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to the 2008-2009 Economic
Crisis

**Lutz Bellmann,
Hans-Dieter Gerner,
Richard Upward**

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Lutz Bellmann, Hans-Dieter Gerner, Richard Upward

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ABSTRACT

We examine the response of a large panel of German establishments to the crisis in terms of their job flows (changes in employment) and consequent worker flows (hires, separations and layoffs). We analyse the extent to which job flows and worker flows 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). We find pronounced evidence of labour hoarding in the sense that labour productivity fell rapidly during the 2008-09 downturn, but we find no evidence that STW (or other policies) increased labour hoarding by reducing layoffs. This may well reflect the probable selection effects involved which are not accounted for by observable differences between STW and non-STW establishments.

RÉSUMÉ

Nous examinons la réponse d'un large panel d'établissements allemands à la crise en termes de flux d'emplois (évolution de l'emploi) et de travailleurs qui en découlent (embauches, départs et licenciements). Nous analysons dans quelle mesure les flux d'emplois et les flux de travailleurs au niveau des établissements sont systématiquement liées aux arrangements institutionnels destinés à promouvoir la flexibilité comme le *Kurzarbeit* (chômage partiel, STW) et l'*Arbeitszeitkonten* (comptes épargne temps, WTA). Nous constatons un effet marqué de la rétention de main-d'oeuvre dans le sens où la productivité du travail a diminué rapidement pendant la récession de 2008-09, mais nous ne trouvons aucune indication que le chômage partiel (ou d'autres politiques) a augmenté la rétention de main-d'oeuvre en réduisant les licenciements. Cela pourrait bien refléter les effets de sélection probables induits qui ne sont pas pris en compte par les différences observables entre les établissements ayant recours ou non au chômage partiel.

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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 experienced one of the strongest declines in GDP amongst the industrialised economies.¹

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. Thus, overall, German firms reacted to the crisis by adjusting on the intensive margin (hours per worker) rather than on the extensive margin (number of workers).

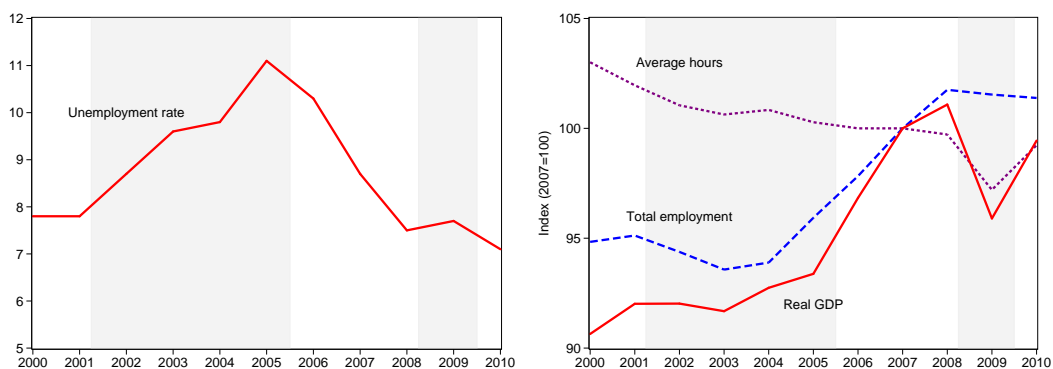


Figure 1: German unemployment rate, real GDP, total employment and average hours 2000–2010. GDP, employment and hours indexed 2007=100. Source: OECD StatExtracts. Recession dates indicated by shaded areas are those used by Burda & Hunt (2011), originally from *Sachverständigenrat* (2010) and cover Q1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

In this study we will examine the response of a large panel of German establishments to the crisis in terms of their job flows (changes in employment) and the consequent

¹OECD (2012, chapter 2) discusses in detail the extent of labour market resilience of OECD labour markets.

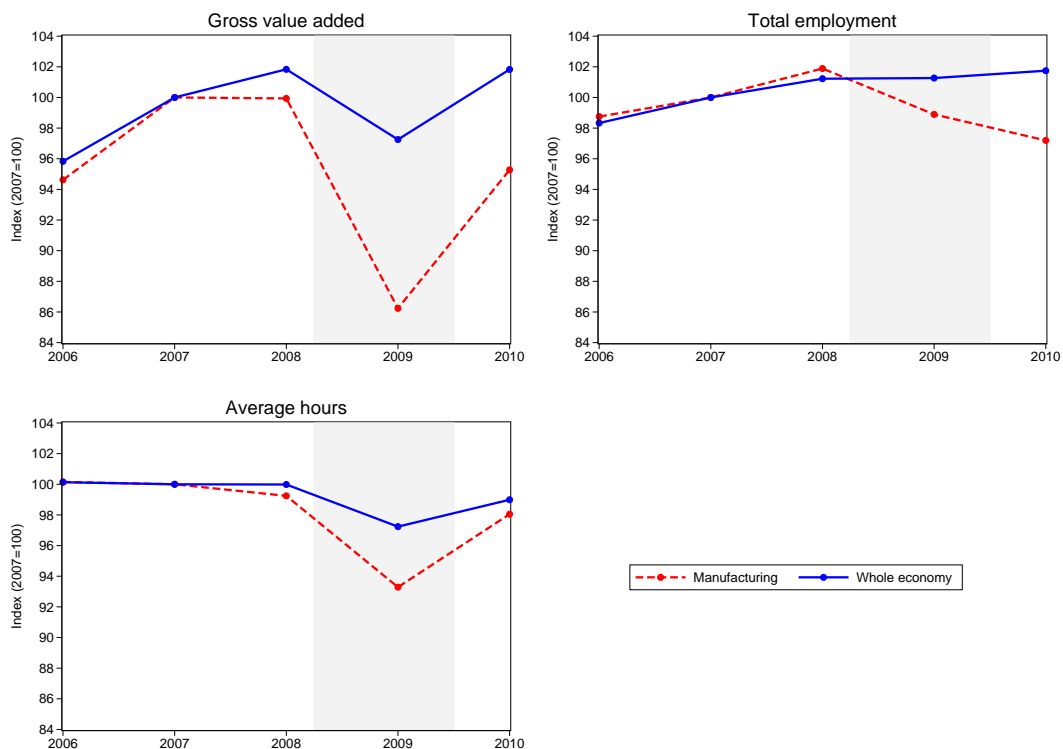


Figure 2: Differences between manufacturing and whole economy 2006–2010. GVA, employment and hours indexed 2007-100. Source: German Federal Employment Agency.

worker flows (hires, separations and layoffs). 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, hires, 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 job flows and worker flows 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, to the extent possible at this time.

In Section 2 we summarise a number of recent studies which have proposed a variety

of explanations for the resilience of the German labour market. 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. We also present descriptive evidence on how establishments reacted to the crisis in terms of employment, output, separations and layoffs. In Section 5 we show how employment changes in German establishments can be decomposed into hiring and layoffs, and we describe the basic short-term relationship between demand shocks and employment change. In Section 6 we compare the use of labour market policies (such as short-time work) between crisis and non-crisis plants, and 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). Section 8 concludes.

2 Explanations for the German labour market “miracle”

A number of explanations have been suggested for the resilience of the German labour market. All these explanations have in common the idea that German firms adjusted their labour input at the *intensive margin* (hours of work) rather than at the *extensive margin* (number of workers). This is often referred to as “labour hoarding”, although one should distinguish between falls in output per hour worked and falls in output per worker. A fall in output can be accommodated through three different channels. First, firms can adjust at the extensive margin by reducing the number of workers. Second, firms can adjust at the intensive margin by reducing the number of hours per worker. Third, output per worker-hour may fall.² Some authors refer to labour hoarding as being both adjustment in hours and adjustment in output per hour. But if reductions in hours lead to a similar reduction in the wage bill, only the third channel actually represents hoarding.

To be convincing, any explanation has to show why German firms used labour hoarding in this crisis, but not in previous downturns, and it has to show why German firms reacted differently to firms in other countries where employment fell much more sharply in the downturn. In this section we discuss the evidence for and against each of the proposed explanations.

²Burda & Hunt (2011) equation (1) formalises these three channels.

2.1 The use of short-time work (STW)

Perhaps the most widely-discussed explanation for the use of labour hoarding (rather than large falls in employment) is the use of short-time work (*Kurzarbeit*.) The short-time working scheme has existed in Germany since early in the 20th Century (see Brenke, Rinner & Zimmerman (2011) for a brief history.) Under this measure, employers may reduce working time of their employees if they face a documented shortfall of demand.³ Employees' loss in income is compensated (by the firm) for between 60%–67% of the difference between their net income before and after the working time reduction, and the firm is subsequently compensated by the German Federal Employment Agency. 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 of 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 six to 18 months in Autumn 2008 and to 24 months in July 2009. The maximum duration was subsequently reduced again to 12 months (until at least the end of 2011).

In Figure 3 we plot the numbers of establishments and workers using STW from 1991 onwards. Note that in the early 1990s the use of STW was dominated by plants and workers in East Germany using the so-called transfer *Kurzarbeit*. The mild recession of the early 2000s saw only a small increase in the use of STW. In contrast, by the end of 2009 almost 80,000 establishments were using STW, affecting about 1.5 million employees. Take-up of STW 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).

Almost by definition, STW schemes encourage firms to use the intensive rather than the extensive margin as a response to a fall in demand. However, in an accounting sense, Möller (2010, Table 5) shows that the use of STW accounts for only a proportion of the reduction in total labour input; reductions in overtime and working time accounts were almost as important, and reductions in productivity per hour were more important.⁴ In addition, both Boysen-Hogrefe & Groll (2010, Figure 1) and Burda & Hunt (2011, Figure 9) show that STW was used heavily in the recessions of the mid 1970s and early

³As explained in Crimmann, Wießner & Bellmann (2010), there are three types of STW: “transfer *kurzarbeit*” which was used extensively during reunification; “seasonal *kurzarbeit*” and “short-time work for economic reasons”. We consider only the third type here.

⁴Although note that accounting exercises such as this one do not necessarily tell us about the effectiveness of the policy because they ignore deadweight and displacement effects.

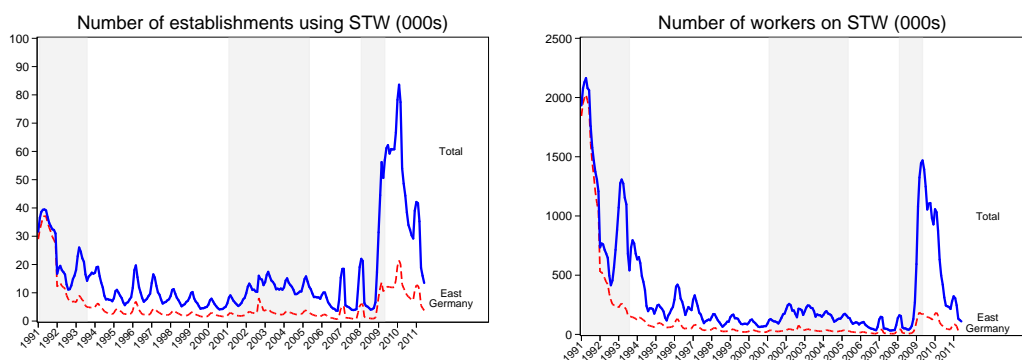


Figure 3: Use of Kurzarbeit by establishments and workers 1991–2011. Source: Bundesagentur für Arbeit.

1980s, and in those recessions employment fell far more than in the most recent crisis. Thus, on its own, STW cannot account for the German success story.

