

The Impact of Trade Union Membership on Overtime in Germany*

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Abstract

Trade unions can support members in conflicts with employers and help them to reduce overtime. However, union members may also have easier access to (paid) overtime than non-members. Hence, the impact of individual trade union membership on overtime is theoretically ambiguous. We empirically investigate the relationship for Germany. Based on SOEP data and using fixed-effects and instrumental-variable approaches, we observe for a multitude of specifications that membership reduces overtime by 0.6 hours per week in the private sector. This effect appears to arise because union membership can protect employees from according working time demands by employers.

Keywords: overtime, working time, trade union membership, German Socio-Economic Panel

JEL Classification: J2, J51

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1 Introduction

Job quality is an important aspect of the employment relationship and has recently gained substantial relevance. In 2000, for example, the EU heads of state and government declared the Lisbon strategy, with the objective of making Europe "the most competitive and dynamic knowledge-based economy in the world, ... with more and better jobs ..." (European Council 2000) Although there is no consensus about what better jobs are, job quality indicators usually include the absence of excessive working hours as important element (European Parliament 2009, OECD 2014, ch.3). Since contractual hours are restricted to about 40 per week in many countries, overtime is the main channel by which excessive hours come about. While long hours and overtime have been argued to impair the employees' health and well-being (Berniell and Bietenbeck 2017, Cygan-Rehm and Wunder 2018), the individual evaluation of actual working hours is strongly affected by their desired number. Put differently: Do employees want to work overtime or are they obliged to do so? The answer to the question of whether employees can realise their preferred number of overtime hours depends crucially on their bargaining power in the employment relationship. Bargaining power of employees, in turn, is likely to be higher if they belong to a trade union because membership can make it more costly for the firm to ignore an individual employee's preferences. A priori, the direction of the impact of union membership on overtime outcomes is ambiguous. Membership provides individuals with information, legal advice and representation in conflicts with the employer. If employers want their workforce to work more hours than employees desire, being a member of a trade union can help members to fend off such demands, inter alia, on account of a greater bargaining power than non-members possess it. Hence, trade union membership can be expected to reduce overtime. Alternatively, it can be hypothesised that employees like to work more hours than agreed upon in collective negotiations, in order to enhance their income. If union members have better access to (paid) overtime because of their bargaining power, a positive relationship between individual union membership and overtime can be predicted. Thus, from a theoretical vantage point, the impact of trade union membership on overtime is ambiguous.

In this paper, we take up this issue from an empirical perspective and analyse the impact of individual trade union membership on overtime in Germany. To illustrate the relevance of the issue, it can be observed that weekly contractual working hours in Germany generally range from 35 to 40 hours for full-time employees. Overtime is widespread. A striking feature is the importance of unpaid overtime (Pannenberg 2005). According to the Institute for Employment Research (IAB 2018), in 2017

each employee worked on average almost 20 hours paid and more than 23 hours unpaid overtime. More than 50% of full-time employees worked two or more hours overtime per week according to the Working Time Report Germany (BAuA 2016). Hence, the large number of overtime hours and, in particular, of unpaid overtime, has been a recurring topic of the public debate. The German Trade Union Federation (DGB), for example, has criticised the large share of unpaid hours as a “scandal” (DGB 2018).

While the subsequent investigation does not constitute the first analysis of the association between unionisation and overtime, previous contributions have often considered collective bargaining coverage and not an individual’s membership. While this may be equivalent in some countries, in particular, if there is a closed-shop system, individual trade union membership is not tightly related to collective bargaining coverage in Germany. The German economy is an interesting case to consider also for a variety of other reasons: First, actual and preferred working time differ for a large majority of employees. More precisely, about half of dependent employees are overemployed, in that they would like to work fewer hours per week than they currently do, taking into account resulting income adjustments (Bell et al. 2012, Knaus and Otterbach 2019). Furthermore, as documented above, overtime is used frequently. Second, a sizeable minority of employees belongs to a trade union. This fraction has been highest just after German unification in 1990 and since then declined substantially. In 2013, net union density was around 18% (Visser 2016). Thus, individual union membership can potentially have a significant effect. Third, studies on other countries have obtained diverse results on the relationship between individual union membership and overtime. Hence, the linkage may depend on the industrial relations system looked at. Germany is characterised by a relatively high collective bargaining coverage and the widespread existence of works councils. These institutions may affect the impact of individual membership on overtime outcome. Fourth, the longitudinal data from the German Socio-Economic Panel (SOEP), which we utilise, make it possible to isolate the ‘true’ membership impact from (time-invariant) characteristics of individuals, which may be correlated both with membership and overtime. Finally, the traditionally close relationship between the Social Democratic Party and trade unions in Germany makes it possible to pursue an approach, in which we use Social Democratic election results as instruments for individual trade union membership. This enables us to interpret our results as describing a causal effect.

Using those nine waves of the SOEP for the period from 1985 to 2015, which contain information on union membership, we find that about half of private sector

employees worked overtime in the preceding month. If they did, they worked 4.6 hours per week on average. When differentiating between members of a trade union and non-members, we observe no differences in the incidence of overtime, that is, whether an employee worked overtime at all, taking into account observable and, additionally, also time-invariant characteristics. However, when focusing on the volume, we find that members of a trade union worked about 0.27 hours per week less than non-members in the private sector. Conditional on a sample of employees who worked overtime, the effect becomes much stronger in magnitude (around -0.6). Findings from pooled OLS estimates are corroborated by IV estimates, using regional voting shares of the Social Democratic party as an instrument. These results allow us to interpret our results as providing evidence of a causal impact of individual union membership. Moreover, comparable estimates can be obtained for a variety of subgroups, for paid and unpaid overtime, and for a subsample of employees who have not changed employers. In contrast to the significant and robust negative impact of an individual's union membership on overtime hours in the private sector, we find no such relationship in the public sector.

Our findings have important implications: First, we establish a further determinant of overtime which has, thus far, played a negligible role in the academic as well as the public debate. Second, we detect an individual gain from union membership, namely differential overtime, which has hitherto gone unnoticed. Third, since union membership has declined over the last decades in Germany, our findings can assist in explaining the observed development of overtime. Fourth, greater flexibility in working time arrangements, for example due to digitisation and automation, makes the use of overtime more likely in the future. Our findings indicate the relevance of trade union membership in such more individualised work environment.

The remainder of the paper is structured as follows: In Section 2 we survey earlier contributions. Subsequently, in Section 3 we develop a number of channels which can rationalise how trade union membership impacts on overtime outcomes. Section 4 describes the data in more detail and outlines the empirical strategy. Results are presented in Section 5. After establishing the union membership-overtime nexus for a variety of approaches and samples, we present our instrumental variable approach. Subsequently, we use various subsample analyses in order to shed light on the potential channels by which an individual's union membership can affect overtime outcomes, outlined in Section 3. The last section contains some concluding remarks.

2 Previous Contributions

In this section we, first, describe earlier contributions on the relationship between trade unions and overtime. Second, we survey findings on the determinants of overtime in Germany, based on longitudinal household data.

Studies focusing on collective bargaining or the presence of a trade union, in general, find that covered employees are less likely to work overtime at all (see [Trejo \(1993\)](#) for the US, [Scheuer \(1999\)](#) for Denmark, [Kalwij and Gregory \(2005\)](#) for men in the Netherlands, and [Jirjahn \(2008\)](#) for West Germany¹). The results for overtime hours are more mixed. There are some analyses which show that covered employees work fewer overtime hours ([Trejo \(1993\)](#) for the US, [Bell and Hart \(1999\)](#) for British males and [Veliziotis \(2013\)](#), also for Britain, and both relating to unpaid hours, as well as [Jirjahn \(2008\)](#) for blue-collar workers in West German manufacturing establishments). This is consistent with evidence provided by the OECD ([OECD 2018](#), p.100f) that any form of employee representation is associated with lower likelihood of working excessive hours. In contrast, [Chiang \(2012\)](#) finds a positive correlation between union membership and overtime hours in Japan and [Miller and Mulvey \(1991\)](#) indicate that the same may be true for men in Australia. [Bell and Hart \(1999\)](#) also document a positive association between union status and paid overtime hours, using the UK Labour Force Survey.² Finally, [Kalwij and Gregory \(2005\)](#) observe no correlation in the Netherlands (??Niederlande??). In sum, the relationship between collective bargaining and overtime appears to vary across countries and industrial relations systems, and also to depend on the indicator of overtime considered.

Turning to individual union membership, the empirical evidence is much scarcer. [Miller and Mulvey \(1991\)](#) use the Australian Longitudinal Survey for 1985. They show that male union members are more likely to work overtime, while the number of overtime hours is unaffected by union status. In addition, there are a number of contributions for Britain. [Pannenberg and Wagner \(2000\)](#) employ data for 1991-1998 from the British Household Panel Survey (BHPS). They report that the likelihood of working paid overtime is higher for a member of a trade union which is active in the establishment where the member works, while the respective prob-

¹The estimated coefficient of the dummy indicating a collective bargaining agreement becomes insignificant in [Jirjahn's \(2008\)](#) analysis, once contractual hours are included as control variable. Using National Compensation Survey data for the United States, [Barkume \(2010\)](#) finds no linkage between a job being unionised and the incidence of overtime either.

