The response of German establishments to the 2008–2009 economic crisis

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1 Introduction

The German labour market has, so far, shown remarkable resilience in the face of the current economic crisis. Several recent articles (discussed more fully in Section 2 below) note that the response of the German labour market has been "astonishingly mild" (Möller 2010), even though Germany has experienced one of the strongest declines in GDP amongst the industrialised economies. A comparison with the US labour market (Elsby, Hobjin & Sahin 2010) highlights just how well Germany has fared.

Figure 1 tells the basic story. The unemployment rate in the recent recession (left-hand panel) barely increased, and is still some four percentage points *lower* than in 2005, at the end of the last downturn. The right-hand panel shows that, as GDP shrank quite dramatically in the 2008–2009 crisis, employment held up while average hours fell, implying a substantial fall in labour productivity. A number of authors (e.g. Burda & Hunt 2011, Boeri & Bruecker 2011) have raised two key questions. First, within Germany, why did this recession lead to a fall in hours as opposed to employment, but not in previous downturns? Second, why was the response in Germany so different to other countries?

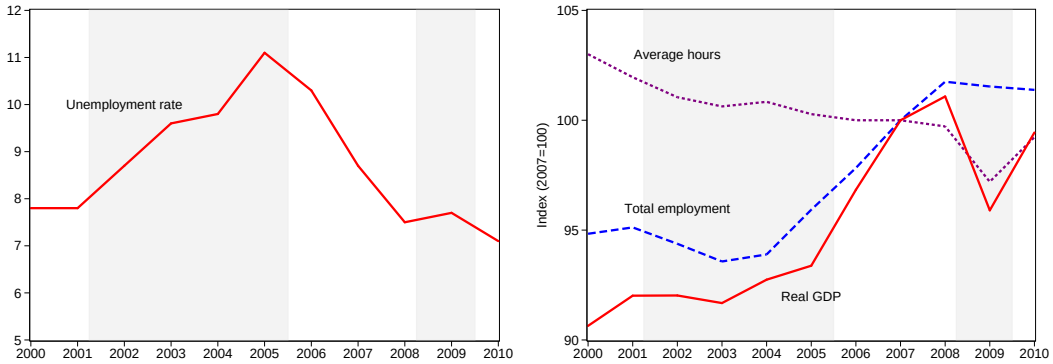

Figure 1: German unemployment rate, real GDP, total employment and average hours 2000–2010. GDP, employment and hours indexed 2007=100. Source: OECD StatExtracts. Recession dates indicated by shaded areas are those used by Burda & Hunt (2011), originally from *Sachverständigenrat* (2010) and cover Q1 2001–Q2 2005 and Q1 2008–Q2 2009.

A key point to note is that the crisis was particularly serious in the manufacturing sector in Germany, in contrast to many other OECD countries. This is illustrated in Figure 2, which shows that the fall in output and the fall in hours was of an order of

magnitude greater in the manufacturing sector than in the economy as a whole. Remarkably, the fall in employment in manufacturing was only slightly greater than in the economy as a whole, although of concern is the fact that employment in manufacturing has not rebounded in 2010.

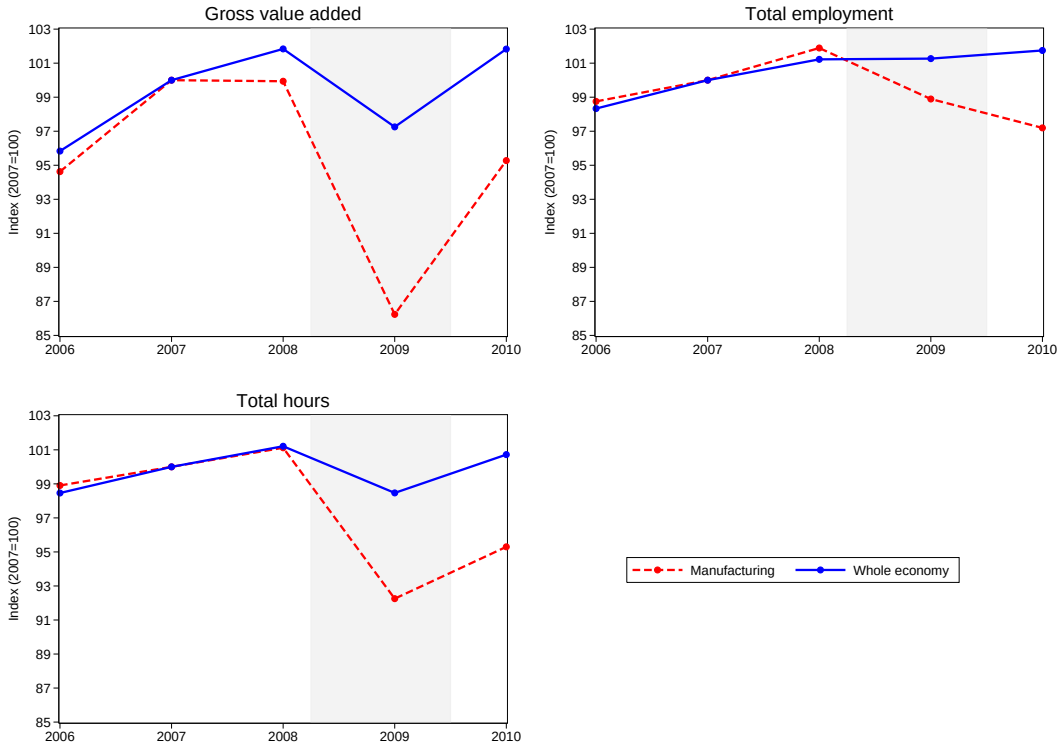

Figure 2: Differences between manufacturing and whole economy 2006–2010. Source: German Federal Employment Agency.

In this study we will examine the response of a large panel of German establishments to the crisis in terms of their employment and layoff decisions. Analysis of the intensive margin (hours of work) is more problematic because the survey we use only measures "standard" hours of work, but we will also consider within-establishment changes in labour productivity.

The objectives of the study are as follows:

1. Describe how individual establishments responded to the crisis in terms of employment, separations and layoffs. The severity of the crisis can be measured by using establishment responses in the survey both during the crisis (2008, 2009) and immediately afterwards (2010).

2. Analyse to what extent changes in employment at the establishment level are systematically related to institutional arrangements intended to promote flexibility such as *Kurzarbeit* (short-time work, STW) and *Arbeitszeitkonten* (working-time accounts, WTA).

3. Analyse the implications of the adjustment patterns described above for the early recovery period.

In Section 2 we briefly summarise other recent studies which have examined the German labour market response to the Great Recession. In Section 3 we describe the data we use, which comes from the IAB establishment panel survey. In Section 4 we show that the IAB establishment panel does capture the key elements of the crisis: namely, a much larger fall in output than in employment. In Section 5 we present descriptive evidence on how establishments reacted to the crisis in terms of employment, output, separations and layoffs. In Section 6 we compare the use of labour market policies (such as short-time work) between crisis and non-crisis plants, and in Section 6.2 we evaluate the effectiveness of these policies. In Section 7 we present some preliminary evidence on the recovery period using the latest available wave of the panel survey (2010).

2 Recent studies on the German labour market "miracle"

A number of explanations have been suggested for the resilience of the German labour market. One is simply that high firing costs and employment protection legislation prevented firms from laying off workers in the short run. Another is that STW schemes[1] and WTA made it easier for firms to adjust along the intensive rather than the extensive margin. Burda & Hunt (2011) also examine the role of wage moderation and increased labour market flexibility in Germany as potential explanations.

Möller (2010) shows that the crisis hit relatively skill-intensive exporting plants more severely, because of the collapse in demand for exports. These firms, it is suggested, chose to accept temporary falls in labour productivity rather than lay off workers

[1] See, for example, Crimmann, Wießner & Bellmann (2010) and Brenke, Rinner & Zimmerman (2011).

because for skill-intensive firms labour-hoarding is an optimal strategy. Dietz, Stops & Walwei (2010) also analyse whether labour hoarding policies contributed to the lack of layoffs.[2]

An alternative explanation is given by Burda & Hunt (2011), who suggest that German manufacturing firms did not lay-off many workers in the downturn because, in fact, they had hired "too few" workers in the preceding upturn of 2005–2008, probably because of weak expectations. They suggest that the weak employment increase in the pre-crisis period accounts for over a third of the difference in the employment response compared to earlier recessions. They conclude, in fact that "The German labor market miracle was not so miraculous after all." They also suggest that the role of short-time work was no greater than in earlier recessions (for example in the 1970s and 1980s), and therefore cannot provide a convincing explanation of the differential response in the most recent crisis.

Based on firm-level micro data for 2008–09, Bellmann & Gerner (2011*b*) investigated the development of the employment and earnings by applying difference-in-differences as well as matching techniques. By comparing the respective developments between crisis and non-crisis plants[3], they give evidence for significant employment losses in firms which were affected by the crisis, despite the "German jobs miracle".