The key difficulty in evaluating the effectiveness of STW in encouraging adjustment at the intensive rather than the extensive margin is one of selection. Firms that use the STW program do so (presumably) because they face larger negative demand shocks than firms which do not use STW. Thus, comparing the employment growth of STW with non-STW firms is likely to seriously underestimate the impact of the program. Indeed, we will show in Section 6.2 that STW firms have worse employment performance than non-STW firms in the crisis period. In principle, one can include control variables which capture the extent of the demand shock (for example the change in sales), but in practice there are likely to be unobserved firm-specific shocks which mean that such a comparison is still flawed.

One solution is to use cross-country evidence and rely on the assumption that the availability and take-up of STW across countries is not correlated with the shock to labour demand. Early examples of this cross-country approach are Abraham & Houseman (1994) and Van Audenrode (1994). Abraham & Houseman argue that there is greater labour market adjustment on the intensive margin in European countries (France, Belgium and Germany) because of a combination of job security regulations with work-sharing. Van Audenrode analyses hours and employment adjustment in 10 OECD countries, and finds that working-time adjustments tend to compensate for labour force adjustment in countries with more generous short-time working arrangements.

Recent cross-country studies on the effectiveness of STW include Hijzen & Venn (2011), Cahuc & Carcillo (2011) and Arpaia, Curci, Meyermans, Peschner & Pierini (2010). Hijzen & Venn’s approach is to compare the employment adjustment of countries before and after the crisis according to the intensity of their use of STW. This difference-in-difference approach is intended to control for pre-existing differences be-

tween countries (such as labour market regulations). Their estimates suggest that STW schemes had an “economically important impact on preserving jobs during the economic downturn”, particularly in Germany and Japan. Arpaia et al. (2010) is a similar cross-country study of STW. A difference-in-difference comparison of countries which had STW schemes in 2007 shows that these countries had smaller falls in employment during the crisis.

Cahuc & Carcillo (2011) argue that the selection problem is also relevant to cross-country studies, because the availability of STW may well be correlated with the severity of the crisis. Indeed, as we have noted, in Germany the rules governing access to the program were loosened in 2008 and 2009. Cahuc & Carcillo show that unemployment increased more in countries with higher STW take-up rates, which, they argue, reflects the endogeneity of the take-up rate. They therefore instrument the use of STW with features of the program *before* the crisis. The argument is that differences in the STW program before the crisis should be uncorrelated with the strength of the demand shock, but should still be strongly correlated with the use of the program during the crisis. The results of an IV regression suggest that the use of STW had a significant negative effect on unemployment rates during the crisis. However, note that, at the country level, there may be another potential selection problem because the use of STW policies may be correlated with other institutional features which are associated with labour hoarding.

Boeri & Bruecker (2011) analyse the effectiveness of STW using both a macro (cross-country) and a micro approach. Boeri & Bruecker instrument the use of STW and working-time accounts in 2009 with establishments’ use of such policies in earlier periods before the 2008-09 crisis. This instrument is plausibly exogenous if the 2009 shock was independent of earlier shocks. In other words, an establishment which uses 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.

To summarise, there is a considerable body of cross-country evidence from both before and during the crisis to suggest that the use of STW can significantly increase adjustment at the intensive margin, and that this can reduce the unemployment effects of a recession. There is much less evidence at the firm-level for Germany, but what there is also supports the idea that STW can prevent job loss. However, it is also clear that STW on its own cannot account for the German labour market miracle. A simple decomposition of hours changes shows that the number of hours lost through STW is far too small to account for the total loss of hours in Germany in 2009. Furthermore, the

uptake of STW is no greater than in earlier downturns, when unemployment increases were far greater.

2.2 Working-time accounts (WTA)

Working time accounts (*Arbeitszeitkonten*) are firm-level agreements which allow actual working hours to vary from agreed working hours within defined limits. WTAs 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, WTAs act as an insurance against lower income during a short-term economic downturn. The use of WTAs in Germany is widespread, although it is not clear to what extent these are short-term “flexitime” arrangements or longer-term accounts which allow firms to adjust to demand shocks. Recent estimates (Morley, Sanoussi, Biletta & Wolf 2009) suggest that 50% of establishments in Germany operate WTAs, while a survey of German works councils (Bogedan, Brehmer & Herzog-Stein 2009) found that changes in WTAs were the most common cost-saving method, short of redundancies, used by German establishments in the second half of 2009.

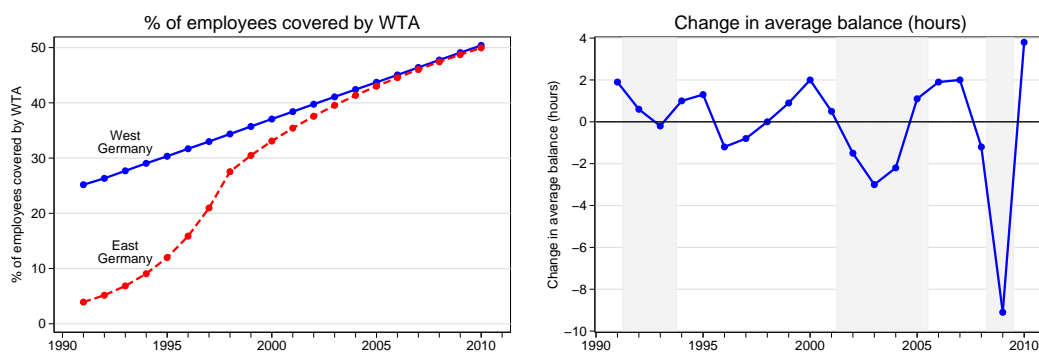


Figure 4: Use of and average balance on Working Time Accounts 1991–2010. Source: Arbeitszeitrechnung des IAB, Bundesagentur für Arbeit.

The left-hand panel of Figure 4⁵ shows that a steadily increasing proportion of workers in Germany were covered by WTA over the last 20 years, and that, by 2010, more than half of workers in both East and West Germany had such accounts. The cyclical pattern in WTA balances is clear from the right-hand panel of Figure 4, and it is

⁵We thank Ines Zapf for providing this information.

striking that the reduction in hours in the 2009 downturn was much greater than in previous downturns. Burda & Hunt (2011, Figure 10) confirm that surpluses in WTAs grew particularly quickly during the 2005–2008 expansion, and fell sharply during the 2008–2009 recession. Burda & Hunt argue that surplus WTAs provide an incentive to reduce layoffs in the short-run, because laid-off workers with a surplus of hours must be compensated. Firms therefore had an incentive to reduce the surplus before laying off workers. They also note that firms with large WTA surpluses would be less likely to use STW.

Econometric evidence on the effect of WTAs on employment adjustment is much less common than evidence on STW. One exception is Bellmann & Gerner (2011*b*), who compare employment growth during the crisis between plants with WTAs and those without. They find no evidence that plants which use WTAs have smaller employment adjustment, although they do find evidence of an effect in smoothing earnings, as would be expected. Boeri & Bruecker (2011) also include a measure of WTA in their plant-level employment response equations, and conclude that WTAs also played some role in saving jobs during the great recession, although a far smaller effect than the use of STW.⁶

2.3 Bargaining arrangements and wage moderation

A number of authors have stressed the role of bargaining arrangements which have allowed companies to deviate from industry-level agreements. In the past, industry-wide agreements on wages and hours of work were regarded as a source of inflexibility which prevented firms from adjusting to demand shocks. More recently, so-called “opening clauses” have been used which allowed firms and worker representatives to agree on deviations from industry-wide agreements. Typically, these take the form of “pacts for employment and competitiveness” (Sisson & Martin Artiles 2000) whereby firms and workers agree to concessions such as reduced wages or increased hours in return for employment guarantees. Ellguth & Kohaut (2008) estimate that about 2% of establishments in Germany have introduced a PEC, but these establishments employ around 14% of the workforce, so they are a potentially important instrument.

Hübler (2005) and Bellmann, Gerlach & Meyer (2008) both analysed the impact of PECs on employment, while Bellmann & Gerner (2012) considered the role of PECs during the recent crisis, and found that the plants which did not exhibit employment losses during the crisis were those more likely to have adopted a PEC. However, as

⁶The estimated coefficients have rather large standard errors, and therefore it is difficult to be precise about the size of the effect.

with STW, the selection effect is important, because establishments which enter PECs typically do so because they face serious negative demand shocks, and therefore the challenge is to find a suitable comparison group to infer what would have happened to employment in the absence of PECs.

Although there is no definitive micro-level evidence on the role of PECs, a number of authors have suggested that the wage moderation and flexibility of working time which arose during the earlier period was an important factor which allowed firms to enter the crisis without serious employment losses. Boysen-Hogrefe & Groll (2010, Figure 6), for example, shows that the real gross hourly wage increased very little from 2000 onwards. Burda & Hunt (2011) also argue that wage moderation may have played some role, though not to the same extent as Boysen-Hogrefe & Groll.

2.4 Other explanations

It seems unlikely that any of the labour market features above (STW, WTA, PECs) can, on their own, account for the resilience of the German labour market. Other factors also play a role, possibly interacting with the policies described above.

For example, Klinger, Rebien, Heckmann & Szameitat (2011) test the hypothesis that labour hoarding was particularly common in German firms that had faced recruitment problems in earlier years. However, comparing firms which experienced labour shortages in 2008 and those that did not, Klinger et al. find no significant difference in labour hoarding behaviour during the crisis.

Möller (2010) notes that exporting firms in manufacturing industries were disproportionately affected by the downturn as a result of the collapse in export markets, and these firms tend to employ highly-skilled workers with firm-specific skills.⁷ The combination of earlier recruitment problems and the potential loss of firm-specific skills increase the incentive to adopt labour hoarding. A closely-related argument (Burda & Hunt 2011) is that German manufacturing firms did not lay-off many workers in the downturn because 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.

Expectations about the length of the crisis also play a role. The crisis in Germany mainly manifested itself in terms of a decline in external demand, rather than the bursting of an asset bubble. Bohachova, Boockmann & Buch (2011) suggest that firms

⁷The prevalence of firm-specific vocational training in Germany may also be a factor here.

expected that the shock to export demand would be short-lived, which reinforces the incentive to adopt temporary labour hoarding strategies rather than lay-off workers permanently.

Bohachova et al. (2011) use the IAB establishment panel to estimate a dynamic labour demand function for the period leading up to the crisis (2000–2008).⁸ The residuals from this regression for the first half of 2009 are taken as a measure of labour hoarding, and these residuals are related to potential factors such as the use of STW and other labour market institutions. However, Bohachova et al. are not able to indicate which factors were “causally responsible” for stabilizing employment, since there is no clear counterfactual. They suggest that German firms have used multiple channels of adjustment which have been enabled by the earlier labour market reforms.

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.⁹ 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

⁸The analysis is only conducted for the state of Baden-Württemberg.

⁹Weights 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.¹⁰

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).¹¹ 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).¹²

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.

The top panel of Table A.1 in the Appendix 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. The bottom panel of Table A.1 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.

In Figure 5 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.

¹⁰This 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. Appendix B gives a precise description of the relevant questions.

¹¹Establishments 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”.

¹²The sample selection procedure used is identical to that used in Bellmann, Gerner & Upward (2011).

