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Temporary Agency Work and the Great Recession

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Abstract

We investigate with German data how the use of temporary agency work has helped establishments to manage the economic and financial crisis in 2008/09. We examine the (regular) workforce development, use of short-time work, and business performance of establishments that made differential use of temporary agency work prior to the crisis. Overall, our results suggest that establishments with a greater use of temporary agency work coped better with the sharp decline in demand and made less frequent use of government-sponsored short-time work schemes.

JEL classification: E32, J23, L23, J68

Key words: labour demand, employment adjustment, economic crisis, temporary agency work, short-time work, establishment data

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1 Introduction

The performance of the German labour market during the economic and financial crisis 2008–09 (“Great Recession”) has spurred a lot of interest from academics and policy makers. Total employment in Germany remained almost constant, although output declined even more heavily than in the USA. This remarkable resilience of the German labour market has been linked to differences in the way that German establishments responded to the crisis. Rather than laying off workers on a large scale, German establishments adjusted their labour input primarily at the intensive margin, by reducing overtime, by using working time accounts, and by taking recourse to government-sponsored short-time work schemes (STW).¹

However, there was also one source of external adjustment that German establishments have used heavily: temporary agency work (TAW). The number of temporary agency workers in Germany declined by almost 200,000 between the second quarter of 2008 and the second quarter of 2009 – a larger absolute decline than the fall in total employment in Germany during the economic and financial crisis. The magnitude of this decline is all the more remarkable given that temporary agency work accounts for only about 2% of total employment in Germany. Surprisingly, however, the role of temporary agency work has so far received little attention in studies on the “German labour market miracle”. We explore this role in detail, making use of high-quality establishment panel data. In particular, we relate various employment outcomes and measures of establishments’ business performance in the years 2009 (main crisis period) and 2010 (early recovery period) to the pre-crisis share of temporary agency workers in establishments’ workforces.

Our main findings are the following. Between 2008 and 2009, establishments with a greater pre-crisis use of TAW experienced a larger decline in total employment (regular plus temporary agency employment) and a similar decline in regular employment. But between 2008 and 2010, they showed a (weakly significant) smaller decline in regular employment. Moreover, establishments with a greater pre-crisis use of TAW made less use of government-sponsored short-time work schemes and were less likely to report a financial loss in the main crisis year 2009. Overall, these results suggest that (the reduction of) temporary agency work served as an alternative to short-time work and that establishments with a greater pre-crisis use of TAW coped better with the sharp and unforeseen decline in demand.

Our research relates to two strands in the literature. First, we add to the existing studies on

¹Section 2 provides background information on the economic and financial crisis in Germany and reviews the terms and use of government-sponsored short-time work schemes by German establishments.

the German labour market performance in the Great Recession (Bellmann et al., 2015; Burda and Hunt, 2011; Boeri and Bruecker, 2011; Bohachova et al., 2011; Möller, 2010)).² These studies, however, do not focus on the role of temporary agency employment as a potentially stabilizing factor.

Second, we address the more general question whether temporary agency employment is able to stabilize regular employment. In general, this question is notoriously difficult to answer as establishments choose all labour inputs jointly, taking business expectations into account. The 2008/2009 economic and financial crisis, however, provides an attractive setting for identification as the drop in demand faced by the establishments was not only exceptionally large, but also unanticipated and fast.³

The remainder of the paper is structured as follows. The next section provides some background on the German (labour market) experience during the Great Recession. Section 3 describes the data and Section 4 the empirical strategy we employ in the analysis. Section 5 presents our main results. Section 6 discusses various robustness checks we conducted. Finally, Section 7 summarizes our main findings and concludes.

2 The Great Recession in Germany

The performance of the German labour market in the Great Recession has already been studied in a number of papers.⁴ We therefore review only briefly some key characteristics which serve as a starting point for our subsequent empirical analysis.

These key characteristics are illustrated in Figure 1. The dotted line (*GDP*) shows that Germany experienced a pronounced decline in output during the Great Recession. Between the first quarter of 2008 (peak) and the first quarter of 2009 (trough), real GDP declined by 6.8% (seasonally adjusted data), a fall in GDP that is larger than the one suffered in the US (Burda and Hunt, 2011). However, the nature of the recession differed considerably between both countries. In the US, the main driver of the recession was domestic demand, which plummeted as a consequence of the bursting of the housing bubble. In Germany, in contrast, the recession

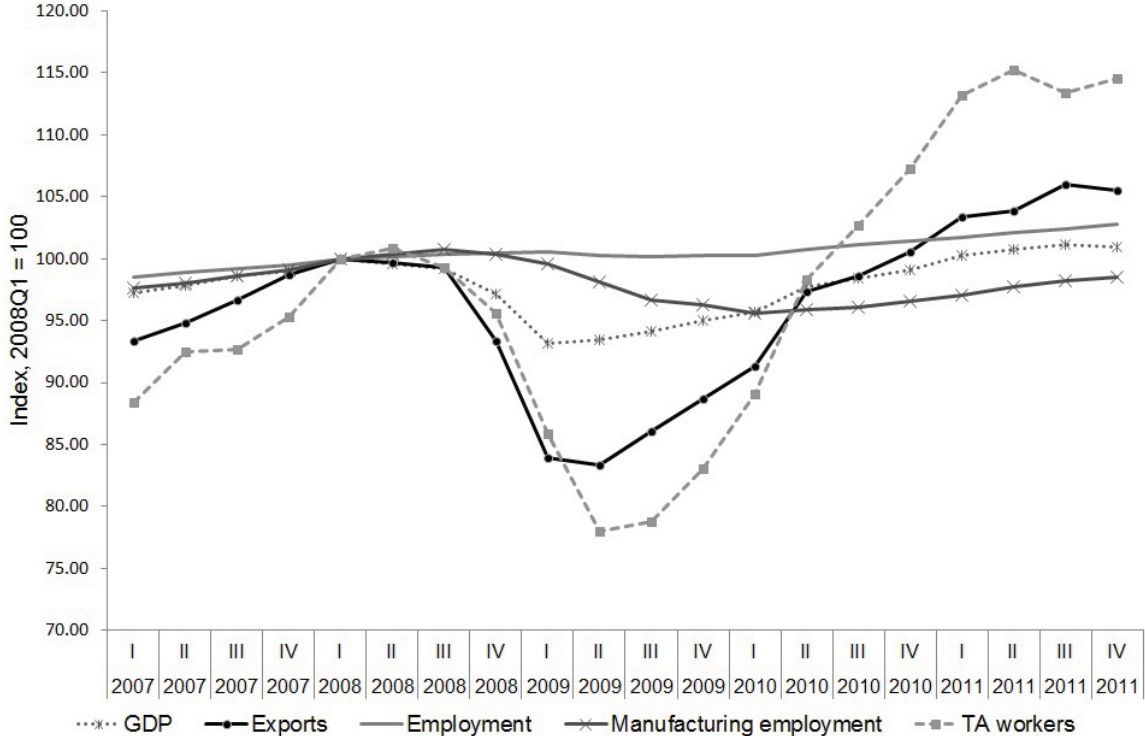
²For a cross-country overview, see, e.g., OECD (2009, 2010).

