The One Constant: A Causal Effect of Collective Bargaining on Employment Growth?*

Tobias Brändle† and Laszlo Goerke‡

November 1, 2013

Abstract

For Anglo-Saxon countries, a large number of articles have analysed 'the one constant' in the economic effects of trade unions, namely that union bargaining reduces employment growth. However, a different institutional setting might lead to a different outcome, making the constant a variable entity. Using official linked-employer-employee data we employ a range of estimation methods to analyse a potentially causal effect of collective bargaining coverage on employment growth in German plants. We find that, similarly to Anglo-Saxon countries, collective bargaining at the industry and plant level can reduce employment growth. The effects are often smaller, sometimes only marginally significant, and range between -0.78 and -5.40 percent per annum, depending on the employed estimation strategy. We can conclude that there is always a non-positive effect that is robust to various alternations such as controlling for plant survival or across different specifications and

*For helpful comments on an earlier version of this paper we would like to thank Rafael Gralla, Julia Lang, Andrew Oswald, Liqui Zhao, and the participants of the 4th Economic Workshop at University Tübingen, the 2nd IFO Workshop on Labour Economics and Social Policy in Dresden, the 15th Colloquium on Personnel Economics at University Paderborn, the 17th Spring Meeting of Young Economists at ZEW Mannheim, and the Annual Meeting of the Verein für Socialpolitik in Göttingen. Further thanks go to Sarah John, Johannes Farrenkopf, Mario Hoffmann, Patrick Maier, Elitza Milenkova and Angelika Storz for valuable research assistance. This study uses the cross-sectional model 2 of the linked-employer-employee data from the Institute for Employment Research (IAB) (LIAB Version QM2 9310, years 2000-2010). We thank the employees of the research data centre (FDZ) of the German federal employment agency (BA) at the IAB for being able to access the data by remote data access. The usual disclaimer applies.

†**Corresponding Author**, IAW Tübingen and Eberhard Karls University Tübingen; Phone: +49 7071 989616; E-mail: tobias.braendle@iaw.edu.

‡IAAEU Trier, IZA Bonn, and CESifo Munich; E-mail: goerke@iaaeu.de.

sub-samples. The use of instrumental variables does not lead to consistent results.

Keywords: collective bargaining, employment growth, job flows, trade unions
JEL code: J23 J52, J 53, J63

1 Introduction

What are the economic effects of trade unions on employment, i.e. does bargaining with a majority union as opposed to individual wage determination at the plant level reduce employment? Neoclassical theory suggests that if wages equal marginal productivity and trade unions raise wages, labour demand will shrink (Hammermesh 1993). However, if firms and trade unions bargain not only over wages, but also employment, this might increase employment (McDonald and Solow 1981). Furthermore, trade unions could raise the quality of job matches and reduce turnover, such that the incentives to invest in firm-specific human capital may be larger, thus increasing labour productivity and boosting employment in unionised plants. Therefore, theoretically, the impact of collective bargaining on employment is ambiguous.[1]

Despite this theoretical ambiguity, empirical analyses at first sight provide a clear-cut picture and have uncovered what Addison and Belfied (2004) refer to as *the one constant* among the economic effects of trade unions: Trade union activity reduces employment growth by about 2% to 4% per annum. This summary interpretation of the evidence is based on a number of studies primarily for Anglo-Saxon countries covering various time periods and samples. However, the countries most estimates rely on are characterised by a pluralistic system of industrial relations and low collective bargaining coverage in the private sector.[2] Moreover, collective bargaining is rather uncoordinated and primarily takes place at the plant level, i.e. between a (majority) union and management (Visser 2011). The question, therefore, arises whether these negative employment effects are also present in more cooperative and corporatist industrial relations systems such as in Germany, where collective bargaining occurs predominantly at the industry level and is rather coordinated.[3]

[1] While in the traditional bargaining models the outcome is inefficient, in the efficient bargaining model the outcome is not on the labour demand curve, implying that the firm has an incentive to choose an employment level other than the agreed one. For a recent and basic overview of the literature, see, for example, Lawson (2011).

[2] Australia is somewhat of an exception in the latter regard with a collective bargaining coverage (at the time the studies there took place, before the WRA) of about 60% (Visser 2011). The results, however, are strikingly similar (see below).

[3] Moreover, collective bargaining is supplemented in many plants by workplace co-determination. Works councils can, in turn, mitigate or strengthen the employment effects of collective bargaining agreements (Addison and Teixeira 2006, Gralla and Kraft 2012, Jirjahn 2010).

To answer this question we empirically analyse the (causal) effect of collective bargaining coverage on employment growth in German plants. Our contribution to the literature is twofold. First, we provide evidence as to whether trade unions have a different effect on employment growth in a different institutional setting.[4] Germany, the largest economy in the European Union and fourth-largest in the world, is an interesting case for a number of reasons: albeit having strong corporatist trade unions, collective bargaining coverage has declined over the last decade by about 15 percent (Ellguth and Kohaut 2011). Further, Germany offers the possibility to observe both sector-level and plant-level bargaining agreements at the same time to analyse the effects of different levels of collective bargaining in the sense of Calmfors and Driffill (1988). Second, we use better (quasi-official linked-employer employee) data and more sophisticated empirical methods (static and dynamic panel as well as instrumental variable techniques) to provide for a causal interpretation of our results.

A priori, we expect that the less adversarial system of industrial relations in Germany may reduce or even prevent negative employment effects of collective bargaining, relative to those observed in Anglo-Saxon countries. We find that collective bargaining reduces employment growth in German plants by up to -0.8 to 1.6% per annum in the static and by up to 5.4% per annum in the dynamic panel models. The range of effects is significantly different from zero in almost all of our specifications and the coefficients are similar to the ones usually found in (recent) Anglo-Saxon studies. However, the effects cannot be causally interpreted in the sense that changes in bargaining status change employment growth, i.e. the differences are not caused by the introduction or the abolition of collective bargaining, at least not in the short run.

Moreover, when analysing different bargaining levels, we expect that the more centralised level of bargaining is likely to mitigate potentially negative employment consequences. However, our results do not systematically differ between different degrees of centralisation, i.e. industry- or firm-level collective bargaining. We further find that neither of the instrumental variables employed in recent studies on other union effects are valid in the context of employment growth.

Our results are robust in various sub-samples, namely manufacturing and services, exporting plants, medium-sized companies, and East and West Germany. Also, our estimates do not differ when altering the treatment and control groups, i.e. excluding plants that orient themselves to collective bargaining or that pay above the collectively bargained wages, when using different measures for changes in collective bargaining coverage, and when controlling for attrition bias due to plant survival via a Heckman sample selection

[4]So far, to our knowledge, the only study for a non-Anglo-Saxon country is the one by Bryson and Dale-Olsen (2008), which also notices the lack of results outside this group of countries.

model.

After having laid out our motivation, we present the context of the literature in Section 2 and use Section 3 to explain the institutional setting our analyses situate in. Sections 4 and 5 gives a short overview of the data and the empirical methods we employ. The results of our analyses cover Section 6, while a discussion on instrumental variables At the end, Section 7 concludes and tries to formulate policy implications.

2 Related Literature

Union Employment Literature: A number of empirical articles have analysed the effects of union bargaining on employment growth. This *union employment literature* has so far been focussed mainly on the United Kingdom and the United States, while it also includes a number of studies for Australia and Canada. In addition, we are aware of one study for Norway and a few contributions on Germany which, however, focus on the employment effects of works councils.

For the UK, there is a large number of articles, generally employing data from Workplace Industrial Relations Surveys (WIRS) and including the public and private sector, reporting that employment in unionised plants grows by between 2% to 4% less per annum than in non-unionised plants Blanchflower et al. (1991), Blanchflower and Burgess (1996). While Booth and McCulloch (1999), Addison et al. (2000), and Bryson (2004) only consider the private sector, whereas Addison and Belfied (2004) and Bryson and Nurmi (2011) utilise the Workplace Employee Relations Survey (WERS), results are basically unaffected by these differences in the data which are analysed.

In partial contrast, Machin and Wadhwani (1991) only observe negative employment effects of union recognition in plants experiencing organisational change, Blanchflower and Burgess (1996) do not find union recognition to be related to the absolute growth rate of employment, and Bryson and Dale-Olsen (2008) use WERS panel data for the period 1998 to 2004 and observe no correlation between employment growth in the private sector and various measures of unionism, also taking into account plant closures. Bryson and Dale-Olsen (2008) even find positive effects of changes in union density on changes in employment growth.

Turning to the United States, Leonard (1992) uses a cross-section of Californian manufacturing plants for the period 1974 to 1980 and finds that employment in large plants with collective bargaining grew by 2% to 4% less than in non-unionised plants. Bronars et al. (1994) detect for a sample of large plants from the Bureau of Labor Statistics, that a 10% increase in union coverage is associated with a 0.5-1.1% decrease in employment

growth.[5] Newer studies try to establish causal results by employing e.g. a regression discontinuity design which utilises the fact that legal recognition of a trade union according to the National Labor Relations Act requires an election among the workforce. While DiNardo and Lee (2004) find no impact of unionisation on hours of work, the findings for nursing homes by Sojourner et al. (2012) are in sharp contrast. Their estimates indicate that hours of work (as a proxy for employment) decline dramatically because of union certification.

For Canada, Long (1993) uses the information on whether any employee in a plant is covered by a collective agreement for a dataset of 510 plants in 1980 to 1985 to estimate a negative employment effect of trade unions amounting to almost 4%. However, such an impact could not be observed for small plants. A more recent study by Walsworth (2010) analyses panel data for private sector plants from the Canadian Workplace and Employment Survey and covers the period from 1999 to 2005. The author finds that plants with a majority union grow about 2.2% less in terms of employment, but also that union presence (per se) and a union density measure are not associated with different employment growth.

As regards Australia, Wooden and Hawke (2000) use data from the Australian Workplace Industrial Relations Survey (AWIRS) for private sector plants surveyed in 1989/90 and in 1995. They estimate a negative impact of union density in private sector plants on employment growth of about 2.5%. Blanchflower and Burgess (1998), in contrast, do not find an effect of unionism on employment growth using cross-section AWIRS data from 1989.

Going beyond Anglo-Saxon countries, Bryson and Dale-Olsen (2008) analyse Norwegian linked-employer-employee data over the period of 1997 to 2003. They find that employment growth is about 3-5% lower in plants in which a union is recognised for the purpose of collective bargaining, compared to non-unionised plants, when correcting for survival bias. However, estimating a dynamic panel-data model and controlling for worker sorting into union membership via union membership fees, the study finds a positive effect of union density on both short-term and long-term employment.[6]

Evidence for Germany: For Germany, the country of main interest of this study, evidence is (also) scarce. This lack of results most probably stems from the fact that collective bargaining is not related as tightly to individual trade union membership as

[5] Bronars et al. (1994) also provide results for other measures of firm performance as well as a good overview of the early literature on union effects in the United States.

[6] While the results of Bryson and Dale-Olsen (2008) are interesting, they might not occur similarly in Germany due to institutional differences: In Germany, firm-level or local bargaining is not a supplement but a substitute for central collective bargaining at the industry level, and union membership per se does not play such a central role in industrial relations (see Section 3).

it is in Anglo-Saxon countries, but rather to a firm's decision to join an employers' federation/association. Recent empirical work has therefore focussed on the employment effects of plant-level co-determination instead, although employee-elected works councils are formally not allowed to bargain over issues dealt with in collective bargaining contracts (Hübler and Jirjahn 2003). While Addison and Teixeira (2006) report a negative effect of works council existence on employment growth in West Germany using the IAB establishment panel, Jirjahn (2010) obtains a positive effect on the basis of data from the Hannover panel when taking into account works council endogeneity. A more recent study by Gralla and Kraft (2012) separates the introduction effects from potential selectivity effects of works councils using a difference-in-differences framework. They find positive selection and negative introduction effects.

All of these three studies also include collective bargaining as a control variable: Addison and Teixeira (2006) find it to have an insignificant or positive impact on employment growth, depending on the specification; Jirjahn (2010) presents coefficients not significantly different from zero using OLS, and negative and marginally significant coefficients in a treatment effects model that caters for the endogeneity of works councils. Gralla and Kraft (2012) present negative but mostly insignificant coefficients. A recent study by Hirsch et al. (2010), that also uses the IAB LIAB data, analyses works council effects on separations and shows that neither industry-level nor firm-level collective bargaining is associated with a change in separation rates. Furthermore, the study by Dustman and Schönberg (2009) finds that workers, especially apprentices, in plants covered by a collective bargaining agreement (CBA) are more likely to be laid off, but less likely to quit voluntarily, leaving the overall effect ambiguous.

On all accounts, the few extant studies have not focused on the question at hand and delivered a blurred picture with respect to whether bargaining coverage in Germany might have similar effects on employment growth compared to union bargaining in Anglo-Saxon countries.