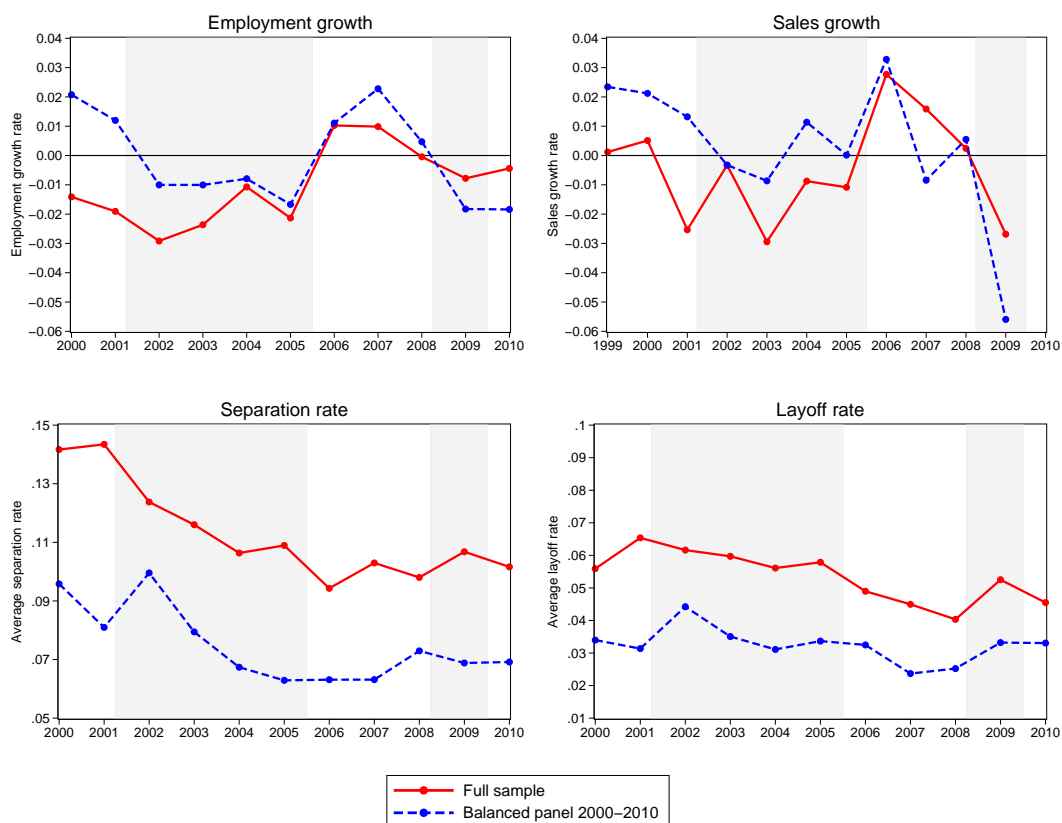


Figure 5: Employment and sales growth rates as measured by the IAB establishment panel. Employment and sales growth are defined as $(x_{it} - x_{it-1})/0.5(x_{it} + x_{it-1})$. The full sample is weighted by cross-section weights; the balanced panel is weighted by longitudinal weights. Sales are reported 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.

4 Identifying “crisis” establishments

The severity of the crisis for individual establishments can be captured using a self-reported measure from the survey, which asks “Have you been affected negatively by the crisis in the last two years?” (asked in 2010). As we would expect, this measure is highly correlated with changes in establishment sales between 2008 and 2009. Those plants which report that they were affected negatively by the crisis experienced on average a 14% fall in sales, compared to a 1.9% increase in sales for plants which did not report

being affected.

We now examine whether establishments which were affected by the crisis differed significantly from those which were not. We do this in order to test whether the claims made in Section 2 about the crisis can be verified in the establishment survey. Table 1 reports the differences between crisis and non-crisis plants according to the self-reported indicator.

	<i>Crisis</i>	<i>Non-crisis</i>	<i>Difference</i>	<i>p-value</i>
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 1: Differences between crisis and non-crisis establishments. Crisis establishments are identified by the 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 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 non-crisis establishments. Crisis establishments are also more “high-tech” than non-crisis establishments, with greater R&D activity and a higher technological standard.¹³

¹³This 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

In Figure 6 we plot the evolution of employment growth and sales growth for establishments separated according to their response to the 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 1). 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.

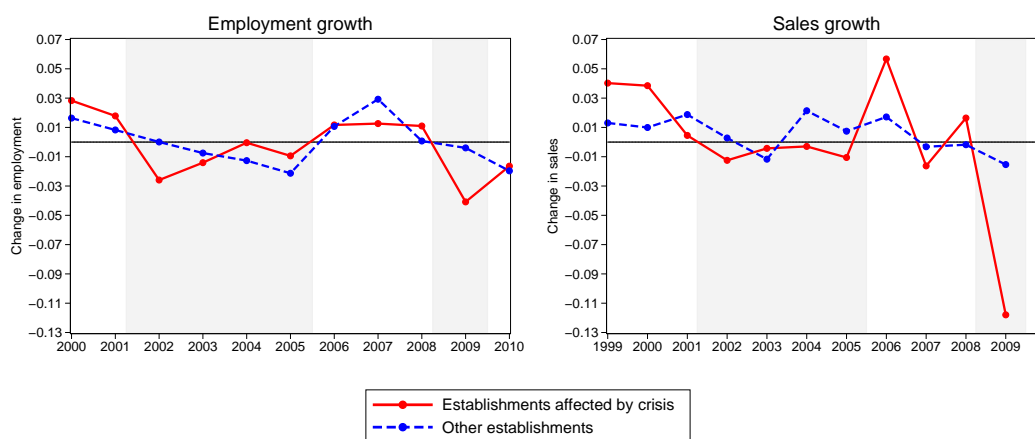


Figure 6: Employment and sales growth separately by establishments which reported being affected by the 2008–2009 crisis and those which did not. Employment and sales growth are defined as $(x_{it} - x_{it-1})/0.5(x_{it} + x_{it-1})$. Sample used is a balanced panel of plants from 2000–2010, weighted 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.

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 it with 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 a question about business expectations question during the period 2001–2005, shown in Table 2.¹⁴

Table 2 generally supports the hypothesis that establishments which were hit by the 2009 crisis were no more seriously affected by the earlier downturn. For example, 2009 the same industry?”

¹⁴This question asks: “Is business volume expected to decrease in the current year compared to the previous year?”

	<i>Crisis</i>	<i>Non-crisis</i>	<i>Difference</i>	<i>p-value</i>
<i>Probability of reporting low business expectations for:</i>				
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 2: Differences between crisis and non-crisis establishments in earlier downturns. Crisis establishments are identified by the 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

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.

5 Demand shocks, job flows and worker flows

Before considering the role of various policy measures and establishment characteristics in determining the employment response to the crisis, we first describe the relationship between demand shocks, employment growth, hires and layoffs in the IAB establishment survey. This is based largely on Davis, Faberman & Haltiwanger (2011) and Bellmann et al. (2011). Davis et al. (2011) show that, given the relationship between employment growth, hires and separations at the establishment level, movements in the distribution of establishment employment growth rates largely drive aggregate hiring and separation rates.

5.1 The relationship between job flows and worker flows

For establishments in the US, falls in employment are achieved largely through an increase in separations, while increases in employment are achieved through an increase in hirings (Davis et al. 2011). Bellmann et al. (2011) show that the pattern is similar in German establishments. We replicate this basic finding for German establishments below.

The IAB panel provides a measure of the number of workers who were recruited and who left the establishment in the first six months of each calendar year. Define N_{it} to be employment of establishment i at time t . The net job flow, or employment change of establishment i , between $t - 1$ and t , is ΔN_{it} . Employment change within an

establishment will almost certainly be an underestimate of worker flows, because even for a given set of jobs, there may be workers joining and leaving the establishment. Let H_{it} (hires) be the number of workers who join the establishment between $t - 1$ and t , and S_{it} (separations) be the number of workers who leave the establishment. It follows that net worker flows are equal to net job flows, $\Delta N_{it} = H_{it} - S_{it}$, but gross worker flows $H_{it} + S_{it}$ may be much larger.

It is standard to calculate separation and hiring rates by dividing by average employment between t and $t - 1$:

$$h_{it} = \frac{H_{it}}{0.5(N_{it} + N_{i,t-1})}$$

$$s_{it} = \frac{S_{it}}{0.5(N_{it} + N_{i,t-1})}$$

Recall that H and S are observed over a six-month period, and so to be consistent $t - 1$ should refer to six months before the survey date. To ensure consistency, we define $N_{i,t-1} = N_{it} - H_{it} + S_{it}$. The net job flow rate (which equals the net worker flow rate) is then $\Delta n_{it} = h_{it} - s_{it}$. The gross worker flow rate is $h_{it} + s_{it}$ which will be greater than the net job flow rate by the amount of churning.

In Figure 7 we plot the within-establishment relationship between employment growth (net job flows) and hiring and separation rates for the entire sample period 1993–2010. To do this we regress, separately, hiring and separation rates on a set of dummy variables for establishment growth rate bands defined by separating Δn_{it} into 50 quantiles.

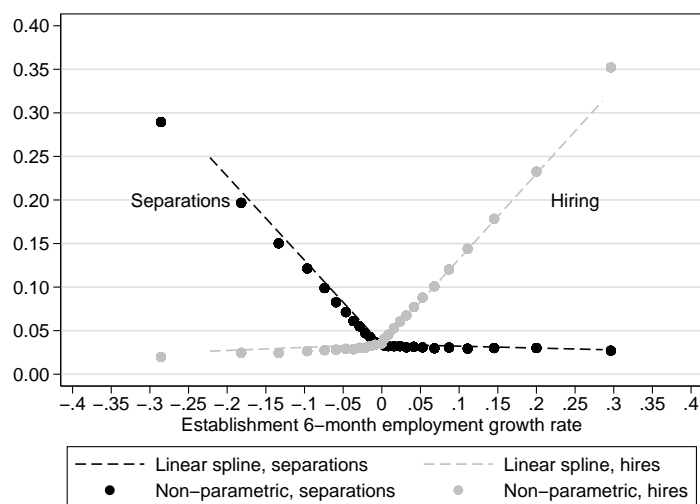


Figure 7: Relationship between employment growth rates in the first six months of t with worker flow rates over the same period. Sample is 40,757 establishments and 164,019 observations. Estimated from a within-establishment fixed-effect regression with bins for each quantile of employment growth.

The almost linear relationship between worker flows and job flows illustrated in Figure 7 suggest the following linear spline approximation:

$$h_{it} = \alpha^h + \beta^h(\Delta n_{it} \cdot 1(\Delta n_{it} > 0)) + \gamma^h(\Delta n_{it} \cdot 1(\Delta n_{it} < 0)) + a_i^h + b_t^h + \epsilon_{it}^h \quad (1)$$

$$s_{it} = \alpha^s + \beta^s(\Delta n_{it} \cdot 1(\Delta n_{it} > 0)) + \gamma^s(\Delta n_{it} \cdot 1(\Delta n_{it} < 0)) + a_i^s + b_t^s + \epsilon_{it}^s, \quad (2)$$

where $1(\cdot)$ is the indicator function. β^h measures the responsiveness of hirings with respect to employment growth; γ^h measures the responsiveness of hirings with respect to employment falls. β^s and γ^s measure the same response with respect to separations. Because $\Delta n_{it} = h_{it} - s_{it}$ it is unnecessary to estimate both the hiring and separation equation, since $\beta^h - \beta^s = 1$ and $\gamma^h - \gamma^s = 1$. The constant in this model ($\alpha^h = \alpha^s$) is an estimate of the hiring rate (= separation rate) when establishment employment is stable over a six-month period. Both models include establishment and time fixed-effects, a_i and b_t which can either be estimated or removed by demeaning in the usual way. The inclusion of establishment fixed effects means that the estimates of β and γ are based on within-establishment changes in job- and worker-turnover rates. We plot the estimates of the six parameters from the two linear splines given in (1) and (2) in Figure 7.

