The general statutory minimum wage's impact on German trade unions' membership

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Abstract

This contribution scrutinizes how the introduction of a statutory minimum wage of € 8.50 per hour of work in Germany on January 1, 2015, impacts on German unions' membership. Based on representative data from the panel 'Labour Market and Social Security' (PASS), we apply a difference-in-differences model on entries in and withdrawals from German DGB unions. Our results show no significant effect on withdrawals from and entries in unions in the aftermath of the minimum wage introduction. Thus, unions' campaign for a minimum wage is an ambivalent success as it apparently did not reverse the segmentation of union membership patterns.

Introduction

When the ‘Act on the Strengthening of Free Collective Bargaining’ introduced a national statutory minimum wage of €8.50 per hour on 1 January 2015, the German wage-setting system switched from an autonomous to a rather hybrid one (Bosch 2015: 173). Although its introduction is widely seen as the “success of strategic action by unions that organize in sectors with a high incidence of low-pay employment” (Dingeldey and Kathmann 2017: 1), unions’ support for the minimum wage needs an explanation. Trade unions and social democrats used to defend the *Tarifautonomie*, the principle of autonomous wage-setting by social partners, and a minimum wage goes against it (Marx and Starke 2017: 560). Hence, social partners resisted for a long time any statutory minimum wage for fear of losing their power in the negotiation of employment and working conditions (Bosch 2018: 19). They changed their position towards a minimum wage not least because the issue was popular among their members and non-members, although it was not clear if it would actually widen or at least consolidate its membership.

By focussing on the minimum wage’s impact on unions’ membership size, we fill a research gap, since analyses of unions’ memberships growth do only cover the time before the minimum wage’s introduction (Anders *et al.* 2015), while research on the minimum wage mostly focuses on institutional change regarding its introduction (Bosch 2015, 2018; Schroeder *et al.* 2016; Dingeldey and Kathmann 2017, Marx and Starke 2017), its effects on employment and wage structures (Bosch and Weinkopf 2015; Bossler and Möller 2018; Bruttel *et al.* 2018), on job satisfaction (Bossler and Broszeit 2017), and on the segmentation of the collective bargaining system in Germany (Dingeldey and Kathmann 2017, Bosch 2018).

To analyse how the introduction of a statutory minimum wage affected unions’ membership, we scrutinize patterns of entries in and withdrawals from unions of the Confederation of German Trade Unions (DGB) of those who benefited from the general minimum wage before and after its introduction. We proceed as following: First, we summarize how a decline in collectively agreed wages and a fast-growing low-wage sector incrementally changed unions’ position towards the introduction of a statutory minimum wage, since they had to admit that they could no longer guarantee standard wages in many employment sectors. Secondly, we highlight the importance of membership size for unions’ organizational self-interest and for their power in free collective bargaining and policymaking as well as individuals’ motifs to

join a union despite the possibility to free ride. Afterwards, we examine how the introduction of a statutory minimum wage has affected the number of union memberships of those who benefited from the minimum wage. Based on representative data from the panel 'Labour Market and Social Security' (PASS), we use a logistic difference-in-differences propensity score matching (DiD-PSM) approach (Heckman et al. 1997, 1998) to isolate the effect of the minimum wage introduction on the fluctuation of union members.

A statutory minimum wage in Germany

In Germany's autonomous wage-setting system, usually companies and employers' associations and trade unions negotiate pay at industry level without any direct state intervention. Direct state intervention in the wage-setting process only occurred when the social partners applied to make collective agreements binding (Bosch 2018: 23). Both, employers and trade unions defended the *Tarifautonomie*, the principle of autonomous wage-setting by social partners. The German employment model and social partnership as mutual recognition, countervailing power and encompassing collective bargaining (Haipeter 2012), favoured unions' interest in securing collectively agreed wages. German labour market institutions are traditionally oriented towards the *Normalarbeitsverhältnis*, a permanent full-time job with collectively agreed wages, protected through high dismissal protection.

The downside of this approach was a segmentation of the labour market between regular and discontinuously occupied persons. Strict labour market regulation and high labour costs acted as a barrier for labour-market outsiders by hampering the expansion of employment in the low-wage sector. The slow growth of jobs in the labour-intensive personal service sector was considered as a reason that a large part of the population remained inactive. This problem was aggravated when after the 1990 German reunification, the adopted West German labour market regulation excluded large parts of East Germany's often low-skilled workforce since their productivity stayed behind their wages (Heinze 2006; Eichhorst and Marx 2011: 76).

In the 1990s, employers increasingly withdrew themselves from social partnership (Haipeter 2012: 388). From the mid-1990s onwards, the erosion of the German inclusive collective bargaining system generated a large low-wage sector, in which pay was determined unilaterally by the employers (Bosch 2018: 30).