²The question [Bell and Hart \(1999\)](#) use refers to individual union membership. They interpret the response as indication of union coverage. [Bell and Hart \(1998\)](#) also present evidence that collective bargaining coverage raises overtime hours, based on the New Earnings Survey.

ability for unpaid overtime is negatively correlated with union membership.³ This is consistent with more recent evidence by [Hart and Ma \(2010\)](#) for a sample of male employees drawn from 15 waves of the BHPS. [Veliziotis \(2013\)](#) only considers unpaid overtime and distinguishes between the for-profit and the caring sector, relying on the BHPS, as well. While pooled estimates reveal differences between sectors, the union membership variable is no longer significantly different from zero in correlated random-effects Tobit and linear fixed-effects specifications. Turning to Germany, [Zapf \(2015\)](#) employs SOEP data for 2011, since this wave contains information on working conditions, on which her investigations concentrate. She finds the probability of working unpaid overtime to be lower for full-time employees who belong to a trade union, while there is no correlation with paid overtime.

To summarise: The empirical evidence on the relationship between individual trade union membership and overtime is inconclusive. Moreover, time-invariant individual characteristics are mostly not accounted for. When doing so, previously significant correlations can no longer be observed. Finally, to the best of our knowledge, none of the relevant studies has considered issues of causality.

Empirical analyses of the determinants of overtime in Germany focusing on individual choices universally employ data from the German Socio-Economic Panel (SOEP) (see [Hübler \(1989\)](#), [Bauer and Zimmermann \(1999\)](#), [Pannenberg and Wagner \(2000\)](#), and [Bell et al. \(2001\)](#)). While there are no studies on overtime behaviour of union members, a number of analyses have looked at works councils. Using data for 2001 and 2006, [Kraft and Lang \(2008\)](#) show that respondents work fewer hours of overtime if they are employed in an establishment in which a works council exists. Moreover, employing three waves of the SOEP, [Gralla et al. \(2017\)](#) obtain evidence of a positive correlation between the existence of a works council and overtime in the private sector, if employees have a contractual working time of 35 hours/week. The correlation is generally negative for employees with 40 contractual hours/week. Finally, [Zapf \(2015\)](#) shows that in 2011 the incidence of paid and of unpaid overtime is lower in works council establishments.⁴ Consequently, the direction of the

³[Pannenberg and Wagner \(2000\)](#) state – but do not document – that union members in Germany are less likely to work unpaid overtime, utilising two SOEP (1989, 1998) waves.

⁴The Linked Employer-Employee study of the SOEP combines SOEP data for 2011 with information obtained from employers (SOEP-LEE). Based on this data set, [Zapf and Weber \(2017\)](#) confirm some of the findings by [Zapf \(2015\)](#). However, the specifications for paid and unpaid overtime based on SOEP-LEE are not comparable since they contain substantially different sets of independent variables and do not include a works council dummy. [Schank and Schnabel \(2004\)](#) base their analysis on data from the IAB establishment panel. Overtime is sometimes related positively to the existence of a works council in pooled samples but no such relationship can be observed in fixed-effects specifications. [Jirjahn \(2008\)](#) observes no correlation between overtime of blue-collar workers in manufacturing establishments and works councils (??Ist das eine Wdh. von der Seite zuvor??).

relationship between overtime hours and the existence of a works council is still in dispute.

3 Impact of Individual Union Membership on Overtime

In Germany, currently somewhat less than 60% of all employees work in firms which are covered by collective bargaining agreements (i.e. unionised in the US terminology). This percentage has declined substantially in recent decades. Moreover, about 50% of those employees whose working conditions are not regulated collectively are actually paid in line with such agreement because firms voluntarily follow its regulations (Addison et al. 2016, Ellguth and Kohaut 2017). In addition to wages, standard working hours and overtime regulations are generally negotiated collectively. While only signatories are legally bound by the content of collective bargaining agreements, firms generally apply the regulations concerning wages, working hours and overtime to all their employees, irrespective of whether they are members of a trade union or not. Moreover, employment in a covered establishment and the application of a collective bargaining agreement cannot be conditioned on an individual's union membership. Accordingly, there is no evidence of a wage difference between union members and non-members (Schmidt and Zimmermann 1991, Fitzenberger et al. 1999, Goerke and Pannenberg 2004).

This feature of the German labour market has an impact also on the relationship between union membership and overtime. This is the case because many theoretical and empirical analyses argue or show that wages and the overtime premium are important determinants of overtime (Hart 2004). However, in the absence of a union membership wage premium, overtime hours will not vary with union membership on account of differential returns to working (paid) overtime. Therefore, we subsequently focus on other aspects of the employment relationship which may provide union members and non-members with differential opportunities to work overtime or to avoid extra work. In doing so, we go beyond the pure bargaining power perspective employed in the introduction.

First, about half of dependent employees in Germany are overemployed, in that they would like to work fewer hours per week than they currently do, taking into account income adjustments (Bell et al. 2012, Knaus and Otterbach 2019). Additionally, there is some evidence that many employees work overtime either because the employer requests them to do so or since it is necessitated by the work load (Hart 2004, p.91, BAuA 2016). This suggests that employees cannot fully enforce

their working time preferences. Being a member of a trade union can help such employees to achieve their desired working time. This is because trade unions can inform members of their legal entitlements and help to enforce. Moreover, unions can prevent disadvantageous treatments of their members who do not want to work the number of hours requested by the employer and protect them from possibly ensuing consequences, such as dismissals, incorrect wage payments or inadequate testimonials. Therefore, the informational and protective role of trade unions, resulting in greater bargaining power vis-a-vis the employer, suggests that members work less overtime. This effect can be expected to be particularly pronounced for individuals who regard themselves as overemployed.

Second, union members may not only be able to realise given working-time preferences better than non-members, but may also be characterised by different preferences or work attitudes. If, for example, individuals identify with their work and attach a high importance to it, they may also be more inclined to participate in the production of public goods provided by unions, such as higher wages for members and non-members alike and more favourable working conditions. If this identification with work extends to the interests of the firm, union members may be more willing to work overtime. However, if the identification focuses more strongly on employees, while the firm is viewed as an adversary, then a negative effect on overtime can be expected. Therefore, a difference in intrinsic motivation between union members and non-members is likely to affect overtime behaviour. The same would be true if working time preferences differed with union status. However, the direction of the impact of union membership on overtime on account of such a preference- or attitude-based linkage is a priori ambiguous.

Third, overtime hours can be used to increase income. In contrast to other countries, there are no legal principles relating to the overtime premium in Germany. The magnitude of such a premium is often determined in collective bargaining agreements and usually amounts to 25% to 50%. Therefore, paid overtime has an immediate income effect. Union members can be argued to work more paid overtime if membership can thereby help them to obtain such extra work more often than non-members. Consequently, union membership represents a means to earn additional income, despite the absence of a membership wage premium. Moreover, models of collective bargaining indicate that if wages and standard hours of work are negotiated, working time is less than the amount that would optimally be chosen by individual employees (Oswald and Walker 1994, Fuest and Huber 2000). Hence, employees would be willing to work extra hours. Therefore, an income-enhancing role of trade unions suggests that members work more paid overtime than non-members.

This effect is likely to arise foremost if overtime is scarce and union members are better able to enforce their working time preferences than non-members, on account of greater bargaining power.

Fourth, overtime hours can also be used to increase income in the longer run. Overtime and, in particular, unpaid overtime may be an investment by employees to signal otherwise not perfectly observable effort to the employer ([Pannenberg 2005](#), [Anger 2008](#)). The returns to such investment are reaped in the future through a steeper wage profile or a greater probability of promotion. Union members can be argued to work more unpaid overtime, since they have greater chances of earning the returns to such investment. This effect occurs because they have longer tenure and are less likely to be dismissed individually than non-members ([Goerke and Pannenberg 2011](#), [Berghlund and Furåker 2016](#)). Therefore, union membership may constitute a kind of insurance mechanism to guarantee the returns to an investment in the form of (unpaid) overtime.

Fifth, union members may choose to work in firms which require a different amount of overtime than other employers. Hence, any observed correlation between individual trade union membership and overtime could represent a selection effect.

Sixth, there is some evidence (see above) that overtime varies with collective bargaining status. As collective bargaining is more likely to exist, the stronger trade unions are, and because unions are likely to be more powerful, the more members they have, a union membership-overtime nexus may also arise because of the correlation with collective bargaining coverage. The direction of the collective bargaining effect is ambiguous though, because the impact of collective negotiations on overtime is not well determined. (??Quellen??)

Finally, labour relations in Germany are strongly influenced by codetermination. In 2016, about 10% of all eligible private sector establishments had a works council. Since works councils are more prevalent in large plants and exist in most establishments with more than 1000 employees, about 42% of employees were represented by a works council ([Ellguth and Kohaut 2017](#)). The Works Constitution Act (WCA) establishes consultation and codetermination entitlements for a variety of aspects. One of the most important is working time and overtime regulations (§87(1) WCA). More specifically, overtime work arrangements have to be agreed upon between the employer and the works council. Such an arrangement may also include rules relating to the selection of employees working overtime. If there is no such agreement, the works council can prevent overtime work from taking place. Since works councillors are in their majority union members ([Goerke and Pannenberg 2007](#), [Behrens 2009b](#)) and help trade unions to expand their membership at

the plant level (Behrens 2009a), union membership is likely to be higher in code-terminated plants. Therefore, we can expect a relationship between individual union membership and overtime on account of the correlation with codetermination at the establishment level. The direction of this works council effect is, once again, a priori uncertain. This is because the empirical evidence on the impact of works councils on overtime is not clear-cut (see Schank and Schnabel 2004, Jirjahn 2008, Kraft and Lang 2008, Zapf 2015, Gralla et al. 2017, Zapf and Weber 2017).