Both the parametric and non-parametric results show a relationship which is very similar to that shown by Davis et al. (2011) for the US. We estimate β^h to be 0.98 and γ^s to be -0.96 . This shows that the lack of layoffs in the crisis is *not* the result of establishments adjusting on the hiring margin. When German establishments shrink, layoffs do increase. This strong, almost symmetric relationship between worker flows and job flows holds even during the 2008–2009 period.¹⁵

5.2 Output shocks and job flows

We therefore need to consider the relationship between the output shock and employment growth itself. We use the same methodology as above. We regress the employment growth rate (as defined above) on a set of dummy variables for sales growth rate defined by separating Δy_{it} into 50 quantiles. We also estimate the linear spline

$$\Delta n_{it} = \alpha^n + \beta^n(\Delta y_{it} \cdot 1(\Delta y_{it} > 0)) + \gamma^n(\Delta y_{it} \cdot 1(\Delta y_{it} < 0)) + a_i^n + b_t^n + \epsilon_{it}^n. \quad (3)$$

Estimates from the non-parametric and linear spline models are plotted in Figure 8. The linear spline seems to capture the non-parametric relationship quite closely.

A number of features are worth noting. First, the relationship is quite weak. β^n

¹⁵During this period we estimate $\beta^h = 0.97$ and $\gamma^s = -0.96$.

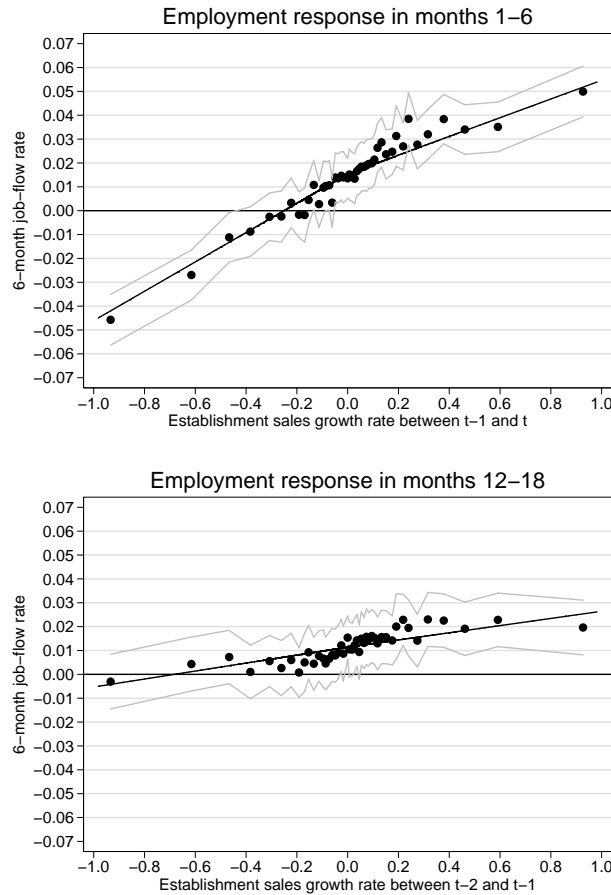


Figure 8: Relationship between sales growth rates between $t - 1$ and t and employment growth rates over the first six months of each year (top panel) and the first six months of the following year (bottom panel). Sample is 23,262 establishments and 96,353 establishment-years. Estimated from a within-establishment fixed-effect regression with (a) bins for each quantile of sales growth which contain approximately equal numbers of observations and (b) a linear spline.

is estimated to be 0.04 (0.003) and γ^n to be only 0.06 (0.003). This is partly because we are looking at a very short-run relationship. The sales growth rate Δy_{it} is measured as the proportionate change in sales between years $t - 1$ and t , while the job flow rate refers to the rate in the first six months of year t . A problem is that employment is measured as a point-in-time stock at the interview date (usually the end of June), while sales are recorded as a flow over the calendar year. Nevertheless, we can use the fact that employment at the beginning of each calendar year is equal to employment at the interview date less (hires – separations) over the preceding six months. Re-estimating (3) using the annual change in employment increases β^n to 0.10 (0.005) and γ^n to 0.12 (0.005). The fact that γ^n is so much smaller than one, even over the full 12 months is evidence for a strong degree of labour hoarding in the short-run. The model predicts that the stronger the negative shock to sales, the larger will be the fall in labour productivity and hence the greater the degree of labour hoarding. Note that “labour

hoarding” in this context may include falls in hours per worker as well as falls in output per hour.

The second key point is that employment losses do not occur at all for small falls in sales. In fact, both the parametric and non-parametric estimates reported in Figure 8 indicate that only quite large negative output shocks to sales result in employment losses. However, employment growth is not symmetric around $\Delta y_{it} = 0$. The response to a negative sales shock is larger than the response to a similar-size positive sales shock: in other words $\gamma^n > \beta^n$. Establishments only reduce employment in response to quite large output shocks, but they shrink faster in response to negative output shocks than they grow in response to positive output shocks.

As noted, Figure 8 shows the very short-run relationship between employment changes in the first six months of year t and output changes between years $t - 1$ and t . In the bottom panel of Figure 8 we plot the relationship between employment changes in the first six months of year t and output changes between years $t - 2$ and $t - 1$, to see if lagged responses are important. It is clear that the slope is greatly reduced (β^n and γ^n are both estimated to be about 0.015, compared to be 0.05 for the contemporaneous response), so it is not the case that a large fraction of employment adjustment occurs in the year following the output shock.

The short-run relationship between output shocks (changes in sales) and employment growth provides a framework for analysing labour hoarding. When $\gamma^n < 1$ this indicates either that establishments are responding on the intensive margin (reducing hours of work per worker), or that labour productivity is falling.¹⁶

In Table 3 we summarise estimates of β^n and γ^n from Equation (3). The first row reports our basic estimate of the 6-month job flow response. As noted, the response is larger for negative output shocks ($\hat{\gamma}^n > \hat{\beta}^n$). The second row shows that the 12-month job flow rates are slightly more than double the 6-month rates, although the positive (hiring) response increases more than the negative (separation) response. If labour hoarding were an important phenomenon in the short-run (i.e. within-year), we would expect that $\gamma^n = 0$ over a six-month period, but $\gamma^n > 0$ over a 12-month period. In fact, it appears that reductions in employment in response to negative output shocks over the first six months are slightly less than half the total response over the entire year.

In the third row and fourth rows we examine whether the relationship between job flows and output shocks is affected by the inclusion of a number of control variables.¹⁷

¹⁶Note that the survey does not allow us to measure total hours of work, so we cannot distinguish changes in hours from changes in output per hour.

¹⁷Controls included are the change in output lagged one year, self-reported profitability, self-reported state of equipment in the establishment, proportion of different worker types, whether the establishment

	$\hat{\beta}^n$	$\hat{\gamma}^n$	N	N^*
(1) 6-month job flow rate	0.039*** (0.003)	0.062*** (0.003)	23, 262	96, 353
(2) 12-month job flow rate	0.101*** (0.005)	0.123*** (0.005)	23, 261	96, 352
(3) Additional controls	0.047*** (0.004)	0.076*** (0.004)	15, 408	55, 775
(4) 12-month job flow rate with additional controls	0.110*** (0.007)	0.148*** (0.007)	15, 408	55, 775
(5) 2008-09	0.042*** (0.010)	0.051*** (0.009)	8, 737	14, 567

Table 3: Estimates of the short-run relationship between output shocks and job flows from Equation (3).

As expected, the inclusion of these controls makes little difference because we are already controlling for firm fixed-effects.

In the fifth row we test whether there is any change in the response during the 2008–2009 downturn. In fact, it appears that the response is quite stable over this period. The response to negative output shocks is slightly smaller, but it is not significantly different to the response for earlier periods. Thus, in the sample as a whole there is no dramatic increase in labour hoarding during the most recent downturn.

To summarise, we find evidence that German establishments have quite a weak relationship between sales shocks and employment growth, evidence either that they adjust on the intensive margin (hours) or that they operate labour hoarding policies which entail temporary falls in labour productivity. However, we find no evidence to support the idea that establishments’ behaviour was different in the 2008-09 period. In other words, labour hoarding did not increase during this period.

5.3 Output shocks and worker flows

Thus far, we have considered the relationship between output shocks and job flows (Figure 8), and the relationship between job flows and worker flows (Figure 7). Putting these together enables us to describe the relationship between output shocks and worker flows. In other words, how do an establishment’s hiring and separations respond to output shocks? Using the same non-parametric methods as described above, Figure 9

is an independent firm, bargaining arrangements and existence of a works council.

illustrates how hirings and separations change in response to output shocks.

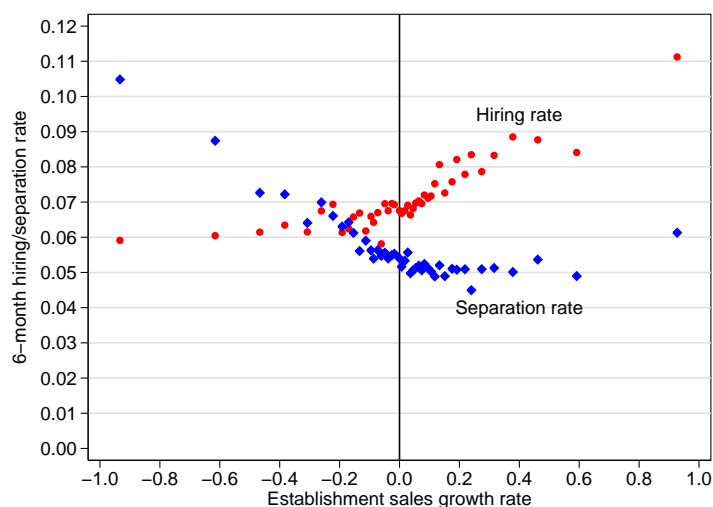


Figure 9: Relationship between sales growth rates between $t - 1$ and t and worker flows (hires and separations) over the first six months of each year. Sample is 23,262 establishments and 96,353 establishment-years. Estimated from a within-establishment fixed-effect regression with bins for each quantile of sales growth which contain approximately equal numbers of observations.

As was clear from Figure 8, in the short-run establishments continue to expand employment even when sales are static, and this is reflected in the fact that hires are about 1.5 percentage points higher than separations when the sales growth rate is zero. The “kink” in the hiring and separation functions is no longer as clear as in Figure 7.

The IAB survey data also allow us to identify, to some extent, whether separations are initiated by the employer or the employee, because respondents are also asked for the cause of the separation. Appendix B gives a precise description of the relevant questions. We define responses 2 (Dismissal on the part of the employer), 3 (Leaving after termination of training) and 4 (Expiration of temporary employment contract) to be layoffs, and define the remaining separations as quits.

Figure 10 shows that layoffs increase more steeply with negative sales shocks, although quits also increase to some extent. This suggests that, even in Germany, employment adjustment is not achieved solely through voluntary redundancy and a reduction in hires, but an actual increase in layoffs.