Although the Confederation of German Trade Unions (DGB) resisted proposals to widen the low-wage sector, the Hartz Reforms, legislated in the years 2003 to 2005 by Chancellor

Gerhard Schröder's red-green government, enhanced reintegration into the labour market by establishing a low pay sector. New schemes to subsidise employment, *Minijobs* and *Midijobs*, with lower or gradually rising taxes and insurance payments and less worker protection aimed to encourage employers to hire. Furthermore, temporary work was deregulated by setting up *Personal-Service-Agenturen*, operating as temporary agencies to place unemployed with employers, and by abolishing the maximum duration of 24 months of an assignment. Temporary work, *Mini*- and *Midijobs* hardly built a bridge into regular employment, but the deregulation at the margin of the labour market led to a decline of the scope of collective bargaining. More and more companies made use of exit options that allow collectively defined standards to be undercut (Eichhorst and Marx 2011: 78–79). The low-wage sector with more than five million German workers in precarious jobs became a working poor trap (Unger 2015: 12).

Downward pressure on wages, working conditions as well as growing inter-industry divisions contributed to the emergence of a pro–minimum wage coalition in the trade union camp within a relatively short period of time (Marx and Starke 2016: 561). Regarding the erosion of the collective bargaining system, unions had to acknowledge that, in many industries, they lost the power to negotiate on equal terms with the employers (Bosch 2018: 19).

Starting around the turn of the millennium, service unions as NGG and ver.di, whose sectors were strongly affected by low-page and which were facing employers reluctant to engage in free collective bargaining, saw a statutory minimum wage as an opportunity to strengthen their organizational self-interest by compensating their weakness in collective bargaining and by distinguishing themselves as advocates of low-wages employees also for non-members within their sectors (Schroeder *et al.* 2016: 151).

In contrast, the manufacturing unions as the IG Metall, Germany's largest union and Europe's largest industrial union, and IG BCE that covers workers in the mining, chemicals and energy industry, rejected a statutory minimum wage. They feared that it would strengthen the government's role in wage determination, endanger free collective bargaining and thereby weaken their own role as an attractive membership organization (Schroeder *et al.* 2016: 140). Since they hardly had members in the low-wage sector but close ties to employers, they favoured regional collective agreements and sector-specific minimum wages that put their organizations central.

A few years later, however, IG Metall and IG BCE realigned their interest towards the introduction of a minimum wage, on the one hand out of an ideology of working-class solidarity. Dualization, the separation of standard and non-standard employment, goes strongly against unions' self-perception. Germany had become such a "dualized" political economy characterized by processes of institutional differentiation between "insiders" and "outsiders". Although a minimum wage cannot reverse dualization entirely as it does not address job security, it reduces the disparities between the lower wages in services and the skilled workers in the export industry (Marx and Starke 2017: 560).

On the other hand, the growth of precarious employment puts the position of insiders under pressure as well. Rising numbers of low paid employees in the industry sectors (such as unskilled workers in East Germany and temporary workers) softened the duality of the export industry and domestic sectors (Schroeder *et al.* 2016: 140; Marx and Starke 2017: 564). Unions could no longer ignore that a lot of their (potential) members called for a statutory minimum wage as a political project. The issue of a general, statutory minimum wage was better to communicate than less inclusive, sector-specific minimum-wages and offered an opportunity for the DGB to unite the trade union camp and to set an agenda with broad public support (Schroeder *et al.* 2016: 147–149).

The minimum wage's 'bite' is strong in reach and wage increase; about four million employees benefited directly from its introduction (Bosch 2018: 30) and hourly wages increased significantly in regions, socio-economic groups, and sectors where a high share of employees earned less than 8,50 EUR before. Beneficiaries are specifically women, employees in East Germany, in marginal part-time jobs, in smaller businesses, and without vocational training (Brüttel et al. 2018: 158). Using a difference-in-differences approach with Linked Personnel Panel data, Bossler and Broszeit (2017) revealed an increase in the affected workers' job satisfaction, which is predominantly driven by changes in pay satisfaction. The minimum wage brought significant increases for low-paid employees, with limited observable negative employment effects (Brüttel et al. 2018; Bossler and Möller 2018).

However, it is yet unclear if the minimum wage contributes to a growing membership. Although the level of unionisation of employees appeared to be in the ascendant after the end of the red-green government, it is by no means sure whether this will endure. An analysis of union membership revealed that unionization of male, full-time and older employees is above average. Thus, membership growth will only continue if unions succeed in organizing more

women, part-timers, and young people (Anders *et al.* 2015: 23–25); groups that disproportionately often benefit of the minimum wage's introduction.

Union membership: Individual motifs and overall importance

Membership size is of central importance for unions. First, it impacts on their financial resources as major prerequisites for their activities (Eising 2007: 339). Unions are financed almost exclusively by membership fees, since financial dependencies on the state or third parties could contradict their credibility and independence in interest representation (Ebbinghaus and Göbel 2014: 207).