Hijzen & Venn (2011) argue that a within-country comparison of STW is difficult because there are likely to be strong selection effects.[4] In particular, we would expect that firms which start using a STW programme are likely to do so because they face stronger negative demand shocks than those who do not. Thus a comparison of (for example) employment between firms is likely to underestimate the effectiveness of the programme. Note that this problem is unlikely to be solved by a difference-in-difference methodology, because differences between STW and non-STW firms are likely to be time-varying. Instead, Hijzen & Venn use a cross-country difference in difference methodology, and show that (subject to some important caveats) countries which used STW programmes more extensively had significantly smaller losses in employment.

Boeri & Bruecker (2011) analyse the effectiveness of STW and WTA using both a macro (cross-country) and a micro approach. Boeri & Bruecker also note the selec-

[2] See also Hübler (2010) for a comment on this paper.

[3] The identification of crisis plants is based on firms' business expectations.

[4] Eichhorst, Feil & Marx (2010) is another cross-country comparison.

tion problem, and deal with this by instrumenting the use of STW and working-time accounts in 2009 with establishments' *previous* use of such policies in earlier periods. This instrument is plausibly exogenous if the 2009 shock was independent of earlier shocks. In other words, an establishment which use STW in, say, 2003, is more likely to use STW in 2009, but the earlier use of STW is not correlated with the size of the demand shock in 2009. They find that the use of STW has an economically sizable positive impact on employment growth rates between 2008 and 2009, and that this effect is much larger when the use of STW is instrumented, as one would expect given the direction of the selection effect.

3 The data

Our main source of data is the *Institut für Arbeitsmarkt- und Berufsforschung (IAB) Establishment Panel*. This is an annual survey of between approximately 4,000 and 10,000 establishments located in West Germany (since 1993) and between 4,000 and 6,000 located in East Germany (since 1996). The sampling frame comprises all establishments in Germany with at least one worker subject to social security as of 30 June in the year before the survey. The survey currently covers approximately 1% of all plants in Germany and approximately 7% of workers because it is weighted towards larger plants.[5] Information is obtained by personal interviews with plant managers, and comprises about 80 questions per year, giving us information on, for example, total employment, bargaining arrangements, total sales, exports, investment, wage bill, location, and industry. In certain years specific questions are also asked about various institutional features (such as use of short-time work) and establishments' experience of the crisis.

The IAB panel also provides a measure of the total number of workers who were recruited and who left the establishment in the first half of each calendar year. In some years, information is also available on the type of workers recruited in terms of their skill level and whether they are hired on fixed-term contracts. An important advantage

[5]Weights to ensure that the sample is representative are calculated by comparing the sample of establishments with the population of establishments in the same Federal state, size and industry cell. The population of plants is obtained from a Federal Agency for Employment establishment database. A more detailed description of the data and the weighting procedure is described in Fischer, Janik, Müller & Schmucker (2009).

of the information on separations in this data is that respondents are also asked for the *cause* of the separation.[6]

We use the longest run of data available to us, from 1993 to 2010. In total, 51,603 establishments (218,570 establishment-years) appear in the survey between 1993 and 2010. We restrict the sample to those establishments in the private sector, which leaves 41,032 establishments (165,999 establishment-years).[7] We also drop establishments with missing information on employment, hires and separations, which leaves a final usable sample of 40,761 establishments (164,046 establishment-years).[8]

The relatively long run of data presents various sample selection issues. Very few establishments are followed for the entire sample period, either because of genuine establishment entry and exit, or because of sample entry and exit. In particular, the number of establishments surveyed increases substantially over time, partly as a result of the introduction of establishments in East Germany in 1996. The average size of establishment also changes over the sample period. It is therefore important to use sample weights, and to focus on within-establishment changes which control for any changes in sample composition.

Table 1 reports the number of establishments in our base sample and illustrates how the average size of establishments has declined dramatically over the sample period. The use of cross-section weights removes this fall in employment. Table 2 reports the number of establishments in a balanced panel defined over the period 2000–2010. Although the use of a balanced panel greatly reduces the sample size, it is essential to be able to compare the same set of establishments before and after the crisis. The survey also includes a set of longitudinal weights which are intended to make the sample representative of the population of surviving establishments over this period.

[6]This includes "Dismissal on the part of the employer", "Leaving after termination of the in-company training" and "Expiration of a temporary employment contract", all of which might be regarded as dismissals by the employer.

[7]Establishments are excluded if any of the following are true: (1) their industry is coded as "public services"; (2) profit status is coded as "non-profit"; (3) legal status is coded as "Public corporation"; (4) ownership status is coded as "Public".

[8]The sample selection procedure used is identical to that used in Bellmann, Gerner & Upward (2011).

	Number of establishments	West Germany	East Germany	Employment (unweighted)	Employment (weighted by cross-section weights)	Employment (weighted by cross-section weights and employment)
1993	2,913	2,844	69	532	15	513
1994	3,006	2,930	76	457	15	487
1995	3,061	2,988	73	418	15	506
1996	5,793	2,941	2,852	257	14	520
1997	6,279	2,899	3,380	214	14	566
1998	6,580	2,946	3,634	199	14	487
1999	6,985	2,956	4,029	175	13	423
2000	10,405	6,096	4,309	138	13	506
2001	11,594	7,057	4,537	133	13	462
2002	11,404	7,201	4,203	128	13	373
2003	11,975	7,349	4,626	114	13	464
2004	11,842	7,324	4,518	126	13	463
2005	12,004	7,381	4,623	127	13	454
2006	11,736	7,172	4,564	120	13	526
2007	12,087	7,453	4,634	109	14	506
2008	11,987	7,251	4,736	106	14	410
2009	12,099	7,394	4,705	101	14	499
2010	12,296	7,513	4,783	93	14	553

Table 1: IAB establishment panel: selected sample. The small number of establishments in East Germany before 1996 are establishments located in West Berlin.

	Number of establishments	West Germany	East Germany	Employment (unweighted)	Employment (weighted by longitudinal weights)	Employment (weighted by longitudinal weights and employment)
2000	2,002	900	1,102	108	19	365
2001	2,002	900	1,102	109	19	368
2002	2,002	900	1,102	107	19	362
2003	2,002	900	1,102	105	18	362
2004	2,002	900	1,102	103	18	355
2005	2,002	900	1,102	102	18	349
2006	2,002	900	1,102	102	18	343
2007	2,002	900	1,102	103	19	342
2008	2,002	901	1,101	104	19	347
2009	2,002	901	1,101	102	18	335
2010	2,002	901	1,101	101	18	329

Table 2: IAB establishment panel: balanced panel 2000–2010

4 The 2008-2009 crisis in Germany as measured by the establishment panel

In Figure 3 we plot employment and sales growth rates for the last ten years, estimated from the IAB establishment panel. Both the full sample and the balanced panel tell a similar story, although the fall in sales in the balanced panel in the most recent crisis is more severe. Nevertheless, it does appear that our sample captures the key feature of the downturn, namely a disproportionately small fall in employment relative to the fall in output.