3 Institutional Background

In Germany the Collective Agreement Act (Tarifvertragsgesetz, TVG) allows firms to choose determining wages and other working conditions either individually with each employee, locally with a union at the plant level, or centrally by joining an employers' association. Therefore, at the end of the day, the level of bargaining is usually not determined by employees who join a union or fight for collective bargaining, but by the firms themselves which decide on this issue. In large parts, especially in the manufacturing sectors, firms chose to join an employers' association (Arbeitgeberverband), which then bargains

sectoral and industry-wide collective bargaining agreements with sector-level unions to set minimum working conditions at the industry level. At the plant level, usually works councils monitor the enforcement of CBA and provide for employee voice.[7] While in decline, this dual system of industrial relations still covers the majority of employees (Addison et al. 2011, Ellguth and Kohaut 2011). Contrary to Anglo-Saxon countries, , only a small minority of (mainly large) firms bargains with unions directly at the firm level (about 2% to 3% of all plants covering 7% to 13% of all employees); even if they do, they usually have to bargain with sector-union representatives and not with union members at the firm itself. On any account, these regulations result in the coexistence of several types or varieties of bargaining regimes: individual wage determination; firm-level contracts, which are quite heterogeneous in their drafting; and (more or less flexible) collective bargaining agreements. Additionally about 50% of the firms that are not formally a member of an employers' association refer to collective contracts when they determine wages and working conditions with their employees individually (Tariforientierung, Ellguth and Kohaut 2011). Therefore, and because collective contracts are usually applied to all employees in a covered firm, not only for union members,[8] collective bargaining coverage is much higher than union density, which has declined in recent years, down from 24% in 2000 to 19% in 2008 (Visser 2011). As a result, there is no evidence of a union membership wage premium in Germany (Schmidt and Zimmermann 1991). In contrast to the decision to introduce collective bargaining, replacing it by individual negotiations is much more difficult. Once a CBA has been place, its regulations are valid at least for the duration of the agreement and until a new contract has been bargained with each employee, which can take up to several years (Nachwirkungsprinzip, §3.3 and §4.5 TVG). Therefore, leaving collective bargaining is not a measure to increase (short-term) flexibility in wage bargaining.

4 Data and Descriptive Statistics

LIAB: For our empirical analyses we use the linked-employer-employee dataset (LIAB) of the Institute for Employment Research in Nürnberg (Institut für Arbeitsmarkt- und Berufsforschung, IAB), more precisely the cross-section version 2 (LIAB QM2 9310). The

[7] Co-determination at the plant level by works councils covers about 45% (37%) of all private sector employees in West (East) Germany in 2010 Ellguth and Kohaut (2011). Works councils have extensive co-determination rights with respect to personnel policy and although forbidden to bargain over wages, have also been shown to raise them citep{Addison:2010}. Such effects are likely to arise because works council can affect pay scales, dismissal behaviour and organisational issues. The consequences which are due to the interaction of collective bargaining and works council activities are also specific to Germany (Brändle 2013).

[8] Among others, Fitzenberger et al. (2012) discuss various reasons and consequences of this practice.

LIAB is created by linking official process-produced person-specific data (in particular the IAB Employment History, IAB EH) with plant-level survey data, namely the IAB Establishment Panel (IAB EP) via a classification indicator (plant number). [9] We cover the years 2000 to 2010, which approximate the most recent business cycle including data on the great recession, and because there have been changes in the sampling design and in the phrasing of the questionnaire of the IAB EP before that period of time, which affect a number of variables of interest.

The IAB EH bases on information from social security contributions and therefore excludes civil servants, students, and self-employed. Information comprises age, sex, nationality, occupation, education, and daily wages.[10] We restrict our analysis to individuals working at least 50% part-time and earning at least 600 Euros a month, aged between 15 and 65, and not being home workers or helping family members.

The IAB EP is a plant-level survey stratified over 10 plant sizes classes and 16 industries, based on the population of all plants in Germany with at least one employee subject to social security. Starting in 1993 in West Germany and 1996 in East Germany, sample size has been steadily increased to up to 16,000 plants per year and covers about 1% of all plants and about 7% of all employees in Germany. The survey is conducted in personal interviews with senior staff or personnel managers, and has a very high response rate and a very low panel attrition. The questionnaire focusses on the plants' personnel structure, development and policy, and offers extensive information on firm characteristics.[11] We restrict our sample to plants with at least 5 employees subject to social security (the legal threshold for works council existence) and drop plants from the agriculture and mining sectors, as well as public administration and non-profit-organisations. We access the data through remote-data access and guest visits at the Research Data Centre (Forschungsdatenzentrum, FDZ) at the IAB.

Collective Bargaining: To assess the impact of union bargaining, we use plant-level information and can distinguish whether a plant is covered by a collective bargaining agreement at the firm level between a sector union and the management of a single firm (firm-level contract, FLC) or at the sectoral level involving an employers' association (collective bargaining agreement, CBA). As regards the comparability of our union bargaining measures, firm-level contracts are institutionally most similar to the existence of a major-

[9] For a more detailed description of the construction of the LIAB, see Jacobebbinghaus and Seth (2010).

[10] The information on wages is very exact, but has two drawbacks. First, wages are censored at the upper earnings limit for social security contributions. Second, there is no information on individual working time in the IAB EH other than whether the individual works full time or (any level of) part time.

[11] For further information on the IAB EP, see Fischer et al. (2009).

Table 1: Prevalence of Bargaining Regimes

Bargaining Regime	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Individual Wage Det.	3,158	3,586	3,796	4,007	3,894	3,996	4,053	4,359	4,228	4,047	3,971	43,095
	30.83%	29.69%	31.56%	32.56%	33.27%	35.03%	36.32%	37.89%	38.46%	38.30%	39.94%	34.90%
Firm-L. Contract	703	700	662	690	696	769	716	719	696	724	607	7,682
	7.34%	8.42%	7.13%	7.82%	7.42%	8.01%	8.08%	7.49%	7.70%	9.69%	8.33%	7.94%
Coll. Barg. Agr.	4,537	4,897	4,722	4,475	4,353	4,397	4,072	4,017	3,792	3,446	3,008	45,716
	61.84%	61.89%	61.31%	59.63%	59.30%	56.95%	55.59%	54.62%	53.84%	52.01%	51.73%	57.16%
Total	8,398	9,183	9,180	9,172	8,943	9,162	8,841	9,095	8,716	8,217	7,586	96,493

Note: Observations are actual plants while employment shares are calculated using representative sample weights.
Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).

ity union (United States) or to recognition for collective bargaining (United Kingdom), while there is no exact match for collective bargaining agreements in the Anglo-Saxon context.[12]

Table 1 features information about the prevalence of bargaining regimes in our sample over time. Collective bargaining agreements are still the dominant bargaining regime in terms of employees, but the share of covered employees has steadily fallen by about 10 percentage points in the time span of our sample. The share of plants covered has experienced a similar development at a lower level, falling from 51% in 2000 to only 38% in 2010 (results available).[13] The share of employees covered by firm-level contracts has been stable more stable over time.

Employment Growth: To measure plant-level employment growth, we use the concept of job flows. The majority of contributions investigates the relationship between unionisation in a base year and growth in terms of employment over a period of several years, while Bryson and Dale-Olsen (2008) summarises that only a minority of studies are able to model year-on-year employment changes due to data limitations. We compute

[12]The union employment literature employs various measures of union strength, depending on the institutional setting in the country and the datasets available. The most common measures are union density (the share of union members among all employees) (Blanchflower et al. 1991, Machin and Wadhwani 1991, Bronars et al. 1994, Dunne and MacPherson 1994, Addison et al. 2000, Wooden and Hawke 2000, Krol and Svorny 2007, Bryson and Dale-Olsen 2008) or union recognition for collective bargaining (Blanchflower et al. 1991, Machin and Wadhwani 1991, Leonard 1992, Blanchflower and Burgess 1998, Booth and McCulloch 1999, Addison and Belfied 2004, Bryson 2004, Bryson and Dale-Olsen 2008, Bryson and Nurmi 2011). Other measures include dummy variables indicating the presence of (at least one) union member (Long 1993, Blanchflower and Burgess 1998, Wooden and Hawke 2000), the existence of a majority union (DiNardo and Lee 2004, Sojourner et al. 2012), the number of collective agreements at the plant level (Bryson and Dale-Olsen 2008) and a dummy variable whether a plant de-unionised during the observation period (Walsworth 2010, Addison and Belfied 2004).

[13]It is worth noting that the decline in collective coverage has predominantly affected covered employees in plants that pay a wage cushion, while the rise of individual bargaining has occurred both in plants that orientate themselves to a CBA and plants that do not.

Table 2: Job Growth Rate by Bargaining Regime

Bargaining Regime	Job Reallocation Rate	Job Creation Rate	Job Destruction Rate	Job Growth Rate (unw.)	Job Growth Rate (plant-w.)	Job Growth Rate (empl.-w.)	N. of Obs.
Individual Wage Det.	0.12	0.07	0.05	0.02	0.05	0.04	43,095
	(0.17)	(0.15)	(0.12)	(0.21)	(0.22)	(0.20)	
Firm-L. Contract	0.10	0.05	0.05	-0.01	0.01	0.00	7,682
	(0.17)	(0.11)	(0.14)	(0.20)	(0.19)	(0.16)	
Coll. Barg. Agr.	0.09	0.04	0.05	-0.00	0.02	0.01	45,716
	(0.14)	(0.11)	(0.11)	(0.17)	(0.18)	(0.15)	
Total	0.10	0.05	0.05	0.01	0.03	0.02	96,493
	(0.16)	(0.13)	(0.12)	(0.19)	(0.20)	(0.17)	

Note: Calculated according to Davis and Haltiwanger (1992); Numbers denote means, standard deviations in parentheses; Plant weights use representative sample weights from the IAB EP, employee weights control for plant size.
Source: LIAB QM2 9310, waves 2000-2010, own calculations using controlled remote data access via FDZ.

employment growth rates according to Davis and Haltiwanger (1992) as the difference in employment levels in a plant j between time t and *t-1* divided by the average employment level in both periods:

$$jgr_{jt} = \frac{x_{jt} - x_{jt-1}}{(x_{jt} + x_{jt-1})/2}$$

Compared to conventional non-standardised growth rates, this measure has the advantage of being approximately normally distributed inside a (0,2) interval. Furthermore, we can make use of the fact that, in the IAB EP, both the employment level of the recent year and the last year are included in every wave of the survey and use an unbalanced panel and even plants with only one valid observation.[14] Furthermore, the survey design corrects for panel attrition by adding strata-representative plants for each panel exit, such that we are confident that our dependent variable does not suffer much from survival bias.[15]

Table 2 presents descriptive statistics of job flow rates and especially on job growth rates by different bargaining regimes. You can see that employment growth is larger in plants with individual wage determination. This is driven by a higher rate of job creation. However, these plants also feature the highest rate of job reallocation overall,

[14]The retrospective information is subject to small inconsistencies, for example due to a change in interview partners between questionnaire waves. We have checked the consistency with previous employment levels. The mean deviation is 1.2 employees or 0.002%. We have checked whether the exclusion of plants with large discrepancies affects our results. This is not the case. Furthermore, plants that are interviewed only once are. of course, not used in within group estimates. Their exclusion does not change the results in pooled OLS or between group estimates.

[15]We have also performed estimates using a balanced panel and estimates that explicitly control for firm survival with a Heckman selection model.

indicating that collective bargaining increases the matching quality of a job. The differences in employment growth between plants covered by firm-level contracts and by collective bargaining agreements are fairly small. Indeed, firm-level contracts seem to display a somewhat lower growth rate, while job reallocation and job creation is potentially larger. Job destruction is about the same across bargaining regimes. The weighted job growth rates are larger because small plants usually have higher job growth rates. The observed patterns, however, do not change.

While these numbers look qualitatively quite similar to the ones presented in studies from the *union employment literature* for Anglo-Saxon countries, quantitatively the difference in employment growth rates between unionised plants and non-unionised plants is smaller in our data. This might be a first hint that there are disparities in the effects of union bargaining on employment growth between countries with different institutions. However, one institutional distinction does not seem to matter much: the level of collective bargaining.

Covariates: Given the linked-employer-employee character of our data, we include both worker- and plant-level control variables to control for differences in observable characteristics. We include individual characteristics as plant-level shares or statistical moments. We use the share of female workers, the average employee age and its dispersion in a plant, the share of tenured workers using seven groups, as well as the share of employees with foreign nationality in a plant. We use employee shares distinguishing unskilled, skilled and high-skilled workers,[16] blue- and white-collar workers as well as trainees and part-time workers. We further include the mean of employees' log daily gross earnings and the share of employees with an individual wage censored at the social security contribution ceiling. To rule out that these control variables are influenced by outliers, we restrict our analysis to plants where we can observe at least five employees per plant in each year.

As regards the plant-level characteristics, we always control for the existence of a works council, alignment to a CBA, the existence of a wage cushion, investment activity, the technical state of assets*, plant age, public or foreign ownership and organisational status (single plant, public listing, public corporation), as well as additional information on the workforce composition (share of open positions, temporary workers, as well as the churning rate[17]).

We further include sensitive characteristics in some specifications. These variables might have an influence on employment growth, but they have a high share of item-non-response, such that sample size is reduced significantly. These are the average working

[16] We use the imputation method supplied by Fitzenberger et al. (2006) to get more and more consistent information.

