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

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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. We find that this provided disincentives for employers to lay off workers in the downturn. While 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.

1 Introduction: A labor market miracle?

Like the United States, Germany experienced a recession of magnitude not seen since the Great Depression. German GDP fell 6.6 percent from its peak in Q1 2008, exceeding the 4.1 percent peak-to-trough GDP decline in the United States from Q4 2007 (see solid lines in graph A in Figure 1). Yet the labor market experiences of the two countries could not have been more different. As shown in graph B, the U.S. unemployment rate soared from 4.5 percent at the start of 2007 to a high of 10.0 percent by the end of 2009, while the German unemployment rate declined over the period, only briefly rising from 7.4 percent to 7.9 percent in 2008-2009. The contrast is mirrored in the evolution of employment, shown in graph C: 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 was larger than its decline in employment, yet still much smaller than the 7.6 percent fall in U.S. person-hours (graph D). These key changes, and the peak and trough dates, are summarized in Table 1.

The German and American labor market experiences are almost polar opposites in the international context. Among traditional OECD countries, only Spain and Ireland had larger employment reductions in 2008-2009 than the United States, and only Australia, which experienced no recession, fared better than Germany in terms of employment.[1] In the graphs of Figure 1, we also plot outcomes for the United Kingdom, a more representative country: the GDP decline was similar to that of the United States, though the recovery has been slower, and the increase in unemployment and reduction in employment fell between the trajectories of the United States and Germany.

The German experience in 2008-2009 contrasts not merely with that of the United States, but also with previous German recessions, as we illustrate in Figure 2. In terms of output decline

[1] http://www.bls.gov/fls/intl_gdp_capita_gdp_hour.htm, accessed February 23, 2011.

(graph A), the 2008-2009 recession was unusually severe. By comparison, GDP declined by 2.4 percent from peak to trough in the 1973-1975 recession, little more than a third of the 2008-2009 decline. Conversely, as shown in graph B, the virtual absence of any employment decline in 2008-2009 is also unprecedented. In the 1973-1975 recession, employment fell 4.3 percent from its peak to its trough 11 quarters later. The 2008-2009 decline in person-hours seems less remarkable (graph C): person-hours fell rapidly, tracing out the early path of the 1973-1975 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 the significant deviation of the labor market response to GDP from historical experience.

We highlight that employment rose less than expected in the expansion preceding the recession, given GDP and labor costs, and that half of this shortfall can be explained using data on employers' business expectations. Employers did not have confidence the boom would last, or were perhaps uncertain how long it would last, leading them to hire less than would have been predicted given contemporaneous conditions, and allowing them 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 2005-2006 period, expressing 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 23 percent of the missing decline can be linked to pessimistic expectations in the expansion.

If labor costs had responded more flexibly than in the past to mitigate employment losses, this could also contribute to explaining the unusually mild labor market response to the recession. However, the fall in labor costs came too late to stem employment losses. Some previous analysts have instead suggested a role for the stagnation of wages beginning in 2001, coinciding with a

decline in the power of labor unions.[2] We find that wage moderation may explain 20 percent of the missing employment decline in the recession.

While we cannot account for about 40% 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, which must be compensated at the overtime premium in case of layoff. Alternatively, workers could be kept employed at low hours until the accounts were drawn down to zero, and then laid off, but if this delays the layoff, the time until the expected upswing may not be long enough to amortize normal layoff and hiring costs. Employers therefore laid off fewer workers in the 2008-2009 recession compared to 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 loss.[3] However, use of the accounts largely substituted for other methods of reducing hours per worker, including the traditional government short-time work scheme. Overall, while 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

[2]Boysen-Hogrefe and Groll (2010) and Gartner and Klinger (2010).
[3]Schneider and Graef (2010), Klös and Schäfer (2010), Möller (2010), Sachverständigenrat (2010); a less decisive role is attributed by Schaz and Spitznagel (2010). Boysen-Hogrefe and Groll (2010) are more skeptical.

contribution of working time accounts was to allow more workers to retain their jobs and experience the expected reduction in hours per worker.

We believe that the 2003-2005 labor market reforms helped reduce unemployment, possibly with a lag that meant the reforms acted as a brake on rising unemployment in the recession,[4] 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 extensive margin that suggests why working time accounts and other recent reforms in German labor market institutions constitute a regime change which 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 is rising 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 react more slowly, 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 to only six months ahead. Reporting in *Handelsblatt* did suggest that, especially by 2009, that firms were concerned about losing skilled workers, who are becoming increasing specialized and difficult to replace over time. It is plausible that employers are increasingly reluctant to part with a greater share of their workers due to the increasing cost of refilling specialized vacancies.

Despite the role of weak hiring in the 2005-2007 expansion in explaining the resilience of the labor market in the recession, the moniker "labor market miracle" may be appropriate, given

[4] As proposed by Gartner and Klinger (2010).

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 employment decline in previous "non-miraculous" recessions. Such flexibility could be beneficial for the United States, but it would be premature to endorse this approach without considering all institutions governing U.S. labor relations (see Abraham and Houseman 1993, Boeri and Brückner 2011).

2. Background to the recession in Germany

The nature of the Great Recession in Germany was quite different from that of its American counterpart. While the United States suffered a decline in domestic demand driven by falling net wealth of the household sector, Germany experienced no housing bubble, and her output decline was driven by the collapse of world trade. Figure 3, which plots the components of GDP, contrasts the stability of consumption with large swings in imports and particularly exports in the 2000s. The government did have to bail out several banks, brought down by their international and especially American 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 may have expected a recovery of favorable demand conditions in export-oriented sectors and regions of Germany that had been booming previously. Indeed, the BRIC countries (Brazil, Russia, India and China) and many key export markets in Eastern Europe did recover rapidly.

The recession should be put in the context of the longer-term evolution of the German economy and labor market. The economy performed sluggishly from the end of the unification boom in 1993 until the expansion beginning in 2005, both in terms of growth and unemployment.

Unification with East Germany may have played a role: increased government debt could have led consumers to revise their wealth downwards, depressing consumption, while higher payroll taxes may have increased unemployment (Carlin and Soskice 2009). The central bank reduced the money supply to deal with post-unification inflation, leaving annual inflation below two percent from 1995-2010; Germany is thought to have entered the European monetary union in 1999 at an overvalued exchange rate (Sinn 1999).

An important labor market development was the stagnation of wages from 2001-2008 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 et al. 2009). Between 1996 and 2008, union coverage declined from 70 to 55 percent in the west and from 57 percent to 40 percent in the east (Ellguth and Kohaut 2009), while wage drift – payment of wages above the collectively bargained rate – declined in the 2000s (Lesch 2010). Pressure on wages in the 2000s, and hence union bargaining power, may have come initially from the need for a real devaluation after European monetary union, and was sustained by the increased attractiveness of offshoring as the European Union expanded eastwards in 2004 (Sinn 2005). Another contributing factor may have been the 2003-2005 labor market reforms, to which we return in detail below.

The upturn of 2005-2007 marked a return to growth and a significant reduction in unemployment. German firms restructured to improve efficiency, especially through increasing the flexibility of working hours and decentralization of pay determination. While unions 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.

3 Decomposing the miracle

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

3.1 Hours per worker and productivity

Two facts implicit in Figure 2 will be useful for our decomposition, and we make them explicit in Figure 4. First, Graph A of Figure 4 shows that hours per worker fell rapidly. However, the path is roughly comparable to that of the shallower 1973-1975 recession. Second, Graph B of Figure 4 shows that hourly labor productivity declined substantially. From a historical perspective, this is the true anomaly: a four percent reduction in productivity in the 2008-2009 recession contrasts with strong *increases* in productivity in all previous recessions.

3.2. Lessons from a simple decomposition

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

$$\Delta Y/Y = \Delta(Y/H)/(Y/H) + \Delta H/H$$

$$= \Delta(Y/H)/(Y/H) + \Delta(H/L)/(H/L) + \Delta(L/LF)/(L/LF) + \Delta LF/LF, \quad (1)$$

where Y is real GDP, H is person-hours, L is employment in persons, and LF is the ILO labor force. This relation 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, one minus the unemployment rate, and the change in the labor force.

Using equation (1), Table 2 decomposes (in logs) the drop in output in the peak to trough period for GDP in both countries, as well as for the longer, common period of Q1 2008-Q4 2009, which is more relevant for employment adjustment.[5] It shows two striking difference between the two countries. First, the qualitatively different behavior of hourly productivity over the recession: a rise in the United States and a fall in Germany (column 2), and the implied much smaller adjustment in person-hours in Germany (column 3). Second, the decline in person-hours in the United States is associated with an increase in unemployment (column 5), while in Germany it is principally due to a reduction in hours per worker (column 4). In neither country did a change in the labor force contribute significantly to the output decline (column 6).

The Great Recession represents a significant departure from Okun's law, the statistical relationship between real GDP growth and changes 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, Okun's relationship becomes a "law" when elements of the right hand side of (1) exhibit a stable correlation structure. *A priori*, hours per worker and participation should fluctuate procyclically, while the evidence on hourly productivity is less clear-cut.[6] Evidently an already unstable Okun's

[5] The results are quantitatively similar when an HP-trend (λ=1600) from the sample 1970:1-2010:3 is removed. German employment rises in this table, contrary to Table 1, because the focus on the peak to trough period for GDP misses the employment decline. Also, different data sources are used.

[6] The real business cycle research agenda is predicated on a procyclical correlation of labor productivity with output, albeit a weak one (see e.g. 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 was -0.05 in the last decade. See Galí and van Rens (2010) and www.econ.upenn.edu/~manovski, accessed March 6, 2011.

relation became unhooked in Germany during the Great Recession.[7] We now turn to the factors responsible for its shift.

3.2. Hours per worker versus workers, given person-hours

Although Germany and the United States experienced comparable recessions and little change in the labor force, German firms reduced person-hours by less than in the United States. But given person-hours, did German firms exploit the intensive versus extensive 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 Abraham and Houseman (1993) showed that, relative to the United States, cyclical adjustment in the German labor market occurs more in hours per worker rather than in terms of bodies (workers).[8] In the United States, one-third of the adjustment to a reduction in hours typically comes through reductions in hours per worker, and two-thirds through reductions in the number of workers. Elsby et al. (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 raw data as well as HP-detrended counterparts (in parentheses). With the exception of the 1991-1993 episode, at least half of the raw hours reduction can be accounted for by reductions in hours per worker (column 4). While all the person-hours adjustment in the 2008-2009 recession occurred via hours per worker, this was not unprecedented and is comparable to the 1979-1982 downturn. At 9 percent, 1991-1993 is an outlier associated, we believe, with the

[7] Regressions of changes in unemployment on changes in log output and a constant for the period 1970 Q1 – 2010 Q3 show that the Okun relationship only accounts for 7% of the variance in Germany as opposed to almost 50% in the US, with an Okun coefficient 1/5 of the corresponding US estimate.
[8] Their data were for manufacturing only. See also Schaz and Spitznagel (2010).

expiry of reunification-related policies keeping hours per worker low in East Germany (Will 2010). The reduction in hours per worker (column 3) was smaller in 2008-2009 than in the 1973-1975 and 1979-1982 recessions. The raw results confirm that Germany adjusts more along the intensive margin than does the United States. Due to 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 2008-2009 relative to other recessions. The 2008-2009 recession was unusual in that employers could not benefit from an ongoing reduction in hours per worker in order to adjust.

4 The German puzzle: More detail

We have shown that the 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.

4.1 Hours per worker

The labor market outcome which has attracted most attention from both German and U.S. analysts is the reduction of working hours per worker. We saw that the 2008-2009 decline in hours per worker was similar to the 1973-1975 fall despite a much larger reduction in GDP. The natural question arises: How different was the decline in hours per worker, conditioning on output and labor costs? We formalize this using out-of-sample forecasts based on reduced form regressions of hours per worker (H/L) on GDP (Y), labor costs per worker (w), including all social security

contributions.[9] Since our focus is on the business cycle, we favor a regression in one-quarter differences to capture cyclical fluctuations in H/L:[10]

$$\Delta\log(H/L)_t = \delta_0 + \delta_1 \Delta\log Y_t + \delta_2 \Delta\log w_t + \Delta\mu_t. \quad (2)$$

We also extend this to estimate an error correction model:

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

It is important to include information on the major recessions of the 1970s and 1980s as well as the mild recession of the 2000s and atypical post-unification slump, so we chain West and 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 due to 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 our regressions are reported in Table 4 columns 1 and 2, and the predicted 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 1970 to 2003 before flattening out in 2004 - and then falling sharply in the 2008-2009 recession and snapping back in the recovery. As already revealed by HP-detrending in Table 3, a large component of declines observed in the 1970s recessions reflected the secular evolution of hours per worker. 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

[9] 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 savings to employers using short-time work, because both the benefits to the workers and the full social security payments are initially paid by the employer, and only subsequently rebated. However, throughout our analysis we use labor cost numbers adjusted to reflect these rebates. We use yearly information from the Statistische Jahrbücher on the accounts of the Bundesagentur für Arbeit and its predecessor, and make it quarterly based on the distribution over the year of hours lost to short-time work. This adjustment is trivial at the aggregate level except in the 1973-1975 and 2008-2009 recessions, and even in these recessions it is very small.

[10] A regression in levels, which picks up low frequency fluctuations, yields a statistically insignificant coefficient on GDP.

cumulated from Q1 2008, when GDP peaked. What is different in 2008-2009 is not the magnitude of the reduction in hours per worker, but that it occurred absent an existing trend. We interpret this finding as evidence that methods of adjustment have changed, a topic to which we return below.

4.2 Employment

To analyze employment, we begin by estimating the error correction model of (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 specification is therefore in levels, with a trend included, and 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).

