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Abstract:
We investigate the role of industrial relations for working from home during and after the COVID-19 pandemic in Germany. Using data from the German Socio-Economic Panel (SOEP) for the years 2020 to 2023 and a special COVID sample (SOEP-CoV) for 2020 and 2021, we examine how collective bargaining and plant-level co-determination are associated with the incidence and frequency of working from home. Controlling for worker, firm, occupation, and industry characteristics, we find that employees covered by a collective bargaining agreement are less likely to work from home and do so less frequently than uncovered employees. In contrast, the incidence and frequency of working from home are positively associated with the presence of a works council.

Keywords: co-determination, collective bargaining, COVID-19, industrial relations, SOEP, working from home.
JEL Classification: J 52, J 53, J 81

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1 Introduction

When the coronavirus first spread and many countries went into lockdown in 2020, governments asked or forced firms to close down workplaces and to reduce onsite employee attendance. As a result, many people started working from home. In July 2020, about a third of all employees worked entirely from home in Europe (Ahrendt et al., 2020). Even after the restrictions were lifted, offices still remained relatively empty. Employers did not call back their staff because adverse productivity consequences of working from home were much less pronounced than initially feared.[1] Moreover, firms could save costs by reducing office space. Also, many employees preferred working from home (Barrero et al., 2021; Aksoy et al., 2022; Deole et al., 2023). This allowed them to reduce commuting time and costs and gave them greater control over their work schedule, thus enabling them to better balance work and family life (Aksoy et al., 2023; Choudhury et al., 2026; Coskun et al., 2026; Nagler et al., 2024).

While the suitability of jobs for working from home, productivity effects and gender-specific consequences, naming but a few examples, have found much attention (Adams-Prassl et al., 2022; Chung et al., 2020; Kosteas et al., 2022), the question of whether labour market institutions, such as collective bargaining, have an influence on remote work has been looked at less intensively. Trade unions and collective bargaining are a widespread characteristic of most OECD economies (OECD, 2019). In Germany, the country we consider in our analysis, there is a second influential institution determining labour relations, namely co-determination at the plant level. Accordingly, in this paper, we enquire whether collective bargaining and co-determination affect the likelihood that an employee works from home and the intensity of remote work.

Collective bargaining often takes place at the industry or sectoral level in Germany. The resulting agreements can regulate working conditions and include arrangements for working from home. If employees express demand for remote work, collective bargaining may help formalise and secure such options. However, based on the stance of the German Trade Union Federation (*Deutscher Gewerkschaftsbund*, DGB), an umbrella organisation representing roughly 75% of all union members, trade unions also focus on whether employees' rights with respect to working time and privacy are at risk if firms introduce or expand working from home. Although trade unions

[1] See, for example, Etheridge et al. (2020), Kunze et al. (2020), and Deole et al. (2023). For a description of the long-term trend in the spread of working from home in the U.S., see Barrero et al. (2023). Moreover, while some studies report small or negligible productivity losses, others find that remote work reduces productivity because of higher communication and coordination costs (Emanuel and Harrington, 2024; Gibbs et al., 2023).

emphasise employees' entitlements to select their preferred place of work, they attempt to regulate these aspects, raising the firms' costs to implement or extend work-from-home options. Given this dual role, i.e., supporting employee preferences on the one hand and enforcing protective constraints on the other, the overall effect of collective bargaining on working from home is a priori ambiguous.

Co-determination at the plant level is often interpreted as shop-floor unionism, suggesting that works councils may also inhibit the use of working from home. However, the role of works councils is distinct from that of collective bargaining. For example, works councils are explicitly prohibited from negotiating wages if remuneration has been or is generally determined by a collective bargaining agreement. Moreover, works councils are obliged to act in the interests of both the firm and its employees and are, therefore, not permitted to call or organise strikes. Therefore, we hypothesise that works councils are more likely to support, rather than restrict, the use of working from home.

To investigate the relationship between working from home and the two main pillars of industrial relations in Germany, we use data from the German Socio-Economic Panel (SOEP) from the regular survey (Core data) for 2020–2023 and special additional surveys during the pandemic (SOEP-CoV) for 2020–2021. Our study shows that employees covered by a collective bargaining agreement are less likely to work from home and do so less often than observationally comparable employees whose working conditions are not regulated by such a contract. This effect can also be observed before the pandemic. Our results are consistent with the view that collective bargaining coverage is associated with more restrictive approaches to working from home. In contrast, co-determination at the plant level via works councils is positively associated with both the incidence and frequency of working from home. These findings are consistent with the view that works councils facilitate the implementation of remote-work arrangements.