[17] Calculated as (hires + separations - (hires - separations)) divided by average employment.

time for full-time employees*, the share of exports, personnel and turnover outlook*, firm-sponsored training*, and the existence of overtime*. Furthermore, we control for productivity at the plant level by using the log of total investments as well as the share of expansion investments.[18] We check whether the inclusion of those variables changes our results due to a (systematically) different sample composition by regressing the model with the non-sensitive variables only on the restricted sample.[19] Furthermore, we use dummy variables for the industry, the region, and the year of the observation at the plant level. We offer a complete list of all variables used in the Appendix (see Table 5).

5 Estimation Procedure

In this section we lay out our empirical procedures, starting from simple estimation techniques to more sophisticated ones, and discuss their pros and cons in order to comprehend the respective possibilities of estimating causal effects.

Basic Model: Making use of the panel character of our linked-employer-employee data, we estimate a linear two-way error-components model in the following (condensed) form:

$$y_{jt} = \beta_k \cdot union_{kjt} + \delta \cdot X'_{jt} + \alpha_j + \mu_t + \epsilon_{jt}$$

where y_{jt} is the employment growth rate for plant j at time t calculated in the above fashion, $union_{kjt}$ are our variables of interest, namely a dummy variable taking the value of one when a plant j at time t is covered by a collective bargaining agreement (k=1) or a firm-level contract (k=2) and zero otherwise. We add individual-specific and plant-specific control variables in X_{jt} (as detailed in the previous section), as well as firm size classes, industry and regional fixed effects to our regression. Then, α_j captures plant-specific unobserved heterogeneity (as well as potentially time-invariant control variables), while the unobserved time effect μ_t is treated as fixed between plants and estimated via time dummy variables to cover macro developments or general time trends. Finally, ϵ_{jt} represents an idiosyncratic error term. We account for the repeated observation of plants over time using cluster-robust standard errors at the plant level in all our estimations.

We first determine the parameters β_k using pooled ordinary least squares (OLS)

[18] We refrain from using methods to impute the capital stock of the plant (a variable missing in the IAB EP), for example by a perpetual inventory method (Gürtzgen 2009, Mueller 2008). Recent work using this method conclude that results are mostly robust against relying on labour productivity alone (Felbermayr et al. forthcoming, Hirsch and Mueller 2012).

[19] Additionally, some of the plant-level variables are systematically missing for certain waves, because they were not asked in each IAB EP questionnaire. We have imputed these variables as indicated by a * by replacing missing values with the ones from a year before or after.

as a reference point, as the coefficients are potentially biased upwards since they ignore unobserved heterogeneity that are simultaneously correlated with collective bargaining coverage and employment growth. However, these estimates provide for a comparison to the results of the *union employment literature*, which often uses cross-section data.

Static Linear Panel Data Model: Then, we use static panel estimators to control for time-invariant and potentially also for time-variant plant-specific heterogeneity.[20] Identification in the panel dimension using a within group estimator (or fixed-effects model) relies on changes in the bargaining status of plants. In our sample the number of plants that changes collective bargaining coverage is rather small. During our observation period, 1,722 plants (5.91% of all plants covering 6.46% of all employees) conclude a collective contract (either CBA or FLC)for the first time, while 2,189 plants (7.91% of all plants covering 4.16% of all employees) leave collective coverage.[21] Institutionally, an a first conclusion or a termination of a collective contract are complex processes and may take time to materialise into employment growth. On the one hand, if a collective contract is first concluded, the bargained wages and working conditions are likely to primarily affect future profits and therefore future labour demand. On the other hand, if a collective contract is terminated, institutional regulations, especially after-effects clauses (Nachwirkungsprinzip, see Section 3), prevent wages and working conditions from adapting for up to several years. Therefore, leaving collective coverage is not going to affect profits and labour demand in the short run, as well. Hence, doubts may arise whether a within group estimator sufficiently identifies our research question, whether collective bargaining reduces employment growth, at least in the short run.

We use three alternative approaches to overcome this problem. First, we use the lags of our main independent variables, i.e. we analyse whether a change in the bargaining status in the past has an effect on recent employment growth. This seems to improve the identification of the fixed-effects estimator at the cost of reducing the number of observations. Second, we analyse the effect of changes in collective bargaining coverage using dummy variables indicating plants that have introduced or terminated collective

[20] As both the dependent and the independent variable of interest are measured at the plant level, a three-way-error component model following Andrews et al. (2006), who control for spell-fixed-effects, i.e. time-constant unobserved heterogeneity for each individual-plant combination (spell) is not advisable here. First, the number of movers between plants is very small, such that the results do not differ from using an individual-fixed-effect. Second, in such a model we would observe individuals nested in plants. Plant size and therefore the number of individuals at each data point (plant) is correlated with collective bargaining coverage. This would bias our results if collective bargaining coverage affects different plant sizes differently, which is likely. As a robustness check, we have performed individual-fixed effects estimations using weights that control for plant size, which, in turn, results in the same coefficients as a plant-level estimation.

[21] Own calculations based on 69,914 plants with multiple observations over time. These numbers exclude 'frequent changers', i.e. plants that change collective coverage back and forth for one year only.

bargaining at one point during our observation and then interact this information with the actual application of collective contracts (difference-in-difference approach). This allows us to control for selection effects of a change in collective bargaining, and also to analyse the long-term effects of a change in collective bargaining on employment growth over the whole sample (Gralla and Kraft 2012). Third, we tackle the problem methodologically using a correlated random effects model that relaxes the strict assumption of uncorrelated heterogeneity and observables (random-effects) by introducing the means of the time-variant characteristics, as further control variables (Mundlak 1978).

Dynamic Panel Data Model: As discussed above, the first conclusion or termination of a collective contract may take time to materialise. In the same manner, the dependent variable itself may take time to adapt to changes in the regressors, i.e. there could be autocorrelation in the data. Therefore, we append the analysis using a linear dynamic panel-data model that includes lags of the dependent variable as covariates and contains unobserved panel-level effects. Our dynamic panel-data model has the form:

$$y_{jt} = \sum_{l=1}^{n} \gamma_l \cdot y_{jt-k} + \beta_k \cdot union_{kjt} + \delta \cdot X'_{jt} + \alpha_j + \mu_t + \epsilon_{jt}$$

where γ_l are parameters of the l lags of the dependent variable to be estimated,[22] while we estimate the vector β_k as the coefficients of interest from endogenously treated covariates of bargaining status and the vector δ as the coefficients of exogenous control variables, while α_j are the panel-level effects, μ_t the time effects, and ϵ_{jt} are i.i.d erros.

According to econometric theory, correlation of unobserved panel-level effects with the lagged dependent variables leads to inconsistent OLS and (in case of short panels also) between group estimators (aka Nickel 1981 bias). Therefore, we use the Arellano and Bond (1991) generalized method of moments (GMM-Diff) estimator, which requires that there is no autocorrelation in the idiosyncratic errors, and its alternative, the Blundell and Bond (1998) GMM-SYS estimator, which uses more moment conditions, but has an additional stationarity assumption.[23] The estimators are constructed by first-differencing to remove the panel-level effects and by using instruments to form moment conditions from the first-differenced errors instruments. Lagged levels of the dependent variable and the endogenous variables are used to form GMM-type *internal* instruments (Arellano and Bond 1991). We discuss the use of external instruments in Section 8.1 in the Appendix. We use the two-step estimator with robust standard errors (Windmeijer 2005), because

[22]The Arellano-Bond test for serial correlation in the first-differenced residuals has found either one or two lags to be appropriate.

[23]The Sargan-Hansen test is rejected more often using GMM-SYS models, suggesting that this could be caused by mean stationarity in the data. We therefore use the GMM-Diff estimator.

the Sargan-Hansen test rejects the instrument moment condition based on a homoskedasticiy assumption.

6 Empirical Findings

6.1 Static Panel Estimation

Table 3 presents an overview of the effect of collective bargaining on employment growth in German plants estimated using static panel data methods: pooled ordinary least squares, fixed effects and random effects. For space limitations we present only the variables of interest and selected specifications, while full tables are presented in Tables 6, 7, and 8 in the Appendix.

Pooled OLS: Turning to to the first two rows, we look at the results from pooled ordinary least squares estimations. Identification rests on controlling for observed differences in (a large number) covariates. Specification (1) presents the raw estimates, which correspond to the differences from descriptive statistics. Two findings need to be acknowledged. First, the differences in average employment growth between covered and uncovered plants are relatively small in comparison to findings from the *union employment literature* and amount to -2.2 and -2.4%.[24] Second, the coefficients of the two different types of union bargaining, i.e. the differences between firm-level and industry-level collective bargaining, are very similar. In fact, they are not statistically different from each other for merely all of our estimation results.

When proceeding to specification (2) we add the dummy variables for firm size, industry, region, and years, as well as individual characteristics and some plant-level characteristics to the equation. This reduces the coefficients of interest to -0.8 and -1.0%, respectively for CBAs and FLCs. Both coefficients are, albeit significantly reduced in size by up to 70%, statistically significantly different from zero. Hence, we conclude from this simple regression, which is, however, comparable to the *union employment literature*, that in a different set of institutions, collective bargaining has comparable effects on employment growth. Furthermore, making use of the fact that we can observe two different levels of collective bargaining parallel, we do not find further evidence for the famous (but already disputed) U-shape hypothesis by Calmfors and Driffill (1988).

Across specifications, the differences in coefficients can be interpreted as capturing only the direct or also the indirect effects of collective bargaining on employment

[24] Over the time span of our data, this, however, amounts to up to 29.8% less employment growth for covered plants.

growth: specification (1) captures the both direct and indirect effects, while we control for almost every possible and observable mechanism through which collective bargaining indirectly influences employment growth: wages, productivity, working time, etc. in the other specifications. Most of the reduction of the coefficients is explained by the inclusion of plant-level control variables, see specification (3) of Table 6.[25] A further inclusion of observation-sensitive plant-level control variables, however, does not qualitatively change the results, as can bee seen from specification (6) in Table 6.

Table 3: Collective Bargaining and Employment Growth: Results from Different Panel Estimations

Method	Ordinary Least Squares		Fixed Effects		Random Effects	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Collective Bargaining Agreement	-0.0219***	-0.0078***	0.0009	0.0016	-0.0209***	-0.0096***
	(0.0013)	(0.0021)	(0.0035)	(0.0041)	(0.0017)	(0.0025)
Firm-Level Contract	-0.0243***	-0.0105***	-0.0023	-0.0024	-0.0229***	-0.0130***
	(0.0024)	(0.0029)	(0.0050)	(0.0050)	(0.0030)	(0.0030)
Firm-Level Variables	No	Some	No	Some	No	Some
Individual-Level Variables	No	Yes	No	Yes	No	Yes
Dummy Variables	No	Yes	No	Yes	No	Yes
N. of Observations	96493	96493	96493	96493	96493	96493
N. of Clusters	26525.00	26525.00	26525.00	26525.00	26525.00	26525.00
F-statistic	149.66	77.72	0.24	.		
Chi squared					172.16	5213.54
R squared overall	0.00	0.10			0.00	0.10
R squared within			0.00	0.13	0.00	0.10
ρ			0.49	0.72	0.31	0.30
Aikaike Criterion	-47085.42	-57255.14	-92788.07	-106466.46	.	.
Sargan-Hansen statistic					72.515***	2044.134***

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; other control variables: as in specification (4) of Tables 6, 7, and 8 in the Appendix; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*

Panel estimators: Turning to the next columns, we present the results of a fixed-effect estimator in a similar manner as above in specifications (3) and (4), while the full regression model can be found in Table 7. We find that the effects of collective bargaining on employment growth are not statistically different from zero, independently from the model specification employed. However, as discussed in Section 5, the fixed effects estimator might suffer from an identification problem if collective contracts take time to materialise. We turn to potential remedies in Section 6.2.

[25]The lack of explanatory power of individual covariates might indicate that worker sorting does not play much of a role in explaining differences in employment growth between covered and uncovered plants, see the discussion in Section 8.1.

In the last columns of Table 3, we display the results of random-effects models. The coefficients are again larger than in the fixed-effects models and statistically significant as well. Plants with a collective bargaining agreement are associated with a lower employment growth, by about 1.0%, while plants with a firm-level contract grow slower by about 1.3%. However, although the random-effects model has the advantage that it does not solely rely on the within-variation of the data and may therefore not suffer from the same identification problem as the fixed-effects model, we have to reject the Sargan-Hansen tests of overidentifying restrictions and can therefore not rule out biased coefficients due to a correlation between the residuals and the set of independent variables.[26] As a potential remedy, we present results from a correlated random effects model in Section 6.2, which does not suffer from such strict assumptions.