5.4 Firm exit

One caveat to the results presented thus far is that they rely on a sample of surviving establishments. If an establishment exits (perhaps as a result of the crisis) then they will

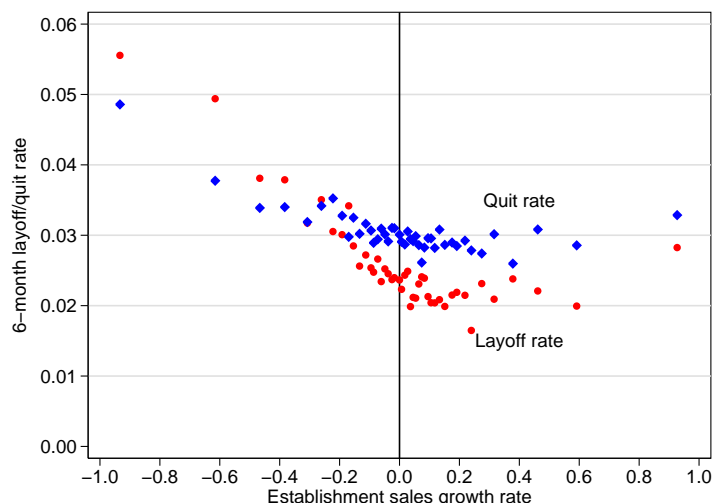


Figure 10: Relationship between sales growth rates between $t - 1$ and t , layoff and quit rates over the first six months of each year. Sample is 23,262 establishments and 96,353 establishment-years. Estimated from a within-establishment fixed-effect regression with bins for each quantile of sales growth which contain approximately equal numbers of observations.

not be interviewed in the 2010 wave, and they will not form part of the sample used to infer the effectiveness of policy measures. Furthermore, for these establishments we do not know their sales in 2009 — recall that sales are reported for the previous calendar year. However, it is worth noting that the IAB establishment panel does contain a measure of exit which is potentially more reliable than that typically used in administrative data, which relies on assuming an establishment has exited if its id number no longer appears in the data. In the IAB survey, an establishment which stops responding is explicitly coded with a variable indicating whether it is no longer in business.

How do exits affect the job-flow rate? In Figure 11 we show that the inclusion of establishment exit creates an important discontinuity in the job-flow rate. As noted, job losses do not increase proportionately with sales shocks, but by definition the job flow rate and the sales growth rate are equal to -2 when an establishment exits.

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

6.1 Use of policy measures

The second aim of this paper is to evaluate whether the response of establishments to the crisis differed systematically according to their use of various policy measures. An

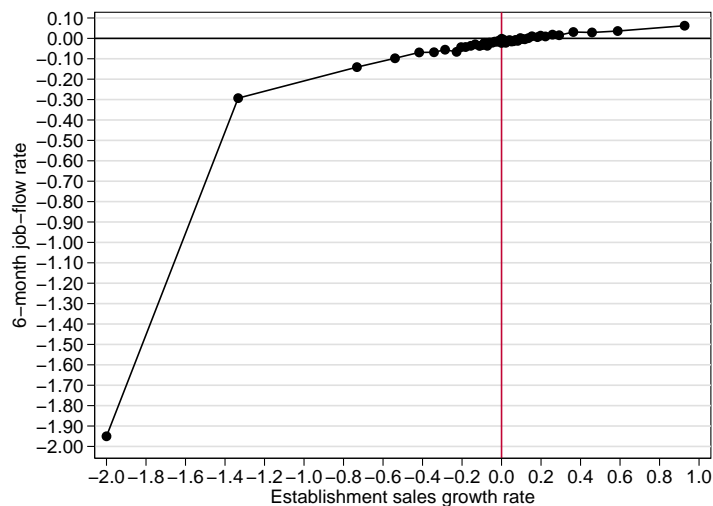


Figure 11: Relationship between sales growth rates between $t - 1$ and t and employment growth rates over the first six months of each year, including establishment exit.

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 causal effect. We focus on several of the factors discussed in Section 2:

1. The use of short-time working schemes. 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-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. The use of working-time accounts. In 2008, 2009 and 2010 the IAB establishment survey asks “Do you have working time accounts?”¹⁸ 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 available 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 (Hübler 2005, Bellmann et al. 2008, Ellguth & Kohaut 2008, Bellmann & Gerner 2011a, Bellmann & Gerner 2012). If establishments have so-called “opening clauses” in their bargaining arrangements with unions, they may introduce these pacts to reduce labour

¹⁸Possible responses: “Yes”, “No”, “We are planning to introduce working time accounts.”

costs, and they may also promote greater flexibility in employment. The IAB survey tells us whether establishments 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 12 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.

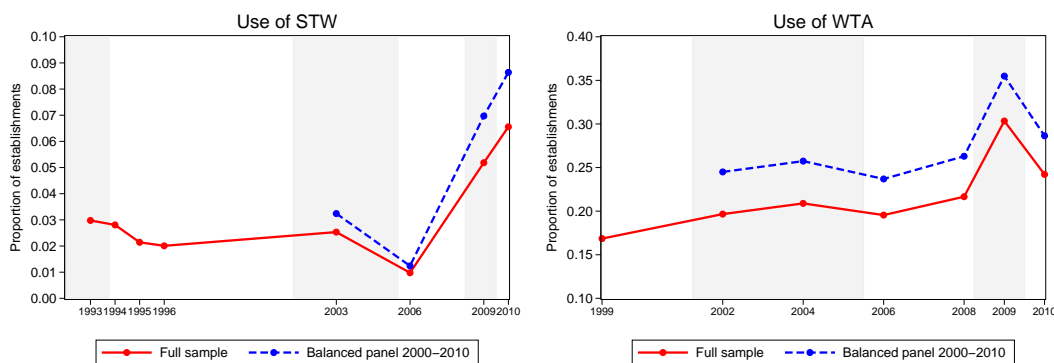


Figure 12: Proportion of establishments using STW and WTA. The full sample is weighted by cross-section weights; the balanced panel is weighted by longitudinal weights.

It is striking that the proportion of establishments which report the use of STW is actually higher in 2010 than 2009. This seems at odds with the perception that German establishments stopped using STW as soon as the recession ended. However, note that

the establishment survey takes place at the end of June in each year, and asks establishments whether they used STW in the first half of that year. In the left-hand panel of Figure 13 we plot the official statistics on the numbers of establishments using STW. One can see that the peak of about 60,000 plants is maintained until the beginning of 2010. The right-hand panel shows the number of workers on STW; this drops off much earlier in 2009. Thus, we would expect estimates from the establishment survey to only start dropping in the 2011 survey.

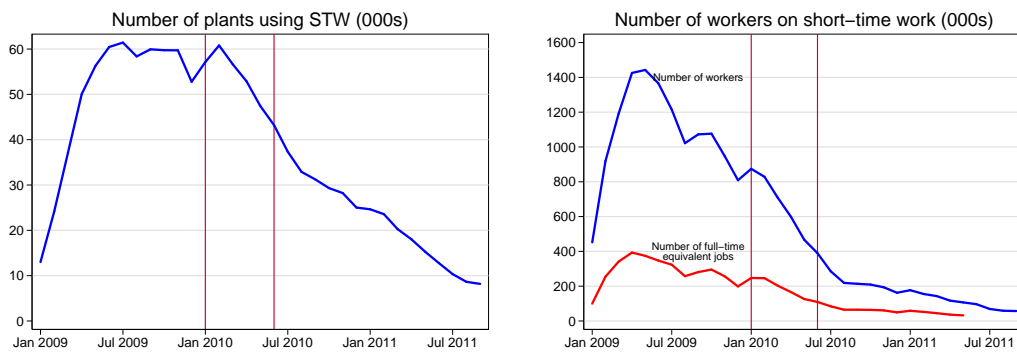


Figure 13: Numbers of establishments and workers on STW. The vertical lines indicate the six-month period to which the 2010 survey results refer. Source: *Bundesagentur für Arbeit*.

Table 4 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.

The bottom panel of Table 4 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 overtime or surpluses on working time accounts. The second most common response was to reduce hiring or delay employment increases, with the use of short-time work the third most widely-used measure. These

	<i>Crisis</i>	<i>Non-crisis</i>	<i>Difference</i>
Establishment uses short-time work	0.14	0.03	0.11***
Proportion of employees covered	0.06	0.01	0.05***
Establishment uses WTA	0.39	0.33	0.06***
Proportion of employees covered	0.35	0.29	0.05**
Establishment uses PECs	0.03	0.01	0.02***
<i>Responses to 2010 question:</i>			
Reduced overtime or surpluses on working time accounts	0.32	0.09	0.23***
Reduced hiring or delayed employment increases	0.31	0.06	0.26***
Short time work	0.24	0.03	0.22***
Increased use of holidays	0.23	0.05	0.18***
Layoffs	0.15	0.05	0.09***
Other reductions in working time	0.12	0.02	0.10***
Reductions in temporary employment	0.11	0.01	0.09***
Increased use of further training	0.08	0.03	0.05***
Layoff trainees at end of training programme	0.04	0.01	0.03***

Table 4: 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.

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 Tables 5 and 6.¹⁹ In Table 5 we report estimates of a Probit model for the probability of using STW in 2009, and estimates of a Tobit model for the proportion of workers covered by STW.²⁰ These results confirm that various measures of firm performance up to 2009 are important determinants of whether or not an establishment uses STW in 2009, and the proportion of workers affected. For example, the expected growth rate of turnover between 2008–2009 is negatively associated with use of STW, and an indicator for turnover decline between 2007–08 is positively associated with use of STW. Self-reported profitability also shows that negative shocks are strongly associated with use of STW. Establishments which report “unsatisfactory” profits for 2008 are 10 percentage points more likely to use STW in 2009 than those reporting “very good” profits. The proportion of workers affected by STW is more than 30 percentage points higher for these establishments.

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

¹⁹This is a similar model to that estimated by Boeri & Bruecker (2011).

²⁰The Tobit model interprets the proportion of workers covered as a continuous variable censored at zero.

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.²¹

Table 5 also shows that establishments which reported labour shortages in 2008 were *not* significantly more likely to use STW, and in fact had a smaller proportion of workers on STW. We also do not find a significant effect for exporting plants or for “high-tech” plants. These insignificant results show that any relationship in the raw data is driven by the industry of establishments, which we are controlling for here.²²

Table 6 estimates the same models for the probability of using WTA and the proportion of workers covered by WTA. Note that the coefficient estimates are quite different, indicating that different factors were associated with the use of WTA. Poorly-performing establishments are not more likely to use WTA, and in fact use of WTA and the proportion of workers covered increase rather than decrease with profitability. This 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. Nevertheless, WTA may still be a way of dealing with a temporary decline in labour demand without resorting to declines in employment.

²¹Deeke (2005) finds a similar result based on earlier waves of the IAB survey.

²²The coefficients on industry are large and highly significant for manufacturing industries in these regressions.