³In this strand of the literature, a recent and closely related study is by Hirsch (2016), who uses German linked employer-employee data to analyse the relationship between an establishment's use of temporary agency work and regular workers' job stability. He finds that individual job stability is significantly larger at establishments which use temporary agency work than at establishments which do not. In contrast to Hirsch (2016), we explicitly focus on the period of the Great Recession which, as we argue, should aid identification as it allows us to reduce concerns about reverse causality and simultaneity bias. In addition, we do not only consider regular workforce stability as an outcome, but also the use of short-time work and business performance.

⁴See Bellmann et al., 2015; Burda and Hunt, 2011; Boeri and Bruecker, 2011; Bohachova et al., 2011; Möller, 2010.

was primarily export-led, a consequence of the collapse of world trade.⁵ In the aforementioned time interval, 2008Q1 to 2009Q1, German exports declined by 16%. What is more, this decline in exports accounted for more than 100% of the decline in GDP. Although the contribution of the export decline to the fall in GDP was partly offset by a parallel decline in imports, overall only one fourth of the total drop in GDP in Germany can be attributed to a fall in domestic demand.

Figure 1: The Great Recession in Germany – selected indicators



Sources: German Federal Statistical Office and German Federal Employment Office.
 Note: Data are quarterly and seasonally adjusted.

Despite this enormous decline in output, employment remained almost unchanged in Germany (see solid grey line in Figure 1). This fact has led some to speak of a “German labour market miracle” (Burda and Hunt, 2011). However, a closer look at the performance of the German labour market during the Great Recession reveals that such portrayal requires some qualifications. First, the more export-intensive manufacturing sector did in fact experience a sizeable fall in employment – albeit with a certain time lag. Between the third quarter of 2008 (peak) and the first quarter of 2010 (trough), manufacturing employment declined by 5%; and it had yet to return to pre-crisis levels by the end of 2011.⁶ Second, the number of temporary agency workers fell sharply and fast. Between the second quarter of 2008 and the second quarter

⁵According to the World Trade Organization (2010, p. 18), this was the “[...] largest decline in world trade in more than 70 years.”

⁶Although sizeable, this fall in employment is significantly smaller in magnitude than the decline of the manufacturing sector’s gross value added (−26% between 2008Q1 and 2009Q1).

of 2009, it declined by 23%. Given the high concentration of temporary agency work in manufacturing, it can be assumed that most of this decline took place in the manufacturing sector. This fall in the number of temporary agency workers was large also in absolute terms ($-176,000$). For comparison, total employment only declined between the first and the third quarter of 2009, and by a mere 139,000; and total manufacturing employment declined by 375,000 from peak to trough. Thus, even though temporary agency work only accounts for about 2% of total employment in Germany, it was of fundamental importance as an adjustment channel during the Great Recession.⁷

Surprisingly, however, the relationship between the dramatic decline in the number of temporary agency workers and the stability of (regular) employment has not received much attention. Instead, the most common explanation put forward in the literature for the striking performance of the German labour market during the Great Recession is that firms responded to the crisis by adjusting their labour input internally rather than externally. During the recession, both the number of hours per worker and output per worker-hour declined substantially. The former was facilitated by a reduction of overtime, the use of working-time accounts, and government-sponsored short-time work schemes.⁸ The latter reflected “labour hoarding”, as firms feared the prospects of later costly and difficult recruitment of (skilled) personnel in the subsequent recovery (Möller, 2010). Of the adjustment mechanisms listed above, short-time work has attracted particular attention. Under these schemes, eligible establishments can temporarily reduce the working hours of (a fraction of) their employees, with the Federal Employment Agency partly making up for the employees’ foregone earnings. These schemes therefore help to preserve jobs at firms experiencing temporarily low demand and they greatly alleviate the financial burden of firms and employees that arises from a fall in demand. However, both firms and employees do have to bear some of the costs. For example, employers still have to fully pay wage components such as holiday pay and Christmas bonuses, and during the first six months of the scheme, they also have to cover 50% of the social security contributions of the affected employees. In total, these “residual costs” are estimated at 24–35% of the usual wage costs (Bach and Spitznagel, 2009). Employees, on the other hand, only receive a partial compensation of the foregone earnings.⁹

⁷For a descriptive overview of how using firms adjusted their TAW use during and after the Great Recession in Germany, see Müller (2014).

⁸Möller (2010) estimates that the total reduction in working time was equivalent to that of 1.39 million workers with average working hours, with the reduction in overtime accounting for 285,000, working time accounts for 244,000, and short-time work schemes for 360,000 thereof, respectively. Note that the reduction in the number of temporary agency workers stated above might well be larger in terms of “workers with average working hours” as the fraction of of full-time workers is larger in the temporary agency sector than in the overall economy.

⁹The Federal Employment Agency pays 60% (67% in the presence of children) of the foregone net earnings.

