGER This paper by Michael Burda and Jennifer Hunt is an interesting and informative analysis of the German labor market in the Great Recession. Even though Germany suffered about the same proportional decline in GDP as the United States, it experienced a much smaller percentage decline in employment. Conventional wisdom (at least in the popular press) is that this is due to German labor market institutions that promote variation in hours per worker rather than in employment. Burda and Hunt show forcefully that the conventional wisdom is incorrect: the responsiveness of hours per worker in the Great Recession in Germany was not different (taking into account the severity of the recession) from that in past recessions. However, in those recessions employment declined much more than it did in the Great Recession.

In assembling this convincing evidence, the authors provide a rich and informative description of the various programs for encouraging variation in hours per worker in Germany. They note, as have others in the literature, that Germany exhibits greater cyclical variation in hours per worker than the United States and that this is likely due to these programs. They also show that the mix of programs has changed over time: for example, working time accounts have become much more important. But their growing importance mostly acted as a substitute for short-time work programs. In addition, Burda and Hunt speculate that the working time accounts create disincentives for laying off workers. However, they are not able to test for that effect directly, given the limitations of the data.

The authors' findings imply that other factors must account for the modest decline in employment that accompanied the large decline in output in Germany in the Great Recession. Their leading candidate hypothesis is associated with issues of confidence and expectations. They argue that in the 2005–07 boom, German firms were more cautious in their hiring

than they had been in previous booms (that is, they had overly pessimistic expectations), and therefore they did not reduce employment as much in the Great Recession as they would have typically, because they were relatively "lean and mean" going into the recession.

The authors offer two types of related evidence in support of this hypothesis. First, they show that the forecast error patterns of a simple model relating employment to output, wages, and other factors are consistent with this story. Second, they acquire data on expectations and show that, at least for manufacturing, expectations in the 2005–07 boom were more out of line with what subsequently happened than they had been in earlier periods. They use the larger-than-usual discrepancy in the relationship between current and expected conditions in the boom to generate what they call counterfactual expectations. They then calculate that these confidence or expectational factors account for 56 percent of the missing employment increase in the boom and 23 percent of the missing employment decline in the downturn.

Is this evidence for the main hypothesis convincing? I would argue that it is suggestive but hardly compelling. If their hypothesis is correct, there should be similar patterns of change in other factors of production—capital in particular—over the cycle. Investment in fixed plant and equipment is among the most volatile components of GDP, and the responsiveness of investment is closely tied to uncertainty, confidence, and expectations. Adjustment costs for capital are larger and involve greater irreversibilities than for labor.

An examination of the patterns of aggregate investment in Germany over this period shows a robust increase in the 2005–07 boom and a substantial decline in the Great Recession. Although further analysis is needed, these fluctuations do not look different from those in earlier cyclical episodes. If that is the case, then for the authors' story to make sense, it must be that confidence and expectational factors affected only employment variation and not investment, which seems implausible.

If confidence and expectational factors do not account for the puzzle, what does? The authors also provide suggestive evidence that wage moderation contributed to mitigating the decline in employment. The evidence is based on noting that since 2001, wage growth in Germany has moderated somewhat. Using a counterfactual, the authors argue that this moderation might account for as much as 20 percent of the missing employment decline in the Great Recession. Although the authors include this point in their summary of the factors that may be at work, they also note that this explanation is not fully satisfactory, since it then introduces another puzzle, namely,

why in the face of such wage moderation German firms did not increase employment more in the 2005–07 boom.

The authors also hint at other possibly important factors that warrant further investigation, in particular the labor market reforms that occurred during 2003–05. These reforms included changes in unemployment benefits, increased job search assistance for the unemployed, changes in layoff rules, and significant deregulation of the temporary agency sector.

All of these factors in principle contributed to greater labor market flexibility. It might be thought that this greater flexibility would yield greater aggregate fluctuations in employment, but this need not follow. Greater labor market flexibility enables workers to move more readily from declining firms to expanding firms. Thus, it can reduce the aggregate costs of the ongoing restructuring and reallocation that are inherently part of market economies.

What is known about the nature and pace of restructuring and reallocation in Germany? Reunification obviously generated an enormous amount of both in the 1990s. However, even when this is taken into account, the evidence shows that Germany did not have as rapid a pace of job creation and destruction as the United States over 1990–2005.[1] Still, it may be that the labor market reforms of 2003–05 changed both the nature and the pace of restructuring and reallocation in Germany.