To summarise: We have identified various channels via which individual trade union membership can affect overtime. A priori considerations suggest that the consequences of membership on overtime may be positive or negative and that they can differ according to whether overtime is paid or not.

4 Data and Empirical Strategy

4.1 Data

For the empirical investigation we use data from the German Socio-Economic Panel (SOEP), a representative panel study of German households conducted annually since 1984 (see SOEP v33 and Goebel et al. 2019). Our main variables of interest are derived from the responses to the following question, which has been asked in each wave since 1988: *“How was your situation with regards to overtime last month? Did you work overtime? If yes, how many hours?”*⁵ Hence, data on the incidence of overtime and the number of overtime hours worked is related to the month before the interview. We divide monthly hours by 4.3 and, thus, analyse weekly hours. The question on individual union membership has been asked in 1985, 1989, 1993, 1998, 2001, 2003, 2007, 2011 and 2015. For the main analysis we utilise all these nine survey waves and, hence, analyse the thirty-years time span from 1985 to 2015.⁶

We control for a broad set of personal characteristics (gender, nationality, education, marital status, whether a child is living in the household, labour market experience in years and experience squared), features of the job (inter alia, log of hourly wage, contractual working time, whether the job is part-time, tenure in years and tenure squared, whether individuals are concerned about job security and have changed their job in the previous year), and the current occupational status (10 cat-

⁵The questionnaire in the year 1985 only includes information on contractual and actual working hours including overtime. We use their difference as a measure for overtime.

⁶It might also be reasonable to focus on the time span from 1998 to the present, as Germany was re-united in 1990 and because of the economic transformation especially in Eastern Germany at the beginning of the 1990s. Restricting the sample accordingly does not qualitatively change results, which are available upon request.

egories, differentiating between various blue- and white-collar types). Moreover, we include firm-size variables, industry (1-digit), regional (at the level of federal states, 'Bundesländer'), and year dummies as covariates. Since our dependent variables refer to behaviour in the month prior to the interview, we also take the month of the interview into account. Table A.1 in the Appendix contains variable definitions for our dependent variables and the covariates.

When evaluating the channels by which union membership affects overtime, we also employ variables that are not included in all waves of the SOEP or have missing values. For instance, we use information on the usual type of overtime compensation: The feasible answers are (1) leisure, (2) partly leisure, partly paid, (3) paid and (4) unpaid. The information on the type of compensation is missing in 2015, but it is available for all other years. This information is present for all individuals who work non-zero overtime hours and additionally for a considerable fraction of those who do not.⁷ Furthermore, the SOEP provides information on whether a respondent works in an establishment in which there is a works councils every five years since 2001. Because these years do not always coincide with the years for which information on union membership is available, we impute the information on the existence of a works council for several years in the time span from 1998 to 2015.⁸

We restrict our sample to paid employees aged between 18 and 65 years and exclude self-employed individuals, apprentices, and marginal employees. This yields a sample of nearly 60,000 observations. In preliminary regressions, we estimated the specifications outlined below separately for the private and the public sector. They consistently revealed the absence of any correlation between individual trade union membership and overtime outcomes in the public sector. Therefore, we subsequently focus on the private sector. This yields a sample of more than 42,000 observations.⁹

Table A.2 in the Appendix shows descriptive statistics for our main sample. Around a half of all respondents worked overtime in the month before the interview. This corresponds to more than 21,400 observations. Given that an individual

⁷Respondents are asked about the usual type of overtime compensation if they work overtime at least occasionally. Some individuals did not work overtime in the previous month but responded to this question. If individuals never work overtime at all, the information on overtime compensation is not applicable.

⁸In order to ensure that the imputed works council information applies to the same employer, we require that the respondent has a sufficient tenure in the respective survey year. Since works council elections usually take place every four years between March and May, we additionally take the interview month in the SOEP into account. For a similar approach, see [Goerke and Jeworrek \(2018\)](#). Due to panel attrition, works council imputation is not feasible for all respondents, resulting in a drop in sample size. Note that the SOEP does not provide information about collective bargaining coverage, with the exception of the years 1995, 2015 and 2016.

⁹Results for specifications including public sector employees and for separate regressions for the public sector sample are available upon request.

recently worked overtime, the average amount of overtime is 4.6 hours per week. This number is comparable to those calculated in other studies (Pannenberg and Wagner 2000, Gralla et al. 2017). The most common compensation of overtime work is time off in lieu (leisure), which is the case for 45% of the sample. A quarter of the respondents working overtime are compensated partly by leisure and partly by a payment, while fully paid and unpaid overtime work are less common. On average, almost one in five workers is a union member. The data also reflects the time trend of decreasing union membership, from more than 30% in the 1980s to less than 15% nowadays (see also Visser 2016).

4.2 Empirical Strategy

For analyzing the data set, we estimate the following regression equation:

$$OT_{it} = X_{it}\beta + UM_{it}\gamma + \epsilon_{it} \quad , \quad (1)$$

where OT_{it} represents either a dummy variable indicating whether an individual i worked overtime within the last month in year t or the number of overtime hours. UM_{it} takes the value of one if individual i is a member of a trade union, and zero otherwise. X_{it} denotes the vector of covariates, while ϵ_{it} is the error term.

We use logistic regressions when considering the incidence of overtime. There are different methods to handle the data structure of overtime hours. Since they are censored to the left by zero, Tobit models could be estimated, as employed by Bauer and Zimmermann (1999), Kraft and Lang (2008), Gralla et al. (2017). Such nonlinear models may suffer from the ‘incidental parameter problem’ when employing panel data methods. This could lead to inconsistent estimates, while linear panel methods are not affected by this methodological issue (Cameron and Trivedi 2005). Therefore, and following most of the literature, we employ linear models, i.e. pooled OLS and linear fixed-effects models. In the latter approach, equation (1) becomes:

$$OT_{it} = X_{it}\beta + UM_{it}\gamma + \mu_i + \tau_t + \epsilon_{it} \quad , \quad (2)$$

where μ_i are individual fixed-effects and τ_t time fixed-effects. Fixed-effects specifications allow us to indirectly control for time-invariant, unobservable characteristics, which could drive our results in the pooled OLS analysis.

In Section 5.3 we employ an IV approach. Since our instrumented variable – union membership – has a binary structure, we handle the potentially endogenous variable like a treatment effect and estimate an endogenous treatment effects

model.¹⁰ This type of model assumes an unobserved latent-variable $Treat_{it}^*$, which determines whether the observed treatment $Treat_{it}$, i.e. being a union member, is received or not:

$$Treat_{it} = \begin{cases} 1 & \text{if } Treat_{it}^* = Z_{it}\beta + \theta_{it} > 0 \\ 0 & \text{if } Treat_{it}^* = Z_{it}\beta + \theta_{it} \leq 0 \end{cases}, \quad (3)$$

where the vector Z_{it} denotes the covariates for the treatment which includes control variables and additionally, at least one instrumental variable. The probability of receiving a treatment is estimated with a probit model, while the treatment is included in a standard linear regression framework for the outcome:

$$OT_{it} = X_{it}\beta + Treat_{it}\gamma + \varepsilon_{it} \quad (4)$$

It is assumed that the error terms θ_{it} and ε_{it} are bivariate normally distributed. The model described by the treatment (3) and the outcome equation (4) are estimated simultaneously by maximum likelihood (for further details see [StataCorp 2017](#) and [Cameron and Trivedi 2010](#)).

We use cluster-robust standard errors at the individual level, in order to accommodate the panel structure of our data.

5 Results

In a first step, we depict descriptive evidence for our key variables – overtime incidence and hours – by union member status. Subsequently, we present the results of regression analyses, which also include an IV approach. Moreover, by looking at various subsamples we are able to analyse the channels discussed in Section 3, by which union membership may impact on overtime outcomes.

5.1 Descriptive Evidence

Table 1 reports the descriptive statistics. In the month before the interview, 47.1% of union members worked overtime at all, while 50.9% of non-members did. The average unconditional number of overtime hours worked per week, i.e., including employees who did not work more than their contractual obligations, was 2.1 hours

¹⁰Another possibility to take into account the binary structure is proposed by [Wooldridge \(2002\)](#). In this procedure, the first stage includes the instrumental variable and is estimated by a probit model. In the second stage, calculated predictions from the first stage are used as an instrument in a standard 2SLS-regression. Employing this approach yields qualitatively similar results.

for union members. They worked around 0.27 fewer hours than non-members. Conditional on a positive amount of overtime (OT Sample), union members worked a fifth of an hour less per week than non-members.

Table 1: Mean Comparison - Private Sector

	Non members		Union members		Difference	
	mean	sd	mean	sd	diff	t-value
OT dummy	0.509	(0.500)	0.471	(0.499)	0.038***	(6.30)
OT hours	2.358	(3.705)	2.091	(3.485)	0.267***	(6.26)
OT hours > 0 (OT Sample)	4.630	(4.054)	4.437	(3.920)	0.193**	(2.80)
Observations	34133		8538		42671	
Unpaid dummy	0.190	(0.392)	0.065	(0.247)	0.125***	(28.52)
Paid dummy	0.150	(0.357)	0.162	(0.369)	-0.012*	(-2.14)
Partly paid dummy	0.229	(0.420)	0.268	(0.443)	-0.039***	(-5.72)
Leisure dummy	0.430	(0.495)	0.505	(0.500)	-0.074***	(-9.66)
Observations	19499		5399		24898	

Source: SOEP. *t*-tests on the equality of means; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Information on the usual type of compensation is not always available (see Chapter 4.1 for details).