3 Data

3.1 Establishment data

The data set used for the analysis is the *IAB Establishment Panel*, which is provided by the Institute for Employment Research (IAB).¹⁰ It is a stratified sample of all establishments which employ at least one worker covered by social security. Strata are defined over regions, industries, and size classes, with larger establishments being oversampled. However, appropriate weights (inverses of individual sampling probabilities) are provided in the data which can be used to make results representative of the population. The IAB Establishment Panel started in 1993 with 4,265 establishments in West Germany. East German establishments were included in the Establishment Panel from 1996 onwards. After taking in several waves of additional establishments, the sample size increased to about 16,000 in 2010. Although participation is voluntary, the response rate of repeatedly interviewed establishments is quite high, amounting to about 80 percent.

The survey is very detailed and covers many different areas. Its main focus, however, is on labour demand. Among others, the survey includes detailed information about the total number of employees, the number of (additional) temporary agency workers, and several other aspects of workforce composition (e.g., by gender, skill, or contract type). These data refer to the 30th of June of a given year. In addition, a number of questions relates to the economic activity of establishments, including, e.g., their industry, their export share in sales, their technology status, and the collective bargaining regime in force. Also, the surveys in 2009 and, in particular, 2010 contain special questions on the economic crisis and its impact on establishments, such as on their use of short-time work schemes.

3.2 Industry-level data and the measure of crisis exposure

To construct a quantitative establishment-level variable of the exposure to the recession, we make use of the fact that the economic crisis in Germany was brought about first and foremost by a decline in exports, as described in Section 2. Specifically, we exploit the fact that the decline in foreign demand varied across industries within the manufacturing sector and that the export share in sales varied across establishments within a given industry.

Some collective bargaining agreements, however, stipulated that employers had to top up these payments to guarantee up to 90% of an employee's regular net earnings.

¹⁰The data are confidential but not exclusive. They are available for non-commercial research by visiting the research data centre of the German Federal Employment Agency at the IAB in Nuremberg, Germany. See <http://fdz.iab.de/en.aspx> for further information. Kölling (2000) and Fischer et al. (2009) provide detailed descriptions of the data set.

We proceed in two steps. First, we make use of the *OECD STAN Bilateral Trade Database by Industry and End-use Category*¹¹ to construct an industry-level measure of the (potential) drop in foreign demand which is exogenous to the German economy. For this purpose, we focus on the imports of Germany’s main trading partners from countries other than Germany.¹² We measure the change in foreign demand applying the following formula:

$$\Delta ForeignDemand_j = \sum_{p=1}^P \frac{Exports_{jD}^p}{\sum_{p=1}^P Exports_{jD}^p} \cdot \Delta Imports_{jp}^{ROW}, \quad (1)$$

where j denotes the two-digit industry (ISIC Rev.3) and p the partner country. $\Delta ForeignDemand_j$ is measured in % and refers to the change between 2007 and 2009 because the second half of 2008 was already affected by the collapse in trade. The changes in imports of Germany’s partner countries from the rest of the world (ROW) are weighted according to their importance for Germany’s exports. To rule out composition effects, these weights are fixed as of 2007. This strategy is very similar to the one employed by Autor et al. (2013) who instrument an US industry’s exposure to import competition from China by China’s exports to other high-income countries.

The measure specified in equation (1) is a rather coarse measure of an individual establishment’s exposure to the recession since not all establishments in an industry rely on exports and those that do, rely on exports to varying degrees. To measure the exposure of establishment i in industry j to a drop in foreign demand, we multiply the industry-level measure with the export share in sales of the establishment in 2007:

$$Shock_i = \Delta ForeignDemand_{j(i)} \cdot Exportshare_i. \quad (2)$$

This gives us the expected drop in sales of establishment i induced by the sharp decline in foreign demand. We code the variable in such a way that a more positive measure corresponds to a greater decline in foreign demand. Hence, the crisis exposure measure varies in two dimensions: (i) across industries according to the magnitude of the decline in foreign demand and (ii) within industries according to the varying importance of exports for the establishment’s total sales.

¹¹For further information, see <http://stats.oecd.org/> and Zhu et al. (2011).

¹²We focus on China, France, Italy, the Netherlands, the UK, and the US. In our base year 2007, the latter five countries were the largest destination markets for German exports. China was the 11th largest destination country in 2007 (the 4th largest in 2011) but also the most important destination in Asia and among the fastest growing destinations overall. In 2007, these six destinations accounted for about 40% of German exports.

4 Empirical strategy

To analyse if the pre-crisis use of temporary agency employment has helped German establishments to manage the 2008/09 economic and financial crisis, we relate outcomes in the main crisis period, 2009, and in the early recovery period, 2010, to the pre-crisis use of temporary agency employment:

$$Y_{it} = \alpha_t + \beta_t TAW share_{i08} + \gamma_t Shock_i + X'_{i08} \delta_t + u_{it}, \quad (3)$$

where i denotes establishments and t the time period, i.e. either 2009 or 2010. $TAW share_{i08}$ denotes the share of temporary agency workers in the total workforce as of June 30, 2008, that is shortly before the beginning of the economic and financial crisis, $Shock_i$ denotes the quantitative “crisis shock” measure, i.e. the expected establishment-level drop in sales induced by the decline in foreign demand as described in Section 3, and X_{i08} denotes a large set of pre-crisis control variables. The idea is to compare establishments with very similar pre-crisis characteristics that have been exposed to the same drop in demand during the crisis, but that relied on temporary agency employment to varying degrees. The coefficient of interest is hence β_t .

As outcome variables, Y_{it} , we consider:

- the percentage change in total employment (including temporary agency workers) between the pre-crisis period 2008 and the years 2009 and 2010, respectively;
- the percentage change in regular employment (which excludes temporary agency workers) between the pre-crisis period 2008 and the years 2009 and 2010, respectively;
- the use and the intensity of use of government-sponsored STW schemes in the years 2009 and 2010, respectively; for this purpose, we consider both an indicator variable of STW use and the share of workers covered by STW schemes in the regular workforce¹³¹⁴;
- business performance in the main crisis period 2009; for this purpose, we use indicator variables for reporting a financial profit or a financial loss, respectively, in 2009.

In considering the use of short-time work as an outcome variable, our analysis differs from

¹³The establishment does not have to apply for STW allowances on behalf of the total workforce, but can do so just for a certain fraction of workers affected by the shortfall in demand, e.g., some units of the establishment. In our sample, between 50% and 60% of regular workers were on average covered by STW schemes among STW using establishments.