6.2 Identification in the Panel Dimension

Lagged fixed effects: As a first remedy for identification in the panel dimension, we use lagged values of the independent variables in the fixed effects models. This could potentially capture the fact that collective contracts take time to come into effect when first signed as well as to account for the existence of after-effect clauses, which prevent the termination of a collective contract to be a tool for instant wage flexibility. The results are shown in the first four columns of Table 9 in the Appendix. We employ a fixed-effects model similar to specification (4) of Table 7, but use the first, second, third, or even fourth lag of a plants collective bargaining status as an explanatory variable in the employment growth estimation. It can bee seen that the coefficients do not change much or become statistically significant except for the third lag. Here, coverage by a collective bargaining agreement three years ago seems to reduce the contemporary employment growth of a plant by 1%, while the effect is 1.5% for firm-level contracts. For FLCs, one can also observe a similar negative effect from using the forth lag. The number of observations in lagged fixed effects estimations is smaller because of the elimination of plants we observe only once, twice, etc. during the sample period. We have run the estimations using pooled OLS on the lagged FE samples to check for sample selection, i.e. whether the differences in the coefficients are driven by any kind of survival bias. It turns out that this is the case. The OLS results on samples that exclude plants that are only surveyed for some few waves turn out different, i.e. non-significant coefficients of collective bargaining coverage.

Difference-in-differences: In specifications (5) and (6) of Table 9 we present the results of a difference-in-differences (DiD) approach in order to control for plant respectively

[26] We use a Sargan-Hansen test instead of a Hausman-Wu test due to clustering in our data (Schaffer and Stillman 2010).

individual selectivity. The exact procedure is explained in more detail in Section 8.1.[27] Our findings show that there exist a potentially negative selection of plants into collective bargaining, as can be seen from the negative treatment group effects. It is, however only significantly different from zero in specification (6), where include plants that are always covered in our model. These plants are also characterised by a significantly smaller employment growth, as compared to plants which never have a collective contract. Turning to the actual treatment effect, we do not find significant results. Therefore, these results suggest that there exists no causal effect from the introduction of a collective contract, but that the negative effects of collective bargaining represent a selection effect.

Correlated random-effects: As a potential corrective for bias in the random-effects model in Section 6.1 we relax its strict assumptions by allowing for correlation between the effects and the explanatory variables (Mundlak 1978). The models are presented in Table 10 in the Appendix.[28] They include, additionally to the covariates used in the other models, the so called 'Mundlak-terms', i.e. means of the time-variant control variables.[29]. As regards the coefficients of our variables of interest, the time-variant parts are insignificant, while the Mundlak terms are significantly different from zero and about the same size as the random-effects models. Interpreting the CRE coefficients we conclude that the 'true coefficients' are driven by between group differences, and not caused by within variation in the data.

To conclude, static panel data models and its extensions do not allow us to infer identification of a causal effect of collective bargaining on employment growth in German plants. Instead, the observed (small) differences are potentially caused by selection and suffer from endogeneity stemming from time-variant heterogeneity.

6.3 Dynamic Panel Estimation

In this section we employ dynamic panel models using GMM-Diff estimators as explained in Section 5. We present an overview of different procedure options for the variables of interest in Table 4. Summary statistics include Arellano-Bond tests to check whether the use of lagged dependent variables is appropriate and a Sargan Hansen test of the instrument moment condition check for overidentification.

Specification (1) performs a simple Arellano and Bond (1991) estimator. The co-

[27]The results shown here use only one dummy variable capturing both types of collective contracts, while qualitatively similar results for a differentiation of the bargaining level are available upon request.

[28]Because of the plethora of variables we only present the variables of interest and the summary statistics.

[29]We test for the joint significance of the Mundlak terms and can reject the null hypothesis that the model is equal to a (traditional) random effects model.

efficients of the variables of interest are insignificant. There is significant autocorrelation in the data, but the Sargan test is rejected. Therefore, we check whether the rejection is based on homoskedasticiy using a two-step estimator in specification (2). Here, the Sargan test is only rejected on the 10% level, while the coefficients of the collective bargaining variables stay insignificant.

Table 4: Collective Bargaining and Employment Growth: Results from Different GMM-Diff Estimations

Method	GMM-Diff	+Two-Step	+Endogenous Regressors	GMM-SYS
Variables	(1)	(2)	(3)	(4)
Job Growth Rate (t-1)	-0.0149	-0.0009	-0.0014	-0.0077
	(0.0107)	(0.0103)	(0.0100)	(0.0100)
Collective Bargaining Agreement	0.0018	0.0030	-0.0392**	-0.0543***
	(0.0061)	(0.0061)	(0.0188)	(0.0136)
Firm-Level Contract	0.0031	0.0053	-0.0122	-0.0501***
	(0.0084)	(0.0082)	(0.0247)	(0.0275)
Constant	0.1549*	0.1290*	0.1576**	0.1848**
	(0.0794)	(0.0778)	(0.0720)	(0.0192)
Firm-Level Variables	Some	Some	Some	Some
Individual-Level Variables	Yes	Yes	Yes	Yes
Dummy Variables	Yes	Yes	Yes	Yes
N. of Observations	47828	47828	47828	67104
Chi squared	2681.36	2599.21	2591.34	2413.45
Arellano-Bond test (1)	-27.281***	25.503***	-24.774***	-24.78***
Arellano-Bond test (2)	.72053	1.2911	1.34	1.126
Sargan test	158.0856***	59.87066*	162.6983**	212.29***

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; other control variables: as in specification of Table 11 in the Appendix; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*

However, they might be biased from endogeneity. In specification (3), we treat the bargaining coverage as endogenous and instrument it with its second lags. In fact, this changes the size of the coefficients of both types of collective contracts, as well as the significance of the one for CBAs. Here, plants that are covered by a collective bargaining agreement have a 3.9% lower employment growth than plants that bargain individually. However, the Sargan test is again rejected more strongly.

As a last check, we use the Blundell and Bond (1998) GMM-SYS estimator in specification (4). Here, the coefficients of both variables of interest are statistically significantly different from zero and even larger in size. Being covered by a collective agreement reduces a plant's employment growth by 5% per year, independently of the bargaining

level, according to this specification. However, the Sargan test is much higher than for the GMM-Diff estimator. Rejection could hint to the existence of mean stationarity, the additional assumption over GMM-Diff.

In Table 11 in the Appendix, we present the results from our preferred specification (3) for different amounts of control variables. It can be seen that as long as we control for dummy variables, i.e. time dummy variables, the significantly negative effects hold. Similarly, we have checked whether the exclusion of firm-level contracts changes our results. This is not the case. Similarly, higher levels of autocorrelation is not present in our data.[30]

7 Conclusion

Summing up, we have analysed 'the one constant' in the economic effects of trade unions. Union bargaining has been found to reduce employment growth in covered plants by a significant amount, varying between 2 and 4% per year in a range of Anglo-Saxon countries. However, this effect has been found to be declining in recent years and has not been proven to be causal by any means. Furthermore, it has, to our knowledge, not been proven to exist in countries with different institutional settings, e.g. industry-level bargaining and corporatist trade unions in large parts of (continental) Europe.

Therefore, we use recent panel data from Germany, the largest economy in Europe and a country that has a long tradition of collective bargaining, albeit recent developments of decentralisation and de-unionisation, similarly experienced in Anglo-Saxon countries. We can make use of official linked employer-employee data to control for a large number of observable confounders and try different estimation methods to estimate a causal effect of collective bargaining coverage on employment growth in German plants between 2000 and 2010.

Our findings suggest that the existence of a small but mostly significant negative effect of collective bargaining on employment growth, ranging between just below 1 and 2% per year for OLS and static panel estimators, while these effects are much larger in the dynamic panel case. Scrutinising the existence of causality, however, proves to be difficult. Within-variation fails to identify, while possible instrumental variables are rejected in state-of-the-art test procedures. If anything, insights from difference-in-differences or correlated random effects models suggest the existence of (negative) selection into collective bargaining.

A series of robustness checks shows that our results are universally valid, but does not follow a clear pattern of effect heterogeneity usually found in pertinent studies.

[30] The results are available upon request.

We conclude that even descriptive statistics have pointed out to smaller effects than usually found in the literature. Econometric analysis provides somehow inconclusive results, which, however, can be at least interpreted in a ways such that the institutional differences in Germany work in the intended direction of inducing smaller (negative) effects.

Furthermore, our results add to the evidence which questions the U-shape hypothesis by Calmfors and Driffill (1988). We do not find that the level of bargaining centralisation influences economic performance. Throughout our specifications, the (negative) effects of the two different levels of union bargaining found in Germany, namely central collective bargaining agreements at the industry level and firm-level contracts, are very similar.

These results might indicate that the formal level of bargaining set by law and institutions does not matter that much when explaining economic outcomes. Instead, the behaviour of the actors involved, management, unions and employers' associations might be more important. This might turn out to be a promising field of further research.

As regards the policy implications of our research, it turns out to be very important since recent reform initiatives, for example those laid out in the report of the GCEE (2011), assume the negative effects of union coverage on employment growth to hold in Germany as well. Therefore, economists still advice decentralising collective bargaining to be an effective tool in an employment-orientated economic policy agenda. For example by abolishing after effect clauses has long been on the political agenda of liberal and conservative parties in Germany.

References

Addison, John T. and Clive R. Belfied, "Unions and Employment Growth: The One Constant?," *Industrial Relations*, 2004, *43* (2), 305–323.

Addison, John. T. and Paulino Teixeira, "The Effect of Works Councils on Employment Change," *Industrial Relations*, 2006, *45* (1), 1–25.

Addison, John T., W. Stanley Siebert, Joachim Wagner, and Xiangdong Wei, "Worker Participation and Firm Performance: Evidence from Germany and Britain," *British Journal of Industrial Relations*, 2000, *38* (1), 7–48.

Addison, J.T., A. Bryson, P. Teixeira, and André Pahnke, "Slip Sliding Away: Further Union Decline in Germany and Britain," *Scottish Journal of Political Economy*, 2011, *58* (4), 490–518.

Andrews, Martyn, Thorsten Schank, and Richard Upward, "Practical Fixed-Effects Estimation Methods for the Three-Way Error-Components Model," *The Stata Journal*, 2006, *6* (4), 461–481.

Antonczyk, Dirk, "Using Social Norms to Estimate the Effect of Collective Bargaining on the Wage Structure," *Discussion Paper, Albert Ludwigs University Freiburg*, 2011.

Arellano, M. and S. Bond, "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 1991, *58*, 277–297.

Baum, C. F., M.E. Schaffer, and S. Stillman, "Enhanced Routines for Instrumental Variables/Generalized Method of Moments Estimation and Testing," *Stata Journal*, 2007, *7*, 465–506.

Blanchflower, David. G. and Simon Burgess, "New Technology and Jobs: Comparative Evidence from a Two Country Study," *Economics of Innovation and New Technology*, 1998, *5* (2-4), 109–138.

Blanchflower, David G. and Simon M. Burgess, "Job Creation and Job Destruction in Great Britain in the 1980s," *Industrial and Labor Relations Review*, 1996, *50* (1), 17–38.

_ , Neil Millward, and Andrew J. Oswald, "Unionism and Employment Behaviour," *Economic Journal*, 1991, *101* (407), 815–834.

Blundell, R. and S. Bond, "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models," *Journal of Econometrics*, 1998, *87*, 115–143.

Booth, Alison L. and Andrew McCulloch, "Redundancy Pay, Unions and Employment," *Manchester School*, 1999, *67* (3), 346–366.

Brändle, Tobias, "Works Council Behaviour and Flexible Collective Bargaining Agreements," *IAW Discussion Paper No. 96*, 2013.

Bronars, Stephen G., Donald R. Deere, and Joseph S. Tracy, "The Effects of Unions on Firm Behaviour: An Empirical Analysis Using Firm Level Data," *Industrial Relations*, 1994, *33* (4), 426–451.

Bryson, Alex, "Unions and Employment Growth in British Workplaces during the 1990s: A Panel Analysis," *Scottish Journal of Political Economy*, 2004, *51* (4), 477–506.

_ **and Harald Dale-Olsen**, "A Tale of Two Countries: - Unions, Closures and Growth in Britain and Norway," *CEP Discussion Paper No. 0867*, 2008.

_ **and Satu Nurmi**, "Private Sector Employment Growth, 1998-2004: A Panel Analysis of British Workplaces," *Cambridge Journal of Economics*, 2011, *35* (1), 85–104.

Calmfors, Lars and John Driffill, "Bargaining Structure, Corporatism and Macroeconomic Performance," *Economic Policy*, 1988, *3* (6), 14–61.

Davis, Steven and John Haltiwanger, "Gross Job Creation, Gross Job Destruction and Employment Reallocation," *Quarterly Journal of Economics*, 1992, *107* (3), 819–864.

DiNardo, John and David S. Lee, "Economic Impacts of New Unionization on Private Sector Employers: 1984-2001," *Quarterly Journal of Economics*, 2004, *119* (4), 1383–1442.

Dunne, Timothy and David A. MacPherson, "Unionism and Gross Employment Flows," *Southern Economic Journal*, 1994, *60* (3), 727–738.

Dustman, Christian and Uta Schönberg, "Training and Union Wages," *The Review of Economics and Statistics*, 2009, *91* (2), 363–376.

Ellguth, Peter and Susanne Kohaut, "Tarifbindung und betriebliche Interessenvertretung: Aktuelle Ergebnisse aus dem IAB-Betriebspanel 2010," *WSI-Mitteilungen*, 2011, *5*, 242–247.

Fackler, Daniel, Claus Schnabel, and Joachim Wagner, "Establishment Exists in Germany: The Role of Size and Age," *IZA Discussion Paper No. 6349*, 2012.