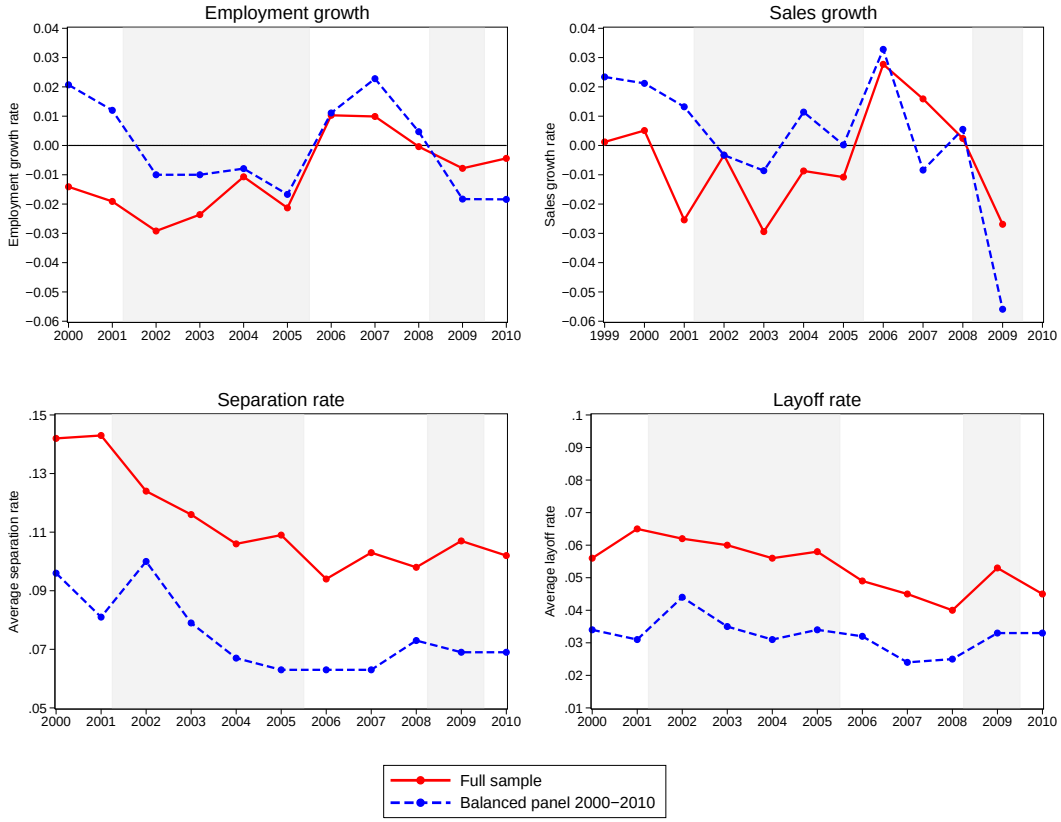

Figure 3: Employment and sales growth rates as measured by the IAB establishment panel. Employment and sales growth are defined as $(x_{it} - x_{it-1})/0.5(x_{it} + x_{it-1})$. The full sample is weighted by cross-section weights; the balanced panel is weighted by longitudinal weights. Sales are reported for the previous calendar year and hence the series runs up to 2009. Employment refers to employment on 30 June in the current calendar year. Separations and layoffs refer to the first six months of the current calendar year.

The small fall in employment is reflected in the very weak relationship with separations and layoffs. As is well known, total separations may not be counter-cyclical because voluntary separations fall as the labour market weakens. The data show only a very small increase in layoffs between 2008 and 2009.

5 Establishments' response to the crisis

5.1 Establishment-level measure of the crisis

There are two questions which can be used to determine whether an establishment is affected by the crisis:

1. Backward looking: "Have you been affected negatively by the crisis in the last two years?" (asked in 2010)
2. Forward looking: "Business volume is expected to decrease in the current year compared to the previous year" (asked in each year)

For the forward looking measure, we additionally classify plants in the following way:

1. All plants which expect business volume to decrease in the current year
2. All plants which expect business volume to decrease in the current year, but which did not expect business volume to decrease 12 months earlier (unanticipated)[9]
3. All plants which expect business volume to decrease in the current year and 12 months earlier, but which did not expect business volume to decrease 24 months earlier (anticipated)

Table 3 shows the fraction of the sample which report being affected by the crisis as well as the three business expectation measures of the crisis. In Figure 4 we plot the time-series variation in business expectations over the sample period. The forward-looking business expectations track the timing of recessions quite well. This may be, in part, because business expectations reflect the fact that recessions are public knowledge.

	Backward looking	Forward looking (all)	Forward looking (unanticipated)	Forward looking (anticipated)
2000	.	0.204	0.130	0.044
2001	.	0.243	0.170	0.044
2002	.	0.317	0.202	0.078
2003	.	0.316	0.161	0.084
2004	.	0.290	0.160	0.053
2005	.	0.265	0.143	0.068
2006	.	0.171	0.095	0.035
2007	.	0.137	0.098	0.021
2008	.	0.169	0.123	0.025
2009	.	0.274	0.209	0.050
2010	0.379	0.139	0.085	0.033

Table 3: Backward-looking crisis measure and business expectations 1993–2010, unbalanced panel, weighted by cross-section weights.

The simplest crisis measure to concentrate will be the backward-looking measure because it is available for all establishments which are interviewed in 2010, and because it is more likely to reflect actual outcomes rather than business expectations. In fact, there is a rather high correlation between the backward-looking measure and the three forward-looking measures. Almost 70% of establishments which reported facing an *expected* fall in demand in 2009 also reported having been affected by the crisis in 2010. This is more than twice the proportion of establishments who did not report facing an expected fall in demand.

5.2 Which establishments were affected by the crisis?

In this section we use the backward-looking crisis measure reported in 2010 and the unanticipated crisis indicator. We examine whether establishments which were affected by the crisis differ significantly from those which were not. Table 4 reports the differences between crisis and non-crisis plants according to the backward-looking indicator; Table 5 reports the differences according to the forward-looking indicator.

For both measures, crisis plants are significantly more likely to be in the manufacturing sector and significantly less likely to be in the service sector. They are significantly larger (in terms of employment and sales) and export a greater share of their output than

[9] This is the measure used by Bellmann & Gerner (2011*b*).

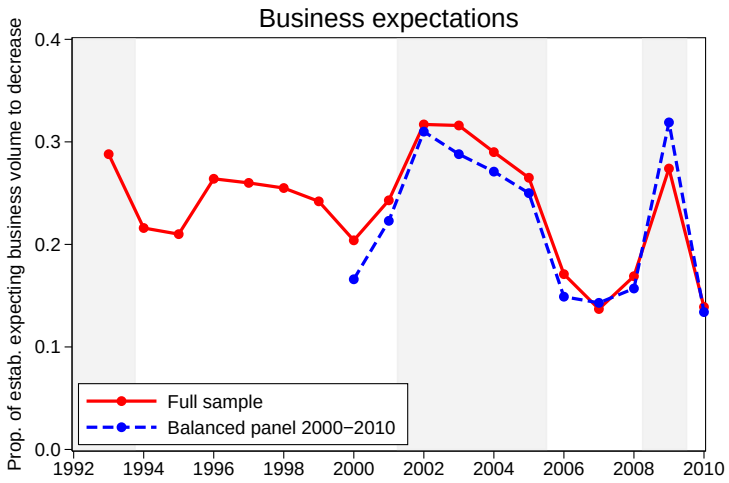

Figure 4: Trends in business expectations over the sample period. Graph plots the proportion of establishments reporting that "business volume is expected to decrease in the current year compared to the previous year". The full sample is weighted by cross-section weights; the balanced panel is weighted by longitudinal weights.

non-crisis establishments. Crisis establishments are also more "high-tech" than non-crisis establishments, with greater R&D activity and a higher technological standard.[10]

[10]This is based on the answer to the question "How do you assess to overall technical state of the plant and machinery, furniture and office equipment of this establishment compared to other establishments in the same industry?"

	Crisis	*Non-crisis*	*Difference*	p-*value*
Primary industries	0.0526	0.0345	0.0181	0.0557
Manufacturing	0.2300	0.1226	0.1074	0.0000
Construction	0.0959	0.1537	−0.0578	0.0003
Wholesale and retail trade	0.2324	0.2349	−0.0025	0.9019
Transport and communication	0.0775	0.0445	0.0330	0.0028
Financial and business services	0.1639	0.1791	−0.0152	0.3963
Other services	0.1477	0.2307	−0.0830	0.0000
East Germany	0.1896	0.1956	−0.0061	0.7454
Number of employees in 2007	26.3206	13.6022	12.7183	0.0005
Sales in 2007 (€M)	5.7	2.3	3.4	0.0133
Sales per worker in 2007 (€M)	0.13	0.12	0.013	0.1717
Standard hours in 2007	39.4769	39.3512	0.1257	0.1887
Net profit in 2007	0.7675	0.7497	0.0179	0.3873
Net loss in 2007	0.1658	0.1858	−0.0199	0.8615
% of sales overseas in 2007	4.6417	1.7081	2.9337	0.0000
High R& D activity	0.0692	0.0229	0.0463	0.0000
High technology standard	2.3428	2.2201	0.1227	0.0005
Share of workers with no degree	0.3596	0.3816	−0.0220	0.0448
Share of workers with university degree	0.0563	0.0394	0.0169	0.0102
Share of workers with advanced training	0.5841	0.5791	0.0050	0.6556
Independent firm	0.8322	0.9154	−0.0832	0.0000
Dependent affiliate	0.0564	0.0314	0.0250	0.0079
Firm headquarters	0.1114	0.0533	0.0581	0.0000

Table 4: Differences between crisis and non-crisis establishments. Crisis establishments are identified by the backward-looking self-reported crisis indicator: "Have you been affected negatively by the crisis in the last two years?", asked in 2010. Characteristics refer to those recorded in 2007. Sample used is a balanced panel of 2,002 establishments observed in every year from 2000–2010. Weighted by longitudinal weights.