¹⁴To be precise, as our STW intensity of use measure, we consider the ratio of workers covered by STW schemes in 2009 and 2010, respectively, to the total number of regular workers in 2008. This is because the denominator of this measure, the total number of regular workers, could also be affected by the recession if it was measured in 2009 or 2010.

related studies (e.g. Bellmann et al., 2015; Boeri and Bruecker, 2011) that have focused on this variable as a conditioning factor for the overall employment response. In our framework, the pre-crisis TAW share is a predetermined variable, while STW use, which is measured in the (post-)crisis years 2009 and 2010, is fully endogenous and measures a reaction to the crisis. Also, STW supposes a reduction in regular employment, albeit in terms of working time as opposed to the number of employees.

We use a linear regression model for all the dependent variables except for the ratio of workers covered by STW schemes to the total number of regular workers, our STW intensity measure. Since the latter variable contains a large fraction of zeros, we use a Tobit regression for this outcome.¹⁵ We cluster standard errors at the industry level throughout the analysis to account for the likely serial correlation of error terms within industries.

For β_t to measure the causal impact of the use of temporary agency employment on subsequent employment and business performance outcomes, the use of temporary agency employment has to be exogenous with respect to these outcomes, conditional on the covariates. We consider the setting of the economic and financial crisis to be helpful in this respect. In normal times, establishments tend to choose all labour inputs jointly and to do so based on their (usually unobserved) business expectations. The sharp drop in demand in the period 2008/09, however, was certainly unanticipated and made previous plans obsolete. That is, no matter what led establishments to choose a certain level of temporary agency workers in mid 2008, they did not do so anticipating the bankruptcy of Lehman Brothers in September 2008 and the ensuing demand shortfall – which greatly exceeded normal business cycle fluctuations – and the associated need to adjust the total labour input. Thus, reverse causality or simultaneity bias should not be an issue. A second potential concern is omitted variable bias, i.e. whether the regression includes all relevant variables that determine both the use of temporary agency employment and the labour adjustment needs in the recession. In our analysis, we control for an extensive set of pre-crisis establishment characteristics: the log of total employment, detailed measures of workforce composition (the share of employees with working time accounts, the share of workers with fixed-term contracts, the share of part-time workers, the share of female workers, and the share of high-skilled workers), a dummy variable that equals one if the (self-reported) production technology of the plant is state of the art compared to that of other

¹⁵Papke and Wooldridge (1996) have proposed fractional response models for dependent variables which are expressed as shares and hence bounded between 0 and 1. Note, however, that our STW intensity measure is not bounded from above, for two reasons. First, the number of workers covered by STW, the numerator, refers to the first half of the year, while the total number of regular workers, the denominator, refers to the date of reference, June 30. Second, we use the pre-crisis instead of the current-year number of regular workers as the denominator to prevent the latter from being contaminated by the crisis.

establishments in the same industry, two dummy variables that equal one if the establishment follows an industry-level or firm-level collective bargaining agreement, respectively, a dummy variable for the existence of a works council, a dummy variable for not being part of a larger enterprise (“single establishments”), full sets of federal state and two-digit industry dummies, and in addition, the quantitative crisis shock measure. Nevertheless, there might still be other, unobserved characteristics that might cause a bias in the coefficient of the TAW share variable. We therefore address several potential threats to validity in our robustness section.

In the analysis, we focus on a balanced panel of establishments, which can be observed over the time period 2007 to 2010. This allows us to follow establishments during the main crisis period 2008 to 2009 and, in addition, for one year pre and post (the main) crisis.¹⁶ We also restrict the analysis to the manufacturing sector, for two reasons. First, it is the sector which, due to its reliance on exports, has been hit hardest by the economic crisis in Germany (apart from the financial sector). Second, temporary agency work is most heavily used in the manufacturing sector. After excluding establishments with missing values on any of the explanatory or outcome variables, our final estimation sample consists of 1,997 establishments. Sample summary statistics of the explanatory and the dependent variables are given in Table A1. The sample mean of the pre-crisis share of temporary agency workers in the workforce, our main variable of interest, is 1.2%. If we decompose this mean value into its extensive and intensive margin, respectively, 11.7% of the establishments in our sample use temporary agency employment to some degree with a mean TAW share conditional on TAW usage of 10.4%.

5 Results

Regression results for equation (3) for our various employment and business performance outcome variables in the years 2009 and 2010 are reported in Table 1. Entries in the table are estimates of the coefficient of the pre-crisis share of temporary agency workers in the total workforce, our variable of interest.¹⁷

In Panel I., regression results pertain to employment outcome variables in 2009, the main crisis period. It can be seen that a greater pre-crisis use of temporary agency work is associated

¹⁶Focusing on a balanced sample naturally gives rise to concerns about sample selectivity, which might be particularly severe if, e.g., many establishments had to close in the recession. We analyse this possibility in our robustness checks.

¹⁷All the regressions reported in Table 1 make use of sampling weights to ensure representativeness at the establishment level. We also ran regressions weighting establishments by size (total employment) in addition to these sampling weights. Results are reported in Table A2 in the Appendix. They are qualitatively and quantitatively very similar to the ones reported in Table 1, albeit with a few differences (in both directions) concerning statistical significance.

with a larger decline in total employment between 2008 and 2009. This is not surprising as these establishments had the opportunity to adjust their labour input quickly and virtually at no cost by cutting down on the number of temporary agency workers. The more interesting question is whether establishments with a larger pre-crisis share of temporary agency workers, having this extra buffer, were better able to stabilize their regular employment in the main crisis period. This is not the case, as the coefficient in the third column of Panel I. reveals. While the estimated coefficient is positive, it is not statistically significant. However, the buffer function of temporary agency work seems to show up in another dimension: the use of government-sponsored short-time work schemes. As the last two columns of Panel I. show, establishments with a greater pre-crisis share of temporary agency workers were significantly less likely to make use of short-time work schemes, and they also had a significantly lower share of workers covered by these schemes.