Unfortunately, data on the pace of job creation and destruction and accompanying worker flows such as hires, layoffs, and quits are not readily available for Germany for the recent period. But since the U.S. employment decline is so large and so different from that in Germany, it is instructive to briefly review the patterns of worker and job flows for the United States over this same period (what follows is drawn from Davis, Faberman, and Haltiwanger 2011). In the Great Recession in the United States, job destruction and layoffs exhibited a spike in late 2008 and early 2009, a pattern similar to that observed in previous recessions (although larger because of the severity of the downturn). What is different from the earlier recessions is the behavior of creation and hiring. Both fell more than usual and have been much slower to recover than in any other cyclical downturn since 1980. In that respect, an important reason for the large and persistent employment decline in the United States is the especially pronounced decoupling of the timing of job creation and job destruction.

1. Here I am comparing statistics provided to me by Stefan Bender from the IAB for the German private sector with U.S. Business Dynamic Statistics available from the U.S. Census Bureau.

The patterns for the United States raise several questions for Germany. For one, in both the 2005–07 boom and the 2008–09 recession, what are the margins of adjustment in terms of job creation, job destruction, hires, layoffs, and quits? Comparing the patterns in the two countries before 2005 shows that job creation is more cyclically volatile in Germany, whereas job destruction is more cyclically volatile in the United States. Thus, it may be that the dampened volatility of employment over the recent boom and recession has more to do with dampened job creation than dampened job destruction. If so, this would suggest focusing more on why job creation and hiring became less volatile in Germany (rather than on why job destruction and layoffs became less volatile, which is the approach that Burda and Hunt take). All of this is, of course, highly speculative, but the point is that without this information it is going to be difficult to understand this period well.

Even though the authors do not find that variation in hours per worker accounts for the German miracle, they suggest that policies that encourage such variation, like those in Germany, might be of interest for the United States to reduce the cyclical volatility of employment. There are a number of open questions as to whether this is a reasonable recommendation. First, one would need to establish that such incentives for varying hours per worker overcome some market imperfection or market failure. Second, one would need to consider the distortions introduced by such policies.

Underlying this discussion are core questions about the nature of recessions. A firm might optimally use hours per worker as the margin of adjustment in response to a temporary negative profitability shock, given the adjustment (hiring and firing) costs of changing employment. However, in response to a permanent (or more persistent) profit shock, a firm might optimally choose to reduce its workforce rather than reduce hours per worker, both because of fixed components of nonwage compensation and because of production efficiencies. The perspective of the traditional representative-agent macro model is that recessions reflect transitory shocks to the representative firm and worker. Thus, it might seem sensible to encourage adjustment along the hours-per-worker margin (although if that is jointly optimal for the firm and the worker, there remains the question of why the government needs to intervene). But the problem with this viewpoint is that it ignores the empirical evidence that shows incredibly heterogeneous dynamics of firms and workers over the cycle. Even though recessions are transitory in the aggregate, many of the employment reductions at the firm level, and therefore job losses at the worker level, are permanent. Individual sectors and the overall economy do recover from recessions, but more often than

not the recovery reflects the entry and expansion of different firms than those that contracted. Viewed from this perspective, providing incentives for firms to cut hours per worker rather than cut workers may not make sense if the firm is unprofitable and the workers would be (ultimately) better off separating to find better opportunities. Of course, this is an oversimplification: even when firm and worker heterogeneity are taken fully into account, it may be that the distortions in the reallocation dynamics in recessions are sufficient that it is optimal to pursue a variety of countercyclical policies.

Another way of making these points is to note that, according to both theory and evidence, policies that discourage employment adjustment may have adverse consequences on productivity. This point is elegantly demonstrated theoretically by Hugo Hopenhayn and Richard Rogerson (1992), among others. The empirical evidence shows that the rapid pace of reallocation in market economies, such as both the United States and Germany, is productivity enhancing (see Bartelsman, Haltiwanger, and Scarpetta 2009 for a survey of the cross-country evidence). That is, reallocation largely reflects resources being moved away from less productive to more productive firms. Moreover, the evidence shows that the reallocation induced by recessions also tends to be productivity enhancing. This, of course, neglects the high cost of recessions in terms of lost output and employment, but it remains relevant that, conditional on a recession happening, the reallocation that is induced is ultimately productivity enhancing. The implication of this discussion is that slowing down the pace of reallocation, even in recessions, may have adverse consequences on productivity. With respect to the most recent downturn in Germany, the implication may be that what was a miracle in terms of employment was also a problem in terms of productivity. It is clear that Germany exhibited a substantial short-run decline in productivity. But there may also have been medium- and longer-term adverse consequences on productivity if the miracle was associated with an inhibition of productivity-enhancing reallocation.