Secondly, unions' relevance in free collective bargaining and in policymaking is strongly affected by their ability to represent and control a large membership. Social partnership as continental Europe's classical pattern of industrial relations is characterised by powerful and centralized interest organizations representing capital and labour. In free collective bargaining to set standard wages and labour standards, membership size impacts on the unions' negotiating strength and ability to strike as well as their legitimacy as the employees' chosen bargaining agents. The more members an association organizes, the more it can claim to be representative of its domain. Furthermore, corporatist scholars have described unions' relevance as an effect of groups' ability to control their membership. Governments incorporate unions in neo-corporatist cooperation and social pacts when they need their cooperation to achieve wage restraint due to their autonomy in collective bargaining (Binderkrantz *et al.* 2015: 99).

Thirdly, groups that represent a broad membership may convey more political support to policymakers. A power base of interest groups is their ability to moderate the public opinion and to mobilize their members or sympathizers to vote for or against a certain party (Weßels 1987: 288-289; Binderkrantz *et al.* 2015: 100). In political exchange with the government, trade unions may employ their mobilization capability in order to either, according to a logic of membership, pursue their members' interests in higher wages and job security, or, following a logic of influence, seek institutional participation in the making and the implementation of policies in advisory boards and tripartite institutions (Streeck 1987). Moreover, they communicate the government's' policy goals (such as wage moderation) to their members and thereby legitimize them (Hassel 2009: 9).

While membership's size importance for unions is apparent, the membership's benefit for employees is not. Trade unions are exposed to a classic collective action problem of free-riding, resulting from the provision of public goods (Olson 1965). By negotiating collectively agreed wages, unions provide non-excludable goods, since non-union members are covered by collective bargaining agreements as well. When employees are aware that they can also choose a free-rider status instead of union membership (Chaison and Davale 1992: 360–365), their decision to join a union in the absence of compulsion may be shaped by five factors which increase the relative attractiveness of union membership:

Firstly, economist theories assume organizations' provisions of *selective incentives* to motivate a self-interested homo oeconomicus to participate in collective action. Groups may devise special services like strike pay or legal protection as a counterforce to the tendency to free-ride (Olson 1965).

Similar and, secondly, unions may provide *preferential treatment* of their members or may convey the impression that they do so. Under such conditions, union membership may have a value in terms of compensation and benefits, job security, opportunities for promotion which may exceed the benefits of free-riding (Chaison and Davale 1992: 360).

Thirdly, trade union membership may be explained with a reputation as an incentive good. Free-riding may carry significant social costs that can be reduced only by union membership. The social custom theory of trade union membership (Booth 1985; Visser 2002) assumes the *value of reputation* as reasons for the rejection of free-rider status.

Fourthly, trade unions may be credited with rising wages and improvements in the working conditions and living standards (Carruth and Schnabel 1990: 341). Some workers may join unions when not required to do so because of their awareness and appreciation of union achievements. Employees with greater organizational tenure have a higher degree of such *union consciousness* than free riders (Chaison and Davale 1992: 362).

Fifthly, dissonance theories are based on the premise that *dissonance between expectations of work and experience of work* regarding pay levels, working conditions, and job satisfaction may pose a trigger to join a union. Here, perceived union instrumentality acts as a mediator (Charlwood 2002: 469). However, Charlwood found only minimal support for the hypothesis that low paid employees will be more willing to join a union. Similar, business cycle models found a 'threat effect' whereas rising prices may induce employees to become or remain union members to defend real wages against inflation (Carruth and Schnabel 1990: 329).

Effects of the statutory minimum wage on the membership of trade unions

Especially the last two theoretical assumptions regarding *union consciousness* and *dissonance between expectations and experience of work* are suitable to hypothesize about the minimum wage's effect on individuals' decision to establish, maintain or terminate a union membership.

Although the appreciation of the minimum wages' introduction as a unions' success may bring employees who directly benefited from the minimum wage to join a union, its introduction also increases the job and pay satisfaction of those employees (Bossler and Broszeit 2017). Thus, according to the dissonance theory's expectation that individuals who believe that their pay is low in relation to their working conditions will more likely join a union than individuals who believe that their pay is reasonable (Charlwood 2002: 479), a minimum wage may reduce incentives to take up union membership. Balancing these two opposing mechanisms, it seems reasonable to give greater weight in the absence of the direct personal reasons of union membership, because of a declining dissonance between expectations of work and experience of work regarding pay levels, than in raising more abstract general attention to unions. Accordingly, our first hypothesis is:

> *H1: The introduction of the new statutory minimum wage decreased the probability of an entry into a union for people who benefit from the minimum wage.*

In addition, people who benefit from the minimum wage and not of collectively agreed wages could become less interested in being organized in a union. In some low-wage sectors, sector-specific minimum wages are overtaken by the general minimum wage adaption. This is regarded as a problem by union representatives who fear that their negotiation success becomes obsolete, which was the case regarding temporary work in 2016 (Dingeldey and Kathmann 2017: 23). Consistent costs for union membership, but declining benefits from a union membership lead to our second hypothesis:

> *H2: The introduction of the statutory minimum wage increased the probability of a withdrawal from a union for people who benefit from the minimum wage.*

The importance of default options in the decision making of people is well-investigated in behavioural economics. It depends on two factors: the domain of the decision and the kind of the default. In decisions about consumer choices, under which union membership can be subsumed, people are more likely to stay in the default then in other areas like health or

environmental issues. Similarly, defaults who operate through the endowment, which reflects the status quo, are found to be largely effective (Jachimowicz et al. 2017). It is reasonable to assume that the probability of non-union members to enter a union decreases stronger than the probability of union members to cancel their membership increases because people stuck to their default and stay in a union even when their desire deceases. Accordingly, our third hypothesis is:

> *H3: The introduction of the statutory minimum wage increased the probability of a withdrawal from a union to a greater extent than its decreased the probability of an entry into a union.*

The empirical analysis of these three hypotheses will be initiated by a descriptive analysis of the observed patterns of entries and withdrawals. This description will be expanded by tests of these hypotheses using two logistic DiD-PSM models, one for each hypothesis.

Identification strategy

In order to identify the causal effects of the new statutory minimum wage on entries in and withdrawals from unions, we employ the following identification strategy: Based on the potential outcome framework (Rubin 1974; Winship and Morgan 1999), which is now the standard notion in the causal inference literature (Sobel 2005: 100), we distinguish a treatment group (D=1) that was directly affected by the introduction of the new statutory minimum wage as their hourly wages increased by law and a control group (D=0) that was not directly affected.

Each individual faces two potential outcomes, in our case entries in and withdrawals from unions. Y^1 is the outcome in the treatment state and Y^0 in the control state, but only one outcome can be observed per person, depending on the individual assignment to the treatment or control group. This *fundamental problem of causal inference* makes it impossible to determine effects of the treatment on an individual level, but *the average treatment effect of the treatment group (ATT)* is still explorable (Morgan and Winship 2007: 33–35).

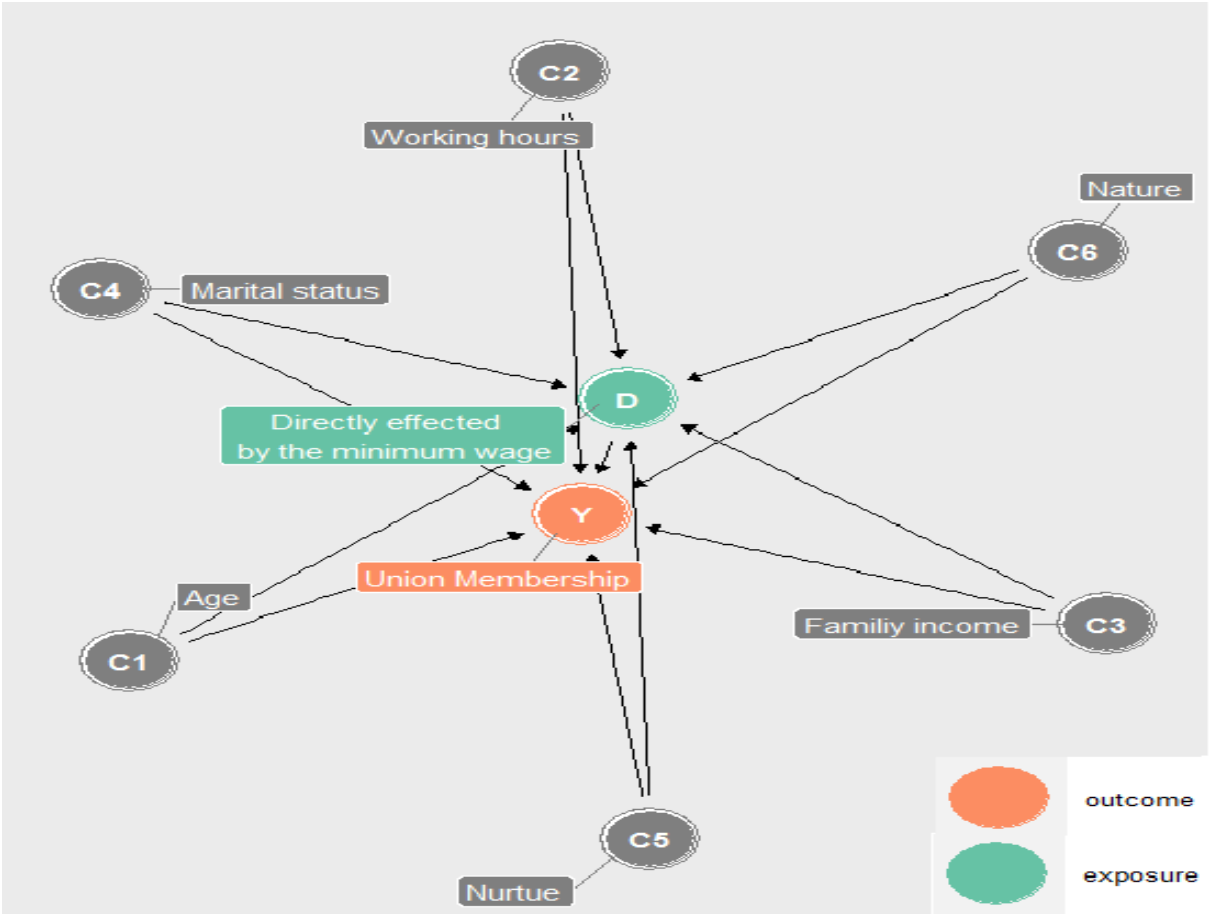
The identification of the ATT requires the *conditional independence assumption (CIA)* to hold