In terms of economic magnitude, a 10 percentage point higher pre-crisis share of temporary agency workers in the workforce – about the mean share among using establishments – is associated with a 6.4 percentage point larger decline in total employment, a 5.3 percentage point lower probability of using STW schemes, and an 1.2 percentage point lower share of workers covered by STW schemes. Compared to the sample means of these variables, these are sizeable magnitudes.¹⁸

The picture looks quite similar overall when focusing on employment outcomes in 2010 (Panel II.). However, there is one notable exception. The positive correlation between the pre-crisis share of temporary agency workers and the change in regular employment between 2008 and 2010 turns weakly statistically significant. Furthermore, the negative association with the probability of making use of short-time work schemes and the share of workers covered by these schemes becomes quantitatively more important.

Thus, the indication of a stabilizing function of temporary agency work is stronger over the medium term, which is consistent with the observation that employment in the manufacturing sector responded with a certain time lag to the decline in demand (cf. Fig. 1). One potential explanation that is consistent with this finding is that establishments which did not have, or only had to a lesser extent, the option to cut down on temporary agency employment first absorbed the shock by means of internal flexibility measures, such as a reduction in overtime and the use of working-time accounts; but once these measures have been exhausted, and with demand still recovering rather slowly, they started to increasingly rely on government-sponsored short-time

¹⁸The sample means are a 1.8% drop in total employment, a 1.4% drop in regular employment, a 14% probability of using STW schemes, and a 7.4% share of workers covered by STW schemes, cf. Table A1.

Table 1: Temporary agency employment and (post-)crisis outcomes: regression results

I. 2009 empl. outcomes	Δ Tot. empl.(%)	Δ Reg. empl.(%)	STW (0/1)	STW int.(%)
TAW share (%)	-0.6442*** (0.1568)	0.1448 (0.1422)	-0.0053*** (0.0017)	-0.1185*** (0.0397)
II. 2010 empl. outcomes	Δ Tot. empl.(%)	Δ Reg. empl.(%)	STW (0/1)	STW int.(%)
TAW share (%)	-0.4461*** (0.0858)	0.3904* (0.1873)	-0.0063** (0.0025)	-0.2001*** (0.0705)
III. 2009 perf. outcomes	Profit (0/1)	Loss (0/1)		
TAW share (%)	-0.0001 (0.0055)	-0.0056*** (0.0013)		

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Each cell contains the estimated coefficient/marginal effect of the *TAW share* variable (pre-crisis percentage share of temporary agency workers in the total workforce) obtained from a different regression. The respective outcome variables are given in the top row of each panel. Δ *Tot. (Reg.) empl.*: percentage change in total (regular) employment between 2008 and the stated year; *STW (0/1)*: indicator whether the establishment has used government-sponsored short-time work schemes in the stated year; *STW int.*: percentage share of workers under short-time work schemes in the total workforce in the stated year; *Profit/Loss*: indicators whether the establishment has reported a positive/ negative financial result in 2009. All regressions are estimated by OLS except for the one on the STW intensity, which has been estimated by a Tobit regression (here, marginal effects on the censored conditional mean are reported). Standard errors (given in parentheses) are clustered at the industry level. Further controls: foreign demand shock; log total employment; share of employees with working time accounts; share of workers with fixed-term contracts; share of part-time workers; share of female workers; share of high-skilled workers; dummy for state-of-the-art technology; dummies for the existence of an industry-level/firm-level collective bargaining agreement; dummy for not being part of a larger enterprise; dummy for the existence of a works council; full sets of federal state and two-digit industry dummies. Regressions make use of sampling weights to ensure representativeness at the establishment level. The number of observations is 1,997 (1,933 in the business performance regressions due to missing values).

work or even on reducing regular employment. Overall, these results suggest that establishments chose different ways of adjusting their labour input during the crisis. In particular, the reduction of temporary agency work seems to have served as a substitute for short-time work schemes.

An interesting follow-up question is whether these alternative ways of adjusting the labour input had a differential impact on the establishments' bottom line. Panel III. of Table 1 shows the association between the pre-crisis share of temporary agency workers and the probability of reporting a financial profit and a financial loss, respectively, in the main crisis period 2009.¹⁹ While the pre-crisis TAW share is not significantly related to the probability of reporting a financial profit, it is associated with a significantly lower probability of reporting a financial loss. A 10 percentage point higher pre-crisis share of temporary agency workers in the workforce

¹⁹The omitted category is a break-even result.

is associated with a 5.6 percentage point lower loss probability, which corresponds to about one third of the mean loss probability in the sample (15.7%). This noteworthy relationship between the pre-crisis TAW share and the establishment’s financial result in the main crisis year might well be linked to the other results shown before. That is, establishments which could absorb the shock via the reduction of temporary agency work had to rely less on short-time work schemes. While these schemes are heavily subsidized by the Federal Employment Agency, non-negligible “residual costs” still have to be borne by the employer (cf. Section 2). Arguably, these costs are higher than the ones arising from a reduction of the number of temporary agency workers, which could explain the differential impact on establishment profitability. However, one should keep in mind that this is only a short-term impact in the main crisis period. Preserving employment via short-time work schemes could well be a profitable strategy in the longer run.

Table 2: Temporary agency employment and the use of short-time work: interactions with the foreign demand shock

	2009		2010	
	STW (0/1)	STW int.(%)	STW (0/1)	STW int.(%)
Shock	0.0144*** (0.0034)	2.3919*** (0.7105)	0.0155*** (0.0045)	2.2650*** (0.8719)
TAW share (%)	-0.0039* (0.0020)	-1.1499* (0.6937)	-0.0046 (0.0027)	-1.1675* (0.7021)
Shock \times TAW share	-0.0009 (0.0006)	-0.2440 (0.1487)	-0.0011*** (0.0003)	-0.2421*** (0.0785)