With respect to the compensation type, union members are much less likely to work unpaid overtime (only 6.5%) than non-members (19%). The reverse is true with respect to overtime which is compensated by time off in lieu (50.5% for members versus 43% for non-members). Regarding fully and partly paid overtime, the means are more similar.

While these descriptive results do not enable us to evaluate the impact of individual union membership on overtime, they provide first evidence on the hypothesised channel, according to which union membership might constitute a kind of insurance in order to guarantee the returns to an investment in the form of (unpaid) overtime. This mechanism could explain the membership-overtime nexus if union members obtain greater expected returns from working unpaid overtime and, thus, worked more such unpaid hours. The substantially lower likelihood of union members, relative to non-members, to work unpaid overtime and the considerably higher fraction of overtime compensated by leisure do not support such a view.

5.2 Main Results

Table 2 reports our main regression results. It depicts the estimated coefficients of interest, that is, the union membership dummy. Full results are displayed in Table A.3 in the Appendix. Column (1) in Table 2 shows logit estimation results for

the full sample, while column (2) is the corresponding fixed-effect estimation.¹¹ In these specifications a dummy variable for the incidence of overtime is the dependent variable. Columns (3) and (4) depict OLS and FE estimates with overtime hours as the dependent variable, including also respondents who did not work overtime in the prior month. Lastly, columns (5) and (6) are restricted to observations which report positive overtime hours (OT sample; OLS > 0, FE > 0). The number of observations in the fixed-effects specifications is substantially lower than in the pooled OLS models because of sample attrition and the fact that union membership is not observed every wave.

Table 2: Main regression results (1985-2015)

	(1) Logit	(2) FE-Logit	(3) OLS	(4) FE	(5) OLS > 0	(6) FE > 0
Union member	-0.036 (-1.09)	-0.030 (-0.45)	-0.216*** (-3.90)	-0.265** (-3.02)	-0.294*** (-3.44)	-0.596*** (-3.50)
Observations	42671	16440	42671	30370	21406	13186
Number of groups		4481		9461		4613
Adj. R^2			0.127	0.028	0.106	0.050

Source: SOEP. Standard errors clustered on the individual level; t statistics in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Dependent variables are a dummy variable for the incidence of overtime in columns (1) and (2), overtime hours in columns (3) and (4), non-zero overtime hours in columns (5) and (6). Full set of controls is used in each specification. Full results are displayed in Table A.3 in the Appendix.

The first main insight from Table 2 is that individual trade union membership has no effect on the incidence of overtime. When estimating specifications (1) and (2) without any and with restricted sets of control variables (results are available upon request), we find that the incidence of overtime in the cross-section is negatively correlated with union membership, as long as we do not control for the occupational status, as measured by 10 different types of blue- and white-collar workers. For the fixed-effects logit specification (column (2)), the estimated coefficient on the membership dummy is not statistically different from zero, irrespective of the set of control variables included. This indicates that the decision whether to work overtime or not may be related to the nature of the job, as captured by the occupational status, but not to an individual's union membership.

The second main result depicted in Table 2 is that individual trade union membership is negatively linked to the amount of overtime. Given the insignificant effect on the incidence, it is not surprising that linear estimates, conditional on positive overtime hours, yield more robust coefficients than without such a restriction. When

¹¹Many individuals either never work overtime or always do so. Those observations are dropped in the maximum-likelihood estimation of the conditional fixed-effects logit model in column (2).

looking at overtime hours, the magnitude of the estimated union membership coefficients becomes larger when employing fixed-effect estimations, whereas the high level of statistical significance remains. The fixed-effects estimate indicate that union members work about 0.6 hours per week less overtime than non-members, conditional on having worked overtime at all. Specifications without and with a restricted set of control variables show a substantial decrease in the magnitude of the estimated coefficients in the OLS specification for the full sample (column (3)) and the OT sample (column (5)) when controlling for occupational positions, without impact on the level of significance. In the fixed effects specifications, no such clear impact occurs. Therefore, the union membership effect on overtime arises across occupations.

An inspection of the covariates (see Table A.3) reveals that women work less overtime (see Kraft and Lang 2008, Zapf 2015, Gralla et al. 2017). Focusing on the fixed-effects specifications (columns (2), (4) and (6) in Table 2), we can, furthermore, note that individuals with a higher contractual working time work overtime more often and, conditional on doing so, work fewer hours(??gilt nur für eine Spezifikation, oder??).¹² Moreover, we find evidence that the hourly wage is negatively associated with all overtime outcomes. Becoming married reduces the number of overtime hours, while working in a larger firms tends to raise the incidence and number of overtime hours. In addition, individuals who are concerned about the security of their job work fewer overtime hours than those who are not concerned. Finally, from column (4) in Table A.3 we can estimate that overtime is maximal at a labour market experience of about 17.5 years. A similar result is obtained with respect to tenure.¹³

We have conducted various robustness checks, which confirm our main findings. We, therefore, only report them in a summary manner below, while detailed results for these robustness exercises and all further estimations which are not reported at large are available upon request. For example, we find no effect on the magnitude of the coefficients of interest and on their significance levels if we estimate specifications (3) to (6) for a sample of individuals for which we have information on personality

¹²In Tobit specifications contractual working hours are sometimes positively associated with overtime (Bauer and Zimmermann 1999, Gralla et al. 2017), sometimes negatively (Kraft and Lang 2008). Pannenberg and Wagner (2000) present fixed-effects estimates and observe a negative effect.

¹³While some of the previous analyses of overtime incorporate linear measures of tenure (Hübler 1989, Zapf 2015) or tenure classes (Kraft and Lang 2008), Bauer and Zimmermann (1999), Pannenberg and Wagner (2000), Kraft and Lang (2008), and Gralla et al. (2017) include age and/ or tenure polynomials in their specifications. Bauer and Zimmermann (1999) and Gralla et al. (2017) observe overtime to be inversely U-shaped in age, which is commensurate with our findings with regard to experience.

traits and also include these indicators as additional control variables.¹⁴ Moreover, our results also do not change qualitatively, if we omit variables which could be considered as potentially endogenous or capturing time-invariant characteristics, such as wages and perceived job insecurity. Also the exclusion of white collar workers with highly qualified or executive tasks does not affect our findings. Furthermore, data on time use and income might be prone to measurement errors. Therefore, we excluded outliers with respect to time use and income variables. This does not affect results. Last, we have estimated specifications (3) to (6) with pooled and random-effects tobit models. They also yield statistically and economically significant negative coefficients for the union membership dummy.

Finally, we have investigated whether the findings depicted for specifications (3) to (6) in Table 2 differ for men and women, blue- and white-collar employees, full-time workers, and between West Germany and East Germany, because overtime is sometimes found to vary according to these dimensions (Hübler 1989, Bauer and Zimmermann 1999, Zapf 2015, Gralla et al. 2017). The respective estimates do not reveal a differential impact of union membership on overtime according to gender or job (blue- vs. white-collar, full-time), and possibly slightly stronger effects in East Germany than in West Germany. In sum, we consistently observe a negative relationship between individual trade union membership and the amount of overtime hours worked.

In our above interpretation of findings, we have focused on fixed-effects estimates. Their identification relies on those individuals who alter their membership status. This raises the question in how far findings from these specifications can be generalised and the interpretation provided above be upheld. This aspect may be particularly relevant if the number of individuals who change status is small. The fixed-effects estimations are identified by around 2,000, respectively 750, individuals who account for more than 4,000, respectively 2,100, observations. Hence, individuals who alter their union membership status constitute about 20% of all observations. Moreover, we can compare individuals who change their union membership status with those who do not. When contrasting respondents who are always a member with those who leave a trade union, we observe virtually no differences in personal or job characteristics. The only exceptions are that those who leave have higher tenure and experience. Comparing individuals who never belong to a trade union with those who join, the picture is similar. We additionally note differences in

¹⁴Information on personality traits is provided for the years 2005, 2009 and 2012/2013. Variables for 15 items on personality are condensed into five factors which correspond to the widely used Big Five traits. Since no survey year containing the personality traits coincides with the information on union membership, we have to impute the Big Five factors for each observation.

occupational status and find individuals who join to be more concerned about their job. Taken together, we can conclude that there is no evidence that our fixed-effects estimates are based on a selective sample.

However, the results described in Table 2 and for the various modifications do not enable us to shed light on the channels by which union membership affects overtime, with one exception: We have seen that the size of the estimated coefficient of individual union membership increases considerably when moving from OLS- to fixed-effects estimates. This suggests that union members are characterised by time-invariant features, such as motivation, work effort or working time preferences, which induce them to work more overtime than employees who do not exhibit this unobservable characteristic. In fixed-effects specifications the union membership effect no longer incorporates this positive correlation and is, hence, greater in absolute magnitude, i.e. more negative, than in the specifications in which the membership effect is primarily identified via variations in the relevant linkage across individuals. Therefore, we can reject the hypothesis that union members work less overtime than non-members because of different preferences or attitude relating to working time. Our results rather suggest the opposite.