	Crisis	*Non-crisis*	*Difference*	p-*value*
Primary industries	0.0545	0.0370	0.0175	0.0999
Manufacturing	0.2284	0.1405	0.0879	0.0000
Construction	0.1294	0.1309	−0.0015	0.9333
Wholesale and retail trade	0.1724	0.2561	−0.0837	0.0002
Transport and communication	0.0965	0.0441	0.0524	0.0000
Financial and business services	0.1516	0.1812	−0.0296	0.1416
Other services	0.1672	0.2101	−0.0429	0.0434
East Germany	0.1534	0.2077	−0.0543	0.0097
Number of employees in 2007	26.5680	15.5238	11.0442	0.0053
Sales in 2007 (€M)	5.7	2.9	2.8	0.0664
Sales per worker in 2007 (€M)	0.14	0.12	0.026	0.0095
Standard hours in 2007	39.5986	39.3323	0.2663	0.0130
Net profit in 2007	0.7699	0.7510	0.0189	0.4149
Net loss in 2007	0.0765	0.0619	0.0146	0.2728
% of sales overseas in 2007	4.8542	2.1333	2.7209	0.0000
High R& D activity	0.0699	0.0310	0.0389	0.0002
High technology standard	2.3172	2.2511	0.0660	0.0942
Share of workers with no degree	0.3624	0.3772	−0.0148	0.2278
Share of workers with university degree	0.0349	0.0497	−0.0148	0.0446
Share of workers with advanced training	0.6027	0.5731	0.0296	0.0184
Independent firm	0.9055	0.8753	0.0301	0.0788
Dependent affiliate	0.0336	0.0436	−0.0100	0.3454
Firm headquarters	0.0610	0.0811	−0.0201	0.1541

Table 5: Differences between crisis and non-crisis establishments. Crisis establishments are identified by the forward-looking self-reported crisis indicator: "Business volume is expected to decrease in the current year compared to the previous year", asked in 2009. Characteristics refer to those recorded in 2007. Sample used is a balanced panel of 2,002 establishments observed in every year from 2000–2010. Weighted by longitudinal weights.

5.3 How did crisis establishments react compared to non-crisis establishments?

In Figure 5 we plot the evolution of employment growth and sales growth for establishments separated according to their response to the backward-looking crisis question. Several points are worth noting here. First of all, the two series are very similar up until 2009. This suggests that crisis establishments were not so different in terms of performance before the 2009 crisis. In particular, there was no difference in the previous downturn of 2001–2005. This result is perhaps surprising in the light of the fact that crisis establishments had quite different characteristics in terms of sector, size and skill intensity (see Table 4). Second, the collapse in sales is very clear in the right-hand panel, with a much smaller fall in employment, implying a large fall in labour productivity.

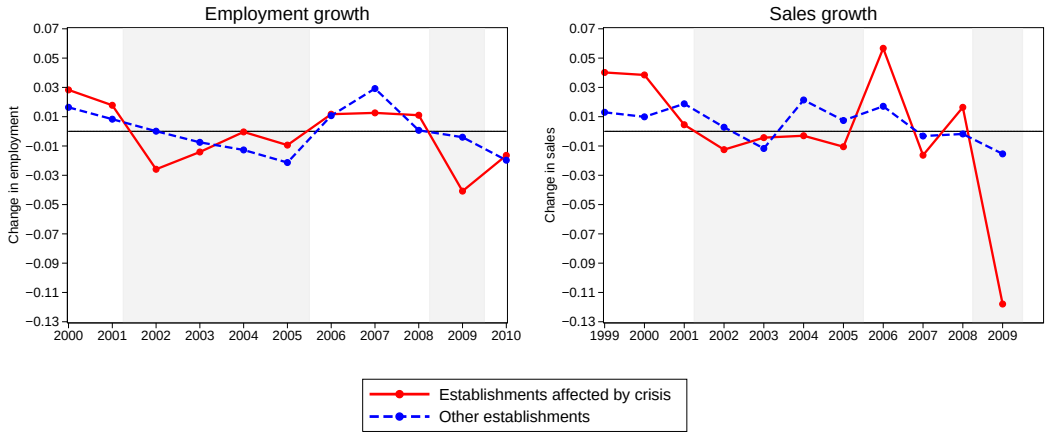

Figure 5: Employment and sales growth separately by establishments which reported being affected by the 2008–2009 crisis and those which did not. Employment and sales growth are defined as $(x_{it} - x_{it-1})/0.5(x_{it} + x_{it-1})$. Sample used is a balanced panel of plants from 2000–2010, weighted by longitudinal weights. Sales are reported for the previous calendar year and hence the series run from 1999–2009. Employment refers to employment on 30 June in the current calendar year.

5.4 Were crisis establishments affected by earlier downturns?

The argument has been made that the current crisis was "different" to earlier downturns. We have already seen that up until 2009, crisis and non-crisis plants were experiencing quite similar patterns of employment and output growth, even though crisis plants were located in different industries. Another way of seeing whether this crisis is different is to compare establishments' previous experience of downturns. If the 2009 crisis affected "good" establishments, we would expect that they were no more (or even less) likely to be affected by earlier downturns. We can do this by examining responses to the business expectations question during the period 2001–2005, shown in Table 6.

	Crisis	*Non-crisis*	*Difference*	p*-value*
Probability of reporting low business expectations for:				
2001 relative to 2000	0.1467	0.1778	−0.0311	0.0789
2002 relative to 2001	0.2701	0.1758	0.0944	0.0000
2003 relative to 2002	0.1693	0.1449	0.0243	0.1576
2004 relative to 2003	0.1525	0.1801	−0.0275	0.1224
2005 relative to 2004	0.1472	0.1368	0.0104	0.5280

Table 6: Differences between crisis and non-crisis establishments in earlier downturns. Crisis establishments are identified by the backward-looking self-reported crisis indicator: "Have you been affected negatively by the crisis in the last two years?", asked in 2010. Balanced panel 2000–2010, weighted by longitudinal weights

Table 6 generally supports the hypothesis that establishments which were hit by the 2009 crisis were not any more seriously affected by the earlier downturn. For example, 2009 crisis establishments were slightly less likely to report low business expectations for 2001 than non-crisis establishments. In four out of five cases the difference is insignificantly different from zero.

6 The use and effectiveness of policy measures in response to the crisis

6.1 Use of policy measures

The second aim of the project is to evaluate whether the response of establishments to the crisis differed systemtically according to their use of various policy measures. An important issue here is that the use of these policy measures is not randomly assigned across establishments, and so one cannot use comparisons of establishments with and without a particular policy to infer the causual effect.[11] We will focus on the following institutional arrangements:

1. Short-time work (*Kurzarbeit*). The short-time working scheme has existed in Germany since early in the 20th Century (see Brenke *et al.* (2011) for a brief history.) Burda & Hunt (2011, Figure 9) shows that the scheme was used extensively in the recession of the early 1970s and 1980s, as well as shortly after reunification. Under this measure, employers may reduce working time of their employees if they face a documented shortfall of demand. Employees' income is reduced proportionally to the cut in hours worked, but employees are compensated by the German Federal Employment Agency for between 60%–67% of the difference between their net income before and after the working time reduction. Originally, employers were also required to pay the full social security contribution based on employees' income before the cut in working time. However, during the 2008–09 crisis the government paid up to half the social security contributions. In addition, if employers combined short-time work with further training, the Federal Employment agency also paid the full social security contributions for the difference in the wages before and after the working time reduction. The maximum period of eligibility was extended from 12 to 18 months in Autumn 2008 and to 24 months in July 2009 (Boeri & Bruecker 2011). Take-up of short-time work in Germany rose from less than 0.1% of employment in 2007 to over 4% in the second quarter of 2009 (Hijzen & Venn 2011, Figure 8).

   In 2009 and 2010 the IAB establishment survey asks "Did you use Kurzarbeit in the first half of this year? If yes, how many employees have been in your short-

[11] See Hijzen & Venn (2011, p.22) for a discussion of this issue.

time work program?". In addition, establishments are also asked "Have there been some further training measures combined with the Kurzarbeit programme?". Information on the use of Kurzarbeit is also available in 1993–1996, 2003 and 2006.

2. Working time accounts (*Arbeitszeitkonten*) are firm-level agreements which allow actual working hours to vary from agreed working hours within defined limits. Working-time accounts also specify the period over which compensation of working time must occur; this is most commonly one year (Seifert 2005), but may be longer or shorter. Total pay does not vary with actual hours worked, so in effect hourly wage rates vary inversely with actual hours worked. This means that establishments can save on labour costs when there is a short-term increase in demand, while for workers, working time accounts act as an insurance against lower income during a short-term economic downturn. The use of working time accounts in Germany is widespread, although it is not clear to what extent these are short-term "flexitime" arrangements or longer-term accounts which would allow firms to adjust to demand shocks. Recent estimates (Morley, Sanoussi, Biletta & Wolf 2009) suggest that 50% of establishments in Germany operate working time accounts, while a survey of German works councils (Bogedan, Brehmer & Herzog-Stein 2009) found that changes in working time accounts were the most common cost-saving method, short of redundancies, used by German establishments in the second half of 2009.