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

The regression results are reported in Table 4, columns 3 and 4; the actual and predicted values are plotted in Figure 6. As already seen in Figures 1 and 2, actual employment (solid line) rises in the boom of 2005-2007, but instead of plunging in 2008-2009, as in previous recessions, 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 1973-1974 recession, given the evolution of GDP and labor costs per worker (dotted line; the shaded area represents the 95% confidence interval). The error correction model (dashed line) fits the data poorly, and suggests that the modest downturn was not very surprising. We do not find this specification convincing.

Interestingly, employment should have risen *more* than it did in the upturn which immediately preceded the 2008-2009 recession, according to both specifications, even though the upturn was unconditionally large.[11] 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 which figures prominently in our analysis later on.[12]

4.3 Composition effects: Where are the missing job losses?

In order to understand the behavior of the labor market 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 service industries, which had swelled in the past two decades. In the case of Germany, we look for patterns in the sectoral structure of employment declines. Can we find sectors which should have contracted person-hours and employment, given the drop in demand and past behavior, but in fact did not?

The upper graph of Figure 7 displays value added by sector (omitting agriculture) from 1970-2010 (as before, the data are chained to remove the jump at unification). The 2008 slump in value added in manufacturing and mining is striking in the historical context: the fall of 23 percent between Q4 2007 and Q1 2009 is considerably larger even than the loss in value added that accompanied the post-unification recession and collapse of East German manufacturing in the early 1990s. By contrast, employment in this sector fell by a modest amount by historical standards, as the lower graph shows. The figure also shows that the manufacturing boom beginning in 2005 is

[11] Logeay and Zwiener (2008) also make this observation by comparing with the previous expansion.
[12] We have verified that no similar pattern of prediction errors occurs when the 1970s and 1980s boom/bust cycles are predicted out of sample.

large by historical standards (upper graph), but is not accompanied by a historically large employment increase (lower graph).

Construction is also a cyclical sector, both in terms of value added and employment. The unification-related boom and bust in both variables are clear, 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 variables from 2006-2010. 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 employment national income account statistics. Manufacturing generally represents a large share of the use of temporary workers (Burda and Kvasnicka 2006), but the distribution of use over time is unknown.

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

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

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

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

where C is consumption, I investment, G government spending, X exports and Z imports. Using these equations, we can judge how much of unpredictable employment change is due to a surprise in how employment reacted to value added (the change in the residual from equation 5, $\Delta\eta_{it.}$) and how much is due to an unexpected evolution of value added (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, non-temporary workers. We also estimate (5) for the whole economy (including temporary workers). As before, we estimate the equations from 1970-2003. Table 5 presents key numbers for the 2008-2009 recession and the preceding expansion, while the underlying regression results are reported in the Table 6.

Table 5 shows (panel A) that while aggregate employment was almost unchanged in the recession (column 1), it would have been expected to fall by 4.2 log points given GDP and labor costs, (column 2), implying a 3.9 log point prediction error (column 3; numbers do not sum due to rounding). The second row shows that employment in manufacturing fell only 3.8 log points in the bust (column 1), compared to an expected fall of 17.6 log points given value added and labor costs (column 2), a prediction error of 13.7 log points (column 3). This 13.7 log point gap may be considered the missing employment decline in manufacturing. To tie manufacturing to the missing aggregate employment decline (given GDP), it is necessary to consider the unexpected evolution of value added in manufacturing. In columns 4 and 5, we present information on the first lag, generally the most influential: value added plunged 23.6 log points (column 4), a considerably larger fall than would have been predicted given the components of GDP (compare columns 4 and 5) when all four lags of value added are considered, offsetting by 5.7 log points (column 6) the

error that would have been made in predicting the evolution of employment based on the components of GDP and labor costs. Summing the components of columns 3 and 6, based on the components of GDP and labor costs, 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 (0.9 log points, column 1), close to the predicted increase of 0.4 based on value added and labor costs (column 2). For construction, all lags of value added play a significant role, so the information in columns 4 and 5 is less informative than for other sectors; column 6 shows that taking all lags 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 an economic surprise for two reasons: first, Germany had no real estate boom in the run-up to the recession; 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 (column 3), with no offsetting effect from value added, which is well predicted (column 6). The missing cyclical job losses (of core workers) appear, therefore, to be from manufacturing.

We observed in Figure 6 that the 2005-2007 expansion created fewer jobs than expected, and in Figure 7 that the expansion in manufacturing and mining did not appear to generate many jobs in the sector. We examine this more formally in panel B of Table 5. Aggregate employment rose 3.9 log points (column 1) but would have been predicted to rise by 5.5 log points based on GDP and labor costs (column 2), a shortfall of 1.6 log points (column 3). 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 (panel A, column 3). The lower rows indicate that the missing employment increase (in core workers) was concentrated in manufacturing.

5 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 GDP and labor costs, so the putative miracle lies in a muted response of employment, in particular in manufacturing (at least for core, non-temporary workers). We now turn to economic and institutional explanations for these statistical findings.

5.1. A simple model of dynamic labor demand

Employment would respond less to current GDP and labor costs if adjustment costs had risen, or if employers doubted the persistence of future developments. To help organize 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 expectations.[13] For simplicity, we study a representative firm which acts competitively in both product and labor markets and has no capital investment decision, 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 $\{\theta_t\}$ to maximize real expected discounted profits:

[13] See Treadway (1970), 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).

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[P_t Y_t - W_t \Omega(\theta_t) L_t \theta_t - \Phi L_t - \frac{c}{2}(L_t - L_{t-1})^2 \right]$$

subject to the production function $Y_t = f(H_t)$ and $H_t = \theta_t L_t$ plus an initial condition L_0, taking as given the sequences of hourly base wages $\{W_t\}$ and prices $\{P_t\}$, both measured in terms of a numeraire good. Costs of changing the level of core employment L_t from past period's value L_{t-1} is 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 $\eta_{\Omega\theta}$.[14] There is a fixed per worker employment charge Φ.

Optimal behavior of the firm is straightforward to derive and presented in the Appendix. It is important to distinguish between long-run steady state and short-run dynamic behavior. In the long run, two equations govern the intensive and extensive margin (dropping subscripts):

$$W\Omega(\theta)\eta_{\Omega\theta} = \frac{\Phi}{\theta} \tag{6}$$

$$\frac{Pf'(\theta L)}{W\Omega(\theta)} = 1 + \eta_{\Omega\theta} \tag{7}$$

Given W, P, Φ, and the function Ω, steady state hours per worker (θ) is determined by (6). Given θ, (7) 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 ambiguous effect on L.

[14] A more realistic formal model would relate overtime in working time accounts (see discussion below) to sustained cumulative deviations of θ from its normal value) to employment adjustment costs directly by modeling them as a state variable – so the more extensive the use made of flexible time accounts in a boom, the more costly the adjustment downward in the aftermath. Such a model is formally more difficult to handle so we have taken the short cut of treating employment adjustment costs as parametric and studying the differential behavior of employment across different parameter values.

While 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 extensive margin, given current and expected future wages W_t and output prices P_t (the latter being a proxy for aggregate demand). Using the carat "^" to denote percentage deviations from the steady state, optimal employment and hours per worker are described by the following two recursive equations:

$$\hat{L}_t = \lambda \hat{L}_{t-1} + \frac{\lambda \Phi}{c \beta L} \sum_{\tau=0}^{\infty} (\lambda \beta)^{\tau} E_t \left[\varphi_P \hat{P}_{t+\tau} - \varphi_W \left(\hat{W}_{t+\tau} - \hat{P}_{t+\tau} \right) \right] \tag{8}$$

$$\hat{\theta}_t = -\eta_{\theta L} \hat{L}_t - \eta_{\theta W} \left(\hat{W}_t - \hat{P}_t \right) \tag{9}$$

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

The 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 summarizes not only the sluggishness of employment but captures the weight applied to future expected values of output price and product wages. Expectations of future demand and factor prices play a central role 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 expected to be permanent rather than temporary. From (8), the larger lambda is, the greater 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 adjustment cost parameter c and/or to a decrease in $\eta_{\Omega\theta}$, the steepness of cost of

using the intensive margin. In the following sections, we search for specific institutional and economic changes in German labor markets which relate to these theoretical implications.

5.2 Flexibility in reducing hours per worker

Although our analysis suggests the decline in hours per worker in the 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 United States-German labor market differences is the system of compensation in the two countries: the German system combines high firing costs, lengthy severance notice periods and selective access to government 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 US 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 German recessions prior to the current one. The highly regarded German short-time work system (*Kurzarbeit*) is frequently cited in the business press as a central factor mitigating the sharp rise in unemployment in Germany.[15]

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

[15] Ralph Atkins, "Europe Reaps Rewards of Short-time Jobs." *Financial Times* October 28, 2009. OECD (2010a) evaluates short-time programs in different countries.

to the employment office, which administers unemployment insurance and active labor policies, for short-time support. The firm then refrains from layoffs, but reduces workers' hours and variable pay in proportion. Workers receive 60-67 percent of the net pay they would have received for the hours not demanded. Firms pay workers this "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, average labor costs 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, which may help protect workers from potential abuse of the system by management.

The short-time 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 six, and the required minimum number of affected workers was reduced. In late 2008 and early 2009, the Federal Employment Agency took out newspaper advertisements encouraging firms to apply for short-time subsidies. In addition, the government assumed half the social insurance costs of the worker 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 to March 2012. Despite the intensity of these efforts, Figure 8 shows that the person-hours lost to short time work were comparable with those in the shallower 1973-1975 recession.[16] On the basis of the volume of reduced time, the use of short time represents the equivalent of about 400,000 jobs in 2009

[16] This has already been noted by Herzog-Stein and Seifert (2010).

(Schneider and Graef 2010), or one percent of employment. Boeri and Brücker (2011) point out that such calculations overstate jobs saved.[17]

Working time accounts

Some analysts attribute the small magnitude of the fall in employment to reductions in hours per worker of another type. Working time accounts 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. The number of hours the employer owes the worker, which may be negative, is tracked in a working time account. The share of workers with 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).[18]

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.[19] The last effect occurs because they reduce overtime premia and the sensitivity of wage costs to the intensive margin, possibly to zero. Person-hours should increase, while 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.[20]

[17] There is a special short-time work scheme for firms which are restructuring, which involves employees "working" zero hours. Though 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).
[18] Gross and Schwarz (2007) also document that employers 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 to short-time work as 2009 wore on.
[19] In a model with physical capital, substitution from capital to labor would also occur.
[20] 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 shows exactly what accounted for the decline in hours per worker between 2008 and 2009 (analysis is difficult at quarterly frequency 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 (column 1), or 32 percent of the reduction (column 3). A reduction in standard weekly hours was the next biggest factor (one quarter of the reduction), with equal contributions from reductions in overtime and working time account balances, and from an increase in the share of workers who are part-time (17-19 percent each). Previous authors 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 could hence be considered to have "saved" 0.5 percent of employment. Column 2 confirms the number cited above of a "saving" of one 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 upon layoff, either as a severance payment which includes an overtime premium, or in the form of low hours at full pay before the layoff takes effect.[21] All things equal, firms using working time accounts will have an incentive to postpone layoffs at the start of the recession, instead drawing down workers' surplus time in the account. Once a worker's account is at zero, the employer may lay him off, but the elapsed time means the upturn may be sufficiently near that it is no longer worthwhile incurring the normal firing and

[21] When a worker with a working time account works an hour of overtime, she gets paid zero, and 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.

hiring costs that apply to all workers. In November 2007, a ruling of the Federal Labor Court (Bundesarbeitsgericht) 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 her account.[22] The analysis is more complex when the availability of the government short-time scheme is taken into account. It is no longer unambiguous that working time account firms lay off less, but they will lay off less if the accumulated surpluses are sufficiently large, a condition likely to have been fulfilled in 2008.

A different consideration is that a firm which has workers with working time account surpluses has less incentive to use the short-time scheme than a firm which does not, because using short-time work does not draw down the working time accounts. A surplus firm which uses short-time work during the 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 than to use short time, as the short-time compensation will not outweigh the excess hours compensation the firm would have to pay workers. Thus, it is theoretically possible, as well as consistent with the fact that short time was not used more than in the milder 1973-1975 recession, that the increased use of working time accounts crowded out short-time work in the 2008-2009 recession. If hours per worker reductions through working time accounts did not come entirely at the expense of short-time work, the accounts may have contributed to flexibility by taking on the role previously assumed in the recession by the downward trend in hours per worker. However, Table 4 column 1 shows the trend was -0.36 log points per quarter, large compared with the 0.5 percent yearly reduction in hours due to working time accounts (Table 7 column 2). Hours per worker must have adjusted along other margins in the recession to compensate for the end of the trend.

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

Uncompensated hours reductions - working time "corridors"

There is another relatively new, but less frequently used option for firms wishing to reduce hours per worker. The so-called "working-time corridors" (*Arbeitszeitkorridore*) are commonly included in "opening clauses" conceded by unions 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 using an opening clause with a working-time corridor provision may reduce working hours and reduce labor costs proportionately. This option is inferior to short-time work for the worker, because lost income is not replaced by a government benefit. It is superior to short-time work for the firm in one important respect, because, unlike in the case of short time, 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 of the order of 15 percent, much less than is possible with short time. Perhaps for this reason, opening clauses appear to have been used little for reducing working time in the recession. A 2009 survey of works councils indicated that only 8 percent of firms were using this measure, compared to 30 percent who were drawing down working-time account surpluses or building up working-time account deficits, 20 percent who were using short-time work and 13 percent who were adjusting through vacation time (Bogedan et al. 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.