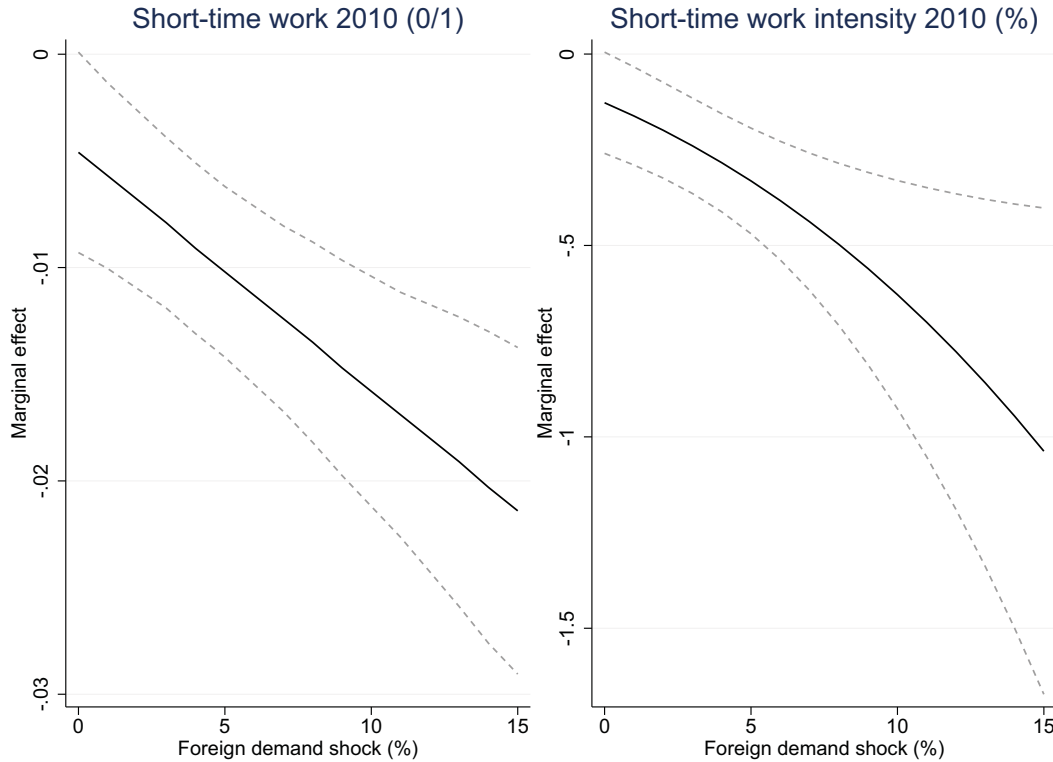
Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
See notes below Table 1.

Next, we analyse whether the relationship between the pre-crisis TAW share and the different outcome variables depends on the size of the shock. If an establishment is only very mildly or not at all hit by a demand shock, we would not expect temporary agency work to have a stabilizing effect on the regular workforce. A larger TAW share, however, might be more helpful for establishments that were severely hit by the crisis. To explore this possibility, we augment equation (3) by an additional interaction term between the TAW share variable and our quantitative shock measure. Regression results are reported in Table 2, where we restrict attention to the outcome variables relating to the use and intensity of use of short-time work in the years 2009 and 2010.²⁰²¹ The results for the two years are very similar, although the ones

²⁰We have done the same exercise for the other outcome variables. While the overall picture is similar, these results are not statistically significant.

²¹Note that in Table 2, we display the estimated coefficients obtained from the Tobit regression for the STW intensity measure. Thus, their magnitude should not be compared directly to the results of the baseline spe-

Figure 2: Temporary agency employment and the use of short-time work in 2010 – variation by the strength of the foreign demand shock



Note: The figure depicts the marginal effect of the pre-crisis share of temporary agency workers on the use of short-time work in 2010 (solid line) and the associated 90-percent confidence interval (dashed lines), obtained from the regressions shown in Table 2.

for 2010 obtain higher levels of statistical significance. It can be seen that the shock measure (main effect) is positively correlated with both the use and the intensity of use of short-time work, while the pre-crisis TAW share (main effect), as before, correlates negatively with these outcome variables. Moreover, this negative association between the pre-crisis TAW share and the use as well as the intensity of use of short-time work in 2010 is indeed more pronounced the larger the shock is, as the negative interaction term reveals. To ease interpretation, we display the marginal effect of the pre-crisis TAW share on the use of short-time work in the early recovery year 2010 in relation to the size of the foreign demand shock experienced by establishments (cf. Fig 2). While the marginal effect of the pre-crisis TAW share on both the probability of use and the intensity of use of short-time work in 2010 is not significantly different from zero for establishments that were not affected by the foreign demand shock ($shock=0$), a 10 percentage point higher pre-crisis share of temporary agency workers in the workforce is associated with a statistically significant and large decline of 21.4 percentage points (probability of use) and 10.4 percentage points (intensity of use), respectively, if the foreign demand shock amounts to 15%.²²

cification in Table 1, which displays marginal effects on the censored conditional mean. We report comparable marginal effects, which now depend on the size of the foreign demand shock, in Figure 2 below.

²²A value of 15% corresponds to the 99th sample percentile of the foreign demand shock measure. The mean is

6 Robustness checks

In the previous section, we have established various correlations between the pre-crisis share of temporary agency workers and employment as well as business performance outcomes in the years 2009 and 2010. The question is whether these are causal relationships. We have argued that, due to the large and unanticipated drop in demand induced by the economic and financial crisis, reverse causality or simultaneity bias should not be an issue in this setting. Furthermore, due the large set of control variables, we account for many potential confounding factors that matter for both the use of temporary agency employment and crisis-related outcomes. Still, potential threats to validity remain, and we aim to address them in this section.

We proceed as follows. First, we provide some supporting evidence for the conjecture that (i) the crisis was unanticipated and (ii) the pre-crisis share of temporary agency workers was unrelated to future employment growth expectations. Second, we address the potential concern that, despite the extensive set of control variables, we might still have compared establishments to each other that are not completely comparable, giving rise to a potential omitted variable bias. Third, since our focus on a balanced sample of establishments could lead to a sample selection bias, we provide some supporting evidence that the pre-crisis TAW share is not related to selective panel drop-out.

6.1 Pre-crisis expectations

To analyse whether establishments might have anticipated the crisis, we again use the regression equation (3), but now focus on pre-crisis (medium-term) employment expectations as the dependent variable. In particular, we consider two dummy variables indicating whether in the pre-crisis year 2007, establishments were expecting employment five years from then to be higher or lower, respectively.²³ Results are given in Table 3 where we focus on the coefficients of the TAW share and the quantitative shock variable, and they are indeed noteworthy.