	<i>Prob. of using STW</i>		<i>Prop. of workers affected by STW</i>	
	<i>Marg. eff.</i>	<i>S.E.</i>	<i>Marg. eff.</i>	<i>S.E.</i>
Expected growth rate of turnover 2008-09	-0.003***	(0.000)	-0.015***	(0.001)
Actual turnover declined between 2007-08 (1=yes)	0.040***	(0.007)	0.154***	(0.030)
Self-reported risk of firm closure (1=yes)	0.015	(0.010)	0.028	(0.040)
High competitive pressure 2009 (1=yes)	0.009	(0.008)	0.064	(0.036)
High competitive pressure 2008 (1=yes)	-0.008	(0.007)	-0.041	(0.032)
Proportion of output exported	0.000	(0.000)	0.001	(0.001)
Self-reported profitability 2008 (base=very good)				
Good	0.012	(0.011)	0.051	(0.048)
Satisfactory	0.025*	(0.013)	0.106*	(0.052)
Sufficient	0.060**	(0.019)	0.235***	(0.058)
Unsatisfactory	0.095***	(0.028)	0.345***	(0.069)
Labour shortages reported in 2008 (1=yes)	-0.009	(0.007)	-0.081*	(0.032)
High share of R&D activities (1=yes)	0.016	(0.010)	0.065	(0.038)
Technical state of establishment (base=state of the art)				
2	0.008	(0.009)	0.029	(0.042)
3	0.018	(0.011)	0.100*	(0.046)
4	0.043	(0.025)	0.170*	(0.079)
obsolete	0.019	(0.063)	0.045	(0.373)
Proportion of qualified workers	-0.031*	(0.014)	-0.145*	(0.066)
Proportion of women	-0.034*	(0.015)	-0.075	(0.077)
Proportion of part-time workers	-0.095***	(0.023)	-0.670***	(0.123)
Proportion of fixed-term workers	-0.087*	(0.044)	-0.404*	(0.196)
Proportion of agency workers	-0.114	(0.062)	-0.598*	(0.300)
Proportion of owners working in plant	-0.148***	(0.032)	-0.786***	(0.167)
Independent plant (1=yes)	0.005	(0.011)	0.050	(0.052)
Headquarters (1=yes)	-0.020	(0.011)	-0.043	(0.060)
Firm managed by owner (1=yes)	0.017	(0.010)	0.059	(0.047)
Firm managed by prof. manager (1=yes)	0.008	(0.012)	-0.014	(0.049)
Chamber of commerce membership (1=yes)	0.011	(0.017)	0.056	(0.095)
Firm-level bargaining (1=yes)	0.004	(0.012)	-0.031	(0.052)
Industry-level bargaining (1=yes)	-0.004	(0.007)	-0.035	(0.036)
Works council (1=yes)	0.001	(0.009)	0.060	(0.042)
Pseudo- R^2		0.379		0.359
N		6,156		6,087

Table 5: Probit estimates of the probability of using STW and Tobit estimates of the proportion of workers affected by STW in the first six-months of 2009. Estimates also include dummies for Bundesland, 1-digit sector and (log) employment in 2008 and 2009. Marginal effects for the Tobit model refer to the marginal effect on the censored mean; see Cameron and Trivedi (2009,p.527).

	<i>Prob. of using WTA</i>		<i>Prop. of workers affected by WTA</i>	
	<i>Marg. eff.</i>	<i>S.E.</i>	<i>Marg. eff.</i>	<i>S.E.</i>
Expected growth rate of turnover 2008-09	-0.000	(0.000)	-0.001	(0.001)
Actual turnover declined between 2007-08 (1=yes)	0.012	(0.015)	0.020	(0.021)
Self-reported risk of firm closure (1=yes)	0.000	(0.022)	-0.004	(0.029)
High competitive pressure 2009 (1=yes)	0.001	(0.018)	0.004	(0.025)
High competitive pressure 2008 (1=yes)	0.051**	(0.016)	0.069**	(0.022)
Proportion of output exported	-0.001	(0.000)	-0.001*	(0.001)
Self-reported profitability 2008 (base=very good)				
Good	-0.052	(0.027)	-0.064	(0.034)
Satisfactory	-0.052	(0.028)	-0.082*	(0.036)
Sufficient	-0.073*	(0.031)	-0.112**	(0.042)
Unsatisfactory	-0.107**	(0.037)	-0.182***	(0.050)
Labour shortages reported in 2008 (1=yes)	0.020	(0.016)	0.050*	(0.022)
High share of R&D activities (1=yes)	0.091***	(0.024)	0.107***	(0.029)
Technical state of establishment (base=state of the art)				
2	-0.010	(0.020)	-0.016	(0.027)
3	-0.025	(0.022)	-0.034	(0.031)
4	0.011	(0.042)	0.017	(0.059)
obsolete	-0.291*	(0.140)	-0.490	(0.333)
Proportion of qualified workers	0.104***	(0.031)	0.143**	(0.045)
Proportion of women	-0.130***	(0.032)	-0.179***	(0.050)
Proportion of part-time workers	-0.107**	(0.038)	-0.194**	(0.063)
Proportion of fixed-term workers	0.037	(0.077)	0.097	(0.103)
Proportion of agency workers	0.107	(0.135)	0.167	(0.151)
Proportion of owners working in plant	-0.442***	(0.072)	-0.997***	(0.117)
Independent plant (1=yes)	0.026	(0.031)	0.048	(0.037)
Headquarters (1=yes)	0.079*	(0.037)	0.108*	(0.042)
Firm managed by owner (1=yes)	-0.057	(0.029)	-0.059	(0.035)
Firm managed by prof. manager (1=yes)	0.002	(0.032)	0.023	(0.035)
Chamber of commerce membership (1=yes)	0.063	(0.033)	0.080	(0.050)
Firm-level bargaining (1=yes)	0.101**	(0.032)	0.119***	(0.036)
Industry-level bargaining (1=yes)	0.060***	(0.017)	0.077**	(0.024)
Works council (1=yes)	0.066**	(0.025)	0.076*	(0.030)
Pseudo- R^2	0.201		0.132	
N	6,180		6,161	

Table 6: Probit estimates of the probability of using WTA and Tobit estimates of the proportion of workers using WTA in the first six-months of 2009. Estimates also include dummies for Bundesland, 1-digit sector and (log) employment in 2008 and 2009. Marginal effects for the Tobit model refer to the marginal effect on the censored mean; see Cameron and Trivedi (2009,p.527).

6.2 The impact of policy measures

6.2.1 STW

As noted in Section 2, an assessment of the impact of STW on the response to the crisis is plagued by an extreme selection problem. Establishments which used STW did so in part because they experienced a larger fall in sales in 2009. Figure 14 illustrates this clearly. In the left-hand panel we plot the density of sales growth between 2008 and 2009 for establishments which reported being affected by the crisis, split between those which used STW in 2009 and those that did not.

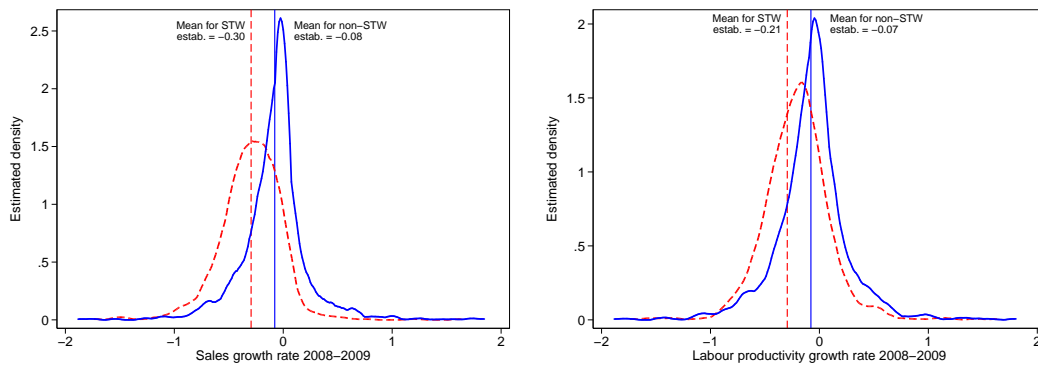


Figure 14: Distribution of sales growth and labour productivity growth rates between 2008 and 2009 for establishments which reported being affected by the crisis, split between those which reported using STW in 2008 and those that did not.

Sales growth is substantially worse for the STW establishments. Our estimates of the employment response to sales shocks in Section 5 suggest that larger negative shocks to sales will cause greater labour hoarding (a greater fall in labour productivity) because $\gamma^n < 1$. In the right-hand panel of Figure 14 we show that this is exactly what happened. The STW establishments had larger falls in labour productivity (greater labour hoarding) during 2009. However, it is important to realise that this observed labour hoarding is *not* the result of the use of STW. Instead, it is a function of the greater output shock faced by these establishments. In fact, the difference in the fall in labour productivity between the two types of establishment is *smaller* than the difference in the fall in sales, which suggests that, for a given fall in sales, STW establishments reduced employment more than non-STW establishments.

To examine the effectiveness of STW on job and worker flows more formally, we use a difference-in-difference variant of Equation (3). We first separate establishments into a treatment and a control group. The treatment group are those establishments which made use of STW in the first six months of 2009, and the control group are those which did not. Define STW_i as a dummy variable which takes the value 1 for

establishments in the treatment group and zero otherwise. Define D_t^{09} as a dummy variable which takes the value 1 in 2009 and zero otherwise. To simplify notation, define $y_{it}^+ \equiv \Delta y_{it} \cdot 1(\Delta y_{it} > 0)$ and $y_{it}^- \equiv \Delta y_{it} \cdot 1(\Delta y_{it} < 0)$. Interacting Equation (3) with the treatment indicator and the indicator for 2009 gives us the following difference-in-difference model:

$$\begin{aligned} \Delta n_{it} = & \alpha_1^n + \beta_1^n y_{it}^+ + \gamma_1^n y_{it}^- + \beta_2^n (y_{it}^+ D_t^{09}) + \gamma_2^n (y_{it}^- D_t^{09}) + \\ & \beta_3^n (y_{it}^+ \text{STW}_i) + \gamma_3^n (y_{it}^- \text{STW}_i) + \beta_4^n (y_{it}^+ \text{STW}_i D_t^{09}) + \gamma_4^n (y_{it}^- \text{STW}_i D_t^{09}) + a_i^n + \epsilon_{it}^n. \end{aligned} \quad (4)$$

The treatment indicator STW_i is not included because we include a full set of establishment fixed-effects a_i^n . In this model, the parameters we are most interested in are γ_1 to γ_4 , which give the response of employment to a negative output shock in the control group and the treatment group before and during the crisis. γ_4 is the difference-in-difference estimate of this response. If establishments in the treatment group have smaller responses to output shocks because they practice greater labour hoarding, then we would predict $\gamma_4 < 0$.

	<i>Job flows</i>	<i>Hires</i>	<i>Separations</i>	<i>Layoffs</i>
$\hat{\gamma}_1$	0.038*** (0.014)	0.012 (0.011)	-0.025** (0.011)	-0.017** (0.009)
$\hat{\gamma}_2$	0.004 (0.021)	0.006 (0.016)	0.002 (0.017)	0.004 (0.012)
$\hat{\gamma}_3$	0.000 (0.038)	-0.021 (0.028)	-0.021 (0.035)	-0.038 (0.033)
$\hat{\gamma}_4$	0.081** (0.039)	0.043 (0.030)	-0.039 (0.036)	-0.021 (0.032)
Estab. with < 50% coverage:				
$\hat{\gamma}_4$	0.141*** (0.049)	0.063 (0.035)	-0.079** (0.039)	-0.072** (0.031)
Estab. with 50 – 75% coverage:				
$\hat{\gamma}_4$	0.177*** (0.070)	0.092 (0.061)	-0.085** (0.035)	-0.046 (0.029)
Estab. with > 75% coverage:				
$\hat{\gamma}_4$	-0.045 (0.064)	-0.019 (0.048)	0.026 (0.071)	0.041 (0.068)

Table 7: Difference-in-difference estimates of the impact of STW on job flows hires and separations, estimated from Equation (4). Sample is a balanced panel of 3,470 establishments observed over the period 2005–2009. The regressions include the full set of controls used to estimate the probability of using STW (see Table 5).

The first column of Table 7 reports estimates of γ_1 – γ_4 from Equation (4) for a balanced panel of establishments observed in every year from 2005–2009. $\hat{\gamma}_1 = 0.038$, which is the estimated employment fall in response to an output shock for the control group in the “before” period (i.e. before 2009). γ_2 is estimated to be zero, which means that the response to output shocks did not change for the control group in 2009. Similarly γ_3 is also estimated to be zero, which means that the response to output shocks for the treatment group was similar to the control group in the pre-crisis period. But γ_4 is estimated to be positive and significant at the 5% level, indicating that STW establishments had *larger* falls in employment for a given output shock.