5.3 Labor costs

The small magnitude of the employment decline in the recession could be explained if labor costs had become more flexible, and the adjustment to the drop in labor demand had come 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 permit 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 et al. 2009). A decline could also have occurred due to the introduction of subsidies to offset payroll taxes for employers using short-time work, subsidies 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. [23]

In Figure 9, we plot hourly labor costs for the period 1970-2010 Q3 (chained to eliminate a jump at unification) as well as on a larger scale for the period 2004-2010 (graphs A and B). Labor cost growth fell to zero in 2001, then jumped up just as the recession began in 2008, as contracts negotiated the previous year came into force. The aggregate wage share dropped sharply from 1982 to the recession (graphs C and D). Labor costs did fall in 2009, but only from the second quarter, after GDP ceased to decline, and therefore too late to stem job losses, since our regressions suggest aggregate employment does not respond faster to labor costs than to GDP.

Certain authors, particularly Boysen-Hogrefe and Groll (2010) and Gartner and Klinger (2011), stress instead the importance of the wage moderation that had occurred since 2001 as

[23] Payroll taxation is significant in Germany and currently represents about 35 percent of aggregate gross pay, as opposed to only about 12-13 percent in the US, and has a tendency to rise in recessions (Burda and Weder 2010). This is due first to a fixed upper bound on contributions, as in the United States, and second, the tendency of governments to raise payroll taxes during recessions to keep the relevant funds operating in the black.

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 1995-2000, 1.12 log points per year, while GDP had kept its actual values. Our own estimate of the compensated elasticity of labor demand is -0.5 (see Table 4, column 3), while a value closer to the literature consensus is -0.7 (Peichl and Siegloch 2010). GDP fell for four quarters, and over this length of time wages would counterfactually have risen 1.12 log points, reducing employment by $0.7 \times 1.12 = 0.8$ log points (focusing on the elasticity of -0.7). Wage moderation could thus account for $0.8/3.9 = 20$ percent of the missing employment decline. Wage moderation appears to deepen the puzzle of sluggish employment growth in the expansion, but may have had a muted effect if employers did not expect wage moderation to last, as would be implied by a dynamic labor demand model.

5.4 Labor market efficiency

A set of landmark labor reforms was passed in the twilight of the left of center SPD government led by Chancellor Gerhard Schröder. In March 2003 he put forward the "Agenda 2010" which sought to increase flexibility in German labor markets. A commission headed by Peter Hartz, a top Volkswagen executive, consisting of representatives of unions, management and government, put forward a number of proposals, many of which were passed by parliament and put into effect in the period 2003-2005. The reforms may loosely be grouped into those reducing reservations wages (and therefore reducing wages), those increasing the efficiency of the job search

process (and therefore increasing wages), and those allowing more flexibility to employers (probably reducing wages). We focus initially on the first two categories.[24]

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 unemployed 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 reduce unemployment, and there is some evidence that they did. For example, the unemployment rate of 50-54 year olds, the group experiencing the largest reduction in benefit duration, began falling in 2005 relative to the rate for 25-49 year olds, and continued to do so throughout the recession (graph available from the authors). Long-term unemployment (spells of over one year) peaked as a share of the unemployed in 2006, and fell through the recession to 45.5 percent in 2009.[25] Fahr and Sunde (2009) and Klinger and Rothe (2010) find that the efficiency of the matching function increased, while Gartner and Klinger (2011) observe that the Beveridge curve shifted in and continues to do so. Overall, the hypothesis that the Hartz reforms reduced unemployment by increasing employment, possibly with a lag that

[24] An excellent source in German for information on the reforms is http://www.hartz-iv-iii-ii-i.de/, accessed March 4, 2011. In English, see Ochel (2005).
[25] http://epp.eurostat.ec.europa.eu/portal/page/portal/employment_unemployment_lfs/data/database, accessed April 1, 2011.

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 five to ten workers. Hartz II introduced so-called mini-jobs, or part-time forms of employment involving monthly income of less than 400 EUR monthly 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 new flexibility did the Hartz reforms afford employers? The growth of the temporary agency sector is considered the most important of these reforms. It gave individual employers flexibility to vary employment without incurring hiring or firing costs, and the share of temporary workers rose from 1.6 percent of employment in 2005 to 2.5 percent in 2007-2008 (Bundesagentur für Arbeit 2011). But the effect on the flexibility of the aggregate economy was lower, as most temporary agency workers have permanent contracts with the temporary help agency. Employment levels 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 temp 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 – 205,000 (Bundesagentur für Arbeit 2011) – represents only 0.5% 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.

5.5 The role of expectations in the boom and the bust

Employment could have responded more inertially to the recession because employers expected it to be shorter than usual. The 2008-2009 recession, though deep, was of shorter duration than other post-war recessions, with the possible exception of the 1973-1975 episode, which had a faster recovery. Employers may have expected this, based on the expectation that world trade would recover quickly. We also hypothesize that employers expected the 2005-2007 boom to be short-lived. We proceed to 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 indices of the current business situation and business expectations from the surveys of the IFO Institute for Economic Research. IFO surveys about 7000 firms each month, asking whether the current situation in their firm is good, satisfactory or poor, and whether their expectations for the next six months are more favorable, unchanged or less favorable. IFO calculates the "balance" as the difference of positive and negative responses. These indices are available for the whole economy, and separately for manufacturing, construction, and wholesale and retail trade. There is no obvious way to deal with unification, and we simply join the series (for most series there is no jump at unification).

In Figure 10, we present these two monthly series for the four sectors, along with quarterly value-added in the corresponding sector, normalized to equal 100 when the 2005 boom begins.

Graph A 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 six month expectations in manufacturing was in December 2008, which is indeed about six months before the trough for the current situation variable for manufacturing, though less than six months before the trough of value added in manufacturing, in Q1 2009. We can say that employers were not surprised by the end of the recession, but without data on expectations farther into the future than six months, we cannot tell what employers expected at the start of the recession, when layoff decisions had to be made.[26]

Examination of the preceding expansion proves more fruitful. As the boom began in 2005, the current situation and expectations initially rose together in manufacturing, before 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 post-unification 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 (graph B), but expectations track the current situation closely throughout for retail and wholesale trade (graphs C and D).

We can use the expectations data to quantify the role of expectations in hiring in the 2005-2007 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 furthermore fluctuate at high

[26] We attempted to use data from the IAB enterprise data ("Betriebspanel") on expected employment a year ahead, but these data proved unreliable.

frequency, so a one-quarter differenced regression is the appropriate specification with expectations themselves (EXP) in levels (converted to quarterly frequency by averaging):[27]

$$\Delta \log L_t = \emptyset_0 + \emptyset_1 \Delta \log GDP_t + \emptyset_2 \Delta \log w_t + \emptyset_3 EXP_{t-2} + \Delta \mu_t. \quad (9)$$

As Table 8 shows, $\emptyset_3$ is positive and very statistically significant, and increases the R^2 of the regression considerably.[28]

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

$$\Delta EXP_t = \rho_0 + \rho_1 \Delta CUR_t + \Delta \xi_t. \quad (10)$$

We estimate $\hat{\rho}_1$ to be 0.61. The counterfactual expectations during the 2005-2007 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 (column 1). The estimation of equation (9) without expectations (column 2) leads the inaccurate prediction of a a mere 1.4 log point employment increase. Adding expectations to the specification significantly improves the accuracy of the prediction to 3.2 log points growth (column 3). The key is to know how much higher employment growth would have been predicted to be had expectations been higher: column 4 shows that with counterfactual expectations, employment growth is predicted to be 4.1 log points. The difference between columns 4 and 3 shows the role of expectations: if expectations had

[27] Neither differenced nor in logs: expectations can have a zero value, and converting to an index involves arbitrariness.
[28] Surprisingly, the interactions of expectations with the other covariates have statistically insignificant coefficients, so we do not include them.

behaved in the boom as they had historically, instead of having been unusually pessimistic, employment growth would have been 0.9 log points higher (column 5). This confirms that employers hesitated to hire in the 2005-2007 boom, lacking confidence it would last and cognizant of the high firing costs in Germany, and when the recession they feared indeed arrived, had less need to fire. The magnitude represents 0.9/1.6=56 percent of the missing employment increase in the boom, and 0.9/1.9=23 percent of the missing employment decline in the downturn.

Evidence from the business press

Our narrative characterizing pessimistic expectations and unexpectedly low (conditional) employment growth in the 2005-2007 expansion is corroborated by our own survey of business cycle reporting by the leading daily German business newspaper, *Handelsblatt*, for the period 2005-2009. Reports in the first two 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 overall business climate, a geometric average of the two indicators discussed above (current situation and expectations indexes), established a relatively pessimistic outlook at the outset.[29] The expansion was seen as driven by buoyant exports and not at all by internal demand (domestic investment and consumption). A commonly-held view was that consumers were holding back spending in light of a continuing string of layoffs and restructuring

[29] "Wolken am europäischen Konjunkturhimmel" (Clouds on European business cycle horizon) *Handelsblatt*, Feb 22, 2005; "Ifo spricht von chronischer Schwäche" (Ifo [Institute] cites chronic weakness) Feb 28, 2005; "Weniger Jobs trotz hoher Gewinne" (Fewer jobs despite higher profits) March 24 2005. Journalist Olaf Storbek 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, or "Reformvorsprung" (A jump ahead with reforms), September 9, 2005.

measures by large firms, despite significant declines in the unemployment rate in 2005 heralded by major policymaking figures.[30]

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.[31] 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.[32] Yet this view is not supported by the data; from Q1 2005 to Q2 2006 real consumption growth averaged 0.5% per annum, compared with 0.3% over following six 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.[33]

By January 2007 the pessimistic mood had reversed completely, despite a 3% 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.[34] By summer 2007, the first signs of the slowdown in the United States had arrived in Germany; yet forecasts of the major economic research institutes warned of only modest spillovers, citing the effect of the reforms and shortages of skilled workers.[35] Positive reports continued into the summer

[30] "Clement sieht Arbeitslosigkeit auf Zenit" ([Economics Minister] Clement sees unemployment at its peak) March 31, 2005.
[31] "Wirtschaft nimmt Fahrt auf - Konsum bleibt Hemmschuh" (The economy is taking off – consumer spending remains the bottleneck) November 11, 2005.
[32] "Der kleine Luxus" (Small luxury) August 4-6, 2006.
[33] "Der Aufwartstrend stockt" (The upward trend is sputtering); June 20 2006. "Konzerne bauen ab" (Corporations are retrenching) July 18, 2006; „Die Jobwende bleibt aus" (The job turnaround isn't materializing) July 18, 2006. As late as summer 2006, Chancellor 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.
[34] See „Experten streiten über die Qualität des Aufschwungs am Arbeitsmarkt" (Experts disagree over the quality of the boom for the labor market) August 2, 2007.
[35] „Herbstgutachten Analyse: Neue Besen kehren gut" (Analysis of the fall economic forecasts: New brooms sweep well) October 18, 2007. The article "Ohne die USA mutig voraus," (Bravely forward without the USA), December 28

of 2008, and a survey of 500 mid-size company managers revealed that 76% believed they would not be affected by the ensuing economic crisis.[36] By July 2008, however, the Ifo composite index had turned sharply south and by August the judgment was unanimous that the boom was over.[37]

Towards the end of the phase of negative growth (Q1 2008-Q1 2009) news reports began to suggest that employers were reluctant to fire workers, using instead short-time work and reducing working time balances and vacation to protect core workers.[38] By July 2009, rising order books and recovery of the world economy contributed to a general recovery, which was mirrored in consumer optimism.[39] By yearend 2009, the consensus view was that the recession was over.

5.6 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 low employment growth in the previous boom. Only about half of the low employment growth in the boom can be attributed to pessimistic employer expectations, however. Franz and Lehndorff (2010) hypothesize that layoffs were low in the recession due to a lack of hiring in the expansion, because 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

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2007 describes a strong positive sentiment that despite problems in the US, export demand would continue and that firms were unlikely to lay off workers, given difficulties finding skilled workers.

[36] „Deutsche Wirtschaft überraschend stark“ (German economy is surprisingly strong), May 15 2008; Wirtschaft hat vielversprechend Pläne“ June 54 2008. „Finanzkrise? Kein Thema“ (Financial crisis? Not an issue) June 7 2008.

[37] See „Der Aufschwung ist vorbei“ (The boom is over) August 14, 2008 which details the negative GDP growth results for the second quarter “Ifo: Abwartstrend mit Riesenschriften” (Ifo: Negative trend with giant letters) September 24, 2008.

[38] In February, *Handelsblatt* reported that burgeoning working time account balances and administrative extension of short time work had made machine tool producers for the crisis in comparison with previous recessions “Erfahrene Zyklikler” (Experienced ‘cyclists’ ”) February 11, 2009. In particular mention is made of holding on to trained personnel as long as possible; see „Trotz Krise gibt es sie - die Jobwunder“ (Despite the crisis - there are job miracles) March 4, 2009.