Felbermayr, Gabriel, Andreas Hauptmann, and Hans-Joerg Schmerer, "International Trade and Collective Bargaining Outcomes," *Scandinavian Journal of Economics*, forthcoming. mimeo.

Fischer, Gabriele, Florian Janik, Dana Müller, and Alexandra Schmucker, "The IAB Establishment Panel – Things Users Should Know," *Schmollers Jahrbuch*, 2009, *129* (1), 133 – 148.

Fitzenberger, Bernd, Aderonke Osikominu, and Robert Völter, "Imputation Rules to Improve the Education Variable in the IAB Employment Subsample," *Schmollers Jahrbuch*, 2006, *126* (3), 405–436.

_ , **Karsten Kohn, and Alexander C. Lebcke**, "Union Density and Varieties of Coverage: The Anatomy of Union Wage Effects in Germany," *Industrial and Labor Relations Review*, 2012, *forthcoming.*

GCEE, *Assume responsibility for Europe. Annual Report 2011/12.*, German Council of Economic Experts, 2011.

Goerke, Laszlo and Markus Pannenberg, "Trade union membership and dismissals," *Labour Economics*, 2011, *18* (6), 810–821.

Gralla, Rafael and Kornelius Kraft, "Separating Introduction Effects from Selectivity Effects: The Differences in Employment Patterns of Co-Determined Firms," *IZA Discussion Paper No. 7022*, 2012.

Gürtzgen, Nicole, "Rent-Sharing and Collective Bargaining Coverage: Evidence from Linked-Employer-Employee Data," *The Scandinavian Journal of Economics*, 2009, *111* (2), 323–349.

_ , "Rent-Sharing and Collective Wage Contracts: Evidence from German Establishment-Level Data," *Applied Economics*, 2010, *42* (22), 2835–2854.

Hammermesh, Daniel S., *Labor Demand*, Princeton University Press: Princeton, New Jersey, 1993.

Hübler, Olaf and Uwe Jirjahn, "Works Councils and Collective Bargaining in Germany: The Impact on Productivity and Wages," *Scottish Journal of Political Economy*, 2003, *50* (4), 471–491.

Hirsch, Boris and Steffen Mueller, "Temporary Agency Work and the User Firm's Productivity," *Economic Journal*, 2012, *122(562)*, F216–235.

_ , **Thorsten Schank, and Claus Schnabel**, "Works Councils and Separations: Voice, Monopoly, and Insurance Effects," *Industrial Relations*, 2010, *49* (4), 566–592.

Imbens, Guido and Jeffrey M. Wooldridge, "Recent Developments in the Econometrics of Program Evaluation," *Journal of Economic Literature*, 2009, *47(1)*, 5–86.

Jacobebbinghaus, Peter and Stefan Seth, "Linked Employer-Employee Data from the IAB: LIAB Cross-sectional Model 2 1993-2008 (LIAB QM2 9308)," *FDZ Datenreport, 05/2010 (en)*, 2010.

Jirjahn, Uwe, "Works Councils and Employment Growth in German Establishments," *Cambridge Journal of Economics*, 2010, *34* (3), 475–500.

Kriechel, Ben, Samuel Mühlemann, Harald Pfeifer, and Schuette Miriam, "Works Councils, Collective Bargaining and Apprenticeship Training," *Industrial Relations*, forthcoming.

Krol, Robert and Shirley Svorny, "Unions and Employment Growth: Evidence from State Economic Recoveries," *Journal of Labor Research*, 2007, *28* (3), 525–535.

Lawson, Nicholas P., "Is Collective Bargaining Pareto Efficient? A Survey of the Literature," *Journal of Labor Research*, 2011, *32* (3), 282–304.

Leonard, Jonathan S., "Unions and Employment Growth," *Industrial Relations*, 1992, *31* (1), 80–94.

Long, Richard J., "The Effect of Unionization on Employment Growth of Canadian Companies," *Industrial Relations*, 1993, *46* (4), 691–703.

Machin, Stephen J. and Sushil Wadhwani, "The Effects of Unions on Organisational Change and Employment," *Economic Journal*, 1991, *101* (407), 835–854.

McDonald, I.M. and R.M. Solow, "Wage Bargaining and Employment," *American Economic Review*, 1981, *71* (5), 896–908.

Mueller, Steffen, "Capital Stock Approximation using Firm Level Panel Data," *Jahrbücher für Nationalökonomie und Statistik*, 2008, *228* (4), 357–371.

Mundlak, Y., "On the Pooling of Time Series and Cross Section Data," *Econometrica*, 1978, *46*, 69–95.

Nickel, S. J., "Biases in Dynamic Panel Models with Fixed Effects," *Econometrica*, 1981, *49*, 1417–1426.

Schaffer, M.E. and S. Stillman, "xtoverid: Stata module to calculate tests of overidentifying restrictions after xtreg, xtivreg, xtivreg2 and xthtaylor," *http://ideas.repec.org/c/boc/bocode/s456779.html*, 2010. http://ideas.repec.org/c/boc/bocode/s456779.html.

Schmidt, Christoph and Klaus F. Zimmermann, "Work Characteristics, Firm Size and Wages," *The Review of Economics and Statistics*, 1991, *73* (4), 705–710.

Schnabel, Claus, Stefan Zagelmeyer, and Susanne Kohaut, "Collective Bargaining Structure and its Determinants. An Empirical Analysis with British and German Establishment Data," *European Journal of Industrial Relations*, 2006, *12* (2), 165–188.

Sojourner, Aaron, Robert J. Town, David C. Grabowski, and Michelle M. Chen, "Impacts of Unionization on Employment, Product Quality and Productivity: Regression Discontinuity Evidence from Nursing Homes," *NBER Working Paper No. 17733*, 2012.

Visser, Jelle, "ICTWSS: Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts in 34 countries between 1960 and 2007, Updated Version 3, Amsterdam Institute for Advanced Labour Studies (AIAS), University of Amsterdam," 2011.

Walsworth, Scott, "Unions and Employment Growth: The Canadian Experience," *Industrial Relations*, 2010, *49* (1), 142–156.

Windmeijer, F., "A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators," *Journal of Econometrics*, 2005, *126*, 25–51.

Wooden, Mark and Anne Hawke, "Unions and Employment Growth: Panel Data Evidence," *Industrial Relations*, 2000, *39* (1), 88–107.

8 Appendix

8.1 Discussion on Endogeneity

Instrumental Variables Model: So far, strict exogeneity has been assumed, namely that the independent variables of interest (as well as the fixed-effects) are uncorrelated with the time-varying part of the error term: $E[\epsilon_{jt}|union_{kjt}] = 0$. While this assumption is often made in the literature (Andrews et al. 2006)„ a number of studies (see below) has argued that it is not met in the case of our research questions. However, relaxing it may allow to causally interpret our results. To do this, we augment the static model:

$$y_{jt} = \beta_k \cdot union_{kjt} + \delta \cdot X'_{jt} + \alpha_j + \mu_t + \epsilon_{jt}$$

by a first stage estimations of $union_{kjt}$:

$$union_{kjt} = \phi \cdot Z'_{jt} + u_{jt}$$

such that there exist *external* instruments Z_{jt} which inhibit an (exogenous) variation with the independent variables of interest $union_{kjt}$, but for which $E(\epsilon_{jt}|Z_{jt} = 0$ holds, which means that the instruments are not systematically correlated with the (remaining) error term. Methodologically, an estimation of a system of equations is needed, either using 2SLS/GMM or fixed effects, depending on the existence of variation over time in the instrumental variables. This approach then uses the concept of a LATE (local average treatment effect), in a sense that the instrumental variables push otherwise similar plants on the brink into collective coverage, after which the employment growth in these otherwise similar plants is compared. In this section, we present a number of possible instrumental variables, for which we have assessed their quality using state-of-the-art test statistics (Baum et al. 2007).

Discussion on Potential Instrumental Variables: Two cases of endogeneity can be distinguished: worker and firm sorting. As regards worker sorting Bryson and Dale-Olsen (2008) make a point that workers sort into trade union membership to be protected against dismissal when they anticipate a bad economic situation.[31] In Germany, however, such a behaviour is not relevant for the existence of a collective contract. There is only a weak short-term link between trade union membership of employees and collective bargaining coverage of a plant. Dismissal legislations should cover all employees equally and social plans in mass lay-offs are set up by local works councils, not sector unions.

[31]Evidence from Goerke and Pannenberg (2011) suggests that union membership reduces dissmissals in Germany as well.

Contrary, firm sorting into collective bargaining coverage might occur, for example, if plants with good (or bad) business conditions are systematically more or less likely to bargain collectively. This could happen because of lower rent-sharing opportunities in collectively covered plants (Gürtzgen 2009).[32] To control for firm sorting, several instrumental variables used in the literature: Bryson (2004) ses the average collective bargaining coverage at the industry level. The more plants are covered in a sector, the stronger the bargaining position of the sector union becomes and, ceteris paribus, the higher the wages that they can bargain with the firms. We have employed a similar instrument, namely the collective bargaining coverage at the district level, where not a direct correlation is expected, but only an indirect one, i.e. by increasing the possibility of a plant being covered by a collective contract if a region is characterised by affinity towards collective bargaining.

Similarly, Antonczyk (2011) uses the share of IG Metall members in the 1960's on a regional level.[33] A high share of union membership creates a 'culture of unionism' that over time influences plants to bargain collectively. However, by using historic data, this instrument would not be correlated with today's employment growth. A similar argument can be made by calculating the average age of plants at the local (district) level, a similar variable to the one used by Gürtzgen (2010). She generates a dummy variable taking the value of one if a plant was founded before 1990. By using information from the Establishment History Panel, a supplement to the LIAB data, we can track the age of a plant up until the early 1970s. Old plants are more likely to bargain collectively than newly founded plants (Schnabel et al. 2006). However, the age of a plant and employment growth might be correlated. Plant age in fact plays a role in determining plant growth, but only in the first years after the foundation of the plant. After several years, this relationship flattens out (Fackler et al. 2012).

Further possible instruments include the share of apprentices at the plant level. Unions often press for a high share of apprenticeships in a plant and fight for a guarantee to take the over. However, for the plant, apprentices can be seen as a substitute for newly hired employees and their share may therefore not be correlated with employment growth in the plant (Kriechel et al. forthcoming).

Findings from Instrumental Variables Estimations: We employ a number of potential variables discussed above (and some more) in order to find suitable instruments to analyse a causal effect of collective bargaining on employment growth. To assess their

[32]However, Gürtzgen (2010) has demonstrated that the overall pattern of rent-sharing across regimes is robust against endogeneity of the bargaining regime.

[33]The IG Metall is one of the largest trade unions in Germany, covering, among others, the metalworking sector.

quality, we, first, use kitchen-sink regressions that incorporate the potential instrumental variables in a static panel model as further control variables. Here, a first set of potential instrumental variables fails to be uncorrelated with employment growth in German plants: the share of old plants at the district level, the share of trainees, average collective bargaining at the secor or at the plant level, and the existence of working-time accounts.

Second, first stage regressions that explain collective bargaining coverage test whether there is a significant correlation with the potential instruments. Again, some fail to achieve the necessary relevance condition to be a valid instrumental variable: the age of plants at the district level, the renumeration of overtime, and the share of taken-over trainees.

Third, we use two-stage least squares (2SLS) and generalized method of moments (GMM) estimators with endogenous regressors that are instrumented and test the potential instruments for (weak) identification, overidentification, and endogeneity.[34] Again, certain instruments fail the tests.

To sum up, none of the potential instrumental variables survive the estimations as valid. Therefore, we have to acknowledge the fact that a causal interpretation of the effect of collective bargaining on employment growth cannot be based on instrumental variables estimations.

Difference-in-differences estimation procedure: In Section 6.2 we also use a difference-in-differences model. In this approach we only look at plants that first conclude a collective contract and disregard termination of collective contracts. This avoids putting the introduction and the abolishment of a collective contract council quantitatively on the same level, as it happens in fixed-effects or first-differences models. As we still use all waves of the panel, we employ DiD in a setup where 'treatment' does not occur at the same moment in time for all plants, following Imbens and Wooldridge (2009). We discern two effects: a time-invariant dummy variable captures the selection (treatment group effect) of plants into the treatment group of which concludes a collective contract for the first time and into the control group of those plants that always bargain individually with each employee throughout the observation period. Accordingly, we disregard all plants that are covered by a collective contract throughout the entire observation period. The variable of interest captures the exposure to the 'treatment' indicating whether plant was covered by a collective contract in period t (treatment effect). As a robustness check, we also use an augmented DiD model, where plants that are always covered by a collective contract are not excluded from the regression but captured using an additional dummy

[34] Estimations have been performed using the *(xt)ivreg2* command by Baum et al. (2007). The employed tests are Kleibergen-Paap (2006) statistics and Sargan-Hansen tests.

variable (Gralla and Kraft 2012).