The remaining columns of Table 7 decompose this job flow differential into its constituent worker flows: hires, separations and layoffs. These are essentially parametric estimates of the relationships plotted in Figures 9 and 10. Note that the response of hires to negative sales shocks is small, and this is reflected in the small and generally insignificant estimates in the second column. Larger responses come through the separation function, and a majority of that response is due to increases in layoffs. For example, the total estimated treatment effect on job flows is 0.081. This can be decomposed into a steeper (more negative) separation response of -0.039 and a steeper (more positive) hiring response of 0.043. Thus about $0.039/0.081 = 48\%$ of the increased job loss of STW establishments came from increased separations, while the remaining 52% came from reduced hires. Further, a majority of the separations ($-0.021/-0.039 = 54\%$) of these separations can be attributed to layoffs rather than quits.

What can explain this finding? The rules governing the use of the STW scheme stipulate that workers may not be laid off during the period that STW is in use. However, our results suggest that STW only directly protects the jobs of those workers who are on short-time work.²³ In 2009 there were 1,202 establishments in the sample which stated that they used STW in the first six months of that year. Of these, 711 had job losses over that same six month period. But only 3 establishments had job losses which were greater than the number of non-STW workers.²⁴

Most establishments only used STW for a minority of their workforce. In Figure 15 we plot the distribution of “unprotected jobs” amongst STW establishments in 2009. 75% of establishments had less than 25% of their jobs protected by STW programs, and so for the great majority it was possible to continue to make employment reductions despite the use of STW. Employment reductions of more than 10% are unusual even in the face of large negative shocks to sales, and so it appears that STW did not prevent

²³A second possible explanation is that the employment adjustment (which is recorded over the first six months of 2009) occurred before the use of STW if STW started after January of 2009.

²⁴We assume that this is caused by measurement error, either in the variable recording employment or the variable recording the number of workers covered by STW.

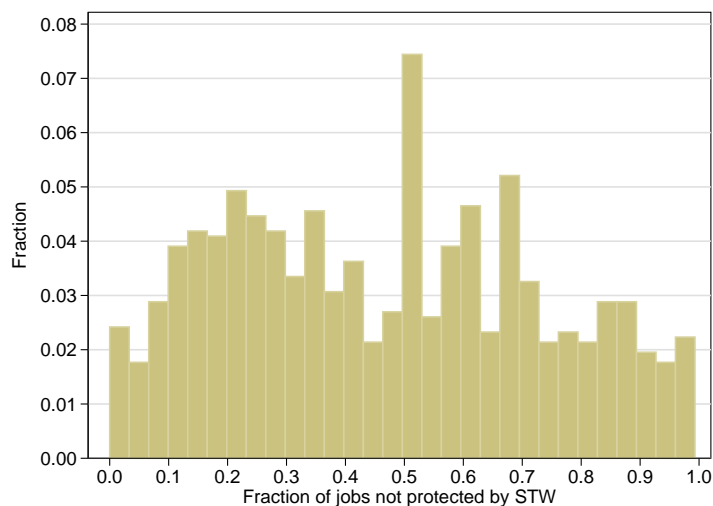


Figure 15: Fraction of jobs which were not protected by STW programs in 2009 amongst those establishments which operated STW. 75% of establishments have less than 25% of their jobs protected by STW programs.

this kind of adjustment.

In the bottom panel of Table 7 we show that the additional employment losses of STW establishments are confined to those establishments with a smaller fraction of workers covered by STW. Splitting the treatment group into three according to the proportion of workers covered reveals that the treatment effect is large and positive for those establishments with less than three-quarters of their workforce on STW. For establishments with more than three-quarters on STW, employment losses are estimated to be smaller than in the control group ($\hat{\gamma}_4 = -0.076$), although this is imprecisely estimated and insignificantly different from zero.

However, it is clear that the additional job losses incurred by STW establishments is almost certainly the result of selection into the program. Although the estimate controls for pre-existing differences in adjustment response (by using a DiD), and is conditional on the change in sales, it still seems plausible that STW establishments faced larger (unobserved) negative shocks in addition to those captured by the change in sales. To deal with this problem requires an instrument which is correlated with the decision to use STW in 2009, but which is not correlated with the shock in 2009. Boeri & Bruecker (2011) suggest that prior use of STW may be a suitable instrument. First, prior use of STW increases indicates that establishments are familiar with the program and are more likely to use it in 2009. Second, Boeri & Bruecker argue that the 2009 shock was uncorrelated with earlier output shocks which caused prior use of STW.

Some evidence to support this idea is available by comparing the pattern of sales shocks for establishments which use STW in 2009 and those which used STW in 2006.

As we have already seen, establishments which used STW in 2009 had much larger falls in sales in that year. However, establishments which used STW in 2006 have almost exactly the same fall in sales in 2009 as establishments which did not use STW in 2006. But use of STW in 2006 is strongly correlated with use of STW in 2009.²⁵

	<i>OLS</i>	<i>IV</i>
$\hat{\gamma}_1^n$	0.038*** (0.014)	0.058 (0.037)
$\hat{\gamma}_2^n$	0.004 (0.021)	-0.001 (0.055)
$\hat{\gamma}_3^n$	0.000 (0.038)	0.076 (0.248)
$\hat{\gamma}_4^n$	0.081** (0.039)	-0.059 (0.241)

Table 8: Comparison of OLS and IV Difference-in-difference estimates of the impact of STW on job flows, estimated from Equation (4). Sample is a balanced panel of 3,470 establishments observed over the period 2005–2009. STW use in 2009 instrumented with use in 2006 and 2003. The regressions include the full set of controls used to estimate the probability of using STW (see Table 5).

Table 8 compares the OLS and IV estimates of the DiD model. Unfortunately, the explanatory power of the instruments in the first stage regression is not enough to draw any reliable conclusions from these results.²⁶ Essentially, we find that prior use of STW does not have enough explanatory power to predict use of STW in 2009. The IV estimates are therefore very imprecise, although we do find that the DiD estimate is now negative rather than positive, as expected.

6.2.2 WTA, PEC and labour shortages

In addition to STW, we are also interested to see if the response to sales shocks was ameliorated in establishments which used WTA, which had negotiated a pact for employment and competitiveness (PEC) and which had experience labour shortages in the period leading up to the 2008-09 downturn. Each of these factors has been suggested as a possible cause of the apparent resilience of the German labour market. To evaluate the impact of these factors we use a simplified version of Equation 4 which estimates β and γ separately for establishments in the treatment and control group. In the case of

²⁵A regression of STW (2009) on STW (2006) has a coefficient of 0.29 with a standard error of 0.04.

²⁶There are five endogenous variables in the DiD model (STW, STW interacted with y^- and y^- and STW interacted with y^+D^{09} and y^-D^{09}). The F statistics from these first stage regressions are always less than the recommended value.

WTA, we have:

$$\Delta n_{it} = \alpha_1^n + \beta_1^n y_{it}^+ + \gamma_1^n y_{it}^- + \beta_2^n (y_{it}^+ \text{WTA}_i) + \gamma_2^n (y_{it}^- \text{WTA}_i) + a_i^n + D_t^{09} + \epsilon_{it}^n. \quad (5)$$

In this case it is less appropriate to use a DiD methodology because the characteristics of the establishment are already set before the 2008-09 crisis begins. Equation (5) therefore simply compares the slope of the adjustment response between different types of plant in 2009.

	<i>Job flows</i> $\hat{\gamma}_2^n$	<i>Hires</i> $\hat{\gamma}_2^h$	<i>Separations</i> $\hat{\gamma}_2^s$	<i>Layoffs</i> $\hat{\gamma}_2^l$
Used WTA in 2008	0.035* (0.019)	-0.001 (0.016)	-0.035** (0.014)	-0.025** (0.010)
Used WTA in 2008: <80% of workers covered	0.018 (0.029)	0.013 (0.023)	-0.005 (0.022)	0.004 (0.016)
80-100% of workers covered	0.045 (0.030)	-0.007 (0.026)	-0.052** (0.023)	-0.039** (0.017)
All workers covered	0.041* (0.023)	-0.003 (0.019)	-0.044** (0.017)	-0.035*** (0.013)
Utilised a PEC in 2008	-0.034 (0.035)	-0.026 (0.029)	0.008 (0.026)	0.017 (0.019)
Experienced labour shortages in 2008	0.044** (0.019)	0.026* (0.016)	-0.018 (0.014)	-0.019* (0.010)

Table 9: OLS estimates of the impact of WTA, PEC and labour shortages on job and worker flows, estimated from Equation 5. The coefficients reported are γ_2^n from Equation 5, and thus represent the additional impact of the treatment on flows relating to negative sales shocks. The regressions include the full set of controls used to estimate the probability of using WTA (see Table 6).

In Table 9 we report estimates of γ_2 from Equation (5). Establishments with WTA in place in 2008 have significantly larger job flows for a given fall in sales ($\hat{\gamma}_2^n = 0.035(0.019)$). Taken at face value, this contradicts the assertion that WTA helped to protect jobs. However, as with the result for STW, we suspect that greater negative selection effects could explain this result. We also note that, unlike STW, there is no evidence that having a greater proportion of the workforce covered by WTA helps to make employment more resilient to output shocks. The estimates of γ_2^n are actually larger for establishments with a greater proportion of the workforce covered. As with STW, the relationship between WTA and employment adjustment comes through separations and not hires. None of the estimates of γ_2^h are significantly different from zero, while establishments with WTA did have significantly more separations. Furthermore, the increase in separations is very similar to the increase in layoffs.

In contrast, establishments which had agreed a PEC in 2008 produce a negative estimate of γ_2^n , indicating that these establishments had smaller job flows. However, the estimate is imprecise. We cannot reject the hypothesis that γ_2^n is equal for PEC and non-PEC establishments, but nor can we reject the hypothesis that $\gamma_1^n + \gamma_2^n = 0$, which would indicate that establishments with a PEC had a zero short-run employment response to output shocks. These results are consistent with those found by Bellmann & Gerner (2012).

Finally, we consider whether establishments which reported labour shortages in 2008 were more likely to hoard labour in 2009 (see Section 2.4 for a discussion of this hypothesis.) We do not have a precise measure of labour shortages, but establishments were asked whether the company could have achieved an increase in turnover with the resources available in that year. We code an establishment as having labour shortages if it stated that it would *not* have been possible to meet an increase in output without hiring more staff. We do not find any support for the notion that establishments which faced labour shortages (or at least those that did not have excess labour) had smaller employment losses. In fact, the estimate of γ_2^n is positive and significant.

7 Policy measures and the pattern of recovery

The third objective of this study 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. Although the survey results for 2010 are now available at the time of writing, information on sales performance is only available for 2009. To assess whether establishments have successfully recovered from the crisis, we make use of a forward-looking question asked in each year: “How do you expect business volume to develop in the current year, as compared to the previous year?”. Respondents are also asked for an estimated of the percentage change in sales between the current and the previous year.