[39] “Die Industrie meldet sich zurück” (Industry is back) July 7 2009. „Deutsche Tugend“ (German virtues) September 2 2009. „Deutsches Mini-Jobwunder macht Hoffnung“ (German mini- Job miracle creates hope) October 15 2009. For note on consumer sentiment, „Verkehrte Welt“ (Topsy-turvy world) October 8 2009.

employment.[40] To assess the possible magnitude, we compute difference-in-differences comparing changes in hours per worker in 1996-2005, when they were still falling rapidly, and 2004-2007, when they leveled out. Prior to 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 wealth into increased leisure.[41] Table 10 shows that the regime change between 1996-2004 and 2004-2007 was driven by a slowing increase in the part-time share, and *rising* standard weekly hours. Even choosing periods to maximize the buildup of working time accounts in the expansion, we find their overall contribution appears small. However, working time account estimates may not be reliable, especially when standard weekly hours are changing, so part of the low hiring in the expansion could be well due to a permanent shift of 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, i.e. changing model parameters which would increase the quasi-fixity of labor. We have focused on working time accounts and their layoff disincentives, yet a number of alternative explanations can also be explored in light of our empirical findings and the predictions of the model presented in Section 5.1. An explanation frequently cited for low employment growth in the 2005-2007 expansion is greater incidence of skilled worker "shortages" than in previous expansions, or reluctance to lay off workers when the recession arrived, fearing difficulties in rehiring them in the recovery.[42] While firms reporting "shortages" in the boom were not less likely to lay off in the recession (Klinger et al. 2011) and the vacancy to employment ratio and the share of firms reporting shortages were similar in the 2005-2007 recession and in its

[40] In terms of the model of Section 5.1, this is a decrease in the parameter $\eta_{\Omega\theta}$.
[41] See Hunt (1998), Alesina, Glaeser and Sacerdote (2005), and Burda, Hamermesh and Weil (2008).
[42] Sachverständigenrat (2010), Schaz and Spitznagel (2010), Schütt (2010). In the business press, this factor was mentioned frequently after the onset of the Great Recession.

predecessor (Klinger and Gartner 2010), it is possible that increasing specialization of the workforce and slow labor force growth has made firms more reluctant to part with their skilled workers in recessions.[43]

An explanation competing with pessimistic employer expectations is that output-constrained firms experienced a positive productivity shock at the beginning of the expansion.[44] A priori, this would seem less plausible for Germany, an open economy facing a competitive international market. Under these conditions, a productivity shock would be more likely to be represented as a fall, not a rise in prices. In any case, comparison of labor productivity (output per hour) in the 2005-2007 boom shows that while output increased rose a similar amount to the previous three booms, labor productivity rose by only half of the corresponding value. There is no evidence that this mechanism was responsible for the sluggish expansion.[45]

6. Conclusion

Like the United States, Germany suffered its worst post-war recession in 2008-2009. 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 show that the large reductions in German hours per worker were largely consistent with the magnitude of the recession and recent wage moderation. The lack of employment decline was a historical anomaly, however. One partial explanation for the "labor market miracle" is pessimistic expectations and low hiring in the previous expansion, meaning that fewer workers were laid off

[43] In terms of the model of section 5.1, this would correspond to an increase in the parameter c.
[44] A firm which cannot sell more of its output at the given price will react to an exogenous increase in productivity by cutting labor (or hiring less).
[45] Using the recessions defined in Table 3, output increased in 2005-2007 boom by 6.2 log points (6.6 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).

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 broadly consistent with the narrative in the business press.

While 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 have occurred since the mid-1990s. The increase in use of privately negotiated working time accounts appears to have cheapened private 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.

While 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 are overseen by works councils.

Appendix: A model of dynamic labor demand with intensive and extensive margins[46]

Model setup

The representative firm faces exogenous sequences of relative output price $\{P_t\}$ and standard hourly wages $\{W_t\}$.[47] At t=0, it chooses a plan of employment $\{L_t\}$ (the extensive margin), and hours per worker $\{\theta_t\}$ (the intensive margin) to maximize expected discounted profits:

$$\max_{\{L_t\},\{\theta_t\}} E_0 \sum_{t=0}^{\infty} \beta^t \left[P_t Y_t - W_t \Omega(\theta_t) L_t \theta_t - \Phi L_t - \frac{c}{2}(L_t - L_{t-1})^2 \right]$$

subject to a neoclassical production function of hours worked (H_t):

$$Y_t = f(H_t) = f(L_t \theta_t)$$

with $f'>0$, $f''<0$. The deterministic discount factor is denoted by β with $0<\beta<1$. The function $\Omega(\theta_t)$ returns the average markup on the standard hourly wage W_t is paid when employees work θ_t hours, reflecting rising costs per hour at the intensive margin (meaning that $\Omega(\theta_t) \geq 1, \Omega' > 0, \Omega'' > 0$ for all θ_t). The elasticity of Ω with respect to θ, $\eta_{\Omega\theta}$, is assumed constant. In addition to variable labor costs $W_t \Omega(\theta_t) \theta_t L_t$, firms also pay a fixed charge Φ per employee which reflect social security contributions and related fixed labor costs.

The first order necessary conditions for an optimum are:

L_t (bodies): $$\theta_t (P_t f' - \Omega W_t) - \Phi - c(L_t - L_{t-1}) + \beta c(\mathrm{E}_t L_{t+1} - L_t) = 0 \qquad \text{(A1)}$$

θ_t (hours/worker): $$(P_t f' - \Omega W_t - \theta_t \Omega' W_t) L_t = 0 \qquad \text{(A2)}$$

Since L_t>0, we can write (A2), using the definition of $\eta_{\Omega\theta}$, as

[46] Patrick Bunk provided research assistance in constructing this appendix.

[47] The price level is normalized to one, so all prices are in real terms. This partial equilibrium perspective is solely for expositional purposes. A more complete model would address feedback effects from labor and product markets in general equilibrium. Because the model is especially relevant for the manufacturing sector, we think this is the right model in this context.

$$P_t f' = (1 + \eta_{\Omega\theta})\Omega W_t \tag{A3}$$

(A1) and (A3) can be combined to obtain

$$\theta_t \eta_{\Omega\theta} \Omega W_t = \Phi + c(L_t - L_{t-1}) - \beta c(\mathrm{E}_t L_{t+1} - L_t) \cdot \tag{A4}$$

Steady state

In the steady state, P_t=P, W_t=W, L_t=L, θ_t=θ, etc. Two equations govern the extensive and intensive labor margins, keeping in mind that $\Omega = \Omega(\theta)$ and $f' = f'(\theta L)$:

$$\theta(Pf' - \Omega W) = \Phi \tag{A5}$$

$$Pf' = W\Omega(1 + \eta_{\Omega\theta}) \tag{A6}$$

which can be rewritten as:

$$W\Omega\eta_{\Omega\theta} = \frac{\Phi}{\theta} \tag{A7}$$

$$\frac{Pf' - W\Omega}{W\Omega} = \eta_{\Omega\theta} \tag{A8}$$

The model dichotomizes in the following sense: given W, Φ, $\eta_{\Omega\theta}$, and $\Omega(.)$, steady-state hours per worker θ is given by (A7). Given θ and P, (A8) determines L and thus H.

Log-linearized approximation

Denote the percentage deviation of X_t around X by $\hat{X}_t$. The log-linearization of the first-order conditions plus the definition of effective hours $(H_t = L_t\theta_t)$ yields three equations in three unknowns, $\hat{L}_t$, $\hat{\theta}_t$ and $\hat{H}_t$:

$$(1 + \eta_{\Omega\theta})\hat{\theta}_t + \hat{W}_t = \frac{cL}{\Phi}(\hat{L}_t - \hat{L}_{t-1}) - \frac{\beta cL}{\Phi}(\mathrm{E}_t \hat{L}_{t+1} - \hat{L}_t) \tag{A9}$$

$$\eta_{\Omega\theta}\hat{\theta}_t + \eta_{f'H}\hat{H}_t = -\hat{W}_t + \hat{P}_t \tag{A10}$$

$$\hat{H}_t = \hat{\theta}_t + \hat{L}_t \tag{A11}$$

where $\eta_{f'H} = -\dfrac{Hf''(H)}{f'(H)}$ is the elasticity of the marginal product of hours evaluated at steady-state, which we assume to be less than one. Conditioning on total hours, an increase in the real product wage reduces use of the intensive margin, and has an ambiguous effect on employees. (A10) and (A11) imply:

$$\hat{\theta}_t = -\frac{\eta_{f'H}}{\eta_{\Omega\theta}+\eta_{f'H}}\hat{L}_t - \frac{1}{\eta_{\Omega\theta}+\eta_{f'H}}\left(\hat{W}_t - \hat{P}_t\right) \tag{A12}$$

which substituted in (A9) and rearranged yields

$$\varphi_W\left(\hat{W}_t - \hat{P}_t\right) - \varphi_P\hat{P}_t = \mathrm{E}_t\hat{L}_{t+1} - A\hat{L}_t + B\hat{L}_{t-1} \quad , \tag{A13}$$

with

$$\varphi_W = \frac{\Phi}{\beta cL}\left(\frac{1-\eta_{f'H}}{\eta_{\Omega\theta}+\eta_{f'H}}\right), \quad \varphi_P = \frac{\Phi}{\beta cL}, \; A = \left[\frac{\Phi(1+\eta_{\Omega\theta})\eta_{f'H}}{\beta cL(\eta_{\Omega\theta}+\eta_{f'H})} + \frac{1}{\beta} + 1\right], \text{ and } B = \beta^{-1}.$$

The method of factorization[48] can be used to find the stable solution of (A13) expressing current employment $\hat{L}_t$ as a function of lagged employment and current and expected future values of output prices and hourly base wage rates:

$$\hat{L}_t = \lambda\hat{L}_{t-1} + \sum_{\tau=0}^{\infty}(\lambda\beta)^{\tau}\mathrm{E}_t\left[\varphi_P\hat{P}_t - \varphi_W\left(\hat{W}_t - \hat{P}_t\right)\right] \tag{A14}$$

where λ denotes the stable root of the difference equation (A14). Equations (A14) and (A12) summarize the firm's optimal of intensive and extensive margins, respectively, and appear as equations (8) and (9) in the main text, with $\eta_{\theta L} = \eta_{f'H}/(\eta_{\Omega\theta}+\eta_{f'H})$ and $\eta_{\theta W} = 1/(\eta_{\Omega\theta}+\eta_{f'H})$.

[48] Sargent (1987, p.183-4)). A more detailed technical derivation is available from the authors on request.

The dependence of λ on the cost of adjustment parameter c and the elasticity of the wage to the extensive margin $\eta_{\Omega\theta}$

To study the effect of *c* and $\eta_{\Omega\theta}$ on the persistence parameter λ, we differentiate the quadratic equation which determines λ, i.e.

$$\lambda^2 - \left[\frac{\Phi}{\beta c L} \frac{(1+\eta_{\Omega\theta})\eta_{f'H}}{\eta_{\Omega\theta}+\eta_{f'H}} + \frac{1}{\beta} + 1 \right] \lambda + \beta^{-1} = 0 , \qquad \text{(A15)}$$

with respect to $\eta_{\Omega\theta}$ and solve:

$$\frac{d\lambda}{d\eta_{\Omega\theta}} = \frac{\lambda \frac{\Phi \eta_{f'H}}{\beta c L} \left[\frac{\eta_{\Omega\theta}(1-\eta_{f'H})}{(\eta_{\Omega\theta}+\eta_{f'H})^2} \right]}{2\lambda - \frac{\Phi}{\beta c L} \frac{(1+\eta_{\Omega\theta})\eta_{f'H}}{\eta_{\Omega\theta}+\eta_{f'H}} + \frac{1}{\beta} + 1} .$$

The denominator is unambiguously negative, since 0<λ<1. The numerator is positive as long as $\eta_{f'H}$<1. Thus dλ/d$\eta_{\Omega\theta}$<0. A decrease in the elasticity of hourly wage with respect to the intensive margin increases the persistence of employment.

The effect of the adjustment cost parameter *c* on persistence λ is given by:

$$\frac{d\lambda}{dc} = -\frac{\lambda \frac{\Phi}{\beta c^2 L} \frac{(1+\eta_{\Omega\theta})\eta_{f'H}}{\eta_{\Omega\theta}+\eta_{f'H}}}{2\lambda - \frac{\Phi}{\beta c L} \frac{(1+\eta_{\Omega\theta})\eta_{f'H}}{\eta_{\Omega\theta}+\eta_{f'H}} - \frac{1}{\beta} - 1} .$$

This expression is always positive; an increase in *c* increases persistence and increases the weights placed on future expectations in (A15). Higher values of λ imply that temporary changes in current demand (proxied by *P*) or product wages (*W/P*) have a smaller effect on current employment, all other things equal.

References

Abraham, Katharine G. and Susan N. Houseman. 1993. *Job Security in America: Lessons from Germany*. Washington, D.C.: Brookings Institution.

Akerlof, George, Andrew Rose, Janet Yellen and Helen Hessenius. 1991. "East Germany in from the Cold: The Economic Aftermath of Currency Union." *Brookings Papers on Economic Activity* 1: 1-87.

Alesina, Alberto, Edward Glaeser and Bruce Sacerdote. 2005. "Work and Leisure in the United States and Europe: Why So Different?" *NBER Macro Annual 2005* 1-64.

Boeri, Tito and Herbert Brücker. 2011. "Short-Time Work Benefits Revisited: Some Lessons from the Great Recession." Institute for the Study of Labor Discussion Paper 5635 (April).

Bogedan, Claudia, Wolfram Brehmer and Alexander Herzog-Stein. 2009. "Betriebliche Beschäftigungssicherung in der Krise: Eine Kurzauswertung der WSI-Betriebsrateumfragung 2009." Unpublished paper. Wirtschafts- und Sozialwissenschaftliche Forschungsinstitut in der Hans-Böckler-Stiftung (December).

Boysen-Hogrefe, Jens and Dominik Groll. 2010. "The German Labour Market Miracle." *National Institute Economic Review* 214: R38-R50.

Bundesagentur für Arbeit. 2011. "Der Arbeitsmarkt in Deutschland: Zeitarbeit in Deutschland – Aktuelle Entwicklung." *Arbeitsmarktberichterstattung* January.

Bundesarbeitsgericht. 2010. juris.bundesarbeitsgericht.de/cgi-bin/rechtsprechung/document.py?Gericht=bag&Art=en&sid=47d5a35b9cef6b6f92baf2ca255a9ec8&nr=12524&pos=7&anz=33, accessed March 4, 2011.