5.3 Endogeneity

Although our results hold in fixed-effects models, some doubts in regards to endogeneity issues might remain. Especially in the German system of industrial relations, where becoming member of a trade union is an individual decision, our variable of interest might suffer from sample selection problems. Personal characteristics of members and non-members might differ in such a way that our control variables are not able to account for this heterogeneity. Alternatively, if employees join a trade union since they worked high numbers of overtime hours in the past, our regression model might be wrongly specified. Therefore, we employ an instrumental variable approach in order to show that such concerns are not warranted.

As an instrumental variable we use the share of votes for the Social Democratic Party of Germany (SPD) in federal elections in the corresponding time span since 1998. We are forced to restrict the estimation period to the last two decades for several reasons: First, a number of local government reorganizations took place in East Germany from 1993 to 1996. Second, the classification of the regional identifier that we use was changed in 1996. Lastly, additional control variables on the regional

level are not available before the mid-nineties.¹⁵ Federal elections basically take place every four years. Therefore, we use election results from 1998 for the surveys in 1998 and 2001, and results for all other elections for the next relevant wave containing information on union status. Traditionally, the SPD has represented the interests of dependent employees most actively in Germany, although the link between trade unions and the SPD has become weaker in recent decades. Moreover, many of the union's leading figures are members of the SPD, and vice versa. Hence, we argue that more left-wing political preferences, as reflected by voting shares of the SPD, make union membership more likely.¹⁶ In addition to a variation over time, the SOEP data allows us to use variation across about 100 German regions, so-called Raumordnungsregionen (ROR).¹⁷ It is not unreasonable to imagine that people in (former) social-democratic strongholds, like the Ruhr area, are more likely to be a trade union member than in regions where the voting shares of the green and liberal party, as well as the conservative and right-wing parties are higher.

In order to fulfil the exclusion restriction, the election results should not have a direct effect on overtime. Our specification includes control variables, especially for industry and firm characteristics, as well as survey years. Moreover, since overtime and union membership might correlate with the regional economic structure, we use additional control variables describing the share of the labor force working in the industrial and tertiary sector at the regional level. Additionally, we control for the regional population density and, therefore, the degree of urbanisation. In sum, we are confident that results are not determined by economic changes either at the national or regional level. In addition, it could be argued that election outcomes have a direct bearing on overtime. Indeed, SPD's election manifestos repeatedly contain calls for a reduction of overtime use. However, especially since 1998, the SPD proposed to strengthen bargaining power of employees in order to achieve this

¹⁵In additional analyses, we approximated regional identification which took the local government reorganization into account. This approximation allowed to expand the time span to 1985 (for Eastern states to 1993) without controlling for regional characteristics. This procedure does not change our results in a qualitative way.

¹⁶[Ebbinghaus et al. \(2011\)](#) demonstrate that a left-wing political orientation is associated with an increase in the probability of union membership in Europe. [Schnabel and Wagner \(2007\)](#) and [Jensen \(2017\)](#) show that this is not true for all countries. In Germany, for example, the association is indeed positive, but not statistically significant, using the first round of the European Social Survey ([Schnabel and Wagner 2007](#)) or an indicator of preferences for the SPD ([Goerke and Pannenberg 2004](#)). Note though that these studies use individual preferences, while we employ voting shares. Beside the SPD, parties like the Greens and the Left also belong to left political spectrum. In our data the corresponding voting shares do not demonstrate statistical power regarding trade union membership.

¹⁷Raumordnungsregionen (ROR) is a classification of regions for purposes of regional planning. 401 NUTS-3-regions are condensed into 96 ROR-regions. Data on election results by German RORs is used from [BBSR Bonn \(2018\)](#).

objective, and did not call for legal restrictions on overtime use. In consequence, it is plausible that election results influence individual trade union membership, but are not connected to overtime decisions.

Table 3: Instrumental variable results (1998-2015)

	(1) Full Sample	(2) OT Sample
OT hours		
Share of sec. sector	0.065* (2.31)	0.104* (2.41)
Share of ter. sector	0.063* (2.35)	0.100* (2.48)
Log. population density	-0.009 (-0.23)	-0.002 (-0.04)
Union member=1	-0.620*** (-5.35)	-0.694** (-3.15)
Union member		
Share of sec. sector	-0.002 (-0.14)	-0.014 (-0.66)
Share of ter. sector	-0.011 (-0.73)	-0.025 (-1.25)
Log. population density	0.039* (1.99)	0.045 (1.72)
SPD election results	0.023*** (7.74)	0.021*** (5.45)
Observations	33297	17662

Source: SOEP. Standard errors clustered on the individual level; t statistics in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Linear endogenous treatment model estimated by maximum likelihood. Full set of controls is used.

For the estimation of the endogenous treatment model, we use all control variables from our main results as covariates in both parts of the IV approach and additionally include the above-mentioned regional controls. Table 3 shows the IV results for the full sample and the OT sample in columns (1) and (2), respectively. The lower half of Table 3 confirms our expectations on the instrument. More specifically, regional SPD election results affect union membership positively. The estimated coefficients are quite similar for both samples. The t-values of around 7.7 and 5.4 demonstrate sufficient instrument relevance. In the upper half we see the estimated average treatment effect of around -0.62 on overtime hours for the full sample, while the coefficient for the OT sample is slightly higher in magnitude. The coefficients are both highly statistically significant. The estimated coefficients can be compared to our main results in Table 2 (columns (3) to (6)) where union membership is not instrumented. We see that the estimated coefficients depicted in Table 3 are much higher in magnitude than the OLS estimates and the fixed-effects specification for

the full sample. In contrast, the estimated coefficients for the fixed-effects- and the IV-estimates for the overtime sample are similar. In sum, the IV approach does not provide evidence that our main results are plagued by endogeneity problems and allows us to interpret the effect of trade union membership on overtime causally.

5.4 Channels

In this section we attempt to ascertain by which channels union membership affects overtime. In order to do so, we present estimates for specification (6) in Table 2 for various subsamples. The basic idea is that some of the channels outlined in Section 3 do not apply to certain subgroups of employees, or do so to a different degree. Hence, by comparing findings for subsamples we can evaluate the empirical relevance of the proposed channels.¹⁸

First, we focus on individuals who are overemployed and desire to work fewer hours. If we do not observe a membership effect for this subsample, our findings would not be consistent with the idea that unions protect their members against excessive overtime demands by employers. Second, we consider the impact of union membership on paid and (partially) unpaid overtime hours separately. This will enable us to investigate the idea of an income-enhancing role of trade union membership and of membership being an insurance for the returns from investing into unpaid overtime. Third, we look at a subsample of individuals who have not changed their employer between subsequent SOEP waves including information on union membership¹⁹. The results of this specification can help to evaluate various effects: (1) If employees have to establish their working time preferences when starting a job in a new firm or have to signal their work attitudes, they may work different amounts of overtime subsequent to a job change, relative to a situation in which they have already communicated this information to their superiors (Pannenberg 2005, Anger 2008). If this informational role of overtime hours differs between union members and non-members, it is unlikely to alter the union membership effect in a subsample

¹⁸Note that we exclude dummies for the federal states in the following. Some subsample analyses lead to relatively small samples, in which variables for the federal states are not well identified.

¹⁹For each individual, we identify the longest employment spell at one employer. If there are several spells with a maximum number of included waves for an individual, we take the earliest one. This procedure leads to a maximum number of observations, compared to the following alternatives. Firstly, we can consider only the first employment spell for generating a stayer sample or, alternatively, only the last spell. Furthermore, we can exclude all individuals who experienced any job change at all in the time they were interviewed by the SOEP. All definitions yield similar results. Note that for the identification of a job change we do not use the variable indicating a job change which is provided by the SOEP, which may also refer to within-firm changes of the job. Instead, we use the information on tenure, which should not capture internal career developments.

of individuals who have not changed their employer. (2) Since the union membership effect is not identified by employer changes in this subsample, it cannot be due to a works council or collective bargaining impact, unless firms altered that status, as well. (3) Focusing on individuals without job change allows us to also account for the selection argument. Fourth, we look at those establishments for which we have information about the existence of a works council. If the effects for council plants are weaker than for non-council ones, this would be consistent with the works council argument. Finally, we look at large firms with 2000 or more employees. They are much more likely to be covered by a collective agreement than smaller establishments (Ellguth and Kohaut 2017). Therefore, we may expect the union membership impact to be less pronounced in such establishments if collective bargaining reduces overtime.

In Table 4 we present results for fixed-effects specifications for subsamples of individuals who worked overtime and are overemployed (column 1), of those who did paid overtime (column 2), or worked overtime which was either completely or partially unpaid (column 3). Finally, column 4 is based on a subsample of individuals who have not experienced an employer change.

Table 4: Subsamples I

	(1) Over- employed	(2) Paid OT	(3) Unpaid OT or leisure comp.	(4) Stayer sample
Union member	-0.687** (-3.22)	0.928 ⁺ (1.67)	-0.728** (-2.60)	-0.533** (-2.91)
Observations	9085	899	5820	10230
Number of groups	3313	386	2264	3722
Adj. R^2	0.050	0.100	0.064	0.043

Source: SOEP. Standard errors clustered on the individual level; t statistics in parentheses; ⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Fixed effects regressions, dependent variable is overtime hours > 0 . Full set of controls (except federal state dummies) is used in each specification.