In Figure 16 we plot the development of these business expectations over time, including the most recent year. The left hand-panel shows how business expectations of establishments which used STW in 2009 plummeted. A comparison with the retrospective reported change in sales between 2008 and 2009 (Figure 14 shows that these

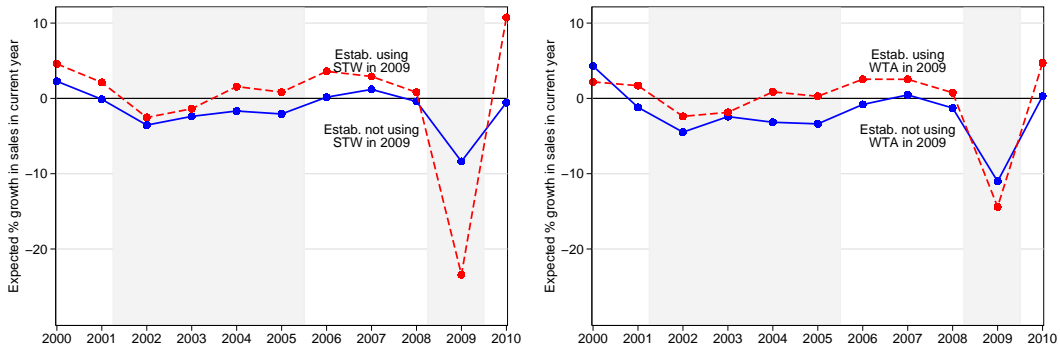


Figure 16: Expected change in sales 2000–2010, for establishments which reported being affected by the crisis, split between use of STW in 2008 and those that did not (left-hand panel) and by use of WTA in 2008 (right-hand panel).

expectations were accurate, on average.) Figure 16 also shows that STW establishments expected to recover quite strongly in 2010, in particular in comparison with non-STW establishments. The right-hand panel makes a similar comparison for WTA and non-WTA establishments. As noted before, WTA was much less of a crisis instrument, and therefore differences are much smaller.

A further simple test of whether establishments which used STW or WTA in 2008 faced ongoing problems is to examine the responses to the question: “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. We estimate a linear model of the form:

$$\Pr(P_i = 1) = \alpha + \beta \text{STW}_i + \gamma \text{WTA}_i + \mathbf{x}'_i \boldsymbol{\delta} + \epsilon_i \quad (6)$$

where P_i is a dummy variable indicating that human resource problems are a potential problem in establishment i . The regressions include the same set of control variables \mathbf{x} used in Tables 5 and 6. Table 10 reports the results of these regressions for a variety of potential human resource issues.

There are significant differences in the raw proportion reporting personnel problems between establishments which used STW and WTA in 2009 and those which did not. Some of these differences are quite large. For example, 36% of establishments which used WTA in 2009 reported that there would be a “high burden from wage costs” in future years, compared to 25% of establishments which did not use WTA in 2009. In fact in every case the proportion of establishments reporting problems is greater in the treatment group. In some cases these differences seem incompatible. For example, a higher proportion of STW establishments report that they have too high a staff level and

	<i>Did not use STW in 2009</i>	<i>Used STW in 2009</i>	<i>Raw difference</i>	<i>OLS difference</i>
(a) Staff level too high	0.049	0.108	0.060***	0.025**
(b) High staff turnover	0.041	0.061	0.020***	0.009
(c) Difficulties in hiring qualified workers	0.351	0.523	0.172***	0.015
(d) Staff shortages	0.079	0.115	0.036***	0.027**
(e) High burden from wage costs	0.250	0.360	0.110***	0.039**
(f) Other personnel problems	0.033	0.049	0.016***	0.001

	<i>Did not use WTA in 2009</i>	<i>Used WTA in 2009</i>	<i>Raw difference</i>	<i>OLS difference</i>
(a) Staff level too high	0.041	0.073	0.032***	0.005
(b) High staff turnover	0.030	0.057	0.027***	0.004
(c) Difficulties in hiring qualified workers	0.270	0.486	0.216***	0.050***
(d) Staff shortages	0.061	0.108	0.046***	0.005
(e) High burden from wage costs	0.220	0.313	0.093***	0.039***
(f) Other personnel problems	0.030	0.041	0.011***	0.010**

Table 10: Probability of human resource problems in future years. 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?”. OLS difference are estimates of β and γ from Equation (6), and include controls for establishment size, sector, location as well as the explanatory variables used in Tables 5 and 6.

that wage costs are too high, but at the same time report that they face staff shortages and difficulties in hiring qualified workers. This seems to suggest a mismatch between establishments’ desired levels of skilled workers and their actual employment.

However, most of these raw differences are accounted for by differences in observable characteristics between the treatment and control plants. After controlling for establishments size, sector and location and measures of performance, STW and WTA establishments are both significantly more likely to report a high burden from wage costs, and STW establishments are significantly more likely to report too high a staff level. These results are only suggestive however, since we have only controlled for observable selection into the treatment, and the information is only available in a single cross-section. To confirm these results we would need to track establishments hires and separations of skilled and unskilled workers over the post-crisis period.

8 Conclusions

A large number of recent studies have suggested a host of potential explanations for the resilience of the German labour market during the 2008-09 crisis. However, there is no clear consensus. While some authors have argued that the use of STW was key, others have pointed out 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 this study we have tested some of these explanations using micro data on a panel of German establishments observed over the period 1993–2010.

The key points are as follows:

1. Establishments in the survey experienced a significant fall in sales during the crisis, but a much smaller fall in employment, consistent with the macro picture.
2. Establishments which reported being directly affected by crisis (so-called crisis establishments) were more likely to be in high-tech manufacturing sectors, and were more likely to be part of a larger organisation.
3. The short-run relationship between sales shocks and employment is relatively weak. Negative shocks to sales translate into only small changes in employment, leading by definition to a reduction in labour productivity.
4. However, the estimated response to sales shocks is quite stable over time: there is no evidence of greater labour hoarding in the most recent downturn. In fact, crisis establishments exhibited a *larger* employment response to a given output shock than non-crisis establishments.
5. The use of STW schemes is very strongly associated with contemporaneous falls in sales, more so than other policy measures such as WTA and PECs.
6. Establishments using STW during the crisis did experience much larger falls in labour productivity than non-STW establishments, but this was largely due to the larger falls in output, not because of smaller falls in employment. In fact, STW establishments had significantly larger falls in employment.
7. We believe that despite conditioning on the change in sales, this result reflects additional (unobserved) negative shocks experienced by STW establishments.
8. We also find no evidence that WTA played an important role in preventing layoffs. This is likely because the size of WTA surpluses at the advent of the global crisis were too small to have any significant buffer effect.
9. The fall in sales experienced by STW establishments in 2009 was probably very short-lived, because there was a strong rebound in managers’ expectations of performance in 2010. Indeed, managers in STW establishments had far more positive expectations for sales growth in 2010 than those in non-STW establishments.

This itself supports the idea that STW was *not* being used by establishments with longer-term structural weaknesses.

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A Additional tables

	Number of establishments	West Germany	East Germany	Employment (unweighted)	Employment (weighted)	Employment (weighted)
<i>Unbalanced sample</i>						
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
<i>Balanced panel 2000–2010</i>						
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 A.1: IAB establishment panel: selected sample. The small number of establishments in East Germany before 1996 are establishments located in West Berlin. The unbalanced panel is weighted by cross-section weights, the balanced panel is weighted by longitudinal weights.

	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 A.2: 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 A.3: IAB establishment panel: outcome measures from the balanced panel 2000–2010, weighted by longitudinal weights

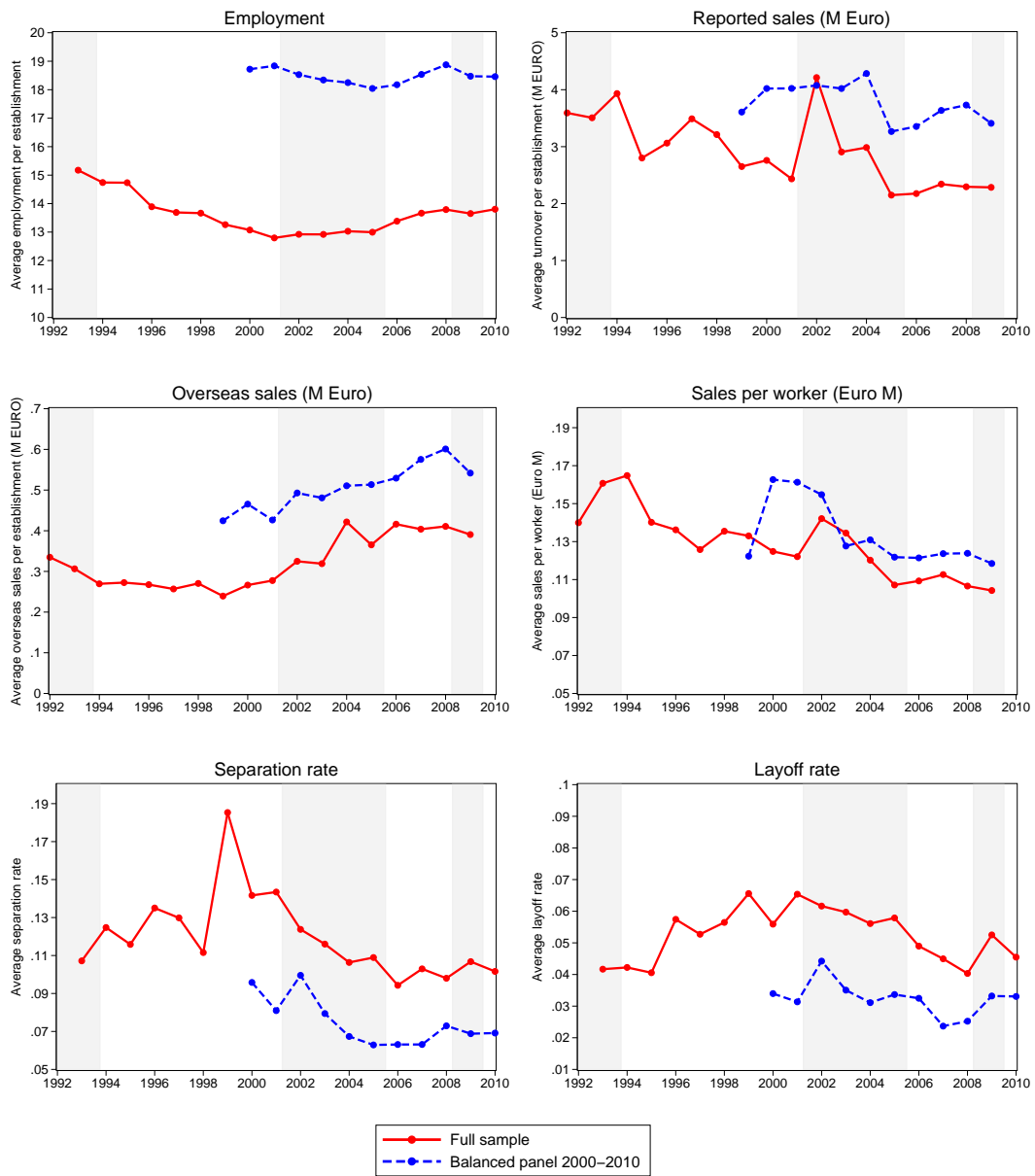


Figure A.1: Trends in employment, sales, separation rates over the sample period. The full sample is weighted by cross-section weights; the balanced panel is weighted by longitudinal weights. Recession dates are those used by Burda & Hunt (2011), originally from *Sachverständigenrat* (2010) and cover 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.

B Questions used in the IAB establishment panel on worker turnover

The following questions are used to determine hires and separations:

1. Did you recruit staff in the first half of <current year>?
2. Please indicate the total number of workers recruited.
3. Did you register any staff leaving your establishment/office in the first half of <current year>?
4. Please indicate the total number of workers who left your establishment.

Respondents are also asked to distribute the total number of employees who left among the following categories:

1. Resignation on the part of the employee
2. Dismissal on the part of the employer
3. Leaving after termination of the in-company training
4. Expiration of a temporary employment contract
5. Termination of a contract by mutual agreement
6. Transfer to another establishment within the organization
7. Retirement after reaching the stipulated pension age
8. Retirement before reaching the stipulated pensionable age
9. Occupational invalidity/ disability
10. Other