$$\left(Y^1, Y^0\right) \perp\!\!\!\perp D \mid C, \tag{1}$$

which states that the potential outcomes (Y^0, Y^1) are independent of D conditional on a set of variables C (Imbens and Wooldridge 2009: 12–13) and thereby the treatment assignment patterns are "as good as randomly assigned" (Gangl 2010: 27).

A sufficient set of variables that satisfies the CIA can be identified via a directed acyclic graph (DAG), which is a tool to make assumptions about the treatment assignment mechanism and related influences on the outcome variable transparent and derived C out of these relationships (Pearl 1995).

Figure 1: Directed Acyclic Graph for the influence of the introduction of the minimum wage on the union membership



Organizational tenure may impact on the probability to be affected by the minimum wage as well as on the probability of union membership. Employees with more tenure probably feel more responsible for their bargaining union's current condition. A greater organizational tenure may also lead to more bitterness toward management, and a greater awareness of union-management struggles. Employee age, as a proxy for organizational tenure, could

capture some of the effects of union consciousness. Younger workers generally have lower seniority and thus have had less opportunity to experience collective bargaining in their present or prior employment (Chaison and Davale 1992: 362–3). Other proxies for organizational tenure are *permanent positions*, since temporary posts reduce seniority and *working hours*, since less time spent in the job reduce the organizational tenure.

Another confounder may be *marital status.* According to the social custom model, social contact to family members who are union members increases the probability to unionize (Ebbinghaus and Göbel 2014: 211).

Some of the derived variables in the set of the confounders C are observed in our dataset. The conditioning of these variables is achieved by a propensity score matching (Lechner 2010).

No measures for the confounder *nature* and *nurture* are available, which prevents conditioning them. But it can be assumed that both factors are constant for adult individuals over time and therefore do not affect the outcomes' development. A within-person comparison as employed by a difference-in-differences (DiD) estimator eliminates the unobserved time constant confounders and satisfies the CIA. The ATT can be estimated in the linear case by a difference-in-differences (DiD) estimator with

$$\begin{array}{c} Y^i \vee D^i = 1, T^i = 1 \\ E[¿] - E[Y^i \vee D^i = 1, T^i = 0] \\ \tau^{ATT} = ¿ \end{array} \qquad -\left[E\left[Y^i \vee D^i = 0, T^i = 1\right] - E\left[Y^i \vee D^i = 0, T^i = 0\right]\right] \tag{2}$$

(Athey and Imbens 2006: 436). Whereby the actual change of the outcome in the treatment group $E[Y_{t1}^1 - Y_{t0}^1 \mid D = 1]$ is corrected for the common time trend independent from the treatment, represented by the change of the control groups outcome $E[Y_{t1}^0 - Y_{to}^0 \mid D = 0]$. This correction depends crucially on the common trend assumption (CTA)

$$E\left[Y_{t1}^0 - Y_{t0}^0 \vee D = 1\right] \quad = \quad E\left[Y_{t1}^0 - Y_{t0}^0 \vee D = 0\right], \tag{3}$$

which states that the treatment and control group face the same development of the outcome in the (counterfactual) absences of the treatment (Abadie and Cattaneo 2018: 484).

Data basis

We test our hypotheses on the basis of various waves of the panel study 'Labour Market and Social Security' (PASS). The PASS was introduced in 2005 "to provide a database which allows analysing the dynamics of welfare benefits receipt after the introduction of the Unemployment Benefits II in Germany" (Trappmann *et al.* 2013: 275). Because of this aim, there is an overrepresentation of people in the low-wage sector which depend of welfare benefits. This characteristic is crucial for our analysis, since regarding a low union density and a relatively small number of people who earned less than 8.5 Euro per hour in Germany, the number of entries in and withdrawals from unions in the treatment group is at risk to become too small in surveys without this overrepresentation.