Column 1 shows that the union membership effect for overemployed is significantly negative and slightly larger than for the full sample (cf. Column 6 in Table 2). This is consistent with a protective role of union membership. In column 2 we find that union membership is associated with a higher level of paid overtime hours. The estimated coefficient of about 0.9 hours is weakly significant (at the 10% level). This effect is not very robust since it can, for example, not be observed in cross-sectional specifications. Thus, our findings do not allow us to reject the hypothesis that union membership in Germany has an income-generating function via a greater use of paid overtime.

Column 3 indicates that union members work significantly fewer overtime hours which are either completely or partially unpaid. This is consistent with the descriptive evidence relating to unpaid hours. Therefore, our results enable us to reject the hypothesis that union membership insures against the loss of returns from (unpaid) overtime investments. The fourth column in Table 4 indicates that union members who have not changed their employer work significantly fewer overtime hours than non-members. Accordingly, there is no indication that our findings are due to, for example, to union members selecting into firms with different overtime hours. Moreover, the results for the stayer sample do not provide evidence commensurate with the works council and collective bargaining channel.

Table 5 contains the results of fixed-effects specifications for the subgroup of respondents, for which we have information on the works council status of the establishment they work in. Moreover, Table 5 contains the findings for subsamples of firms with less than 2000 employees and with a greater number of staff.

Table 5: Subsamples II

	(1) Council sample	(2) Council exists	(3) Less than 2000 employees	(4) More than 2000 employees
Union member	-0.925*** (-3.54)	-0.738* (-2.50)	-0.638** (-2.93)	-0.054 (-0.18)
Observations	5125	2966	9357	2770
Number of groups	2053	1189	3387	999
Adj. R^2	0.041	0.049	0.053	0.041

Source: SOEP. Standard errors clustered on the individual level; t statistics in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Fixed effects regressions, dependent variable is overtime hours > 0 . Full set of controls (except federal state dummies) is used in each specification. Columns (1) and (2) are restricted to firms with more than 5 employees since this is the legal threshold for works council elections. Due to a very small number of big firms in agriculture, we exclude the corresponding industry in column (4).

As indicated above, the information on the works council status of a firm is available for a substantially reduced number of observations. When estimating our standard fixed-effects specification for this entire subsample, the union membership is significantly negative (column 1 of Table 5) and somewhat larger in absolute size than for the full sample, also incorporating waves for which no works council information is provided (see Table 2). When additionally splitting the reduced sample into one for employees working in plants without works councils (not depicted) and one in which such institution is present (column 2), the estimated membership coefficient becomes insignificant for non-codetermined firms and stays significant for codetermined firms. Accordingly, we can reject the hypothesis that the impact of trade union membership on overtime is due to a correlation between union member-

ship and works councils on the one hand and works councils and overtime on the other.

Furthermore, inspection of columns 3 and 4 in Table 5 reveals that the union membership effect cannot be observed in firms with 2000 or more employees, but arises in the subsample of firms with fewer employees. The results depicted in column 4 of Table 5 may be consistent with the view that the observed union membership effect on overtime is actually a collective bargaining artefact. While our data does not allow us to refute such claim, other findings cast some doubt on this interpretation. First, we do observe a union membership effect for the works council firms. Since the existence of a works council and coverage by collective bargaining agreements coincide to a large extent, the findings presented in columns 1 and 2 of Table 5 are not compatible with the view that the union membership-overtime nexus is a consequence of collective bargaining. Second, the estimate for the sample of employees who do not change their job and for which we implicitly hold constant (time-invariant) firm characteristics, reveal a significantly negative union membership effect. This suggests that firm-fixed effects do not play a role. Since, moreover, changes in bargaining status are relatively seldom for large firms, this calls further into question the validity of collective bargaining channel. Third, all of our specifications include as control variable the number of contractual working hours (see Table A.3 in the Appendix). Since they are determined by collective bargaining, if a firm is covered by such agreement, this variable implicitly controls for bargaining status.

In sum, the findings presented in Table 5 do not allow us to refute the collective bargaining argument. Thus, this potential explanation for the observed impact of individual union membership on overtime, as well the income-generating view, deserve further scrutiny. In contrast, our results are rather conclusive with regard to the selection argument, the works council and the insurance of investment view; they provide no evidence of such channels. While we can obviously not directly test the protective role of union membership argument, none of our findings is in conflict with such interpretation.

6 Conclusion

Using data from the Socio-Economic Panel (SOEP) for the period from 1985 to 2015, we find consistent and robust evidence that union members in the private sector in Germany work about 0.6 hours overtime per week less than comparable non-members. Furthermore, instrumenting union membership with regional election

results for the time span from 1998 to 2015 confirms this finding. This effect of individual trade union membership can be observed across a variety of sub-groups. It is restricted to the number of hours, but cannot be discerned for the incidence of overtime. Moreover, it is a private sector phenomenon.

Aggregated over one year, 0.6 hours per week almost equal contractual working time for one week. While this union membership effect, at first sight, appears to result in substantial, though detrimental, financial consequences, it has to be taken into account that about 50% of all overtime hours of union members are either compensated by leisure or are unpaid (cf. Table A.2). Upon closer scrutiny, the income effect of working fewer overtime hours is, therefore, probably less than 1% of gross income.

We have considered a number of channels which may enable union members to work fewer overtime hours. Our results allow us to – tentatively – rule out some of them. More specifically, we obtain no evidence that is consistent with the view that unpaid overtime constitutes an investment which provides a greater return to union members because they tend to stay longer with their employer. Furthermore, we have argued that a linkage between overtime use and union membership may arise because works councils can have a substantial influence on their allocation and union members are more likely to work in works council establishments than non-members. If works council reduced overtime, the negative union membership effect may actually be a works council impact. However, our results for a subsample of observations for which we know about the works council status, allows us to reject this hypothesis, as the negative overtime effect of union membership can also be observed in works council firms. We have also considered the possibility that the union membership-overtime nexus is due to collective bargaining. This may be the case if collective bargaining reduces overtime and, at the same time, union membership is more widespread in firms covered by collective negotiations. Unfortunately, the SOEP provides no adequate information on collective bargaining status for the relevant period. Looking at large firms which in their overwhelming majority negotiate wages and working conditions with trade unions in Germany, we do not observe the trade union membership impact. Thus, we cannot rule out this explanation. However, the fact that overtime is more pronounced in large firms is not consistent with this view. Overtime may also generate more income. The weak evidence of a positive union membership effect on paid overtime is consistent with such a view. A further hypothesis we have put forward is that union membership and overtime are related because overtime is an indicator of work effort or work attitudes and because union members exhibit different such attitudes than non-members. The differences

in the size of the estimated coefficients in pooled OLS and linear fixed-effects specifications allow us to evaluate this view. In particular, the higher absolute value of the estimated, negative coefficients in the fixed-effects specifications suggests that union members may be characterised by time-invariant work attitudes, which reveal themselves in a higher number of overtime hours than worked by non-members. However, the estimated coefficient of membership on overtime is negative. Hence, the preference- or attitude-based perspective cannot explain our findings. The only remaining explanation for the negative impact of union membership on overtime is that union members are better able to enforce their working time preferences than non-members. Given the evidence that a large fraction of employees in Germany would like to reduce working time, this impact of union membership is reflected in fewer overtime hours worked.

Since we do not observe a union membership impact on overtime in the public sector, the above interpretation may suggest that such a protective role as possibly effective in the private sector is not required for employees in the public domain. Evaluating the hypothesis that union membership has differential effects on working conditions in the private and the public sector in Germany, however, is beyond the scope of this paper. Moreover, public sector employees are covered by collective bargaining contracts in their large majority. Hence, it may be the case that the protective and possibly income-generating role of trade union membership is less relevant in settings in which wages and working conditions are negotiated collectively. This issues also warrants further scrutiny.

Furthermore, it is noteworthy that the impact of an individual's union membership relates to the number of hours, but not to the incidence of overtime. This suggests that, for example, the protective role of trade union membership only becomes relevant if employer demands for overtime become too pronounced. Since the estimates for the incidence of overtime do not yield a picture across subsamples, which substantiates this conjecture, the causes for the differential impact of union membership on the incidence and amount of overtime also remain an open issue.

Putting our findings into an international perspective, it is noteworthy that the studies on union membership and overtime in Great Britain, surveyed in Section 2, tend to find a positive correlation. Once again, this may be interpreted as indicating a differential role of union membership, in this instance, in two countries. Importantly, the findings suggest that research on the effects of trade unions should not ignore specificities of industrial relations systems in which these organisations operate.