8.2 Tables

Table 5: Operationalisation and Summary Statistics of Covariates

Variable	Obser-vations	Mean	Std. Dev.	Min	Max
Variables of Interest					
Job reallocation rate	96,493	.0929052	.1447418	0	1.943144
Job creation rate	96,493	.0567338	.1308231	0	1.927273
Job destruction rate	96,493	.0361714	.0891057	0	1.943144
Job growth rate	96,493	.0205625	.1707596	-1.943144	1.927273
Collective Bargaining Agreement	96,493	.5715612	.4948551	0	1
Firm-Level Contract	96,493	.079402	.2703666	0	1
Union Bargaining	96,493	.6509632	.4766681	0	1
Every First Concluded a CBA	96,493	.1056187	.3073505	0	1
First Concluded a CBA	96,493	.0566623	.2311975	0	1
Individual Characteristics (Shares)					
Female Employees	96,493	.4444407	.2935666	0	1
Employees with Foreign Origin	96,493	.066699	.1050717	0	1
Empl. with Tenure $<$ 1 Years	96,493	.2648507	.2000448	0	1
Empl. with Tenure 1 to 3 Years	96,493	.1490909	.1449542	0	1
Empl. with Tenure 3 to 5 Years	96,493	.2129363	.1725539	0	1
Empl. with Tenure 5 to 10 Years	96,493	.1232522	.1402132	0	1
Empl. with Tenure 10 to 15 Years	96,493	.0663502	.0967642	0	1
Empl. with Tenure $>$15 Years	96,493	.0769005	.115656	0	1
Average Employee Age	96,493	40.60742	4.629242	18.9	63
Employee Age Dispersion	96,493	10.80267	1.956918	.5773503	21.32068
Flexible Employees	96,493	.1347461	.1821414	0	1
Trainees	96,493	.0487352	.0837053	0	1
Skilled Employees	96,493	.5890318	.2656569	0	1
Highly-Skilled Employees	96,493	.0867753	.1467257	0	1
Blue-Collar Workers	96,493	.3437037	.3124619	0	1
Part-Time Employees	96,493	.2562366	.2598253	0	1
Average Gross Daily Wage	96,493	71.87453	31.85184	1.193333	178.0406
Dispersion of Gross Daily Wage	96,493	.0592973	.1048942	0	1
Firm Level Characteristics					
Works Council	96,493	.5031344	.4999928	0	1
Orientation to CBA	96,493	.1821933	.3860058	0	1
Existence of Wage Cushion	96,493	.3321569	.4709894	0	1
Share of Open Positions	96,493	.0149239	.0478099	0	1
Share of Temporary Workers	96,493	.0638939	.131039	0	1
Churning Rate	96,493	.0626082	.1583517	0	13.01408
Investment Activity	96,493	.7689891	.4214816	0	1
New Technical Assets	96,493	.7260253	.4459985	0	1
Firm Age (up to 20 Years)	96,493	16.58751	5.776527	0	20
New Firm (Founded after 1990)	96,493	.3100126	.4625008	0	1
Public Ownership	96,493	.0707555	.2564174	0	1
Foreign Ownership	96,493	.0768661	.2663802	0	1
Single Firm	96,493	.5899971	.4918364	0	1
Listed Company	96,493	.9637005	.5845144	0	2
Public Sector	96,493	.1378107	.344703	0	1
Average Standard Working Time	65,249	38.61324	2.310183	4	70
Log. of Total Investments	65,249	9.639861	5.781361	0	22.45461
Share of Expansion Investments	65,249	.2200994	.3293118	0	1
Share of Exports	65,249	.1342707	.2569259	0	1
Firm-Sponsored Training	65,249	.7554741	.429809	0	1
Overtime	65,249	.7662442	.4232219	0	1
Business Outlook	65,249	.314788	.464435	0	1
Personnel Outlook	65,249	.1789408	.3833057	0	1
Dummy variables					
Sector:	9 dummy variables for different industries (approx. Nace1)				
Region:	12 dummy variables for German Laender (some combined)				
Firm size:	5 dummy variables for different firm size classes				
Year:	9 dummy variables for each year				

Table 6: Collective Bargaining and Employment Growth: Results from Ordinary Least Squares

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Collective Bargaining Agreement	-0.0219***	-0.0241***	-0.0108***	-0.0078***	-0.0078***	-0.0060**
	(0.0013)	(0.0015)	(0.0021)	(0.0021)	(0.0024)	(0.0024)
Firm-Level Contract	-0.0243***	-0.0296***	-0.0163***	-0.0105***	-0.0078**	-0.0073**
	(0.0024)	(0.0025)	(0.0029)	(0.0029)	(0.0032)	(0.0031)
Works Council			-0.0295***	-0.0151***	-0.0182***	-0.0191***
			(0.0018)	(0.0018)	(0.0021)	(0.0021)
Orientation to a CBA			-0.0025	0.0008	0.0010	-0.0003
			(0.0020)	(0.0019)	(0.0021)	(0.0020)
Wage Cushion			-0.0018	-0.0005	-0.0000	-0.0017
			(0.0017)	(0.0016)	(0.0019)	(0.0019)
Share of Vacancies			0.1272***	0.0197	0.0185	-0.0421
			(0.0250)	(0.0242)	(0.0287)	(0.0287)
Share of Temp Workers			0.0368***	-0.0569***	-0.0222*	-0.0199*
			(0.0083)	(0.0087)	(0.0117)	(0.0114)
Churning Rate			0.0032	-0.0711***	-0.0686***	-0.0660***
			(0.0077)	(0.0098)	(0.0129)	(0.0126)
Investment Activity			0.0337***	0.0344***	0.0328***	0.0001
			(0.0016)	(0.0016)	(0.0018)	(0.0060)
Modern Technical Assets			0.0173***	0.0150***	0.0142***	0.0111***
			(0.0014)	(0.0013)	(0.0015)	(0.0015)
Firm Age			-0.0058***	-0.0028***	-0.0029***	-0.0026***
			(0.0003)	(0.0003)	(0.0003)	(0.0003)
New Firm (after 1990)			-0.0358***	-0.0210***	-0.0209***	-0.0201***
			(0.0029)	(0.0029)	(0.0032)	(0.0031)
Public Ownership			-0.0082***	-0.0040	-0.0077	-0.0063
			(0.0030)	(0.0030)	(0.0053)	(0.0052)
Foreign Ownership			-0.0094***	-0.0100***	-0.0084***	-0.0082***
			(0.0029)	(0.0028)	(0.0029)	(0.0029)
Single Firm			0.0034**	0.0082***	0.0090***	0.0093***
			(0.0015)	(0.0014)	(0.0017)	(0.0017)
Limited Firm			-0.0096***	-0.0041***	-0.0084***	-0.0101***
			(0.0014)	(0.0014)	(0.0016)	(0.0016)
Public Sector Plant			0.0137***	0.0183***	0.0110*	0.0116*
			(0.0031)	(0.0031)	(0.0063)	(0.0061)
Female Employees				0.0106***	0.0034	0.0013
				(0.0038)	(0.0043)	(0.0043)
Foreign origin				-0.0359***	-0.0398***	-0.0344***
				(0.0102)	(0.0114)	(0.0112)
Tenure: 1 to 3 years				-0.2707***	-0.2736***	-0.2588***
				(0.0127)	(0.0147)	(0.0144)
Tenure: 3 to 5 years				-0.3912***	-0.3980***	-0.3774***
				(0.0123)	(0.0142)	(0.0139)
Tenure: 5 to 10 years				-0.3812***	-0.3914***	-0.3668***
				(0.0118)	(0.0137)	(0.0134)
Tenure: 10 to 15 years				-0.3659***	-0.3796***	-0.3544***
				(0.0119)	(0.0137)	(0.0135)
Tenure: 15 to 20 years				-0.3548***	-0.3681***	-0.3427***
				(0.0122)	(0.0141)	(0.0138)
Tenure: over 20 years				-0.3871***	-0.4020***	-0.3693***
				(0.0130)	(0.0150)	(0.0147)
Mean Employee Age				-0.0021***	-0.0013***	-0.0009***
				(0.0002)	(0.0002)	(0.0002)
Std.Dev Employee Age				0.0007*	0.0006	0.0005
				(0.0004)	(0.0004)	(0.0004)
Other Employees				0.0092	0.0111	0.0124
				(0.0080)	(0.0095)	(0.0093)
Trainees				-0.1073***	-0.0873***	-0.0759***
				(0.0127)	(0.0149)	(0.0145)

... Table 6 continued ...

Qualification: Skilled				-0.0055*	-0.0047	-0.0038
				(0.0030)	(0.0033)	(0.0032)
Qualification: High-Skilled				0.0022	0.0026	-0.0041
				(0.0062)	(0.0083)	(0.0081)
Status: Blue-Collar Worker				0.0010	-0.0056	-0.0043
				(0.0041)	(0.0047)	(0.0046)
Status: Part-Time Worker				0.0224***	0.0132**	0.0140**
				(0.0052)	(0.0064)	(0.0062)
Mean of gross daily wages				0.0004***	0.0005***	0.0003***
				(0.0001)	(0.0001)	(0.0001)
Employees at s.s.contribution limit				-0.0506***	-0.0574***	-0.0499***
				(0.0126)	(0.0150)	(0.0149)
Working Time						-0.0002
						(0.0005)
Log. of total investments						0.0019***
						(0.0005)
Share of expansion investments						0.0232***
						(0.0022)
Share of Exports						-0.0079**
						(0.0035)
Firm-sponsored Training						0.0077***
						(0.0018)
Overtime Dummy						0.0004
						(0.0017)
Rising Turnover Outlook						0.0505***
						(0.0017)
Rising Employment Outlook						0.0140***
						(0.0022)
Constant	0.0185***	0.0025	0.0625***	0.3520***	0.3414***	0.3110***
	(0.0010)	(0.0040)	(0.0069)	(0.0164)	(0.0191)	(0.0274)
Dummy Variables	No	Yes	Yes	Yes	Yes	Yes
N. of Observations	96493	96493	96493	96493	65249	65249
N. of Clusters	26525.00	26525.00	26525.00	26525.00	18583.00	18583.00
F-Statistic	149.66	37.62	57.64	77.72	62.16	73.03
R squared	0.00	0.01	0.04	0.10	0.12	0.14
Aikaike Criterion	-47085.42	-48097.71	-50954.25	-57255.14	-46090.19	-47577.20

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*

Table 7: Collective Bargaining and Employment Growth: Results from Fixed-Effects Estimation

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Collective Bargaining Agreement	0.0009	-0.0045	-0.0003	0.0016	-0.0018	-0.0019
	(0.0035)	(0.0035)	(0.0043)	(0.0041)	(0.0049)	(0.0049)
Firm-Level Contract	-0.0023	-0.0062	-0.0028	-0.0024	-0.0079	-0.0075
	(0.0050)	(0.0049)	(0.0053)	(0.0051)	(0.0062)	(0.0061)
Works Council			-0.0173***	-0.0136**	-0.0167**	-0.0155**
			(0.0058)	(0.0056)	(0.0075)	(0.0074)
Orientation to a CBA			0.0047*	0.0056**	0.0033	0.0028
			(0.0028)	(0.0027)	(0.0029)	(0.0029)
Wage Cushion			0.0013	0.0012	0.0035	0.0024
			(0.0025)	(0.0024)	(0.0029)	(0.0028)
Share of Vacancies			0.0331	0.0074	0.0131	-0.0200
			(0.0349)	(0.0332)	(0.0386)	(0.0388)
Share of Temp Workers			0.1637***	0.0823***	0.0916***	0.0871***
			(0.0151)	(0.0144)	(0.0184)	(0.0182)
Churning Rate			0.0298**	-0.0217	-0.0209	-0.0212
			(0.0127)	(0.0148)	(0.0183)	(0.0179)
Investment Activity			0.0235***	0.0211***	0.0210***	-0.0212***
			(0.0021)	(0.0020)	(0.0023)	(0.0082)
Modern Technical Assets			0.0037*	0.0036*	0.0039*	0.0032
			(0.0020)	(0.0020)	(0.0022)	(0.0022)
Firm Age			-0.0030***	-0.0017***	-0.0021***	-0.0019***
			(0.0005)	(0.0005)	(0.0006)	(0.0006)
New Firm (after 1990)			-0.0191***	-0.0129**	-0.0149**	-0.0125**
			(0.0056)	(0.0054)	(0.0059)	(0.0058)
Public Ownership			-0.0004	-0.0005	0.0005	0.0003
			(0.0052)	(0.0050)	(0.0102)	(0.0101)
Foreign Ownership			-0.0113	-0.0086	0.0005	0.0017
			(0.0073)	(0.0068)	(0.0069)	(0.0069)
Single Firm			0.0020	0.0030	0.0037	0.0033
			(0.0030)	(0.0028)	(0.0034)	(0.0034)
Limited Firm			-0.0012	-0.0047	-0.0060	-0.0058
			(0.0043)	(0.0042)	(0.0048)	(0.0048)
Public Sector Plant			0.0054	0.0074	0.0019	0.0017
			(0.0079)	(0.0076)	(0.0194)	(0.0195)
Female Employees				-0.0162	-0.0179	-0.0176
				(0.0211)	(0.0233)	(0.0230)
Foreign origin				0.0819***	0.0600*	0.0508
				(0.0316)	(0.0345)	(0.0345)
Tenure: 1 to 3 years				-0.3841***	-0.3903***	-0.3695***
				(0.0161)	(0.0186)	(0.0184)
Tenure: 3 to 5 years				-0.5316***	-0.5345***	-0.5085***
				(0.0161)	(0.0187)	(0.0184)
Tenure: 5 to 10 years				-0.5470***	-0.5554***	-0.5278***
				(0.0162)	(0.0188)	(0.0185)
Tenure: 10 to 15 years				-0.5449***	-0.5619***	-0.5368***
				(0.0170)	(0.0198)	(0.0196)
Tenure: 15 to 20 years				-0.5211***	-0.5413***	-0.5176***
				(0.0188)	(0.0218)	(0.0215)
Tenure: over 20 years				-0.5048***	-0.5497***	-0.5269***
				(0.0278)	(0.0322)	(0.0319)
Mean Employee Age				-0.0010	0.0000	-0.0000
				(0.0006)	(0.0007)	(0.0007)
Std.Dev Employee Age				0.0010	0.0005	0.0006
				(0.0008)	(0.0009)	(0.0009)
Other Employees				-0.0651***	-0.0462*	-0.0445*
				(0.0209)	(0.0242)	(0.0241)
Trainees				0.0078	0.0443	0.0413
				(0.0302)	(0.0340)	(0.0337)

... Table 7 continued ...