The PASS contains a wide range of topics with an emphasis on labour market and poverty. It is conducted every year since 2005, with the latest available data form 2017. Participants are interviewed every year, which enables us to track individual developments in membership status and salary (Trappmann *et al.* 2013, S. 275–277). For each year, we code if an individual enters an union ($Y_{entry}=1$), stays a non-member ($Y_{entry}=0$), terminates her membership ($Y_{withdrawal}=1$), or remains a member ($Y_{withdrawal}=0$). We define the treatment and control group by the hourly wages a person earned in her main occupation. A person was assigned to the treatment group (D=1) when her hourly wage was lower than 8.5 Euro before 2015 and lower than 9.5 Euro since 2015. We chose these limits to include people who earned less than the prospective minimum wage before 2015. The maximum wage was set just slightly above the minimum wage to include employees whose companies providently increased the wages above the minimum wage in order to meet the next raise of the minimum wage. When her wage was constantly over 8.5 Euro, we assigned the person to the control group (D=0). The introduction of the minimum wage was incorporated in the *Year2015* dummy variable which is 0 before 2015 and 1 since then.

In the following analysis, we included only those who continuously participated in the PASS from 2014 or earlier to 2015 or later to ensure that the effect of the minimum wage's introduction can be studied on each participant.

The study population consists of 14,362 observations in the period from 2012 to 2017. Whereas in 2012 2,042 individuals were examined, the number of observations has risen to 3,096 in 2014 and declined again until 2017. Table 1A (in the appendix) displays the size of

the treatment and control group. On average, the treatment group is less than a fifth of the study population.

Descriptive Analysis

A descriptive analysis of the membership in a union[1] reveals that on average 14.22% of the study population was active in a union between 2012 and 2017. In the period before the minimum wage was introduced, there was a steady decline in the membership to 11.69%. In the following two years, the proportion of members reached a higher level than in 2013 but declined again in 2017 to 13.41% (Table 1).

The changes in numbers in the two groups are determined by four factors. Firstly, in the years before 2015, an increasing number of people can be tracked at least over the two years 2014/15. Ever since, the number of people who can be tracked decreases. These two aspects explain a large proportion of the observed development. Secondly, the entries in unions and the withdrawals from unions explain the shifts between these two groups.

Table 1: Membership in a union (over time)

	Membership in a Union		
Year	**No**	**Yes**	***%***
2012	1476	251	*17.01*
2013	1906	263	*13.80*
2014	2713	317	*11.69*
2015	2564	370	*14.43*
2016	1703	255	*14.97*
2017	1275	171	*13.41*

Note: Number of observations in the treatment and control group per year. *Source:* Own calculations based on the PASS data for 2012-2017.

1 The following analysis describes the characteristics of the study population and not of the population in Germany as a whole, because yet no weighing was performed. The analysis is not about the description of the determinants of the decreasing union density in Germany, but about the influence of the introduction of the minimum wage on entries in and withdrawals from unions.

In a more detailed view, the entries in unions can be split up in the total number of entries per year (overall) and the entries of people belonging to the treatment or the control group. In addition to the absolute number of entries, the share of joiners in relation to all people which originally were not organized in a union is displayed in Table 2. Overall, the number of entries increases until 2015 up to 122 (4.76% of all non-union members) and steadily declines in the following years. The total entries in the post-minimum-wage-period (214) exceeds the total of the pre-minimum-wage-period (151) by nearly a quarter. This development is matched by the control group but with an even sharper spike in 2015 in means of the proportion of joiners which nearly doubled from 2.79% in 2014 to 5.52% in 2015. The treatment group seems to be exposed to the same trend with a maximum of 8 entries or 1.27% of all prior non-union members in 2014. Afterwards, the numbers and share of entries started to decline sharply.

Table 2: Entries in unions (over time)

	Number of entries in unions								
	overall			**Treatment group**			**Control group**		
Year	**No**	**Yes**	***%***	**No**	**Yes**	***%***	**No**	**Yes**	***%***
2012	1476	39	*2.64*	225	3	*1.33*	1251	36	*2.88*
2013	1906	47	*2.47*	351	6	*1.71*	1555	41	*2.64*
2014	2713	65	*2.40*	708	9	*1.27*	2005	56	*2.79*
2015	2564	122	*4.76*	698	19	*2,72*	1866	103	*5.52*
2016	1703	60	*3.52*	276	2	*0.72*	1427	58	*4.06*
2017	1275	32	*2.51*	123	3	*2.44*	1152	29	*2.52*

Notes: Number of entries in unions (Yes) and non-union members (No) per year overall and by treatment and control group; percentage of non-union members (actual + previous non-union members) who joined a union.

Source: Own calculations based on the PASS data for 2012-2017.

The withdrawals from unions represent the other side of the mechanism that shifts observations from one state union membership to the other. In Table 3, the withdrawals from unions is represented in an equivalent representation to Table 2. Overall, about a fifth of the observed union members leaves their union in 2013. This proportion declines until 2015 to

17.8% and starts to increase again from 2016 on to about a third in 2017. Similar to the analysis of the entries, the control group meets this trend nearly exactly with the proportion of exits until 2015 (17.3%). Overall and in the control group, the period since the introduction of the minimum wage was marked by higher rates of withdrawals than before.