To sum up, I am more persuaded by what the authors show does *not* account for the German miracle than I am by what they claim does account for it. I suspect that the puzzle in this episode will not be fully solved without more data showing the patterns of capital adjustment as well as the patterns of worker and job flows, and how they compare with previous cycles. In like fashion, understanding such worker and job flow dynamics over the cycle will prove critical to understanding the positive and normative aspects of policies that provide incentives for adjusting hours per worker relative to adjusting employment over the cycle.

REFERENCES FOR THE HALTIWANGER COMMENT

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GENERAL DISCUSSION Betsey Stevenson understood working time corridors to be about wage smoothing rather than a way of avoiding separation costs. During the boom, workers should have been paid overtime rates for their extra hours. Instead, firms had the option of not paying overtime but rather shifting work hours to periods when there was more demand. Stevenson thought it worth thinking about whether the benefits of such smoothing are exceeded by the costs of delaying reallocation. Further, she noted, in both German and U.S. policy circles, short-time accounts are widely believed to explain the difference between the two countries. It would be worthwhile to have a broader discussion about where that belief comes from and whether it is valid.

Robert Hall wondered how Germany could produce extra output without any extra labor. In the authors' story, faced with increased demand for their output, employers were thinking that the strong demand would not last and somehow met that demand with their existing workforce rather than by adding workers. In the U.S. setting that would not be possible because the workforce is working at full throttle all the time. In Germany there must have been a tremendous amount of slack during the boom that made it possible to increase output sharply without additional workers.

David Romer noted that when output rises for a given level of employment, usually it means that something good has happened, perhaps in terms of technology, that allows for increased efficiency. He wondered how to distinguish between that kind of story and the authors' story about cautious firms. In the authors' time series, the jump in the deviation of predicted from actual employment took place right at the beginning of the boom. It could be that firms were very cautious at this point and kept employment low, and somehow got more output from that smaller workforce in the following years. Then, when the recession came, they did not need to cut employment.

But an alternative story would be that something positive happened in terms of their ability to produce output from given inputs.

Donald Kohn raised the question of whether Germany's labor market reforms played an important role in firms' hesitancy to hire. Following up on Romer's comment, he suggested that the good thing that happened at the beginning of the boom was that firms found they could get more output from their existing workforce because they now had more flexibility to use workers in more efficient ways. On that basis he wondered what the decline in productivity in Germany over the last two years implied about the reforms: did they really raise productivity, or did they merely push productivity from one part of the cycle to another?

Richard Cooper observed that one important stylized difference between the German and the U.S. economy is that the former depends much more on exports and the latter much more on consumption. The question then is whether most of the drop in GDP in the recent recession in Germany was actually a drop in export demand compared with the United States, especially given very stable consumption demand in Germany.

Justin Wolfers highlighted the relevance of Germany's recession experience for recent proposals in the United States to adopt work sharing. Normal short time or work sharing does not seem to have had a big effect in Germany, but that was because another institution, working time corridors, effectively did the work that work sharing would normally do. Thus, the fact that work sharing was not a major factor in Germany did not argue against the claim that work sharing might be important in the United States.

Wolfers also asked whether more evidence could be provided for the causal link between two very important facts that emerged from the paper: first, that there has recently been either underfiring or overhiring in Germany, and second, that during the boom there was underhiring. The paper linked the two causally: yesterday's underhiring caused today's overhiring. Wolfers therefore wondered whether the same phenomenon had been witnessed in previous episodes: had there been underhiring during an earlier boom followed by overhiring in the subsequent recession?

Kristin Forbes suggested that there were some key similarities between Japan and Germany that mattered for the paper's topic. Japan, too, had had slow growth for a number of years before the crisis, and its very strong manufacturing sector relied heavily, like Germany's, on exports. Then, during the crisis, unemployment in Japan was surprisingly stable, as it was in Germany. There were important institutional differences between the two countries, but nevertheless Forbes wondered whether some of the other parts of the story for Germany might also apply to Japan.

Gerald Cohen found it remarkable that there had recently been a decline in the German unemployment rate of more than 1 percentage point from the previous cyclical low despite the fact that GDP was still below its peak. He thought that was the most interesting puzzle presented by the German experience in the recession.

Robert Gordon offered that the key issue was whether the decline in productivity in Germany in the last two years was simply offsetting unusually high productivity in the previous five years. Figure 6 in the paper suggested that this might be the case: too much employment after 2008 and too little employment before. He thought it would be helpful to use a symmetric productivity equation to predict productivity by a time series arrangement with lags. On Hall's question of how Germany produced extra output with no extra employees, Gordon proposed that the answer was largely variation in capital utilization. There was an additional, unmeasured factor input, namely, running the machines faster or longer, that allowed extra output to be produced with an unchanged number of workers.