Qualification: Skilled				-0.0317**	-0.0226*	-0.0203
				(0.0123)	(0.0132)	(0.0130)
Qualification: High-Skilled				-0.0403	-0.0185	-0.0178
				(0.0310)	(0.0377)	(0.0372)
Status: Blue-Collar Worker				0.0860***	0.0780***	0.0762***
				(0.0191)	(0.0213)	(0.0211)
Status: Part-Time Worker				0.0246	0.0267	0.0245
				(0.0176)	(0.0226)	(0.0224)
Mean of gross daily wages				-0.0005**	-0.0002	-0.0003
				(0.0002)	(0.0003)	(0.0003)
Employees at s.s.contribution limit				0.0541	0.0450	0.0399
				(0.0351)	(0.0474)	(0.0465)
Working Time						0.0010
						(0.0009)
Log. of total investments						0.0034***
						(0.0007)
Share of expansion investments						0.0135***
						(0.0028)
Share of Exports						-0.0073
						(0.0069)
Firm-sponsored Training						0.0088***
						(0.0025)
Overtime Dummy						0.0034
						(0.0026)
Rising Turnover Outlook						0.0464***
						(0.0020)
Rising Employment Outlook						0.0010
						(0.0026)
Constant	0.0059***	-0.0442	-0.0119	0.4384***	0.5597***	0.4978***
	(0.0019)	(0.1443)	(0.1449)	(0.1325)	(0.1612)	(0.1601)
Dummy Variables	No	Yes	Yes	Yes	Yes	Yes
N. of Observations	96493	96493	96493	96493	65249	65249
N. of Clusters	26525.00	26525.00	26525.00	26525.00	18583.00	18583.00
F-Stat	0.24	.	.	.	.	.
R squared within	0.00	0.06	0.07	0.13	0.13	0.14
ρ	0.49	0.74	0.73	0.72	0.76	0.76
Aikaike Criterion	-92788.07	-98487.95	-99398.10	-106466.46	-79552.79	-80584.44

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*

Table 8: Collective Bargaining and Employment Growth: Results from Random-Effects Estimation

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Collective Bargaining Agreement	-0.0209***	-0.0273***	-0.0131***	-0.0095***	-0.0096***	-0.0080***
	(0.0017)	(0.0019)	(0.0025)	(0.0025)	(0.0028)	(0.0028)
Firm-Level Contract	-0.0229***	-0.0320***	-0.0183***	-0.0130***	-0.0122***	-0.0114***
	(0.0030)	(0.0031)	(0.0034)	(0.0033)	(0.0039)	(0.0038)
Works Council			-0.0433***	-0.0244***	-0.0247***	-0.0249***
			(0.0024)	(0.0024)	(0.0027)	(0.0027)
Orientation to a CBA			-0.0022	0.0010	0.0003	-0.0004
			(0.0022)	(0.0022)	(0.0023)	(0.0022)
Wage Cushion			-0.0001	0.0002	0.0006	-0.0010
			(0.0019)	(0.0018)	(0.0022)	(0.0021)
Share of Vacancies			0.0856***	-0.0077	-0.0022	-0.0462
			(0.0271)	(0.0261)	(0.0307)	(0.0308)
Share of Temp Workers			0.0775***	-0.0219**	0.0053	0.0050
			(0.0096)	(0.0099)	(0.0130)	(0.0128)
Churning Rate			0.0120	-0.0602***	-0.0601***	-0.0587***
			(0.0089)	(0.0115)	(0.0155)	(0.0150)
Investment Activity			0.0301***	0.0301***	0.0289***	0.0005
			(0.0017)	(0.0017)	(0.0019)	(0.0066)
Modern Technical Assets			0.0125***	0.0113***	0.0111***	0.0093***
			(0.0016)	(0.0015)	(0.0017)	(0.0017)
Firm Age			-0.0058***	-0.0024***	-0.0025***	-0.0022***
			(0.0003)	(0.0003)	(0.0003)	(0.0003)
New Firm (after 1990)			-0.0353***	-0.0192***	-0.0186***	-0.0173***
			(0.0034)	(0.0033)	(0.0036)	(0.0035)
Public Ownership			-0.0074**	-0.0029	-0.0069	-0.0054
			(0.0034)	(0.0033)	(0.0061)	(0.0060)
Foreign Ownership			-0.0126***	-0.0131***	-0.0100***	-0.0090***
			(0.0034)	(0.0033)	(0.0035)	(0.0034)
Single Firm			0.0063***	0.0102***	0.0104***	0.0105***
			(0.0018)	(0.0017)	(0.0020)	(0.0020)
Limited Firm			-0.0167***	-0.0091***	-0.0137***	-0.0152***
			(0.0017)	(0.0017)	(0.0020)	(0.0020)
Public Sector Plant			0.0098***	0.0169***	0.0105	0.0109
			(0.0038)	(0.0038)	(0.0075)	(0.0074)
Female Employees				0.0146***	0.0052	0.0039
				(0.0052)	(0.0057)	(0.0056)
Foreign origin				-0.0357***	-0.0399***	-0.0366***
				(0.0126)	(0.0139)	(0.0137)
Tenure: 1 to 3 years				-0.3300***	-0.3280***	-0.3087***
				(0.0134)	(0.0155)	(0.0152)
Tenure: 3 to 5 years				-0.4581***	-0.4562***	-0.4314***
				(0.0131)	(0.0151)	(0.0148)
Tenure: 5 to 10 years				-0.4549***	-0.4572***	-0.4292***
				(0.0127)	(0.0147)	(0.0144)
Tenure: 10 to 15 years				-0.4425***	-0.4496***	-0.4225***
				(0.0128)	(0.0148)	(0.0146)
Tenure: 15 to 20 years				-0.4279***	-0.4354***	-0.4085***
				(0.0133)	(0.0153)	(0.0151)
Tenure: over 20 years				-0.4505***	-0.4641***	-0.4309***
				(0.0146)	(0.0167)	(0.0164)
Mean Employee Age				-0.0020***	-0.0011***	-0.0008***
				(0.0003)	(0.0003)	(0.0003)
Std.Dev Employee Age				0.0008*	0.0005	0.0006
				(0.0005)	(0.0005)	(0.0005)
Other Employees				0.0042	0.0123	0.0136
				(0.0101)	(0.0117)	(0.0115)
Trainees				-0.0875***	-0.0535***	-0.0486***
				(0.0153)	(0.0178)	(0.0174)

... Table 8 continued ...

Qualification: Skilled				-0.0099***	-0.0073*	-0.0067*
				(0.0038)	(0.0041)	(0.0040)
Qualification: High-Skilled				-0.0081	-0.0049	-0.0083
				(0.0082)	(0.0107)	(0.0104)
Status: Blue-Collar Worker				0.0020	-0.0058	-0.0041
				(0.0056)	(0.0062)	(0.0061)
Status: Part-Time Worker				0.0218***	0.0109	0.0115
				(0.0067)	(0.0081)	(0.0080)
Mean of gross daily wages				0.0004***	0.0004***	0.0003***
				(0.0001)	(0.0001)	(0.0001)
Employees at s.s.contribution limit				-0.0353**	-0.0478**	-0.0433**
				(0.0157)	(0.0188)	(0.0185)
Working Time						0.0000
						(0.0006)
Log. of total investments						0.0018***
						(0.0006)
Share of expansion investments						0.0206***
						(0.0024)
Share of Exports						-0.0093**
						(0.0042)
Firm-sponsored Training						0.0078***
						(0.0020)
Overtime Dummy						0.0001
						(0.0019)
Rising Turnover Outlook						0.0504***
						(0.0018)
Rising Employment Outlook						0.0059***
						(0.0023)
Constant	0.0225***	0.0050	0.0683***	0.4028***	0.3816***	0.3396***
	(0.0013)	(0.0050)	(0.0081)	(0.0192)	(0.0222)	(0.0322)
Dummy Variables	No	Yes	Yes	Yes	Yes	Yes
N. of Observations	96493	96493	96493	96493	65249	65249
N. of Clusters	26525.00	26525.00	26525.00	26525.00	18583.00	18583.00
Chi squared	172.16	1127.62	2529.83	5213.54	4041.34	5082.95
R squared overall	0.00	0.01	0.04	0.10	0.12	0.14
ρ	0.31	0.32	0.30	0.30	0.30	0.29
Sargan-Hansen statistic	72.515***	1732.756***	1856.467***	2044.134***	1192.806***	1350.286***

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*

Table 9: Collective Bargaining and Employment Growth: Results from Lagged Fixed-Effects and Difference-in Differences Estimation

Model	Lagged Fixed Effects				Difference-in-Differences	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Lagged CBA Coverage	0.0042	0.0000	-0.0100**	0.0032		
	(0.0038)	(0.0044)	(0.0050)	(0.0057)		
Lagged FLC Coverage	-0.0014	-0.0031	-0.0148**	-0.0140*		
	(0.0054)	(0.0061)	(0.0074)	(0.0084)		
DiD-Treatment Group Effect					-0.0082*	-0.0068
					(0.0046)	(0.0047)
DiD-Treatment Effect					-0.0035	0.0021
					(0.0060)	(0.0069)
Always Covered						-0.0115***
						(0.0024)
Works Council	-0.0069	-0.0052	0.0016	0.0024	-0.0138***	-0.0136***
	(0.0063)	(0.0081)	(0.0099)	(0.0119)	(0.0020)	(0.0032)
Orientation to a CBA	0.0066**	0.0025	0.0026	-0.0020	0.0012	0.0029
	(0.0026)	(0.0030)	(0.0035)	(0.0039)	(0.0022)	(0.0022)
Wage Cushion	0.0023	0.0012	0.0022	-0.0009	-0.0003	-0.0058
	(0.0026)	(0.0030)	(0.0035)	(0.0038)	(0.0017)	(0.0078)
Share of Vacancies	-0.0140	-0.0195	0.0292	0.0247	0.0173	0.0122
	(0.0422)	(0.0539)	(0.0727)	(0.0909)	(0.0253)	(0.0345)
Share of Temp Workers	0.0958***	0.1045***	0.1165***	0.1347***	-0.0519***	-0.0547***
	(0.0177)	(0.0211)	(0.0246)	(0.0290)	(0.0094)	((0.0129)
Churning Rate	-0.0103	-0.0103	0.0073	0.0029	-0.0678***	-0.0663***
	(0.0201)	(0.0269)	(0.0349)	(0.0394)	(0.0102)	(0.0136)
Investment Activity	0.0161***	0.0138***	0.0117***	0.0116***	0.0351***	0.0372***
	(0.0022)	(0.0026)	(0.0029)	(0.0034)	(0.0017)	(0.0025)
Modern Technical Assets	0.0032	0.0028	0.0059**	0.0077**	0.0151***	0.0144***
	(0.0022)	(0.0025)	(0.0029)	(0.0035)	(0.0015)	(0.0024)
Firm Age	-0.0002	-0.0004	0.0000	-0.0002	-0.0027***	-0.0034***
	(0.0005)	(0.0006)	(0.0007)	(0.0009)	(0.0003)	(0.0004)
New Firm (after 1990)	0.0033	0.0013	0.0058	0.0013	-0.0199***	-0.0233***
	(0.0058)	(0.0065)	(0.0072)	(0.0086)	(0.0032)	(0.0043)
Public Ownership	0.0012	0.0073	0.0018	-0.0063	-0.0033	-0.0069
	(0.0054)	(0.0061)	(0.0064)	(0.0073)	(0.0031)	(0.0103)
Foreign Ownership	-0.0060	-0.0055	-0.0026	-0.0065	-0.0099***	-0.0093*
	(0.0075)	(0.0083)	(0.0102)	(0.0112)	(0.0029)	(0.0056)
Single Firm	0.0051*	0.0026	0.0045	0.0058	0.0087***	0.0128***
	(0.0030)	(0.0033)	(0.0036)	(0.0044)	(0.0015)	(0.0028)
Limited Firm	-0.0051	-0.0013	0.0009	0.0100	-0.0049***	-0.0100***
	(0.0045)	(0.0050)	(0.0061)	(0.0076)	(0.0015))	(0.0025)
Public Sector Plant	0.0177**	0.0155	0.0183	0.0214	0.0182***	0.0080
	(0.0086)	(0.0104)	(0.0124)	(0.0165)	(0.0035)	(0.0072)
Female Employees	-0.0451*	-0.0177	-0.0720*	-0.0736	0.0114***	0.0082
	(0.0242)	(0.0291)	(0.0369)	(0.0450)	(0.0042)	(0.0059)
Foreign origin	0.0368	-0.0109	0.0219	0.0113	-0.0426***	-0.0370**
	(0.0377)	(0.0448)	(0.0543)	(0.0729)	(0.0109)	(0.0178)
Tenure: 1 to 3 years	-0.2930***	-0.2809***	-0.2562***	-0.2514***	-0.2827***	-0.2986***
	(0.0187)	(0.0221)	(0.0275)	(0.0322)	(0.0136)	(0.0183)
Tenure: 3 to 5 years	-0.4615***	-0.5056***	-0.4882***	-0.4701***	-0.3994***	-0.4402***
	(0.0184)	(0.0227)	(0.0278)	(0.0336)	(0.0133)	(0.0181)
Tenure: 5 to 10 years	-0.4858***	-0.5159***	-0.5007***	-0.5066***	-0.3873***	-0.4268***
	(0.0183)	(0.0225)	(0.0279)	(0.0335)	(0.0127)	(0.0174)
Tenure: 10 to 15 years	-0.5091***	-0.5317***	-0.5261***	-0.5338***	-0.3711***	-0.4039***
	(0.0192)	(0.0232)	(0.0288)	(0.0348)	(0.0128)	(0.0176)
Tenure: 15 to 20 years	-0.5031***	-0.5222***	-0.5221***	-0.5316***	-0.3616***	-0.3819***
	(0.0211)	(0.0248)	(0.0309)	(0.0371)	(0.0132)	(0.0185)
Tenure: over 20 years	-0.4802***	-0.4820***	-0.4899***	-0.4849***	-0.3909***	-0.4164***
	(0.0313)	(0.0366)	(0.0432)	(0.0523)	(0.0140)	(0.0209)