This evidence holds true for the members of the treatment group as well. Since the introduction of the minimum wage, 22.9% left their union on average per year, whereas the average was 25.6% in the time before. Despite this concordance, the development in the treatment group differs extremely. The proportion of withdrawals started to increase before the introduction of the minimum wage, dropped in 2015 sharply by around 10%, but again reached the level of 2014 one year later .

Table 3: Withdrawals from unions (over time)

	Number of withdrawals from unions								
	Overall			**Treatment group**			**Control group**		
Year	**No**	**Yes**	***%***	**No**	**Yes**	***%***	**No**	**Yes**	***%***
2012	251	33	*13.1*	9	2	*22.2*	242	31	*12.8*
2013	263	60	*22.8*	18	4	*22.2*	245	56	*22,9*
2014	317	64	*20.2*	31	10	*32.3*	286	54	*18.9*
2015	370	66	*17.8*	41	9	*22.0*	329	57	*17.3*
2016	255	60	*23.5*	10	3	*30.0*	245	57	*23.3*
2017	171	57	*33.3*	6	1	*16.7*	165	56	*33.9*

Notes: Number of withdrawals in unions (Yes) and union members (No) per year overall and by treatment and control group; percentage of union members (actual + previous union members) who left a union. *Source:* Own calculations based on the PASS data for 2012-2017.

Altogether, entries in unions increased from the introduction of the minimum wage in the study population. This growth was carried by the control group, in which the share of entries raised especially in 2015 and remained on a high level in 2016. In the treatment group, the year 2015 marks a turning point as the share of entries declined to 0.7% in 2016. From this descriptive perspective, the minimum wage reduced union entries in the treatment group compared to the control group.

This conclusion does not hold true for withdrawals from unions, where no unique effect of the minimum wage on the treatment group can be observed. Since 2015, the developments in the treatment and control group were similar.

Results of the regression model

Our descriptive analysis suggests a negative influence of the minimum wage's introduction on entries in unions for members of the treatment group, whereas a contrary development is observed in the control group. Regarding withdrawals from unions, we found no distinct effect for none of the two groups; instead we observed an overall increase. These observations can be misleading, since they could result from the composition of the treatment and the control group. In fact, the two groups differ in some crucial characteristics such as the age and the number of working hours per week, which are known to determine the probability for a union membership. These compositional effects are derived from a different composition of the two groups in the society on the one hand, and from an uneven panel mortality on the other. In relation to the control group, the rate of people who retire from the panel is higher in the treatment group (Table 1A in the appendix).

To eliminate the observed differences on the outcome variable that are caused by compositional effects, we conduct a regression analysis. A difference-in-differences propensity score matching model allows us to calculate the treatment effect that controls for possible simultaneous trends over time. Therefore, we estimate the average differences of the outcome variable before and after the introduction of the minimum wage for the treatment group. As other influencing factors could have changed simultaneously and thereby bias the results, this influences had to be removed. Again, we calculate the average differences of the outcome variable for the period before and after the introduction of the minimum wage, now for the control group. This difference contains the effects of all other influencing factors that changed simultaneously and is subtracted from the first difference. Thereby, the estimated effect is cleaned up from disturbing influences (Wooldridge 2010: 321).

The outcome variables are binary in this study which prohibits the use of a linear model as explained above and recommends a logit model. The functionality of the fundamental difference-in-differences mechanism stays the same for logit models but the interpretation of the calculated effects changes to odds ratios. Therefore, we employ a difference-in-differences logit model.

Table 4 displays the first two difference-in-differences models. We calculated the effect of the introduction of the minimum wage on the entries into a union twice: in model (1) without control variables, and in model (2) with the industry sectors as dummy control variables (estimates not shown). The pure difference-in-differences model displays three coefficients.

Table 4: Difference-in-differences estimates of entries in a union

	Endogenous Variable			
	"Joining a union"			
Exogenous variables	**(1)**		**(2)**	
	OR	**Cl**	**OR**	**CI**
Year2015*MW	0.809	(0.3683 - 11.788)	1.307	(0.501 - 3.627)
Year2015	2.048 **	(1.283 - 3.3378)	1.794 *	(1.099- 2.984)
MW	0.692	(0.3686- 1.2641)	0.540	(2.232 –1.175)
N	5,138		3,914	
AIC	1,105.790		945.939	

Notes: Endogenous variables: joining a union (1 = yes); method: difference-in-differences logit model (ORs reported); confidence intervals in parentheses; ORs of factor variable branch-of-industry not reported.
Levels of significance: 0.05 = * / 0.01 = ** / 0.001= *** (one-tailed test).
Source: Own calculations based on the PASS data for 2013-2016.

MW is the effect of the belonging to the treatment group and expresses the different levels of entries into a union between the treatment and control group. The calculated effect is not significant. The confidence interval indicates that the precision of the coefficient is not very high[2]. The dummy variable Year2015 displays the overall effect of the minimum wage on the entries in unions. It is significant at a level of 0.1% in model (1); the proportion of entries increased by about 105% since 2015. The last coefficient displays the effect of the interaction between Year2015 and MW and indicates the effect of the minimum wage on the treatment group. The effect is not significant, which means that within the treatment group the share of entries since 2015 did not change.