Burda, Michael and Michael Kvasnikca. 2006. "Zeitarbeit in Deutschland: Trends und Perspectiven." *Perspektiven der Wirtschaftspolitik* 7:195-225.

Burda, Michael, Daniel Hamermesh and Philippe Weil. 2008. "The Distribution of Total Work in the EU and the US." In *Working Hour and Job Sharing in the EU and the USA: Are Europeans Lazy or Americans Crazy?*, edited by Tito Boeri, Michael Burda and Francis Kramarz. Oxford: Oxford University Press.

Burda, Michael and Mark Weder. 2010. "Payroll Taxes, Social Insurance and Business Cycles." CEPR Discussion Paper 7984, September.

Carlin, Wendy and David Soskice. 2009. "German economic performance: disentangling the role of supply-side reforms, macroeconomic policy and coordinated economy institutions." *Socio-Economic Review* 7:67-99.

Cooley, Thomas F. ed. 1995. *Frontiers of Business Cycle Research* Princeton, N.J.: Princeton University Press.

Dustmann, Christian, Johannes Ludsteck and Uta Schönberg. 2009. "Revisiting the German Wage Stucture." *Quarterly Journal of Economics* 124: 843:881.

Ellguth, Peter and Susanne Kohaut. 2009. "Tarifbindung und betriebliche Interessenvertretung in Ost und West: Schwund unterm sicheren Dach." *IAB Forum* 2:68-75.

Elsby, Michael, Bart Holbijn, and Aysegul Sahin. 2010. "The Labor Market in the Great Recession." *Brookings Papers on Economic Activity* 1: 1-48.

Fahr, René and Uwe Sunde. 2009. "Did the Hartz Reforms Speed Up the Matching Process? A Macro-Evaluation Using Empirical Matching Functions." *German Economic Review* 10(3): 284-316.

Franz, Christine and Steffen Lehndorff. 2010. "Arbeitszeitentwicklung und Krise – eine Zwischenbilanz." *IAQ-Report: Aktuelle Forschungsergebnisse aus dem Institut Arbeit und Qualifikation* 7: 1-12.

Farber, Henry. 2010. "Job Loss and Unemployment in the 21st Century: The Great Recession in Labor Market Perspective." Unpublished paper. Princeton University (November).

Fuchs, Johann, Markus Hummel, Sabine Klinger, Eugen Spitznagel, Susanne Wanger and Gerd Zika. "Der Arbeitsmarkt schließt an den vorherigen Aufschwung an." *IAB Wochenbericht* 18:1-12.

Galí, Jordi and Thijs van Rens. 2010. "The Vanishing Procyclicality of Labor Productivity." Unpublished paper. Universitat Pompeu Fabra (July).

Gartner, Hermann and Sabine Klinger. 2010. "Verbesserte Institutionen für den Arbeitsmarkt in der Wirtschaftskrise." *Wirtschaftsdienst* 90(11): 728-734.

Gordon, Robert J. 2010. "Okun's Law, Productivity Innovations, and Conundrums in Business Cycle Dating." *American Economic Review: Papers & Proceedings* 100(2): 1–9.

Gross, Hermann und Michael Schwarz. 2007. "Betriebs- und Arbeitszeiten 2005: Ergebnisse einer repäsentativen Betriebsbefragung." *Beiträge aus der Forschung: Sozialforschungsstelle Dortmund* 153: 1-174.

Hamermesh, Daniel S. 1989. "Labor Demand and the Structure of Adjustment Costs." *American Economic Review* 79(4): 674-689.

Hamermesh, Daniel S. and Gerard Pfann. 1996. "Adjustment Costs in Factor Demand." *Journal of Economic Literature* 34(3): 1264-1292.

Herzog-Stein, Alexander, Fabian Lindner, Simon Sturn and Till van Treeck. 2010. "Vom Krisenherd zum Wunderwerk? Der deutsche Arbeitsmarkt im Wandel." *Institut für Makroökonomie und Konjunkturforschung Report* 56: 1-18.

Herzog-Stein, Alexander and Hartmut Seifert. 2010. "Der Arbeitsmarkt in der Grossen Rezession – Bewährte Strategien in neuen Formen." *WSI-Mitteilungen* 11: 551-559.

Hoff, Andreas. 2009. "Arbeitszeit-Korridor statt Kurzarbeit." *Personalmagazin* 9: 54-56.

Hunt, Jennifer. 1999. "Has Work-Sharing Worked in Germany?" *Quarterly Journal of Economics* 114(1): 117-148.

Hunt, Jennifer. 1998. "Hours Reductions as Work-Sharing." *Brookings Papers on Economic Activity* 1: 339-381.

Khan, Aubhik and Julia K. Thomas. 2003. "Nonconvex Factor Adjustments in Equilibrium Business Cycle Models: Do Nonlinearities Matter?" *Journal of Monetary Economics* 50: 331-360.

Klinger, Sabine, Martina Rebien, Markus Heckmann and Jörg Szameitat. 2011. "Did recruitment problems account for the German job miracle?" *International Review of Business Research Papers* 7(1): 265-281.

Klinger, Sabine and Thomas Rothe. 2010. "The impact of labour market reforms and economic performance on the matching of short-term and long-term unemployed." IAB Discussion Paper, 13/2010, Nürnberg, 35 pp.

Klös, Hans-Peter and Holger Schäfer. 2010. "Krisenmanagement über Variationen des Arbeitsvolumens? " *Arbeit* 2-3: 132-146.

Lesch, Hagan. 2010. "Lohnpolitik 2000 bis 2009: Ein informelles Bündnis für Arbeit." *IW-Trends: Vierteljahresschrift zur empirischen Wirtschafsforschung* 37(1): 1-15.

Logeay, Camille and Rudolf Zwiener. 2008. "Deutliche Realeinkommensverluste für Arbeitnehmer : Die neue Dimension eines Aufschwungs." *WSI Mitteilungen* 8: 415-422.

Möller, Joachim. 2010. "The German labor market response in the world recession – de-mystifying a miracle." *Zeitschrift für Arbeitsmarkforschung* 42(4): 325-336.

Ochel, Wolfgang. 2005. "Hartz IV- Welfare to Work in Germany." *CESifo DICE Report* 2: 18-25.

Okun, Arthur. 1962. "Potential GNP: Its Measurement and Significance." *American Statistical Association, Proceedings of the Business and Economics Statistics Section* 98–104.

Organisation for Economic Cooperation and Development (OECD). 2010a. *Employment Outlook 2010: Moving Beyond the Jobs Crisis.* Paris: Organisation for Economic Cooperation and Development.

Organisation for Economic Cooperation and Development (OECD). 2010b. *Economic Survey of Germany 2010: The banking system: lessons from the financial crisis.* Paris: Organisation for Economic Cooperation and Development.

Peichl, Andreas and Siegfried Siegloch. 2010. "Incorporating Labor Demand Effects into the Microsimulation of Tax and Benefit Reforms. " Unpublished paper. Institute for the Study of Labor (January).

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung. 2010. *Jahresgutachten 2009/10: Die Zukunft nicht aufs Spiel setzen* Paderborn: Bonifatius GmbH Buch-Druck-Verlag.

Sargent, Thomas J. 1978. "Estimation of Dynamic Labor Demand Schedules under Rational Expectations." *Journal of Political Economy* 86(6): 1009-1044.

Sargent, Thomas J. 1987. Macroeconomic Theory (2nd edition). New York: Academic Press.

Schaz, Philipp and Eugen Spitznagel. 2010. "Makroökonomische Dynamik von Arbeitsmärkten. Ein Vergleich interner und externer Flexibilitäten in den USA und in Deutschland." *WSI Mitteilungen* 12: 626-635.

Schneider, Stefan and Bernhard Graef. 2010. "Germany's jobs miracle: Short-time work, flexible labour contracts and healthy companies." Deutsche Bank Research Briefing, 27 April.

Schütt, Petra. 2010. "Fachkräfte finden, binden und entwickeln." *Arbeit* 2-3: 178-194.

Seifert. Hartmut. 2004. "Flexibility through working time accounts: Reconciling economic efficiency and individual time requirements," WSI Discussion Paper 130, Wirtschafts- und Sozialwissenschaftliches Institut der Hans-Böckler Stiftung, August.

Sinn, Hans-Werner. 2005. *Ist Deutschland Noch zu retten?* Berlin: Ullstein Buchverlage.

Sinn, Hans-Werner. 1999. "International Implications of German Reunification." In *The Economics of Globalization: Policy Perspectives from Public Economics*, edited by Assaf Razin and Efraim Sadka. Cambridge: Cambridge University Press.

Treadway, Arthur B. 1970. "Adjustment Costs and Variable Inputs in the Theory of the Competitive Firm." *Journal of Economic Theory* 2: 329-347.

Will, Henner. 2010. "Kurzarbeit als Flexibilisierungsinstrument: Hemmnis strukturellen Wandels oder konjunkturelle Brücke für Beschäftigung?" *Institut für Makroökonomie und Konjunkturforschung Study* 5: 1-92.

Zapf, Ines and Wolfram Brehmer. 2010. "Arbeitszeitkonten haben sich bewährt." *IAB Kurzbericht* 22: 1-8.

Table 1. Changes in output and labor market measures in the Great Recession

	United States			Germany		
	Peak	Trough	Change	Peak	Trough	Change
Output	Q4 2007	Q2 2009	-4.1	Q1 2008	Q1 2009	-6.6
Unemployment rate	Q1 2007	Q4 2009	5.5	Q4 2008	Q2 2009	0.5
Employment	Q1 2008	Q4 2009	-5.6	Q4 2008	Q2 2009	-0.5
Person-hours	Q4 2007	Q4 2009	-7.6	Q2 2008	Q2 2009	-3.4

Note: Changes are expressed in % for output, employment and hours, and percentage points for the unemployment rate. All are seasonally adjusted, and output is real GDP.

Source: GDP: Bureau of Economic Analysis, Federal Statistical Office; unemployment and employment: comparable data from the Bureau of Labor Statistics; person-hours: Bart Hobijn estimates of total nonfarm hours, Federal Statistical Office.

Table 2. Accounting for output in the Great Recession 2008-2010

	Output	Productivity	Person-hours	Hours/worker	Workers/LF	Labor force
	ΔY/Y	Δ(Y/H)/(Y/H)	ΔH/H	Δ(H/L)/(H/L)	Δ(L/LF)/(L/LF)	ΔLF/LF
	(1)	(2)	(3)	(4)	(5)	(6)
United States						
Q4 2007-Q2 2009	-4.2	+2.5	-6.7	-2.1	-5.3	+0.7
Q1 2008-Q4 2009	-2.4	+6.0	-8.4	-2.2	-6.1	-0.1
Germany						
Q1 2008-Q1 2009	-6.8	-4.0	-2.9	-3.3	+0.4	+0.1
Q1 2008-Q4 2009	-5.4	-3.0	-2.4	-2.6	+0.4	-0.2

Note: Units are log points (approximately percent changes). Columns 2 and 3 sum to column 1, and columns 4, 5 and 6 sum to column 3. For the United States, column 2 refers to non-farm business and column 4 to the private sector only, so columns 3 and 5 obey the identity by construction. German figures may not add due to rounding.

Sources: Germany: Federal Statistical Office; U.S. GDP: Bureau of Economic Analysis; U.S. employment: Bureau of Labor Statistics CPS series from international comparative tables; U.S. hours per worker: Bureau of Labor Statistics series CES0500000002; U.S. productivity: Bureau of Labor Statistics series PRS85006093; labor force: Civilian labor force BLS series LNS11000000Q. Authors' calculations: log differentiation of change in output.

Table 3: Decomposition of German person-hours reductions into employment and hours per worker

Recession	Δ person-hours	Δ employment	Δ hours per worker	Percent of adjustment in hours per worker
	(1)	(2)	(3)	(4)
1973-1975	-7.9	-3.4	-4.5	57
	(-4.4)	(-2.6)	(-1.8)	(41)
1979-1982	-4.1	-0.2	-3.9	94
	(-2.7)	(-1.5)	(-1.2)	(44)
1991-1993	-4.4	-4.0	-0.4	9
	(-3.1)	(-4.0)	(+0.9)	(-29)
2001-2005	-3.6	-1.5	-2.2	60
	(-2.1)	(-2.2)	(+0.1)	(-5)
2008-2009	-3.3	0.2	-3.5	106
	(-3.6)	(-0.8)	(-2.8)	(78)

Note: Quarterly, seasonally adjusted data. Units are log points (approximately percent changes). Figures in parentheses refer to counterparts in HP-detrended data (λ=1600). Recession dates are taken from the Sachverständigenrat (Council of Economic Advisors) (2010): Q2 1973-Q2 1975, Q4 1979-Q4 1982, Q1 1991-Q3 1993, Q1 2001-Q2 2005, Q1 2008-Q2 2009. The units in columns 1-3 are log points (approximately percent changes); column 4 is in percent. Columns 2 and 3 may not add up to column 1 due to rounding.

Source: Federal Statistical Office, authors' calculations: log differentiation of change in person-hours.

Table 4: Correlates of hours per worker and employment

	Hours per worker		Employment	
	Δ H/L	Δ H/L	L_t	ΔL
	(1)	(2)	(3)	(4)
Δ GDP	0.18	0.17	--	0.18
	(0.05)	(0.05)		(0.05)
Δ Labor costs per worker	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 cost per $worker_{t-1}$	--	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
Observations	135	135	135	135

Note: All variables are in logs except the trend. Newey-West standard errors based on four lags in parentheses. Quarterly, seasonally adjusted data from 1970-2003. Labor costs are adjusted for reimbursements for short-time payments and short time-related social security payments.