   In 2008, 2009 and 2010 the IAB establishment survey asks "Do you have working time accounts?"[12] Establishments which do have working time accounts are also asked what proportion of employees are covered, and the time period over which the surplus and deficit have to be balanced. Information on WTA is also avaialable in 1999, 2002, 2004 and 2006.

3. Company-level pacts on employment and competitiveness have become increasingly widely used by establishments in the 21st Century (Ellguth & Kohaut 2008, Bellmann & Gerner 2011*a*, Bellmann & Gerner forthcoming). If establishments have so-called "opening clauses" in their bargaining arrangements with unions, they may introduce these pacts to reduce labour costs, and they may also promote greater flexibility in employment. The IAB survey tells us whether establishments

[12] Possible responses: "Yes", "No", "We are planning to introduce working time accounts."

had such a pact in 2008 and 2009.

The IAB survey also asks establishments a more general question (in 2010 only) about their use of measures over the previous two years, and whether these measures were used in the light of the economic crisis:

1. Reduced overtime or surpluses on working time accounts
2. Increased use of holidays
3. Short-time work
4. Other reductions in working time
5. Reductions in temporary employment
6. Increased use of further training
7. Reduced hiring or delayed employment increases
8. Layoffs

In Figure 6 we plot the proportion of establishments using STW and WTA, which also shows which years the information is available. Both the balanced panel and the full sample tell a similar story. The proportionate increase in STW is much greater during the current crisis, but there is still a sizable increase in the use of WTA.

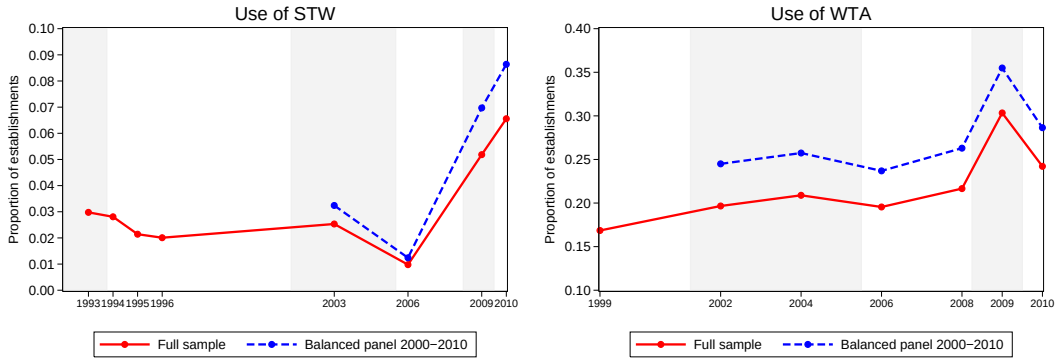

Figure 6: Proportion of establishments using STW and WTA. The full sample is weighted by cross-section weights; the balanced panel is weighted by longitudinal weights.

Table 7 summarises the use of these various policy measures in 2009, separately for crisis and non-crisis establishments. Unsurprisingly, crisis plants were nearly five

times more likely to have used STW in 2009, although for those that did use STW, the difference in the proportion of workers covered was smaller. There is also a significant difference in the use of WTA, but this difference is much smaller, which presumably reflects the fact that WTAs were introduced as a result of negotiations with labour unions, rather than explicitly as a crisis measure.

The proportion of establishments using company-level pacts for employment and competitiveness is also significantly higher amongst crisis plants, but the overall proportion using them is small. Note that PECs were predominantly used by larger establishments, and these results are weighted to reflect the population of establishments, which comprises many more small establishments.

	Crisis	*Non-crisis*	*Difference*	*p-value*
Establishment uses short-time work	0.1356	0.0278	0.1078	0.0000
Proportion of employees covered	0.5557	0.5075	0.0482	0.0976
Establishment uses WTA	0.3910	0.3321	0.0589	0.0095
Proportion of employees covered	0.8935	0.8821	0.0114	0.4062
Establishment uses PECs	0.0332	0.0109	0.0224	0.0007
Responses to 2010 question:				
Reduced hiring or delayed employment increases	0.2671	0.0555	0.2560	0.0000
Reduced overtime or surpluses on working time accounts	0.2228	0.0707	0.2075	0.0000
Short time work	0.1723	0.0267	0.2171	0.0000
Layoffs	0.1584	0.0390	0.0948	0.0000
Increased use of holidays	0.1579	0.0471	0.1769	0.0000
Other reductions in working time	0.1098	0.0243	0.0990	0.0000
Reductions in temporary employment	0.0906	0.0195	0.0975	0.0000
Increased use of further training	0.0645	0.0270	0.0482	0.0000
Layoff trainees at end of training programme	0.0356	0.0079	0.0347	0.0000

Table 7: Differences between crisis and non-crisis establishments in the use of policy measures. Crisis establishments are identified by the backward-looking self-reported crisis indicator: "Have you been affected negatively by the crisis in the last two years?", asked in 2010. Balanced panel 2000–2010, weighted by longitudinal weights.

The bottom panel of table 7 shows the proportion of crisis and non-crisis plants which reported having used various measures in response to the crisis. These are ordered by the frequency of use amongst crisis establishments. It is striking that the most common response for crisis plants was to reduce hiring; nearly 70% more plants reported reduced hiring rather than increasing layoffs. The next most common response

was to reduce surpluses on working-time accounts, following by the use of short-time work. These responses confirm that only a small fraction of plants resorted to layoffs in response to the crisis.

A more systematic examination of the determinants of the use of STW and WTA is presented in Table 8.[13] In this table we report estimates of a linear probability model which includes as explanatory variables measures of establishment and firm performance and other characteristics in 2009. This confirms that various measures of firm performance up to 2009 are important determinants of whether or not an establishment uses STW in 2009. For example, expected growth rate of turnover between 2008–2009, actual turnover between 2007–08, risk of closure and profitability are all significantly associated with using STW, even after controlling for industrial sector, establishment size. In each case, *worse* performance on these measures is associated with a greater probability of using STW, reinforcing that negative selection into STW is an important factor.

These same factors are generally less systematically related to the use of WTA, which confirms that WTA is not used as an emergency crisis measure, but relates to longer-term negotiations between establishments and unions. Note, for example, that the use of WTA is positively associated with firm- and industry-level bargaining measures, the existence of a works council and establishment size in 2008.

We also note that various measures of the "flexibility" of the existing workforce are negatively related to the use of STW. For example, establishments with a higher proportion of workers on fixed-term contracts and agency workers are less likely to adopt STW, which suggests that STW is a substitute for the flexibility which comes from having a short-term workforce.

[13] This is a similar model to that estimated by Boeri & Bruecker (2011).

	Probability of using STW			*Probability of using WTA*		
	Coeff.	*S.E.*	*p-value*	*Coeff.*	*S.E.*	*p-value*
Proportion of output exported	0.0008	(0.0003)	[0.001]	−0.0006	(0.0004)	[0.093]
Expected growth rate of turnover 2008-09	−0.0045	(0.0002)	[0.000]	−0.0002	(0.0003)	[0.596]
Actual turnover declined between 2007-08 (1=yes)	0.0442	(0.0085)	[0.000]	0.0087	(0.0120)	[0.467]
Self-reported risk of firm closure (1=yes)	0.0235	(0.0121)	[0.053]	−0.0063	(0.0171)	[0.710]
High competitive pressure 2009 (1=yes)	0.0137	(0.0102)	[0.179]	0.0025	(0.0144)	[0.862]
High competitive pressure 2008 (1=yes)	−0.0115	(0.0090)	[0.200]	0.0398	(0.0127)	[0.002]
Self-reported profitability 2008						
(base=very good)						
Good	0.0160	(0.0148)	[0.280]	−0.0372	(0.0209)	[0.076]
Satisfactory	0.0267	(0.0154)	[0.083]	−0.0379	(0.0217)	[0.081]
Sufficient	0.0606	(0.0175)	[0.001]	−0.0555	(0.0247)	[0.025]
Unsatisfactory	0.1060	(0.0208)	[0.000]	−0.0806	(0.0293)	[0.006]
Labour shortages reported in 2008 (1=yes)	−0.0150	(0.0088)	[0.089]	0.0186	(0.0124)	[0.135]
High share of R&D activities (1=yes)	0.0624	(0.0133)	[0.000]	0.0689	(0.0188)	[0.000]
Technical state of establishment						
(base=state of the art)						
2	0.0089	(0.0112)	[0.425]	−0.0116	(0.0158)	[0.463]
3	0.0193	(0.0125)	[0.124]	−0.0296	(0.0177)	[0.093]
4	0.0422	(0.0237)	[0.075]	0.0049	(0.0335)	[0.884]
obsolete	0.0070	(0.0788)	[0.929]	−0.2312	(0.1109)	[0.037]
Proportion of qualified workers	−0.0369	(0.0174)	[0.034]	0.0868	(0.0245)	[0.000]
Proportion of women	−0.0283	(0.0178)	[0.112]	−0.0977	(0.0252)	[0.000]
Proportion of part-time workers	−0.0821	(0.0217)	[0.000]	−0.0810	(0.0306)	[0.008]
Proportion of fixed-term workers	−0.1250	(0.0432)	[0.004]	0.0750	(0.0608)	[0.218]
Proportion of agency workers	−0.2213	(0.0539)	[0.000]	0.0821	(0.0759)	[0.280]
Proportion of owners working in plant	−0.1073	(0.0383)	[0.005]	−0.2173	(0.0541)	[0.000]
Independent plant	0.0101	(0.0173)	[0.562]	0.0124	(0.0245)	[0.611]
Headquarters	−0.0271	(0.0204)	[0.184]	0.0501	(0.0287)	[0.081]
Firm managed by owner	0.0204	(0.0164)	[0.214]	−0.0598	(0.0232)	[0.010]
Firm managed by professional manager	0.0021	(0.0171)	[0.902]	−0.0023	(0.0242)	[0.923]
Chamber of commerce membership	−0.0004	(0.0182)	[0.982]	0.0333	(0.0256)	[0.193]
Firm-level bargaining	−0.0053	(0.0176)	[0.762]	0.0744	(0.0248)	[0.003]
Industry-level bargaining	−0.0056	(0.0096)	[0.564]	0.0443	(0.0136)	[0.001]
Works council	0.0228	(0.0145)	[0.116]	0.0745	(0.0205)	[0.000]
Log employment in 2008	0.0444	(0.0094)	[0.000]	0.0974	(0.0132)	[0.000]
R^2	6,194			6,180		
N	0.3081			0.2450		