... Table 8 continued ...

Mean Employee Age	-0.0002	-0.0009	-0.0010	-0.0007	-0.0022***	-0.0018***
	(0.0007)	(0.0008)	(0.0011)	(0.0014)	(0.0002)	(0.0003)
Std.Dev Employee Age	0.0008	-0.0000	-0.0004	0.0004	0.0006	0.0006
	(0.0009)	(0.0011)	(0.0014)	(0.0016)	(0.0004)	(0.0006)
Other Employees	-0.0923***	-0.0950***	-0.1369***	-0.1302***	0.0056	0.0094
	(0.0240)	(0.0297)	(0.0367)	(0.0417)	(0.0086)	(0.0128)
Trainees	0.0121	0.0143	0.0298	0.0309	-0.0988***	-0.1070***
	(0.0344)	(0.0441)	(0.0573)	(0.0701)	(0.0142)	(0.0209)
Qualification: Skilled	-0.0320**	-0.0171	-0.0311	-0.0537**	-0.0059*	-0.0094**
	(0.0142)	(0.0172)	(0.0215)	(0.0257)	(0.0033)	(0.0043)
Qualification: High-Skilled	-0.0703*	-0.0675	-0.1045*	-0.1785**	0.0010	-0.0072
	(0.0376)	(0.0462)	(0.0592)	(0.0730)	(0.0066)	(0.0094)
Status: Blue-Collar Worker	0.0959***	0.0857***	0.0746**	0.1027**	0.0030	-0.0068
	(0.0224)	(0.0269)	(0.0333)	(0.0410)	(0.0045)	(0.0063)
Status: Part-Time Worker	0.0401*	0.0216	0.0251	0.0525	0.0276***	0.0226***
	(0.0205)	(0.0252)	(0.0310)	(0.0387)	(0.0056)	(0.0087)
Mean of gross daily wages	-0.0006**	-0.0007**	-0.0010**	-0.0006	0.0005***	0.0005***
	(0.0003)	(0.0003)	(0.0004)	(0.0005)	(0.0001)	(0.0001)
Employees at s.s.contribution limit	0.0877**	0.0867*	0.0764	0.0287	-0.0454***	-0.0121
	(0.0427)	(0.0491)	(0.0700)	(0.0779)	(0.0133))	(0.0205)
Constant	0.1988***	0.2605***	0.3037***	0.2941***	0.3634***	0.3872***
	(0.0669)	(0.0600)	(0.0787)	(0.0901)	(0.0177)	(0.0256)
Dummy Variables	Yes	Yes	Yes	Yes	Yes	Yes
N. of Observations	67104	50106	37599	28044	38459	82045
N. of Clusters	18214.00	13572.00	10511.00	8235.00	11606.00	23988.00
F-Statistic	.	.	.	.	39.56	64.74
R squared within	0.13	0.13	0.13	0.14		
R squared	0.13	0.13	0.13	0.14	0.12	0.11
ρ	0.70	0.69	0.70	0.74		
Aikaike Criterion	-85376.03	-65183.27	-50421.27	-39311.39	-14925.07	-48202.16

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*

Table 10: Collective Bargaining and Employment Growth: Results from Correlated Random-Effects Estimation

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Collective Bargaining Agreement	0.0009	0.0011	0.0036	0.0036	0.0009	0.0003
	(0.0035)	(0.0035)	(0.0042)	(0.0040)	(0.0047)	(0.0047)
Average CBA	-0.0321***	-0.0453***	-0.0230***	-0.0194***	-0.0119**	-0.0078
	(0.0040)	(0.0041)	(0.0053)	(0.0051)	(0.0059)	(0.0058)
Firm-Level Contract	-0.0023	-0.0026	-0.0003	-0.0005	-0.0049	-0.0048
	(0.0050)	(0.0049)	(0.0053)	(0.0051)	(0.0060)	(0.0059)
Average FLC	-0.0349***	-0.0550***	-0.0276***	-0.0193***	-0.0085	-0.0068
	(0.0063)	(0.0064)	(0.0071)	(0.0068)	(0.0079)	(0.0078)
Constant	0.0284***	0.0158***	0.0770***	0.3606***	0.3169***	0.2910***
	(0.0014)	(0.0051)	(0.0097)	(0.0233)	(0.0268)	(0.0393)
Firm-Level Variables	No	No	Some	Some	Some	All
Individual-Level Variables	No	No	No	Yes	Yes	Yes
Dummy Variables	No	Yes	Yes	Yes	Yes	Yes
N. of Observations	96493	96493	96493	96493	65249	65249
N. of Clusters	26525.00	26525.00	26525.00	26525.00	18583.00	18583.00
Chi squared	324.63	1357.17	2858.21	5843.07	4458.56	5690.91
R squared overall	0.00	0.01	0.05	0.12	0.14	0.16
ρ	0.31	0.32	0.30	0.30	0.29	0.28

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*

Table 11: Collective Bargaining and Employment Growth: Results from GMM-Diff Estimation

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Job Growth Rate (t-1)	0.0270*	0.0344**	0.0293**	-0.0097	-0.0118	-0.0084
	(0.0146)	(0.0139)	(0.0140)	(0.0138)	(0.0156)	(0.0161)
Collective Bargaining Agreement	0.0055	-0.0455***	-0.0482**	-0.0429**	-0.0528**	-0.0535**
	(0.0184)	(0.0173)	(0.0212)	(0.0202)	(0.0228)	(0.0233)
Firm-Level Contract	0.0449	0.0040	0.0070	0.0125	0.0596*	0.0604**
	(0.0291)	(0.0271)	(0.0292)	(0.0275)	(0.0313)	(0.0308)
Works Council			0.0073	0.0052	0.0177	0.0174
			(0.0103)	(0.0100)	(0.0134)	(0.0144)
Orientation to a CBA			-0.0020	-0.0008	0.0002	-0.0006
			(0.0060)	(0.0058)	(0.0060)	(0.0060)
Wage Cushion			0.0047	0.0036	0.0062	0.0042
			(0.0044)	(0.0042)	(0.0050)	(0.0053)
Share of Vacancies			-0.0023	0.0127	-0.0392	-0.0773
			(0.0633)	(0.0589)	(0.0515)	(0.0571)
Share of Temp Workers			0.2337***	0.1497***	0.1154***	0.0963***
			(0.0306)	(0.0286)	(0.0307)	(0.0310)
Churning Rate			0.0508	-0.0040	-0.0322	-0.0431
			(0.0387)	(0.0380)	(0.0284)	(0.0291)
Investment Activity			0.0074**	0.0073***	0.0079**	-0.0175
			(0.0029)	(0.0028)	(0.0031)	(0.0117)
Modern Technical Assets			-0.0020	-0.0014	0.0010	0.0007
			(0.0029)	(0.0028)	(0.0031)	(0.0032)
Firm Age			0.0004	0.0003	-0.0005	-0.0005
			(0.0009)	(0.0009)	(0.0011)	(0.0011)
New Firm (after 1990)			0.0104	0.0078	0.0064	0.0068
			(0.0095)	(0.0090)	(0.0104)	(0.0105)
Public Ownership			0.0053	0.0054	0.0180	0.0181
			(0.0077)	(0.0072)	(0.0130)	(0.0132)
Foreign Ownership			-0.0030	0.0005	0.0022	0.0033
			(0.0122)	(0.0113)	(0.0111)	(0.0118)
Single Firm			0.0012	0.0013	0.0023	-0.0021
			(0.0038)	(0.0037)	(0.0044)	(0.0045)
Limited Firm			0.0108	0.0105	0.0021	0.0040
			(0.0073)	(0.0070)	(0.0080)	(0.0084)
Public Sector Plant			0.0273*	0.0254*	0.0497***	0.0613*
			(0.0144)	(0.0139)	(0.0180)	(0.0313)
Female Employees				0.0128	-0.0045	0.0120
				(0.0397)	(0.0439)	(0.0457)
Foreign origin				0.0773	0.0338	0.0283
				(0.0638)	(0.0578)	(0.0589)
Tenure: 1 to 3 years				-0.2618***	-0.2657***	-0.2558***
				(0.0241)	(0.0229)	(0.0238)
Tenure: 3 to 5 years				-0.4358***	-0.4290***	-0.4139***
				(0.0258)	(0.0251)	(0.0256)
Tenure: 5 to 10 years				-0.4910***	-0.4882***	-0.4692***
				(0.0267)	(0.0263)	(0.0267)
Tenure: 10 to 15 years				-0.5283***	-0.5434***	-0.5162***
				(0.0284)	(0.0285)	(0.0293)
Tenure: 15 to 20 years				-0.5365***	-0.5589***	-0.5227***
				(0.0302)	(0.0313)	(0.0319)
Tenure: over 20 years				-0.5442***	-0.5597***	-0.5483***
				(0.0502)	(0.0554)	(0.0515)

... Table 11 continued ...

Mean Employee Age				-0.0032***	-0.0032***	-0.0025**
				(0.0012)	(0.0012)	(0.0012)
Std.Dev Employee Age				0.0037**	0.0044***	0.0042***
				(0.0015)	(0.0015)	(0.0016)
Other Employees				-0.1162***	-0.0909**	-0.0503
				(0.0428)	(0.0455)	(0.0487)
Trainees				-0.0016	0.0268	0.0798
				(0.0636)	(0.0695)	(0.0647)
Qualification: Skilled				-0.0773**	-0.0572*	-0.0299
				(0.0302)	(0.0303)	(0.0305)
Qualification: High-Skilled				-0.1712**	-0.0988	-0.0579
				(0.0754)	(0.0840)	(0.0763)
Status: Blue-Collar Worker				0.1821***	0.1914***	0.2156***
				(0.0435)	(0.0398)	(0.0387)
Status: Part-Time Worker				0.0343	0.0727*	0.0873**
				(0.0379)	(0.0432)	(0.0434)
Mean of gross daily wages				-0.0002	0.0002	0.0002
				(0.0004)	(0.0005)	(0.0005)
Employees at s.s.contribution limit				0.0570	0.0533	0.0154
				(0.0515)	(0.0627)	(0.0621)
Working Time						0.0009
						(0.0014)
Log. of total investments						0.0020*
						(0.0011)
Share of expansion investments						0.0101**
						(0.0039)
Share of Exports						0.0019
						(0.0090)
Firm-sponsored Training						0.0068*
						(0.0037)
Overtime Dummy						0.0069*
						(0.0038)
Rising Turnover Outlook						0.0292***
						(0.0027)
Rising Employment Outlook						-0.0123***
						(0.0036)
Constant	-0.0136	-0.3196***	-0.3592***	0.1848**	0.1400	0.0215
	(0.0102)	(0.0314)	(0.0365)	(0.0870)	(0.0890)	(0.1048)
dummy variables	No	Yes	Yes	Yes	Yes	Yes
N. of Observations	34568	34568	34568	34568	25454	22531
Chi squared	6.43	937.19	1011.71	1742.83	1355.30	1467.20

*Note: Standard errors clustered at the plant level in parentheses; dummy variables: firm size classes, industries, regions and years; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: LIAB QM2 9310, Waves 2000 to 2010; own calculations (controlled remote data access via FDZ).*