First, the coefficient of the quantitative shock variable is positive and significant in the “increasing employment expectations” regression, suggesting that the establishments that arguably could be expected to suffer most from the drop in foreign demand during the crisis were actually

just over 1%, which is due to the fact that this measure is 0 by construction for all non-exporting establishments, i.e. about 77% (weighted) of all establishments.

²³Specifically, we make use of a survey question in the 2007 survey which asked respondents whether they expected employment five years from then to be (a) considerably higher ($> 10\%$), (b) slightly higher ($\leq 10\%$), (c) about equal, (d) slightly lower ($\leq 10\%$), or (e) considerably lower ($> 10\%$). For the two dummy variables, we pool categories (a) and (b) as well as (d) and (e), respectively. We focus on the 2007 as opposed to the 2008 expectations since the latter were likely already affected by the beginning economic crisis, given that surveys take place in the fall of each year.

Table 3: Temporary agency employment and pre-crisis employment expectations

	Exp. increase in empl. _{.0712} (0/1)	Exp. decrease in empl. _{.0712} (0/1)
Shock	0.0176*** (0.0054)	-0.0013 (0.0034)
TAW share (%)	0.0064 (0.0054)	-0.0012 (0.0013)
Observations	1,477	1,477

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
See notes below Table 1.

the most optimistic before the crisis. This finding can be explained by the fact that export-oriented establishments were doing very well before the crisis. Most importantly, however, this finding lends further support to the notion that the drop in demand was not anticipated. Second, conditional on the vast set of control variables, the 2008 TAW share was not related to the pre-crisis medium-term employment expectations, which mitigates concerns that the former might be correlated with superior unobservable growth prospects.

6.2 Sample composition and omitted variable bias

Despite our extensive set of control variables, it is possible that we still compare establishments to each other that are not completely comparable. To address such concerns about a potential omitted variable bias, we modified our baseline analysis in various ways. In this section, we present and discuss the results of these robustness checks.

As a first robustness check, we restrict the sample to exporting establishments. Since the drop in foreign demand was the primary source of the economic crisis in Germany, exporters are the establishments that should have been particularly affected. Also, the quantitative shock variable, which is based on the establishment-level export share in total sales as well as the industry-level decline in foreign demand, is arguably more adequate for this group of establishments.

Another concern might be that those establishments that make use of temporary agency work and those that do not are just establishments of different kinds. The volatility of demand faced by these establishments might be different, and the same may hold true for their (personnel) management. Therefore, as a second robustness check, we restrict the sample to TAW using establishments only. This way we only exploit variation in the intensity of use among (the arguably more homogeneous group of) TAW users.

Finally, as a third robustness check, we add lagged total employment growth – that is, the employment growth rate in the pre-crisis period 2007 to 2008 to the list of explanatory

Table 4: Temporary agency employment and (post-)crisis outcomes: robustness checks

	Baseline	Only exporters	Only TAW users	Lagged empl. growth
I. 2009 empl. outcomes				
Δ Tot. empl. (%)	-0.6442*** (0.1568)	-0.5097*** (0.1096)	-0.5153*** (0.1055)	-0.4675** (0.1735)
Δ Reg. empl. (%)	0.1448 (0.1422)	0.1997 (0.1656)	0.1562* (0.0857)	0.3055 (0.1938)
STW (0/1)	-0.0053*** (0.0017)	-0.0070*** (0.0022)	-0.0106*** (0.0024)	-0.0049*** (0.0017)
STW int. (%)	-0.1185*** (0.0397)	-0.5322*** (0.1942)	-0.6916*** (0.1551)	-0.1158*** (0.0386)
II. 2010 empl. outcomes				
Δ Tot. empl. (%)	-0.4461*** (0.0858)	-0.5359*** (0.1821)	-0.4934*** (0.1033)	-0.3281*** (0.0953)
Δ Reg. empl. (%)	0.3904* (0.1873)	0.5197 (0.3632)	0.5583* (0.2988)	0.5033** (0.1769)
STW (0/1)	-0.0063** (0.0025)	-0.0077*** (0.0021)	-0.0113*** (0.0026)	-0.0074*** (0.0024)
STW int. (%)	-0.2001*** (0.0705)	-0.5298*** (0.0926)	-0.5862*** (0.1193)	-0.2410*** (0.0679)
III. Business outcomes				
Profit (0/1)	-0.0001 (0.0055)	0.0063*** (0.0021)	0.0019 (0.0040)	-0.0016 (0.0057)
Loss (0/1)	-0.0056*** (0.0013)	-0.0059*** (0.0018)	-0.0062*** (0.0018)	-0.0038** (0.0014)
Observations	1,997 ^a	960 ^a	669 ^a	1,997 ^a

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

^a Due to missing values, the number of observations in the business outcomes regressions drops to 1,933 (baseline and lagged employment growth), 919 (only exporters), and 641 (only TAW users), respectively. Each cell contains the estimated coefficient/ marginal effect of the *TAW share* variable (pre-crisis percentage share of temporary agency workers in the total workforce) obtained from a different regression. The respective outcome variables are given in the left column while the respective specification/sample restriction is given in the top row. Baseline: redisplay the estimation results of the baseline specification (cf. Table 1); Only exporters: restricts the sample to exporting establishments; Only TAW users: restricts the sample to temporary agency work using establishments; Lagged empl. growth: includes lagged total employment growth (Δ_{0708} Tot. empl.) as additional explanatory variable. See notes below Table 1 for further information.

variables. This is to account for the possibility that establishments with a higher pre-crisis share of temporary agency workers might have been just on a differential growth path. If there are permanent differences between establishments that use, respectively do not use TAW, then these differences should also be visible in, and hence be captured by, this lagged variable.

For all the robustness checks and all outcome variables considered in the analysis, estimation results pertaining to the variable of interest, the pre-crisis share of temporary agency workers, are given in Table 4. For comparison, the baseline results are re-displayed in the second column. As can be seen, the results remain remarkably stable.²⁴ If at all, the estimated coefficients tend to be larger in absolute terms if the samples are restricted to exporters or TAW using establishments, i.e. made more homogeneous. However, one should keep in mind that the sample means of the outcome variables are in general also larger in absolute terms for these restricted samples, such that, measured relative to the sample mean, effect magnitudes are again similar to the baseline analysis.