Table 8: Linear probability estimates of the probability of using STW and WTA in 2009. Estimates also include dummies for region, sector and establishment size in 2009. Estimates of the determinants of the proportion of the workforce covered by STW and WTA are shown in Table 14 in the Appendix.

6.2 The effectiveness of policy measures

In this section we estimate a model which regresses the pattern of adjustment (i.e. change in employment) on the use of policy measures.

$$\Delta N_{it} = f(\text{STW}, \text{WTA} \mid \text{demand shocks}, \text{firm characteristics})$$

where ΔN_{it} is the growth rate of employment, defined as $N_{it} - N_{it-1}/(0.5(N_{it} + N_{it-1})$. As noted, the extent to which this model tells us something about the causal impact of STW and WTA on employment growth depends on whether the controls for demand shocks deal with selection into the policies.

To deal with this problem, Boeri & Bruecker (2011) suggest an instrument based on previous experience of STW and WTA. The argument is that an establishment which used STW in, for example 2003, will be more likely to use STW in 2009 (because the management are aware and familiar with the programme). Furthermore, there should be no direct relationship between previous use of STW and employment growth in 2009 because, as we have seen, the within-firm correlation of demand shocks is weak. We use a similar methodology here. We instrument the use of STW in 2009 with the dummy variables which indicte the use of STW in 2003 and 2006 and measures of the proportion of the workforce affected by STW in those years. Similarly, we instrument the use of WTA in 2009 with dummy variables indicating the use of WTA in 1999, 2002, 2004 and 2006 and measures of the proportion of the workforce affected by WTA in those years.

In Table 9 we report first-stage estimates from the 2SLS procedure which use these instruments to explain the use of STW and WTA, in addition to those controls used in Table 8. We can see that previous use of FTA in 2006 is significantly associated with use in 2009, but there is a weaker relationship with use in 2003. Unsurprisingly, use of WTA in recent years is strongly associated with use of WTA in 2009 because WTA is an ongoing firm-level policy, rather than a particular response to the crisis. The proportion of workers covered by STW and WTA are also important predictors of the proportion of workers covered in 2009.

	Probability of using STW			*Proportion of workers covered by STW*		
	Coeff.	*S.E.*	*p-value*	*Coeff.*	*S.E.*	*p-value*
Used STW in 2003 (1=yes)	0.0287	(0.0338)	[0.396]	−0.0022	(0.0215)	[0.917]
Used STW in 2006 (1=yes)	0.1604	(0.0679)	[0.018]	0.0358	(0.0397)	[0.367]
Proportion of workers covered by STW in 2003	0.0903	(0.0378)	[0.017]	0.0732	(0.0227)	[0.001]
Proportion of workers covered by STW in 2006	−0.0542	(0.0947)	[0.567]	0.0295	(0.0671)	[0.661]
	Probability of using WTA			*Proportion of workers covered by WTA*		
	Coeff.	*S.E.*	*p-value*	*Coeff.*	*S.E.*	*p-value*
Used WTA in 2002 (1=yes)	0.0377	(0.0316)	[0.232]	0.0041	(0.0308)	[0.893]
Used WTA in 2004 (1=yes)	0.0452	(0.0336)	[0.178]	−0.0313	(0.0317)	[0.324]
Used WTA in 2006 (1=yes)	0.1379	(0.0302)	[0.000]	0.0365	(0.0299)	[0.222]
Used WTA in 2008 (1=yes)	0.3411	(0.0281)	[0.000]	0.0953	(0.0274)	[0.001]
Proportion of workers covered by STW in 2002	−0.0012	(0.0347)	[0.972]	0.0342	(0.0344)	[0.321]
Proportion of workers covered by STW in 2004	0.0164	(0.0366)	[0.655]	0.1116	(0.0352)	[0.002]
Proportion of workers covered by STW in 2006	0.0295	(0.0323)	[0.360]	0.1380	(0.0329)	[0.000]
Proportion of workers covered by STW in 2008	0.0948	(0.0290)	[0.001]	0.3385	(0.0298)	[0.000]

Table 9: First stage regression results. Regressions also include all controls included in Table 8.

In Table 10 we report preliminary estimates of the relationship between the use of STW and WTA on employment growth between 2008–09. As we have noted, we would expect that the OLS comparison of STW will yield smaller effects than the 2SLS estimates, because of the negative selection into STW. This is what we find both for the use of STW and the proportion of workers covered by STW. However, the standard errors associated with the 2SLS are too large to draw any firm conclusions about the effectiveness of STW on retaining employment. In the case of WTA, we can find absolutely no relationship between use of WTA or the proportion of workers covered and employment growth.

	OLS			*2SLS*		
	Coeff.	*S.E.*	*p-value*	*Coeff.*	*S.E.*	*p-value*
Used STW in 2009	−0.015	(0.009)	[0.107]	0.090	(0.072)	[0.209]
Proportion of workers covered by STW	−0.032	(0.017)	[0.064]	0.108	(0.128)	[0.399]
Used WTA in 2009	0.007	(0.005)	[0.134]	−0.003	(0.009)	[0.702]
Proportion of workers covered by WTA	0.003	(0.005)	[0.571]	−0.002	(0.010)	[0.811]

Table 10: OLS and 2SLS estimates of the impact of STW and WTA on employment growth. Controls include all those shown in Table 8.

7 Policy measures and the pattern of recovery

The third objective is to examine the implications of the use of STW and WTA for the early recovery period. As noted by Hijzen & Venn (2011), one of the main concerns about the use of STW is that it may inhibit reallocation of employment and growth, if the schemes are allowed to continue for a longer period. We note that this worry does not seem particularly relevant for Germany, where the use of STW was time-limited, and where the use of STW was already declining by the start of 2010.

We can only draw tentative conclusions here, mainly because of data availability. The establishment panel survey is, at the time of writing, only available up to 2010. Nevertheless, the 2010 survey does contain a forward-looking question, namely: "What kind of problems with human resources management do you expect for your establishment/office during the next two years?" Responses include whether the establishment was expected to face too high a staff level, too much staff turnover, difficulties in hiring qualified workers, and high wage costs.

A simple test of the relationship between the use of STW and WTA in 2009 and future employment problems is to estimate linear probability models of the form:

$$\Pr(\text{Human resource problems in the future}) = f(\text{Use of STW and WTA}, \text{other controls})$$

In Table 11 we report the results of these regressions. What is striking here is that there is almost never any statistically significant relationship between the use of STW and WTA and future human resource problems. Given that there is negative selection into STW, this result seems encouraging.