2 Nearly all calculated coefficients are not very precise and the associated confidence intervals covers a broad spectrum of values. This is grounded in the relatively small number of observations in the treatment group, and the even smaller number of cases with an entry in or a withdrawal from a union, which widens the confidence intervals.

Our second model, which controls for the branch of industry, largely confirms these results. The coefficient of the interaction became higher and remained not significant.

Table 5 displays the withdrawals from unions in addition to the entries. In the two estimated models, we found no significant effect of the minimum wage on the rate of withdrawals from unions within the treatment group. This is reflected in the huge confidence intervals for the interaction term, which indicate that the coefficients cannot be interpreted meaningfully. The same holds true for the treatment dummy MW.

Altogether, the introduction of the minimum wage has neither increased the rate of withdrawals from unions, nor has it decreased the rate of entries within the treatment group. This rejects our first two hypotheses. As a result, our third hypothesis must be rejected as well, since its basis is not valid.

Table 5: Difference-in-differences estimates of withdrawals from a union

	Endogenous Variable			
	"Leaving a union"			
Exogenous variables	**(1)**		**(2)**	
	OR	**Cl**	**OR**	**CI**
Year2015*MW	0.535	(0.196 - 1.433)	0.342	(0.073 – 1.408)
Year2015	1.519	(0.877 - 2.685)	1.518	(10.838 - 2.801)
MW	1.855*	(0.903 – 3.747)	0.928	(0.273 – 2.795)
N	532		460	
AIC	494.328		430.392	

Notes: Endogenous variables: ending a union membership (1 = yes); method: difference-in-differences logit model (ORs reported); confidence intervals in parentheses; ORs of factor variable branch-of-industry not reported.
Levels of significance: 0.05 = * / 0.01 = ** / 0.001 = *** (one-tailed test).
Source: Own calculations based on the PASS data for 2013-2016.

Conclusion

In this paper, we examined how the legislation of a minimum wage introduced 2015 impacted on the unions' membership. We start from the premise that union's resources in policy-making are largely determined by two factors: the degree of coverage of collective agreements on the

one hand, and the size of membership on the other. Apart from a general trend towards lower bargaining coverage and unionization starting in the 1990s, the Hartz reforms contributed significantly to a growing low-wage sector and an erosion of free collective bargaining. Trade unions were hardly able to enforce labour relations or wages independently of the priorities of the government.

The minimum wage, introduced with the 'Act on the Strengthening of Free Collective Bargaining', aimed at strengthening German unions position in social partnership. However, recent evidence point to the contrary; tariff commitment continues to decline.[3]

In addition, although the involvement of the social partners in the minimum wage commission resembles classical tripartite negotiations, no real bargaining over the minimum wage takes place; increases follow an index that is developed with assistance from the BA. Obviously, trade unions unions' involvement serves the legitimacy of the minimum wage.

Interestingly, unions' policy interests' in a minimum wage changed. While originally unions rejected statutory minimum-wages to avoid a decreasing appeal of union membership, now they see them as an opportunity to strengthen their organizational self-interest by advocating the interests of labour-market-outsiders. Our analysis reveals that this is partly wishful thinking; withdrawals from unions did not decrease and entries in unions did not increase significantly after the minimum wage's introduction. This overall stagnation proofs the unions wrong in their strategy of advocating the interests of labour-market-outsiders in order to increase their membership base, but it also shows that it caused no harm in form of decreasing entries or increasing withdrawals. Regarding that social partnership depends on powerful and centralized union which can control a large membership (Haipeter 2012: 389–390), unions are facing the dilemma that their greatest achievement in recent times, the successful campaign for a statutory minimum wage, does not pay off for them and they are still endangered to become redundant for parts of the workforce. If the unions follow a logic of influence (Streeck 1987) and seek institutional security rather than effectively pursue their own interests, and the most important issue in tripartite negotiations consist in fixing minimum wages,social partnership becomes a façade (Hassel 2009: 20–21).

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3 https://www.iab-forum.de/tarifbindung-der-abwaertstrend-haelt-an/

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Appendix

Table A6: Observations in control and treatment group

Year	Control group	Treatment group
2012	1493	235
2013	1801	369
2014	2291	739
2015	2196	740
2016	1672	286
2017	1317	129

Note: Number of observations in the treatment and control group per year.
Source: Own calculations based on the PASS data for 2012-2017.

Data access

The data basis of this article is the actual anonymous data of the panel “Labour Market and Social Securty” (PASS), Wave 11. The data was accessed via a Scientific Use File, which was made available via the Research Data Center of the Federal Employment Agency at the Institute for Employment Research. DOI: 10.5164/ IAB.PASS-SUF0617.de.en.v1