Table 5: Sources of unexpected employment changes

	Employment change			Value added change t-1		Sum weighted residuals
	Actual	Predicted	Residual	Actual	Predicted	
	ΔL_i	$\Delta\hat{L}_i \mid V_i, w$	$\Delta\eta_{it}$	ΔV_{it-1}	$\Delta\hat{V}_{it-1} \mid GDP_{t-1}$	$\Sigma_j \beta_j \Delta\varepsilon_{it-j}$
	(1)	(2)	(3)	(4)	(5)	(6)
A. Recession						
All industries	-0.002	-0.042	0.039	--	--	--
Manufacturing	-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	0.002	-0.020	0.021	-0.062	-0.039	-0.001
B. Expansion						
All industries	0.039	0.055	-0.016	--	--	--
Manufacturing	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	0.029	0.057	-0.027	0.066	0.018	0.018

Note: The recession is Q3 2008-Q3 2009, the expansion Q2 2005-Q3 2008. V represents value-added in the industry (for all industries, GDP), w represents labor costs, GDP represents the components of GDP. The sum of weighted residuals (column 6) reflects the change in employment due to unexpected change in lagged value added (see text). Manufacturing includes mining and trade includes hospitality sectors and transportation.

Table 6: Correlates of employment and value added by sector

	Manufacturing		Construction		Trade	
	Employ-ment$_t$	Value added$_t$	Employ-ment$_t$	Value added$_t$	Employ-ment$_t$	Value added$_t$
	(2)	(3)	(4)	(5)	(6)	(7)
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$_{t-1}$	-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
Observations	132	136	132	136	132	136

Note: All variables are in logs except the trend. The independent variables except value added refer to the aggregate economy. Quarterly, seasonally adjusted data from 1970-2003. Labor costs include employer and employee social security payments and are adjusted for reimbursements related to short-time work. Trade includes hospitality sectors and transportation. Manufacturing includes mining. Newey-West standard errors based on four lags in parentheses.

Table 7: Sources of changes in hours per worker 2008-2009

	Change (hours) (1)	Change (percent of annual hours per worker) (2)	Share of hours decline (percent) (3)
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	-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
Annual hours per worker	-41.3	-3.1	100

Source: IAB Working Time Calculation and authors' calculations.

Notes: Calculations based on change in yearly average from 2008 to 2009. The calendar effect reflects different numbers of working days in the two years.

Table 8: The role of expectations in employment adjustment

	(1)	(2)
Δ GDP	0.170	0.163
	(0.047)	(0.038)
Δ Labor costs per worker Δw	-0.038	-0.049
	(0.035)	(0.031)
Expectations balance E_{t-2}	--	0.00013
		(0.00003)
Constant	0.0002	0.0014
	(0.0006)	(0.0006)
R^2	0.18	0.38
Observations	135	134

Note: The dependent variable is the change in log employment. All variables are in logs except the expectations balance. The balance of expectations is the difference between the share of firms expecting business conditions in six months to be better and the share expecting them to be worse. Quarterly, seasonally adjusted data from 1970-2003. Labor costs include employer and employee social security payments and are adjusted for reimbursements for related to short-time work. Newey-West standard errors based on four lags in parentheses.

Table 9: Role of expectations in employment in the expansion 2005-2008

Change in employment	Predicted change in employment			Effect of changed expectations (4)-(3)
	No expectations controls	Expectations controls	Counterfactual expectations	
(1)	(2)	(3)	(4)	(5)
0.037	0.014	0.032	0.041	0.009

Note: Values are reported for the period Q3 2005-Q3 2008. Predictions are based on one-quarter differenced regressions reported in Table 8. All regressions control for the change in GDP and labor costs. Variables except expectations are in logs.

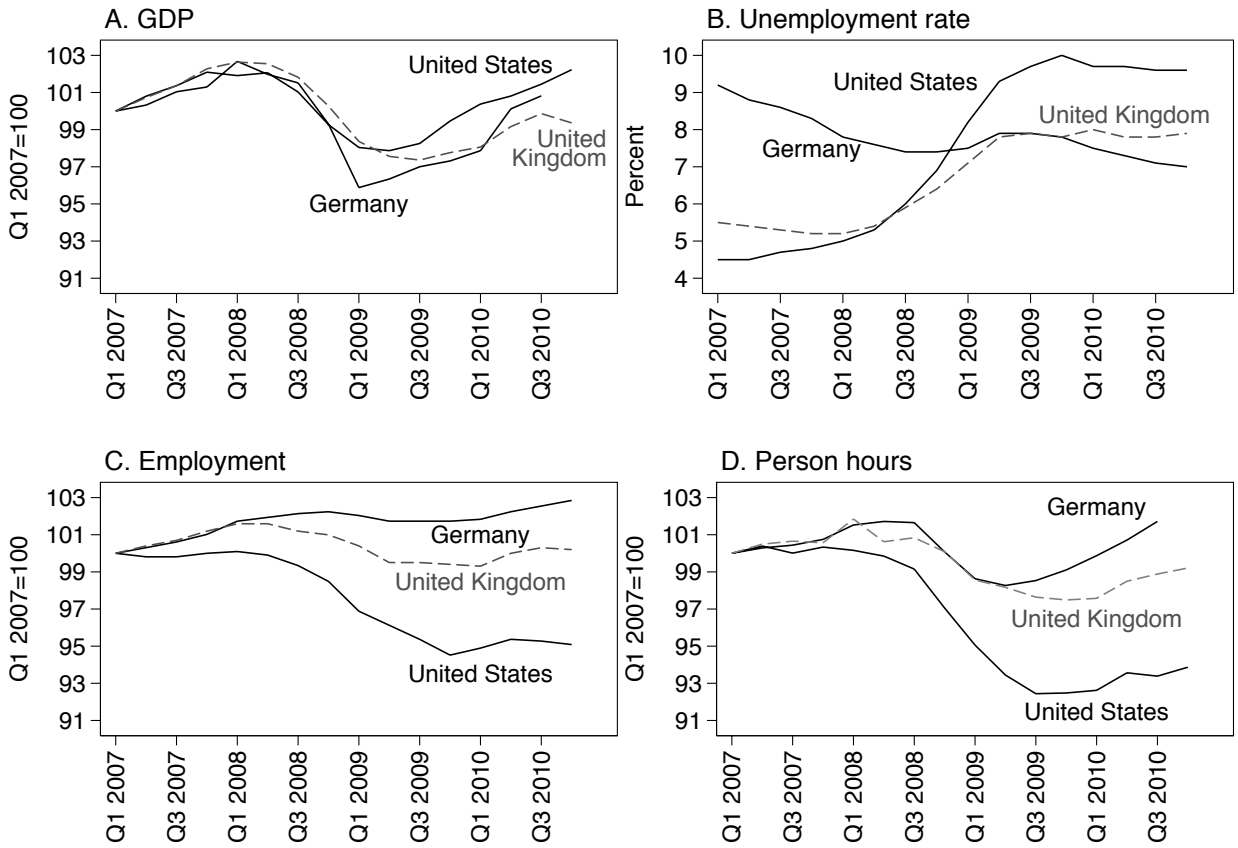
Table 10: Sources of changes in hours per worker 1996-2007

	Change per year (hours)		Double difference (hours)
	1996-2004	2004-2007	(2)-(1)
	(1)	(2)	(3)
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	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
Annual hours per worker	-9.3	-3.6	5.7

Source: IAB Working Time Calculation data and authors' calculations.

Notes: Annual data. The calendar effect reflects different numbers of working days across years.

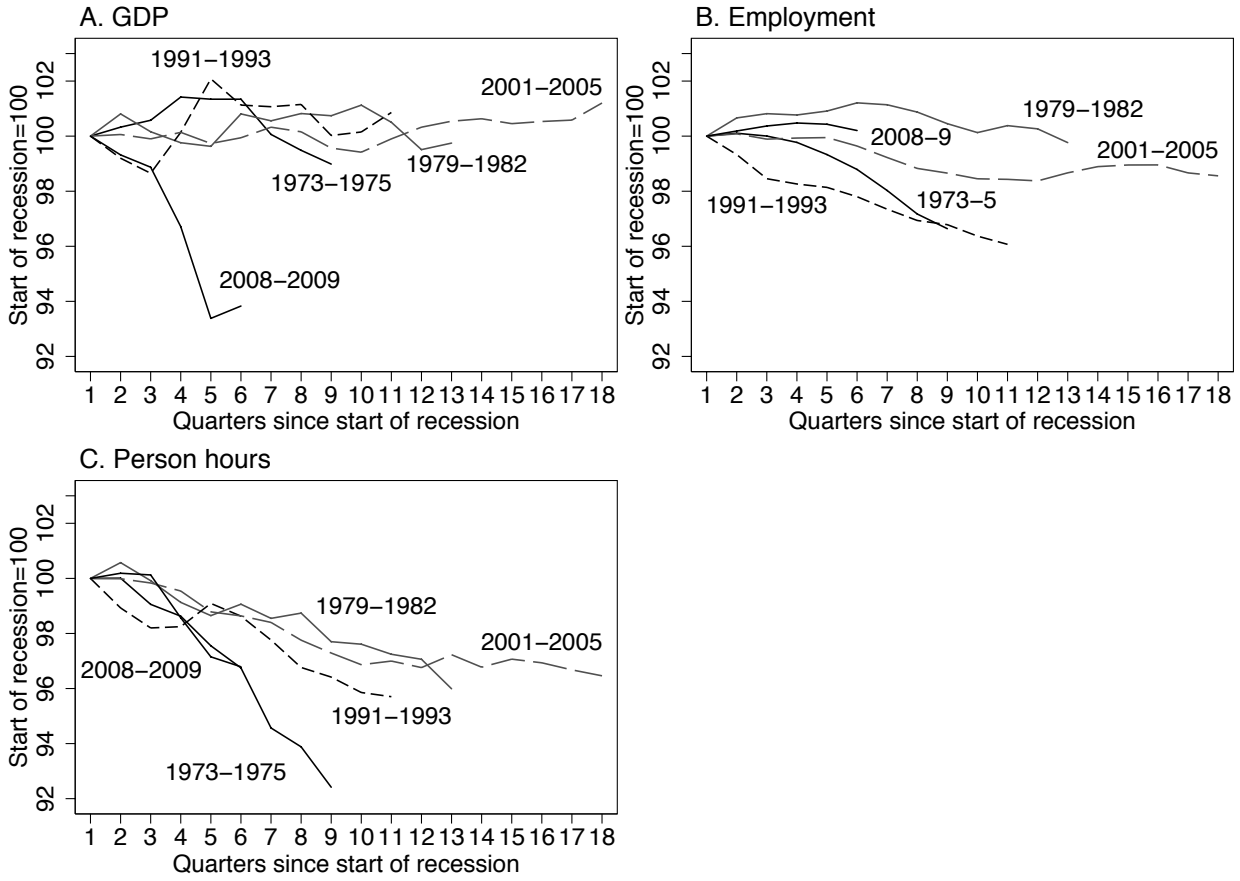
Figure 1: The Great Recession in the United States, Germany and United Kingdom, 2007-2010



Note: Quarterly, seasonally adjusted data. Real GDP.

Source: GDP: Bureau of Economic Analysis, Federal Statistical Office, Office for National Statistics; unemployment and employment: comparable data from the Bureau of Labor Statistics; person-hours: Bart Holbijn estimates of total nonfarm hours, Federal Statistical Office, Office for National Statistics.

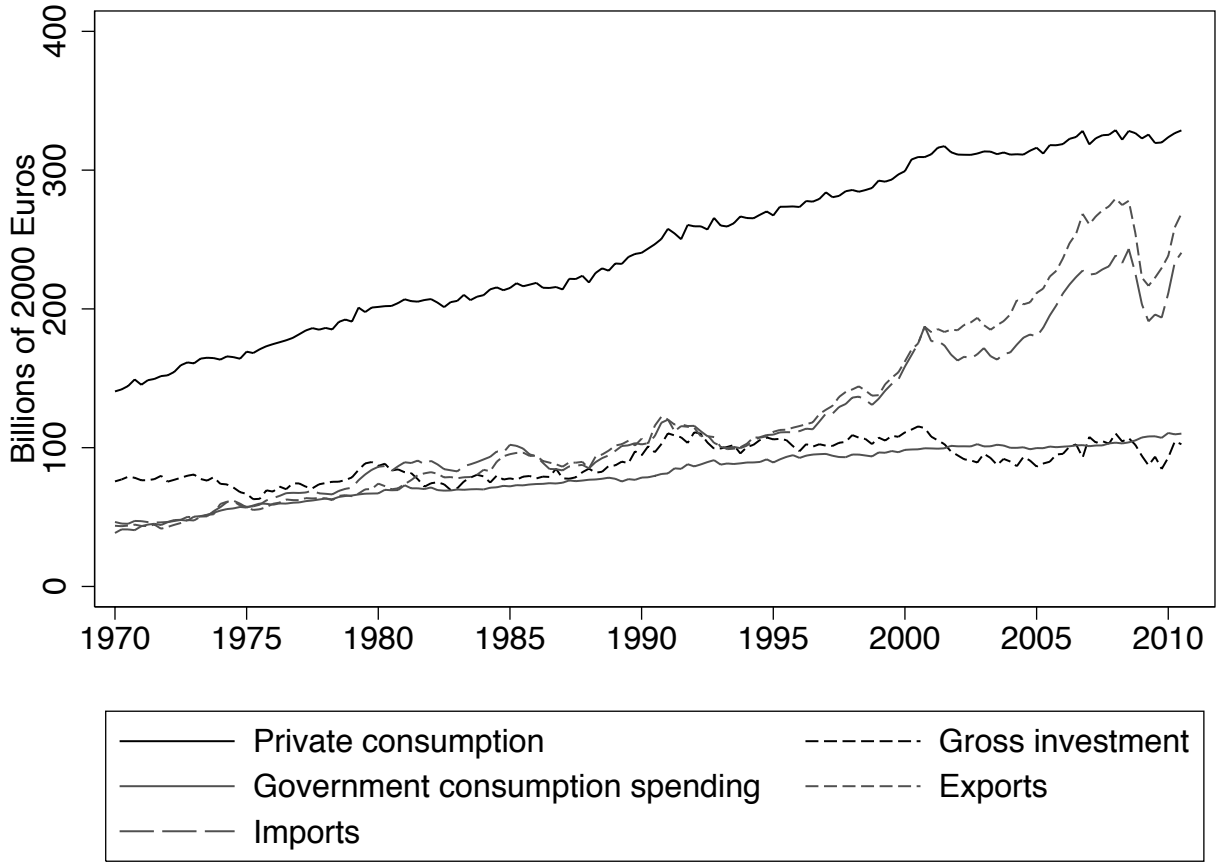
Figure 2: Output and labor market outcomes in past German recessions



Note: Quarterly, seasonally adjusted data. Real GDP. Recession dates taken from the Sachverständigenrat (2010): Q2 1973-Q2 1975, Q4 1979-Q4 1982, Q1 1991-Q3 1993, Q1 2001-Q2 2005, Q1 2008-Q2 2009.