	Coeff.	*S.E.*	*p-value*
(a) Staff level too high			
Used STW in 2009	-0.0223	(0.0246)	$[0.365]$
Used WTA in 2009	-0.0034	(0.0185)	$[0.854]$
(b) High staff turnover			
Used STW in 2009	0.0063	(0.0212)	$[0.767]$
Used WTA in 2009	-0.0053	(0.0161)	$[0.742]$
(c) Difficulties in hiring qualified workers			
Used STW in 2009	-0.0118	(0.0407)	$[0.772]$
Used WTA in 2009	0.0581	(0.0365)	$[0.112]$
(d) Staff shortages			
Used STW in 2009	0.0243	(0.0290)	$[0.403]$
Used WTA in 2009	0.0300	(0.0231)	$[0.194]$
(e) High burden from wage costs			
Used STW in 2009	-0.0219	(0.0408)	$[0.591]$
Used WTA in 2009	0.0227	(0.0355)	$[0.523]$
(f) Other personel problems			
Used STW in 2009	-0.0091	(0.0175)	$[0.603]$
Used WTA in 2009	0.0060	(0.0141)	$[0.673]$
(g) No personel problems			
Used STW in 2009	0.0245	(0.0322)	$[0.448]$
Used WTA in 2009	-0.0578	(0.0331)	$[0.081]$

Table 11: OLS estimates of the impact of STW and WTA on future personnel problems. Dependent variable is the answer to the question "What kind of problems with human resources management do you expect for your establishment/office during the next two years?", regressed on measures of whether the establishment used STW and WTA in 2009 and the same set of control variables used in Section 6.

8 Conclusions

A number of authors have suggested that the extensive use of short-time work in Germany helped to prevent the large job losses observed in other OECD countries which experienced similar falls in GDP (Hijzen & Venn 2011, Boeri & Bruecker 2011). Others have suggested that, since the use of short-time work was not that much greater than in recessions in the 1970s and 1980s, the use of short-time work cannot explain the "missing" fall in employment (Burda & Hunt 2011).

In Section 4 we show that the IAB Betriebspanel captures the key features of the crisis, with a significant fall in sales but a much smaller fall in employment. In Section 5 we show that the self-reported measures of the crisis are quite consistent over time: establishments which expected a downturn in sales in 2009 were much more likely to subsequently report being affected by the crisis in 2010. Establishments which were affected by crisis are heavily concentrated in manufacturing, tend to be more technologically sophisticated and are more likely to be part of a larger organisation. The difference in average sales growth between crisis and non-crisis plants is massive, while the difference in employment growth is much smaller. Perhaps most importantly, the probability that crisis establishments were affected by the earlier 2001–2005 downturn is not significantly greater than for non-crisis plants. Thus, we argue that the 2008–2009 crisis was effectively independent of earlier shocks.

In Section 6 we show that the use of STW schemes was very strongly associated with the crisis. Crisis establishments were nearly five times more likely to use STW in 2009. Differences in the use of WTA and PECs was significant but much smaller, reflecting the fact that the use of these arrangements was based on longer-term bargaining arrangements. We also show that the three most common responses to the crisis were to reduce hiring, to reduce overtime and to increase short-time work. Layoffs were cited by only 15% of crisis plants as a measure which had been used. A multivariate analysis shows that indicators of poor business performance in the lead up to the crisis are significant determinants of the use of STW, but not for the use of WTAs. STW is also significantly more likely to be used in establishments with a greater proportion of permanent workers.

In Section 6.2 we provide preliminary evidence on the effectiveness of these policies in preventing job loss during the crisis. However, our results are not sufficiently precisely determined to be able to say for sure that STW saved jobs. After instrument-

ing for selection into STW, the employment growth rate in STW establishments is about 10% higher than in non STW establishments, but the difference is not significantly different from zero.

Finally, in Section 7, we show that the use of STW and WTA is not associated with any greater expectation of human resources problems amongst plant managers. Of course, the longer-run impact of these policies can only really be analysed in detail when more data is available.

References

Bellmann, L. & Gerner, H.-D. (2011*a*), "Continuous training and company-level pacts for employment in Germany", *Journal of Economics and Statistics* .

Bellmann, L. & Gerner, H.-D. (2011*b*), "Reversed roles? Wage and employment effects of the current crisis", *Research in Labor Economics* **32**, 181–206.

Bellmann, L. & Gerner, H.-D. (forthcoming), "Company-level pacts for employment in the global crisis 2008/09: first evidence from representative German establishment-level panel data", *International Journal of Human Resource Management* .

Bellmann, L., Gerner, H.-D. & Upward, R. (2011), "Job and worker turnover in German establishments", Mimeo, University of Nottingham.

Boeri, T. & Bruecker, H. (2011), "Short-time work benefits revisited: some lessons from the Great Recession", IZA Discussion Paper 5635.

Bogedan, C., Brehmer, W. & Herzog-Stein, A. (2009), "Betriebliche Beschäftigungssicherung in der Krise", Kurzauswertung der WSI-Betriebsrtebefragung 2009.

Brenke, K., Rinner, U. & Zimmerman, K. (2011), "Short-time work: the German answer to the great recession", IZA discussion paper 5780.

Burda, M. & Hunt, J. (2011), "What explains the German labour market miracle in the great recession?", Paper presented at the Brookings Papers conference.

Crimmann, A., Wießner, F. & Bellmann, L. (2010), "The German work-sharing scheme: an instrument for the crisis", International Labour Organisation Conditions of work and employment working paper series no. 25.

Dietz, M., Stops, M. & Walwei, U. (2010), "Safeguarding jobs through labour hoarding in Germany", *Applied Economics Quarterly* **56**(61), 125–150.

Eichhorst, W., Feil, M. & Marx, P. (2010), "Crisis, what crisis? Patterns of Adaptation in European Labor Markets", IZA discussion paper 5045.

Ellguth, P. & Kohaut, S. (2008), "Ein bund fürs Überleben? Einflussfaktoren für die vereinbarung betrieblicher Bündnisse zur Beschäftigungs- und Standortsicherung", *Industrielle Beziehungen* **15**(3), 1–24.

Elsby, M., Hobjin, B. & Sahin, A. (2010), "The labor market in the great recession", NBER working paper 15979.

Fischer, G., Janik, F., Müller, D. & Schmucker, A. (2009), "The IAB Establishment Panel — things users should know", *Schmollers Jahrbuch* **129**(1), 133–148.

Hijzen, A. & Venn, D. (2011), "The role of short-time work schemes during the 2008-09 recession", OECD social, employment and migration working papers No. 115.

Hübler, O. (2010), "Comment on Dietz, Stops and Walwei", *Applied Economics Quarterly* **56**(61), 151–165.

Möller, J. (2010), "The German labor market response in the world recession — demystifying a miracle", *Journal for Labour Market Research (Zeitschrift für Arbeitsmarkt Forschung)* **42**(4), 325–336.

Morley, J., Sanoussi, F., Biletta, I. & Wolf, F. (2009), "Comparative analysis of working time in the European Union", Mimeo, European Foundation for the Improvement of Living and Working Conditions.

Seifert, H. (2005), "Flexibility through working time accounts: reconciling economic efficiency and individual time requirements", *in* A. Hegewisch, ed., *Working time for working families: Europe and the United States*, Friedrich-Ebert-Stiftung.

A Additional tables

	Employment	Sales (€m)	Overseas sales (€m)	Sales per worker (€m)	Hiring rate	Separation rate	Layoff rate	Prob. of estab. exit
2000	13.073	2.651	0.239	0.133	0.126	0.142	0.056	0.064
2001	12.795	2.759	0.266	0.125	0.118	0.143	0.065	0.062
2002	12.922	2.434	0.278	0.122	0.108	0.124	0.062	0.059
2003	12.919	4.213	0.325	0.142	0.102	0.116	0.060	0.046
2004	13.030	2.907	0.319	0.135	0.109	0.106	0.056	0.053
2005	12.996	2.985	0.422	0.120	0.096	0.109	0.058	0.056
2006	13.383	2.149	0.365	0.107	0.113	0.094	0.049	0.043
2007	13.665	2.177	0.416	0.109	0.113	0.103	0.045	0.041
2008	13.790	2.342	0.404	0.113	0.106	0.098	0.040	0.042
2009	13.651	2.295	0.411	0.107	0.103	0.107	0.053	0.039
2010	13.803	2.285	0.391	0.104	0.105	0.102	0.045	0.000

Table 12: IAB establishment panel: outcome measures from the full unbalanced sample, weighted by cross-section weights.