A Appendix

Table A.1: Variable definitions

<i>Dependent variables</i>	
OT dummy	Individual worked overtime in the month before the interview.
OT hours	Weekly overtime hours in the month before the interview
OT hours > 0	Weekly overtime hours in the month before the interview if overtime is greater than zero
<i>Independent variable of interest</i>	
Union member	Individual is a trade union member.
<i>Type of overtime compensation</i>	
Unpaid dummy	Overtime is generally not compensated.
Paid dummy	Overtime is generally compensated with additional pay.
Partly paid dummy	Overtime is generally partly compensated with additional wage and partly compensated with time-off.
Leisure dummy	Overtime is generally compensated with time-off.
<i>Socio-demographic controls</i>	
Woman	Individual is female.
Foreign citizen	Individual has a non-German citizenship.
Married	Individual is married and living together.
Child in household	At least one child is living in the household.
Apprenticeship	Individual has completed an apprenticeship.
University degree	Individual holds a university degree.
<i>Job-related controls</i>	
Hourly wage	Logarithm of current gross income from employment
Experience	Labour market experience in years (fulltime)
Tenure	Job at the same employer in years
Contract. work time	Contractual working hours per week.
Part-time job	Individual works part-time.
Side job	Individual has a side-job.
<i>Concerns about job security</i>	
Job Sec.: No concerns	Individual states no concerns about job security.
Job Sec.: Some concerns	Individual states some concerns about job security.
Job Sec.: Big concerns	Individual states big concerns about job security.
<i>Job change</i>	
Job Change: No	Individual states no recent job change or entered employment for the first time.
Job Change: No info	No information available if recent job change occurred.
Job Change: Yes	Individual states recent job change.
<i>Further categorized controls</i>	
<i>Firmsize</i>	4 dummies indicating the number of employees in individual's firm (1-19, 20-199, 200-1999, 2000+).
<i>Occupation</i>	12 dummies indicating occupational status, distinguishing between different qualifications for blue- and white collar employees
<i>Industry</i>	8 industry dummies on a one digit level (energy and mining combined)
<i>Federal State</i>	15 regional dummies at the level of the federal states with Rhineland-Palatinate and Saarland combined
<i>Interview month</i>	8 month dummies (August-December combined)
<i>Survey Year</i>	9 year dummies
<i>Variables used for robustness checks</i>	
Works council	Existence of work council in firm
Overemployed	Difference between actual and desired working hours greater than zero
Stayer	Longest employment spell at the same employer (generated via tenure)

Table A.2: Descriptive Statistics

	count	mean	sd	min	max
OT dummy	42671	0.50	0.50	0	1
OT hours	42671	2.30	3.66	0	40
OT hours > 0	21406	4.59	4.03	.2	40
Unpaid dummy	24898	0.16	0.37	0	1
Paid dummy	24898	0.15	0.36	0	1
Partly paid dummy	24898	0.24	0.43	0	1
Leisure dummy	24898	0.45	0.50	0	1
Union member	42671	0.20	0.40	0	1
Woman	42671	0.43	0.50	0	1
Foreign citizen	42671	0.16	0.37	0	1
Married	42671	0.65	0.48	0	1
Child in household	42671	0.45	0.50	0	1
Apprenticeship	42671	0.69	0.46	0	1
University degree	42671	0.16	0.37	0	1
Log. hourly wage	42671	2.59	0.48	0	6.957498
Experience	42671	15.69	11.29	0	49.6
Experience squared	42671	373.71	437.70	0	2460.16
Tenure	42671	9.74	9.26	0	50.9
Tenure squared	42671	180.61	302.45	0	2590.81
Contract. work time	42671	35.00	8.88	.8	78
Part-time job	42671	0.17	0.38	0	1
Side job	42671	0.06	0.24	0	1
Job Sec.: No concerns	42671	0.45	0.50	0	1
Job Sec.: Some concerns	42671	0.41	0.49	0	1
Job Sec.: Big concerns	42671	0.14	0.35	0	1
Job Change: No	42671	0.84	0.37	0	1
Job Change: No info	42671	0.02	0.14	0	1
Job Change: Yes	42671	0.14	0.35	0	1
Firm size 1-19	42671	0.26	0.44	0	1
Firm size 20-199	42671	0.30	0.46	0	1
Firm size 200-1999	42671	0.21	0.41	0	1
Firm size 2000+	42671	0.22	0.41	0	1
Work council	11857	0.50	0.50	0	1

Note:

Table A.3: Main results (1985-2015)

	(1)	(2)	(3)	(4)	(5)	(6)
	Logit	FE-Logit	OLS	FE	OLS > 0	FE > 0
Union member	-0.036 (-1.09)	-0.030 (-0.45)	-0.216*** (-3.90)	-0.265** (-3.02)	-0.294*** (-3.44)	-0.596*** (-3.50)
Woman	-0.358*** (-10.81)		-0.924*** (-17.51)		-1.093*** (-13.27)	
Foreign citizen	-0.446*** (-10.88)	0.188 (0.83)	-0.430*** (-7.22)	0.211 (0.80)	0.114 (1.06)	0.458 (0.89)
Married	-0.037 (-1.29)	-0.039 (-0.57)	-0.001 (-0.02)	-0.182* (-2.02)	-0.012 (-0.16)	-0.359* (-2.37)
Child in household	-0.002 (-0.08)	-0.145** (-2.73)	-0.002 (-0.05)	-0.142* (-2.13)	0.001 (0.02)	-0.144 (-1.25)
Apprenticeship	0.199*** (5.04)	0.139 (1.17)	0.178** (3.08)	0.261 (1.63)	-0.004 (-0.04)	0.317 (0.95)
University degree	0.315*** (5.60)	0.727** (2.76)	0.291** (3.12)	1.289*** (3.98)	0.108 (0.74)	1.154* (2.28)
Log. hourly wage	-0.143*** (-3.91)	-0.508*** (-6.46)	-0.624*** (-10.03)	-1.019*** (-9.27)	-1.070*** (-9.65)	-1.942*** (-8.34)
Experience	0.019*** (4.57)	0.041** (2.97)	0.057*** (9.08)	0.091*** (5.32)	0.084*** (7.80)	0.161*** (4.95)
Experience squared	-0.001*** (-6.61)	-0.001*** (-5.67)	-0.001*** (-8.07)	-0.003*** (-8.04)	-0.001*** (-4.86)	-0.004*** (-7.11)
Tenure	-0.006 (-1.47)	-0.003 (-0.36)	-0.022** (-3.05)	-0.025* (-2.31)	-0.035** (-3.02)	-0.034+ (-1.75)
Tenure squared	-0.000 (-0.44)	-0.000 (-0.87)	0.000 (0.40)	0.001* (2.19)	0.000 (1.04)	0.002** (2.65)
Contract. work time	0.036*** (18.43)	0.022*** (5.13)	0.030*** (12.00)	-0.003 (-0.53)	0.015* (2.46)	-0.031* (-2.28)
Part-time job	0.144*** (3.38)	0.211* (2.38)	-0.009 (-0.19)	-0.058 (-0.66)	-0.010 (-0.10)	-0.332 (-1.57)
Side job	0.271*** (5.61)	0.199* (2.22)	0.157+ (1.89)	-0.113 (-0.93)	-0.157 (-1.38)	-0.432* (-2.37)
Job Sec.: Some concerns	-0.041+ (-1.65)	-0.099* (-2.26)	-0.198*** (-4.92)	-0.198*** (-3.75)	-0.306*** (-4.97)	-0.300*** (-3.30)
Job Sec.: Big concerns	-0.121*** (-3.42)	-0.245*** (-3.84)	-0.147* (-2.44)	-0.291*** (-3.62)	-0.007 (-0.07)	-0.381** (-2.58)
Job Change: No info	-0.337*** (-3.71)	-0.791 (-1.51)	-0.310* (-2.56)	-0.856* (-2.37)	-0.142 (-0.67)	-1.127+ (-1.70)
Job Change: Yes	-0.086* (-2.47)	-0.110+ (-1.80)	0.001 (0.01)	-0.077 (-0.93)	0.173+ (1.89)	-0.015 (-0.11)
Firmsize 20-199	0.251*** (7.79)	0.143* (2.16)	0.423*** (8.21)	0.310*** (3.40)	0.400*** (4.82)	0.479** (2.87)
Firmsize 200-1999	0.342*** (9.11)	0.254** (3.17)	0.437*** (7.38)	0.270* (2.50)	0.338*** (3.67)	0.250 (1.27)
Firmsize 2000+	0.363*** (9.11)	0.271** (3.07)	0.587*** (9.01)	0.350** (2.90)	0.611*** (6.08)	0.356+ (1.67)
Year dummies	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Fed. State dummies	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Industry dummies	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Occupational dummies	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Int. month dummies	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Observations	42671	16440	42671	30370	21406	13186
Number of groups		4481		9461		4613
Adj. R^2			0.127	0.028	0.106	0.050

Source: SOEP. Standard errors clustered on the individual level; t statistics in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Dependent variables are a dummy variable for the incidence of overtime in columns (1) and (2), overtime hours in columns (3) and (4), non-zero overtime hours in columns (5) and (6). Dummies for industry, region, occupational status, survey year and interview month are used in each specification.