Source: Federal Statistical Office.

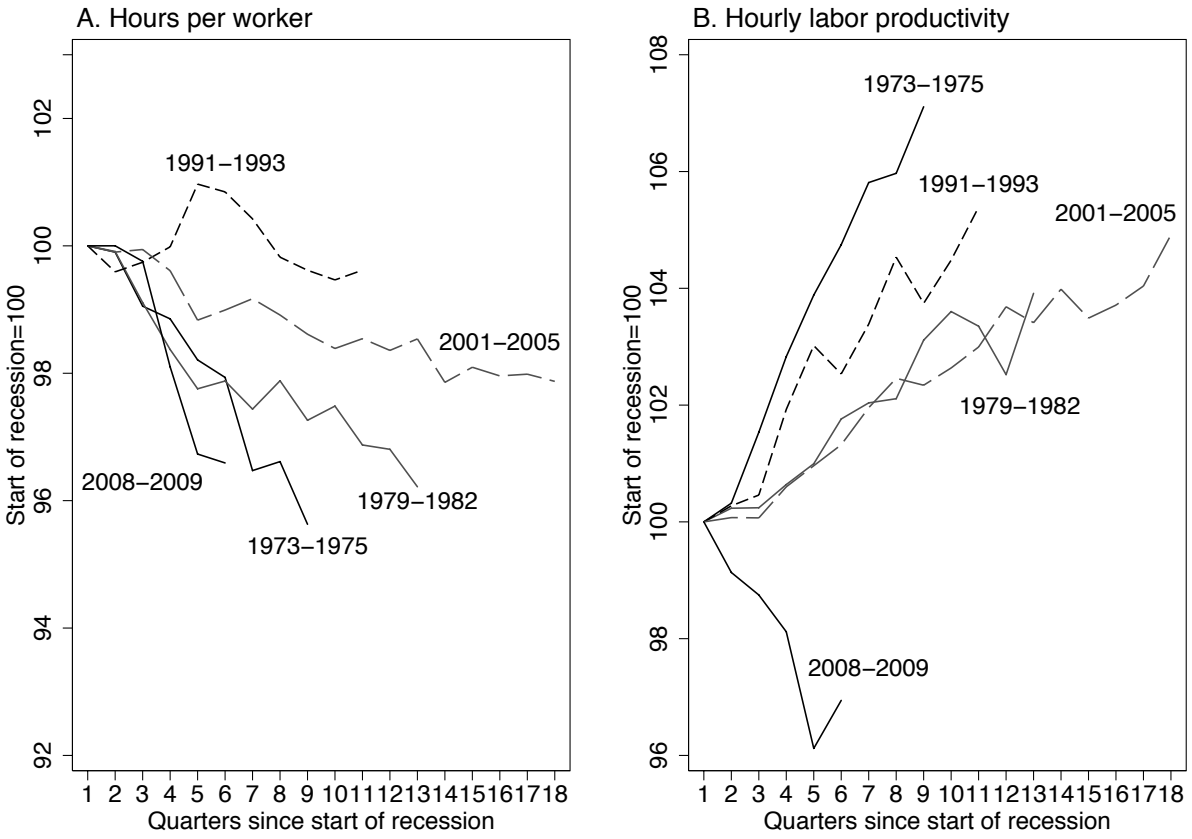
Figure 3: Components of GDP



Note: Quarterly, seasonally adjusted data 1970-2010.

Source: Federal Statistical Office.

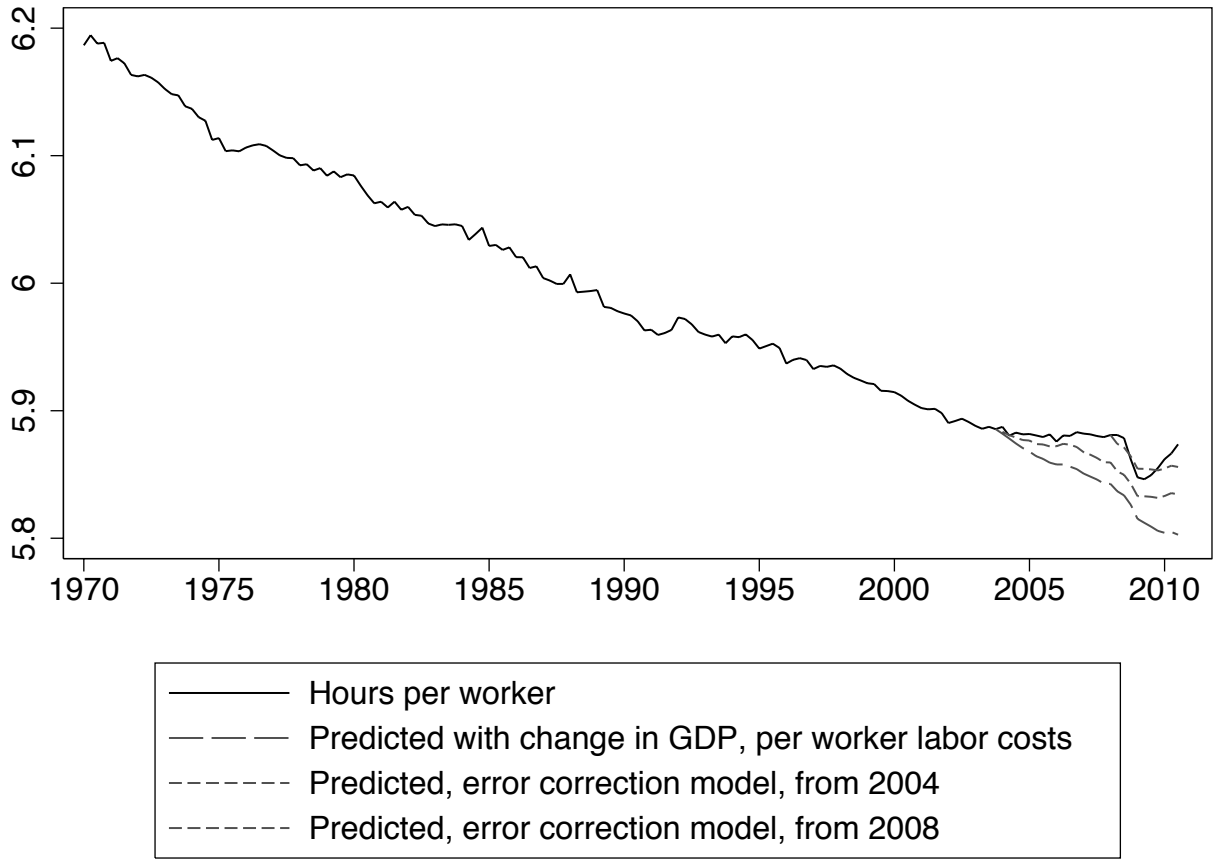
Figure 4: Hours per worker and productivity in past German recessions



Note: Quarterly, seasonally adjusted data. Real labor productivity. Recession dates taken from the Sachverständigenrat (2010): Q2 1973-Q2 1975, Q4 1979-Q4 1982, Q1 1991-Q3 1993, Q1 2001-Q2 2005, Q1 2008-Q2 2009.

Source: Federal Statistical Office.

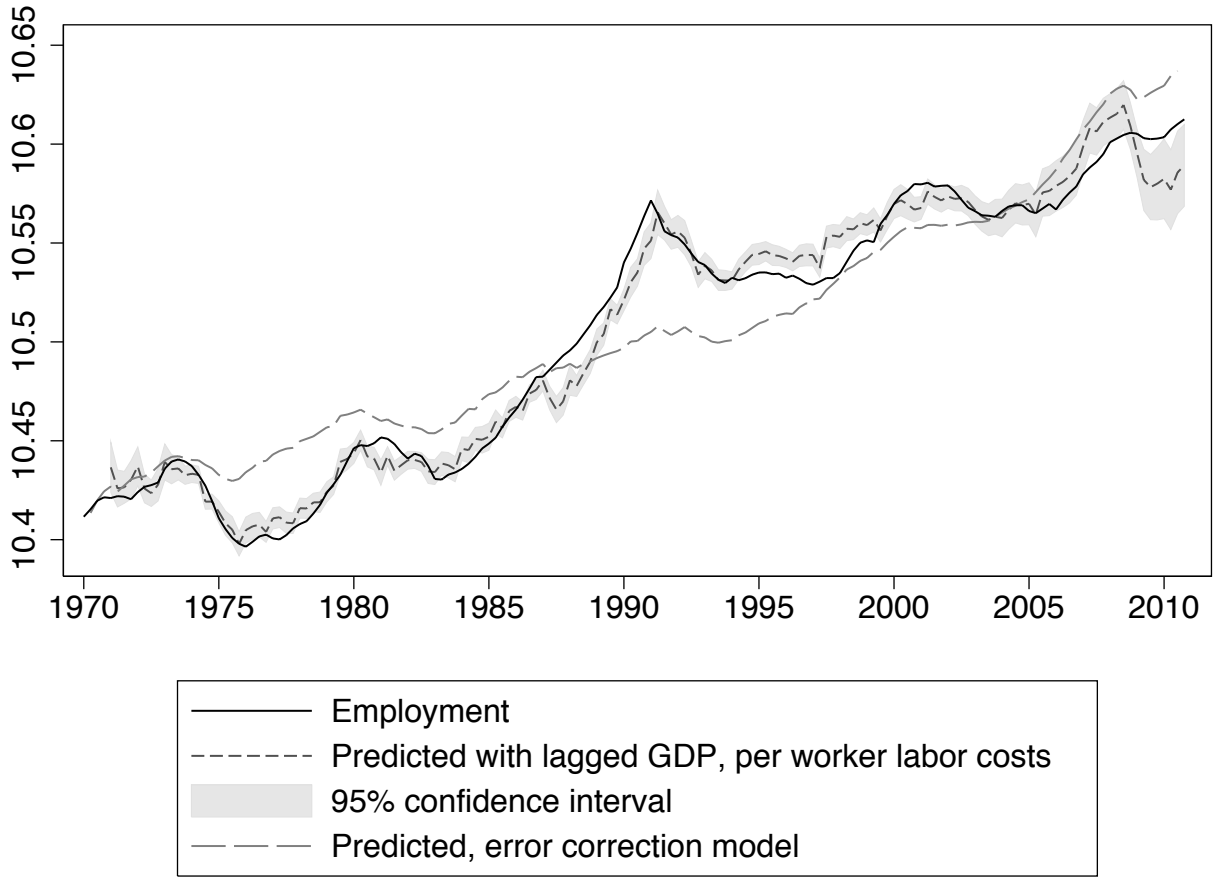
Figure 5: Actual and predicted log hours per worker



Note: Hours per worker are predicted using a one-quarter differenced regression or an error correction regression using quarterly, seasonally adjusted data from 1970-2003. Differences are cumulated either from Q1 2008 or Q1 2004. All variables are in logs. Hours per worker are per quarter.

Source: Federal Statistical Office and authors' calculations.