6.3 Sample selection

Another concern might be that our focus on a balanced sample, which aims at making results for different time horizons comparable to each other, might lead to a selected sample. We therefore analysed also whether the pre-crisis share of temporary agency workers in the total workforce is related to the probability of leaving the panel, where we consider both general panel attrition (for whatever reason) and explicit plant exit as dependent variables (cf. Table 5).

Table 5: Temporary agency employment and panel attrition/establishment exit

	Attrition (0/1)	Closure (0/1)
TAW share (%)	0.0004 (0.0027)	-0.0019 (0.0011)
Observations	3,279	2,505

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
See notes below Table 1.

In both of these regressions, however, the coefficient of the TAW share variable is close to zero and not statistically significant, suggesting that our coefficient of interest should not be

²⁴In fact, only in very few cases do coefficients that have been significant turn insignificant and vice versa, and if they do, they only do so in one out of three robustness checks. Specifically, the positive association between the pre-crisis TAW share and the change in regular employment between 2008 and 2009 becomes weakly statistically significant if the sample is restricted to TAW users. In contrast, the positive association between the pre-crisis TAW share and the change in regular employment between 2008 and 2010 becomes insignificant if the sample is restricted to exporters. Finally, again for the sample of exporters, the pre-crisis TAW share is not only negatively related to the probability of reporting a financial loss in 2009, but also positively related to the probability of reporting a financial profit.

affected by sample selectivity.

7 Summary and conclusion

Using rich German establishment data, this paper has analysed the effect of temporary agency work on using establishments' regular workforce stability, use of short-time work, and business performance in response to the large and unanticipated drop in demand induced by the 2008/09 Great Recession.

Our results have shown that establishments with a greater pre-crisis use of TAW were indeed better able to stabilize regular employment. While the association between the pre-crisis TAW share and the number of regular workers is only marginally significant, and only over the medium term, the use of TAW has been strongly negatively related to the use of government-sponsored short-time work schemes during the crisis. Thus, temporary agency work mainly led to a stabilization of regular workers' working time (and income) and seems to have substituted for other employment adjustment mechanisms. In addition, establishments with a greater pre-crisis use of TAW were less likely to report a financial loss in the main crisis year 2009, suggesting that cutting down on the number of temporary agency workers has been a less costly adjustment mechanism than its alternatives, at least in the short run.

The following conclusions can be drawn from our analysis. First, temporary agency work does indeed exert a buffer function. Second, temporary agency work played an important role as an employment adjustment mechanism during the Great Recession in Germany. Hence, analyses of the German labour market miracle that only focus on the widely discussed short-time work schemes and working time accounts portray an incomplete picture of the actual adjustment patterns. Finally, on a more general note, this paper has also highlighted that firms/establishments adjust their labour input in response to a demand shock in numerous ways other than via the number of regular workers. Hence, studies analysing the cyclicity of labour demand at the firm level (e.g., Fort et al., 2013) or the job and worker turnover patterns in response to exchange rate (or other globalization) shocks (e.g., Klein et al., 2003; Moser et al., 2010) most likely underestimate the strength of the employment adjustment if they only focus on the number of regular workers.

It is important to note that our results do not allow us to draw conclusions regarding the welfare effects of temporary agency work. For this purpose, benefits accruing to regular workers and using establishments would have to be weighed against the costs borne by the dismissed temporary agency workers. Also, while our results lend some support to the notion that, from

an establishment's perspective, cutting down on the number of temporary agency workers has been a more profitable (or less costly) adjustment mechanism than its alternatives in the short run, it is less clear whether this also holds true for the medium to long run. Analysing how the use of alternative employment adjustment channels during the Great Recession is related to more long-term establishment outcomes is, in our view, a promising avenue for future research.

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Appendix

Table A1: Summary statistics

	Mean	Std. Dev.
Outcome variables		
Δ_{0809} Reg. empl. (%)	-1.413	23.090
Δ_{0809} Tot. empl. (%)	-1.830	23.914
Short-time work 2009 (0/1)	0.140	0.347
Short-time work intensity 2009 (%)	7.393	20.204
Δ_{0810} Reg. Empl. (%)	-1.255	28.671
Δ_{0810} Tot. Empl. (%)	-1.432	29.445
Short-time work 2010 (0/1)	0.171	0.377
Short-time work intensity 2010 (%)	8.229	20.399
Profit (0/1) ^a	0.620	0.486
Loss 2009 (0/1) ^a	0.157	0.363
Explanatory variables		
Foreign demand shock (%)	1.047	3.038
TAW share 2008 (%)	1.222	4.558
WTA share (%)	28.867	42.478
Share of workers with fixed-term contracts (%)	1.987	5.797
Share of female workers (%)	32.897	25.399
Share of part-time workers (%)	19.687	20.247
Share of skilled workers (%)	62.810	23.246
In total employment	2.260	1.237
Collective agreement at industry level (0/1)	0.329	0.470
Collective agreement at firm level (0/1)	0.033	0.179
State-of-the art production technology (0/1)	0.158	0.365
Single-plant firm (0/1)	0.906	0.293
Works council (0/1)	0.097	0.296
Observations	1,997	

^a Due to missing values, the number of observations is 1,933 for the variables Profit and Loss.

Table A2: Temporary agency employment and (post-)crisis outcomes: size-weighted regression results

I. 2009 empl. outcomes	Δ Tot. empl.(%)	Δ Reg. empl.(%)	STW (0/1)	STW int.(%)
TAW share (%)	-0.5179*** (0.0735)	0.0586 (0.0922)	-0.0054 (0.0031)	-0.3889* (0.2133)
II. 2010 empl. outcomes	Δ Tot. empl.(%)	Δ Reg. empl.(%)	STW (0/1)	STW int.(%)
TAW share (%)	-0.4972*** (0.0882)	0.2079 (0.2308)	-0.0062** (0.0027)	-0.2844** (0.1420)
III. 2009 perf. outcomes	Profit (0/1)	Loss (0/1)		
TAW share (%)	0.0038* (0.0020)	-0.0042* (0.0024)		

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Observations are weighted by establishment total employment \times sampling weight. See notes below Table 1 for further information.

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