References

- Addison, John T., Paulino Teixeira, Katalin Evers, and Lutz Bellmann,** “Is the erosion thesis overblown? Alignment from without in Germany,” *Industrial Relations: A Journal of Economy and Society*, 2016, 55 (3), 415–443.
- Anger, Silke,** “Overtime work as a signaling device,” *Scottish Journal of Political Economy*, 2008, 55 (2), 167–189.
- Barkume, Anthony,** “The structure of labor costs with overtime work in US jobs,” *Industrial and Labor Relations Review*, 2010, 64 (1), 128–142.
- BAuA,** “Arbeitszeitreport Deutschland 2016,” Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, <https://www.baua.de/DE/Angebote/Publikationen/Berichte/F2398.pdf>, 2016.
- Bauer, Thomas and Klaus F. Zimmermann,** “Overtime work and overtime compensation in Germany,” *Scottish Journal of Political Economy*, 1999, 46 (4), 419–436.
- BBSR Bonn,** “INKAR (Indikatoren und Karten zur Raum- und Stadtentwicklung),” Federal Institute for Research on Building, Urban Affairs and Spatial Development, <http://www.inkar.de/>, 2018.
- Behrens, Martin,** “Still married after all these years? Union organizing and the role of works councils in German industrial relations,” *Industrial and Labor Relations Review*, 2009, 62 (3), 275–293.
- , “Unterscheiden sich Mitglieder von Betriebs- und Personalräten vom Rest der Belegschaften?,” *Industrielle Beziehungen/The German Journal of Industrial Relations*, 2009, 16 (4), 303–326.
- Bell, David N.F., Alessandro Gaj, Robert A. Hart, Olaf Hübler, and Wolfgang Schwerdt,** “Unpaid overtime working in Germany and the UK,” Working Paper, <http://zinc.zew.de/pub/zew-docs/div/wwheworkshop/hart.pdf>, 2001.
- **and Robert A. Hart,** “Working time in Great Britain, 1975–1994: Evidence from the New Earnings Survey panel data,” *Journal of the Royal Statistical Society*, 1998, 161 (3), 327–348.
- **and –** , “Unpaid work,” *Economica*, 1999, 66 (262), 271–290.
- , **Steffen Otterbach, and Alfonso Sousa-Poza,** “Work hours constraints and health,” *Annals of Economics and Statistics*, 2012, 105/106, 35–54.
- Berglund, Tomas and Bengt Furåker,** “Employment protection regulation, trade unions and tenure of employment: An analysis in 23 European countries,” *Industrial Relations Journal*, 2016, 47 (5–6), 492–512.
- Berniell, Maria Ines and Jan Bietenbeck,** “The effect of working hours on health,” *IZA Discussion Paper Nr. 10524*, 2017.

- Cameron, A. Colin and Pravin K. Trivedi**, *Microeconometrics: Methods and applications*, Cambridge University Press, 2005.
- and –, *Microeconometrics using Stata*, Vol. 2, Stata Press, 2010.
- Chiang, Hui-Yu**, “The effect of fringe benefits on the paid overtime hours in Japan,” *Journal of Applied Business and Economics*, 2012, 13 (3), 123–136.
- Cygan-Rehm, Kamila and Christoph Wunder**, “Do working hours affect health? Evidence from statutory workweek regulations in Germany,” *Labour Economics*, 2018, 53, 162–171.
- DGB**, “So viele Überstunden machen die Deutschen,” DGB, <http://www.dgb.de/-/E0s>, 2018.
- Ebbinghaus, Bernhard, Claudia Göbel, and Sebastian Koos**, “Social capital, ‘Ghent’ and workplace contexts matter: Comparing union membership in Europe,” *European Journal of Industrial Relations*, 2011, 17 (2), 107–124.
- Ellguth, Peter and Susanne Kohaut**, “Tarifbindung und betriebliche Interessenvertretung: Ergebnisse aus dem IAB-Betriebspanel 2016,” *WSI-Mitteilungen*, 2017, 70 (4), 278–286.
- European Council**, “Presidency Conclusions, Lisbon,” https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/00100-r1.en0.htm, 2000.
- European Parliament**, “Indicators of job quality in the European Union,” <http://www.europarl.europa.eu/document/activities/cont/201107/20110718ATT24284/20110718ATT24284EN.pdf>, 2009.
- Fitzenberger, Bernd, Isabelle Haggene, and Michaela Ernst**, “Wer ist noch Mitglied in Gewerkschaften? Eine Panelanalyse für Westdeutschland,” *Journal of Applied Social Science Studies (Schmollers Jahrbuch)*, 1999, 119 (2), 223–263.
- Fuest, Clemens and Bernd Huber**, “Is tax progression really good for employment? A model with endogenous hours of work,” *Labour Economics*, 2000, 7 (1), 79–93.
- Goebel, Jan, Markus M. Grabka, Stefan Liebig, Martin Kroh, David Richter, Carsten Schröder, and Jürgen Schupp**, “The German Socio-economic Panel (SOEP),” *Jahrbücher für Nationalökonomie und Statistik*, 2019, 239 (2), 345–360.
- Goerke, Laszlo and Markus Pannenberg**, “Norm-based trade union membership: Evidence for Germany,” *German Economic Review*, 2004, 5 (4), 481–504.
- and –, “Trade union membership and works councils in West Germany,” *Industrielle Beziehungen/The German Journal of Industrial Relations*, 2007, 14 (2), 154–175.
- and –, “Trade union membership and dismissals,” *Labour Economics*, 2011, 18 (6), 810–821.

- **and Sabrina Jeworrek**, “Paid vacation use: The role of works councils,” *Economic and Industrial Democracy*, 2018, *forthcoming*.
- Gralla, Rafael, Kornelius Kraft, and Stanislav Volgushev**, “The effects of works councils on overtime hours,” *Scottish Journal of Political Economy*, 2017, *64* (2), 143–168.
- Hart, Robert A.**, *The economics of overtime working*, Cambridge University Press, 2004.
- **and Yue Ma**, “Wage–hours contracts, overtime working and premium pay,” *Labour Economics*, 2010, *17* (1), 170–179.
- Hübler, Olaf**, “Individual overtime functions with double correction for selectivity bias,” *Economics Letters*, 1989, *29* (1), 87–90.
- IAB**, “Durchschnittliche Arbeitszeit und ihre Komponenten in Deutschland,” IAB, http://doku.iab.de/arbeitsmarktdaten/AZ_Komponenten.xlsx, 2018.
- Jensen, Carsten S.**, “Political attitudes and trade union membership in the Nordic countries,” *European Journal of Industrial Relations*, 2017, *23* (4), 381–395.
- Jirjahn, Uwe**, “On the determinants of shift work and overtime work: Evidence from German establishment data,” *British Journal of Industrial Relations*, 2008, *46* (1), 133–168.
- Kalwij, Adriaan S. and Mary Gregory**, “A panel data analysis of the effects of wages, standard hours and unionization on paid overtime work in Britain,” *Journal of the Royal Statistical Society*, 2005, *168* (1), 207–231.
- Knaus, Michael and Steffen Otterbach**, “Work hour mismatch and job mobility: Adjustment channels and resolution rates,” *Economic Inquiry*, 2019, *57* (1), 227–242.
- Kraft, Kornelius and Julia Lang**, “The causes and consequences of adopting a works council,” *Jahrbücher für Nationalökonomie und Statistik*, 2008, *228* (5-6), 512–532.
- Miller, Paul and Charles Mulvey**, “Trade unions and the distribution of paid overtime,” *Journal of Industrial Relations*, 1991, *33* (2), 220–233.
- OECD**, “OECD Employment Outlook 2014,” OECD Publishing, Paris. doi:[10.1787/empl_outlook-2014-en](https://doi.org/10.1787/empl_outlook-2014-en), 2014.
- , “OECD Employment Outlook 2018,” OECD Publishing, Paris. doi:[10.1787/empl_outlook-2018-en](https://doi.org/10.1787/empl_outlook-2018-en), 2018.
- Oswald, Andrew J. and Ian Walker**, “Rethinking labor supply: Contract theory and unions,” *The University of Sydney, Working Papers in Economics No. 207*, 1994.
- Pannenberg, Markus**, “Long-term effects of unpaid overtime,” *Scottish Journal of Political Economy*, 2005, *52* (2), 177–193.

- **and Gert G. Wagner**, “Umfang und Kompensation von Überstunden - Eine vergleichende Analyse für Westdeutschland und Großbritannien,” *DIW Discussion Paper No. 234*, 2000.
- Schank, Thorsten and Claus Schnabel**, “Betriebliche Determinanten des Überstundeneinsatzes,” in Lutz Bellmann and Claus Schnabel, eds., *Betriebliche Arbeitszeitpolitik im Wandel*, BeitrAB 288, 2004, pp. 37–62.
- Scheuer, Steen**, “The impact of collective agreements on working time in Denmark,” *British Journal of Industrial Relations*, 1999, 37 (3), 465–481.
- Schmidt, Christoph M. and Klaus F. Zimmermann**, “Work characteristics, firm size and wages,” *The Review of Economics and Statistics*, 1991, 73 (4), 705–710.
- Schnabel, Claus and Joachim Wagner**, “Union density and determinants of union membership in 18 EU countries: evidence from micro data, 2002/03,” *Industrial Relations Journal*, 2007, 38 (1), 5–32.
- SOEP v33**, “Socio-Economic Panel (SOEP),” Version 33, data for years 1984-2016. doi:[10.5684/soep.v33.1i](https://doi.org/10.5684/soep.v33.1i), 2018.
- StataCorp**, *Stata Treatment-Effects Reference Manual, Release 15*, Stata Press, 2017.
- Trejo, Stephen J.**, “Overtime pay, overtime hours, and labor unions,” *Journal of Labor Economics*, 1993, 11 (2), 253–278.
- Veliziotis, Michail**, “Trade unions and unpaid overtime in Britain,” *UWE Economics Working Paper Series No. 1304*, 2013.
- Visser, Jelle**, “ICTWSS: Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts in 51 countries between 1960 and 2014,” *Version 5.1 , September 2016, Amsterdam Institute for Advanced Labour Studies (AIAS), University of Amsterdam*, 2016.
- Wooldridge, Jeffrey M.**, *Econometric analysis of cross section and panel data*, MIT Press, 2002.
- Zapf, Ines**, “Individual and workplace-specific determinants of paid and unpaid overtime work in Germany,” *IAB Discussion Paper No. 15*, 2015.
- **and Enzo Weber**, “The role of employer, job and employee characteristics for flexible working time: An empirical analysis of overtime work and flexible working hours’ arrangements,” *IAB Discussion Paper No. 4*, 2017.