	Employment	Sales (€m)	Overseas sales (€m)	Sales per worker (€m)	Hiring rate	Separation rate	Layoff rate	Prob. of estab. exit
2000	18.720	3.608	0.425	0.122	0.115	0.096	0.034	0.000
2001	18.837	4.021	0.465	0.163	0.095	0.081	0.031	0.000
2002	18.530	4.023	0.426	0.161	0.098	0.100	0.044	0.000
2003	18.342	4.075	0.493	0.155	0.082	0.079	0.035	0.000
2004	18.249	4.021	0.481	0.128	0.078	0.067	0.031	0.000
2005	18.044	4.284	0.511	0.131	0.066	0.063	0.034	0.000
2006	18.175	3.266	0.513	0.122	0.080	0.063	0.032	0.000
2007	18.537	3.355	0.529	0.121	0.074	0.063	0.024	0.000
2008	18.875	3.636	0.575	0.124	0.087	0.073	0.025	0.000
2009	18.474	3.731	0.601	0.124	0.052	0.069	0.033	0.000
2010	18.460	3.410	0.542	0.118	0.056	0.069	0.033	0.000

Table 13: IAB establishment panel: outcome measures from the balanced panel 2000–2010, weighted by longitudinal weights

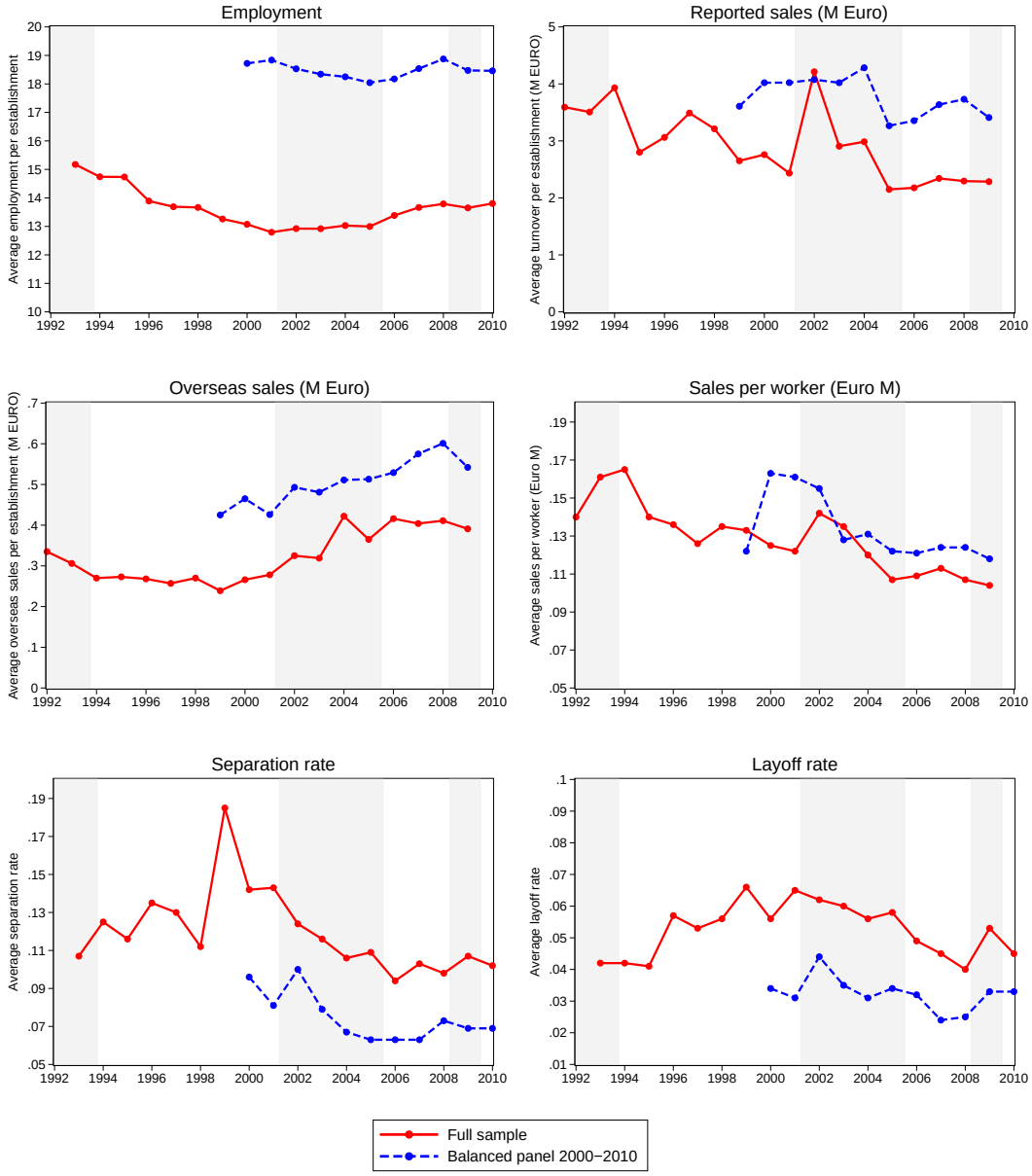

Figure 7: Trends in employment, sales, separation rates over the sample period. The full sample is weighted by cross-section weights; the balanced panel is weighted by longitudinal weights. Recession dates are those used by Burda & Hunt (2011), originally from *Sachverständigenrat* (2010) and cover Q1 1991–Q3 1993, Q1 2001–Q2 2005 and Q1 2008–Q2 2009. Sales, overseas sales and sales per worker are reported for the previous calendar year and hence the series runs from 1992 to 2009. Employment refers to employment on 30 June in the current calendar year. Separations and layoffs refer to the first six months of the current calendar year.

	Proportion of workforce in STW			*Proportion of workforce on WTA*		
	Coeff.	*S.E.*	*p-value*	*Coeff.*	*S.E.*	*p-value*
Proportion of output exported	0.0004	(0.0002)	[0.062]	−0.0004	(0.0003)	[0.186]
Expected growth rate of turnover 2008-09	−0.0027	(0.0006)	[0.000]	−0.0004	(0.0003)	[0.205]
Actual turnover declined between 2007-08 (1=yes)	0.0245	(0.0054)	[0.000]	0.0107	(0.0112)	[0.340]
Self-reported risk of firm closure (1=yes)	0.0050	(0.0086)	[0.561]	−0.0093	(0.0161)	[0.564]
High competitive pressure 2009 (1=yes)	0.0110	(0.0068)	[0.105]	0.0041	(0.0136)	[0.763]
High competitive pressure 2008 (1=yes)	−0.0072	(0.0058)	[0.211]	0.0368	(0.0119)	[0.002]
Self-reported profitability 2008 (base=very good)						
Good	0.0190	(0.0101)	[0.059]	−0.0370	(0.0203)	[0.069]
Satisfactory	0.0251	(0.0105)	[0.017]	−0.0443	(0.0211)	[0.035]
Sufficient	0.0439	(0.0116)	[0.000]	−0.0579	(0.0235)	[0.014]
Unsatisfactory	0.0853	(0.0166)	[0.000]	−0.0913	(0.0270)	[0.001]
Labour shortages reported in 2008 (1=yes)	−0.0216	(0.0055)	[0.000]	0.0339	(0.0119)	[0.004]
High share of R&D activities (1=yes)	0.0384	(0.0109)	[0.000]	0.0750	(0.0177)	[0.000]
Technical state of establishment (base=state of the art)						
2	0.0011	(0.0067)	[0.867]	−0.0108	(0.0150)	[0.469]
3	0.0132	(0.0078)	[0.089]	−0.0266	(0.0168)	[0.113]
4	0.0275	(0.0161)	[0.087]	0.0011	(0.0302)	[0.970]
obsolete	−0.0280	(0.0520)	[0.591]	−0.1703	(0.0855)	[0.046]
Proportion of qualified workers	−0.0334	(0.0105)	[0.001]	0.0824	(0.0233)	[0.000]
Proportion of women	0.0034	(0.0096)	[0.722]	−0.0754	(0.0239)	[0.002]
Proportion of part-time workers	−0.0635	(0.0085)	[0.000]	−0.0873	(0.0291)	[0.003]
Proportion of fixed-term workers	−0.0822	(0.0210)	[0.000]	0.0341	(0.0621)	[0.583]
Proportion of agency workers	−0.1752	(0.0533)	[0.001]	0.1444	(0.0996)	[0.147]
Proportion of owners working in plant	−0.0672	(0.0227)	[0.003]	−0.2044	(0.0462)	[0.000]
Independent plant	0.0255	(0.0124)	[0.039]	0.0130	(0.0223)	[0.559]
Headquarters	0.0132	(0.0147)	[0.370]	0.0454	(0.0261)	[0.082]
Firm managed by owner	0.0032	(0.0120)	[0.787]	−0.0359	(0.0220)	[0.102]
Firm managed by professional manager	−0.0099	(0.0129)	[0.442]	0.0289	(0.0227)	[0.201]
Chamber of commerce membership	0.0001	(0.0087)	[0.987]	0.0233	(0.0231)	[0.314]
Firm-level bargaining	−0.0167	(0.0128)	[0.190]	0.0760	(0.0229)	[0.001]
Industry-level bargaining	−0.0105	(0.0059)	[0.074]	0.0397	(0.0129)	[0.002]
Works council	0.0407	(0.0104)	[0.000]	0.0830	(0.0196)	[0.000]
Log employment in 2008	0.0233	(0.0071)	[0.001]	0.0666	(0.0125)	[0.000]
R^2	6,087			6,161		
N	0.2779			0.2115		

Table 14: OLS estimates of the proportion of the workforce covered by STW and WTA. Estimates also include dummies for region, sector and establishment size in 2009.