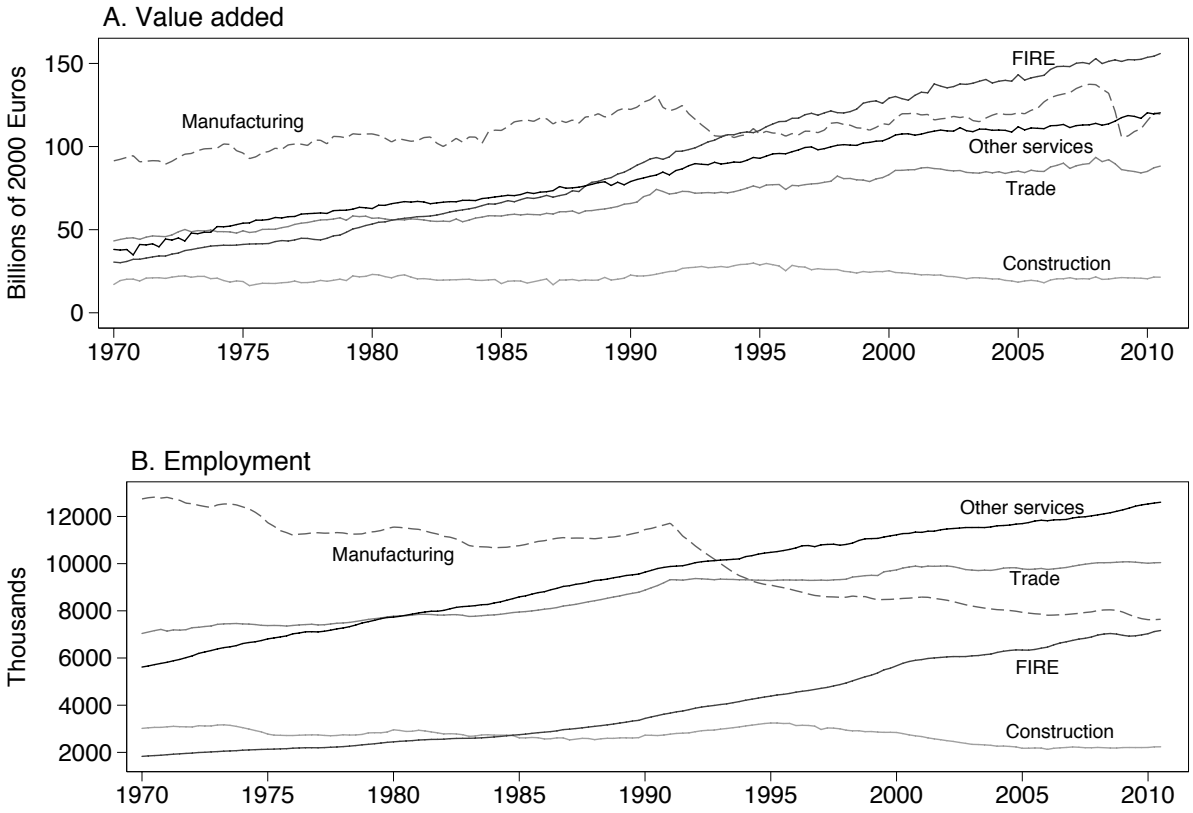
Figure 6: Actual and predicted log employment



Note: Employment is predicted using a regression in levels or an error correction regression using quarterly, seasonally adjusted data from 1970-2003. All variables are in logs. Employment is in thousands.

Source: Federal Statistical Office and authors' calculations.

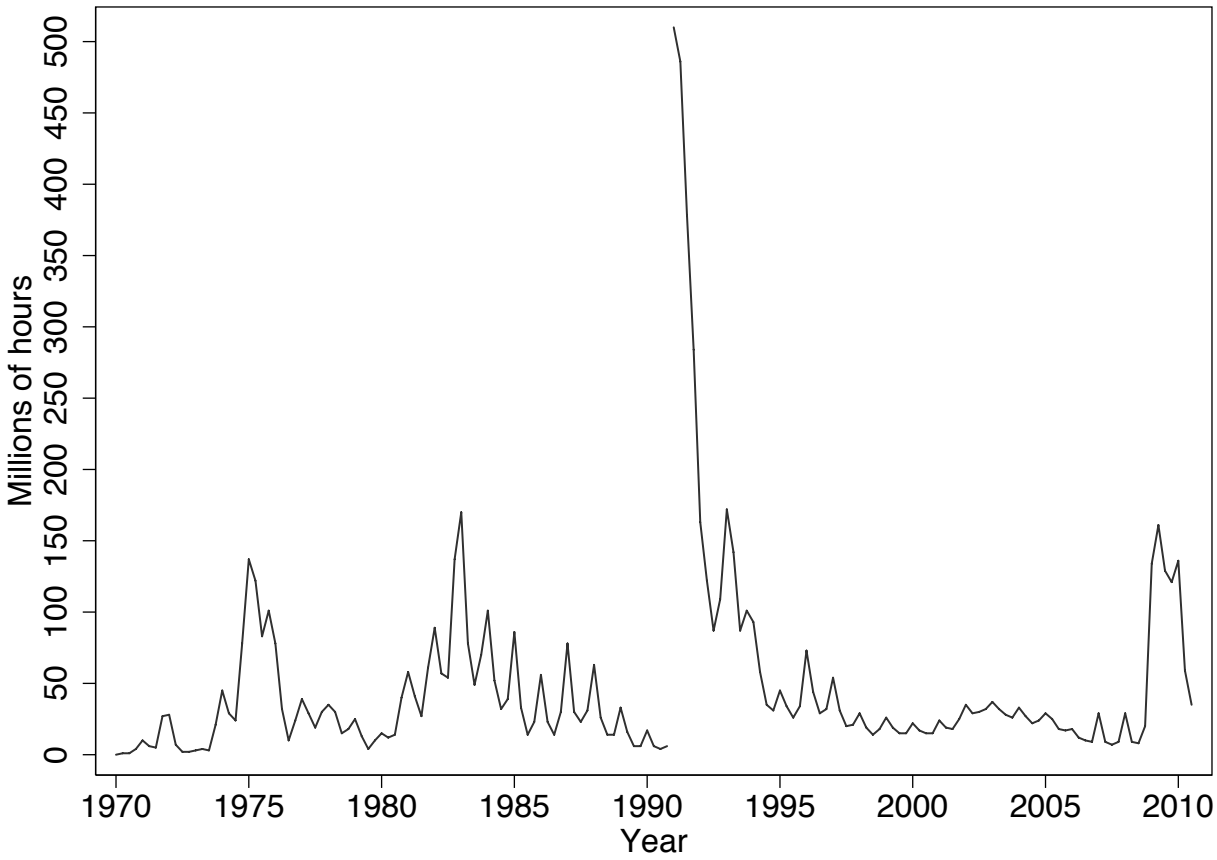
Figure 7: Value added and employment by sector, 1970-2010



Note: Quarterly, seasonally adjusted data. Manufacturing includes mining; trade includes hospitality sectors and transportation; FIRE includes finance, insurance, real estate and other firm services. Other services include health, education and other public and personal services.

Source: Federal Statistical Office.

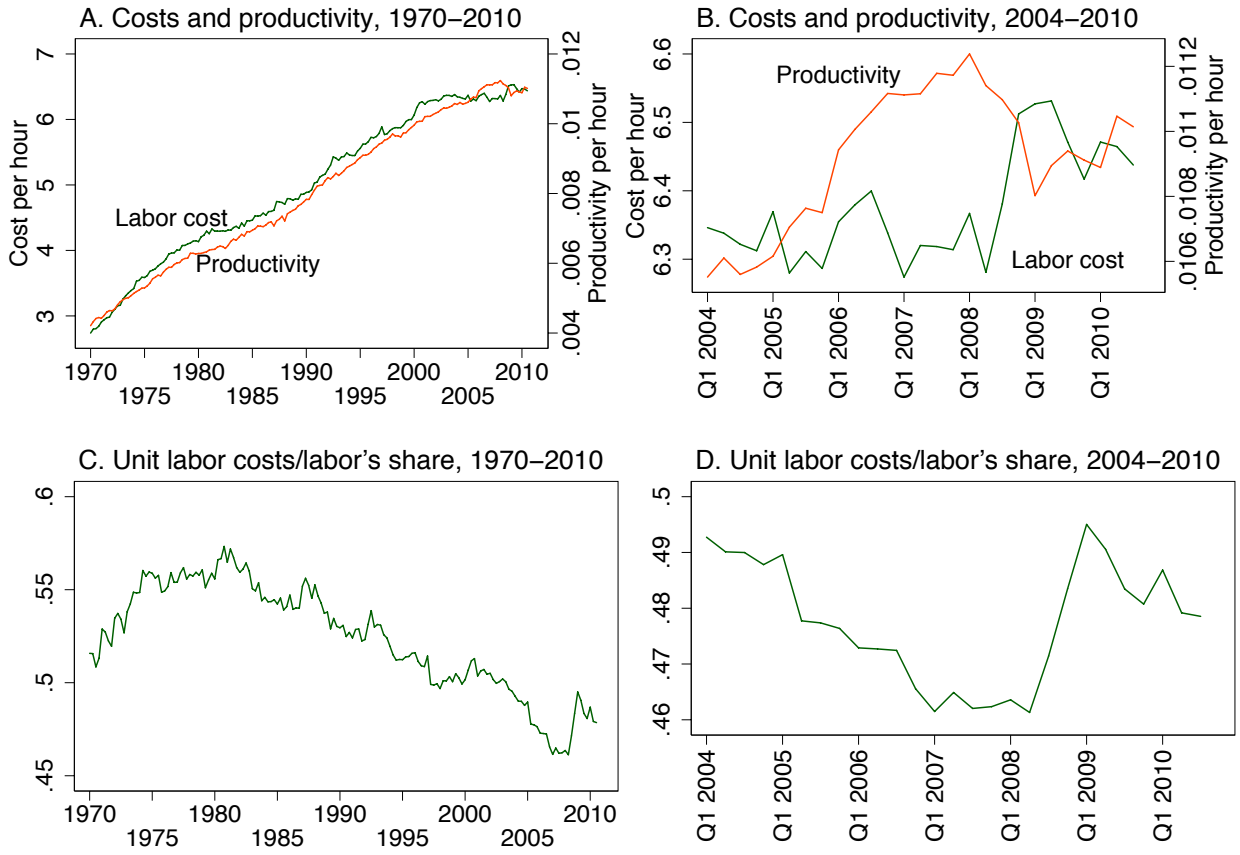
Figure 8: Hours of work lost through short-time work 1970-2010



Note: Quarterly, seasonally unadjusted data, not adjusted to avoid break at unification.

Source: Institut für Arbeitsmarkt- und Berufsforschung.

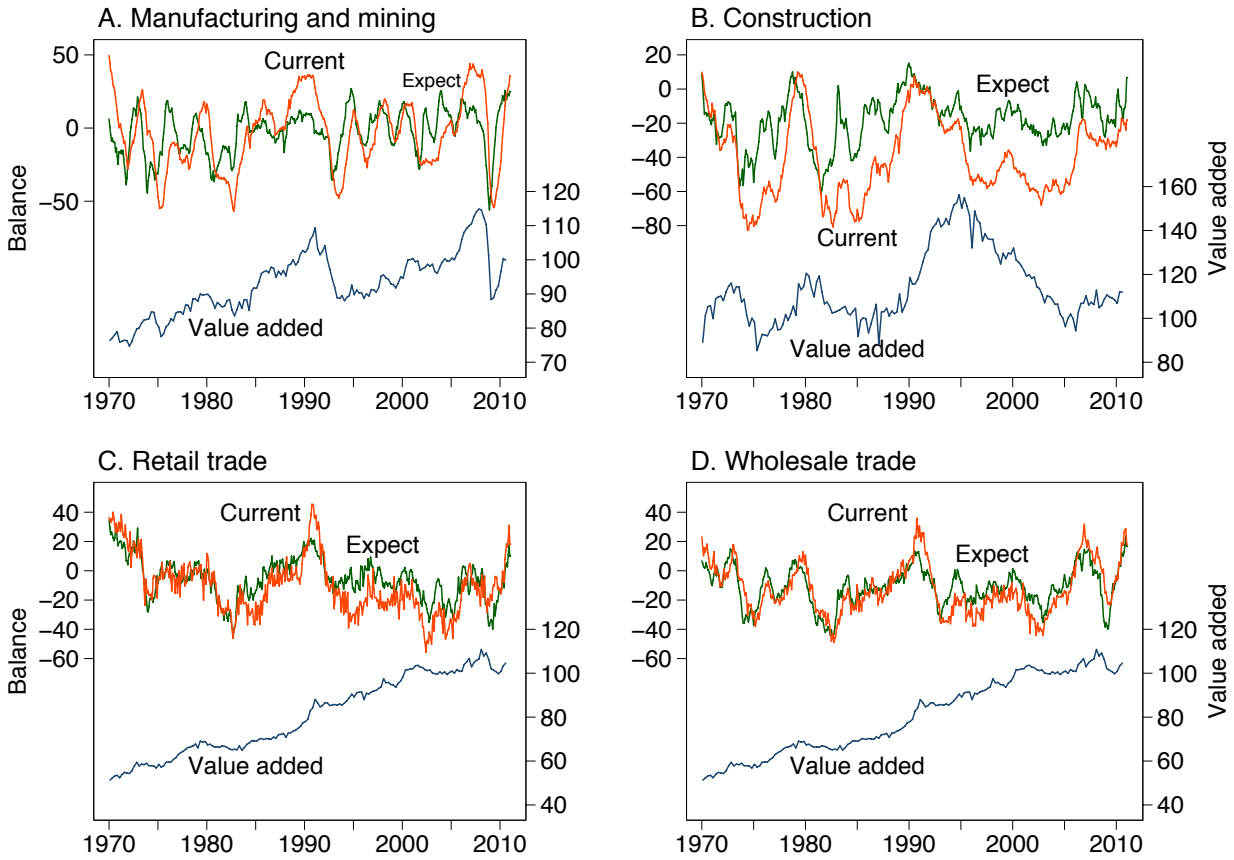
Figure 9: Labor costs and productivity per hour, labor's share



Note: Labor costs include employer and employee social security contributions, and adjusted for reimbursements related to short-time work. Labor productivity is output divided by hours worked. All values are real. Unit labor costs are computed as labor costs divided by productivity. Quarterly, seasonally adjusted data.

Source: Federal Statistical Office.

Figure 10: IFO Business expectations and Current situation



Note: Balance is the difference between the share of firms with positive and negative responses: for expectations the difference between better and worse; for current situation the difference between good and bad. Business expectations are for the coming six months. The firm responses for manufacturing exclude the food industry. Real, quarterly, seasonally adjusted value added is normalized so Q2 2005=100. The value added plotted in graphs C and D refers to both retail and wholesale trade, as well as hospitality and transportation. Expectations and current situation data are monthly, not seasonally adjusted.

Source: IFO Institute for Economic Research and Federal Statistical Office.

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