Our analysis is highly relevant in order to understand the future of the employment relationship. Working from home was at some stage regarded as part of the *new normal*, meaning that every employee whose job is suitable for remote work would work from home at least some days a week (see, e.g. Towers-Clark (2020)). This evaluation seems to have changed as firms and employees have become aware of the detrimental consequences of not working onsite. Therefore, how working conditions will develop concerning the place of work will depend on how employees can either enforce their preferences or counter requests from their employers. Accordingly, details of the industrial relations system can strongly affect the *new normal*. This also includes the question of which employees are more likely to be able to assert their interest in working from home. While

employers in Germany were expected to induce or even force their employees to work from home as soon as possible at the beginning of the coronavirus pandemic and in the course of the general lockdowns, this question of remote work has arisen anew since the end of the pandemic. Even prior to the pandemic, however, evidence from the UK shows that the increase in working from home was highest among those who were highest paid, highly skilled, and living in London in particular (Felstead and Reuschke, 2020). This selection gives rise to an increasing polarisation between two employment groups, "new home-centered workers" and "established factory/office-centered workers". The first group includes well-skilled and well-paid workers with high autonomy and a high share of working from home, while the second group consists of those with low skills, low pay, and a low share of working from home. This additional polarisation of employees poses a challenge for industrial relations. If collective bargaining reduces the use of working from home, as argued above, it is likely to strengthen the polarisation because unions are strongest among the "established factory/office-centered workers". These patterns likely shaped the dynamics of remote-work adoption during the pandemic and continue to influence its development today.

Despite growing interest, the linkage between facets of industrial relations and working from home—or remote work, terms we use interchangeably—has not yet received much attention. Before the pandemic, the focus was often on family-friendly work policies (Budd and Mumford, 2004, 2006; Heywood and Jirjahn, 2009). Based on data from the British 1998 Workplace Employee Relations Survey, Felstead et al. (2002) document a negative relationship between the option to work from home and both trade union density and collective bargaining coverage. The authors indicate that these correlations may not exist in the private sector. Employing the same data set, Budd and Mumford (2004) report that the opportunity to work from home is lower for union members in covered establishments, but not related to collective bargaining coverage.[2] Using wave eight of Understanding Society, covering a period shortly before the pandemic, Wels (2021) shows that access to working from home and its actual use are negatively correlated with collective bargaining coverage. Goñi-Legaz and Ollo-López (2015) employ the Spanish Quality of Working Life Survey and observe no correlation with union presence at the establishment for the years 2001–2004. Finally, we are aware of one study for Germany for the pre-pandemic period. Yang et al. (2023) analyse two waves of the German Linked Personnel Panel (LPP). The probabilities of what the authors call 'replacement working from home' (instead of onsite) and 'extension working from home'

[2]Budd and Mumford (2006) employ a slightly different sample and report the same finding concerning bargaining coverage and no correlation between working from home and union membership.

(in addition to onsite work) are unrelated to collective bargaining coverage and the existence of a works council.[3]

Furthermore, some studies investigate the impact of industrial relations on various labour market outcomes during and after the pandemic. They, for example, investigate the probability of retaining employment or the job, hirings and firings, working hours, and labour income (Lemieux et al., 2020; Lamb et al., 2022; Braakmann and Hirsch, 2024; Bellmann et al., 2024). Working from home has found relatively little attention.[4] Norlander and Erickson (2022) use data from job advertisements in the United States and find that jobs are about 8% more likely to be advertised as suitable for working from home if covered by a collective bargaining agreement. During the pandemic, the difference was about half as large. Using Current Population Survey (CPS) data, Han (2023) finds that union members were significantly less likely to work remotely than uncovered non-members during both the initial phase of the pandemic (May to August 2020) and the subsequent recovery period (September 2020 to December 2021). For workers covered by a union contract but not union members, a negative association emerges only during the recovery period. For public school teachers, however, the relationship is positive, causing Han (2025) to conclude that the unions' role for remote work depends on the characteristics of the labour market. Laß and Wooden (2025) employ data from the 2023 wave of the Household, Income and Labour Dynamics in Australia (HILDA) panel and observe a pronounced negative relationship between union membership and working from home. Behrens and Pekarek (2023) analyse a representative sample of German employees interviewed in June 2020 who were, inter alia, asked whether there are provisions establishing the possibility to work from home. They report that such regulations are more likely in establishments with a works council. Finally, Grunau and Wolter (2024) use two waves of the LPP, one conducted before and one after the pandemic. They find no correlation between the possibility to work from home and co-determination in 2016, but a positive relationship in 2023. However, conditional on the availability of working from home, neither collective bargaining nor co-determination is associated with the extent to which employees work from home.

In sum, the pre-pandemic evidence suggests either no or a negative correlation between collective bargaining and remote work, while there are few findings on the link with co-determination. Additionally, the existing studies focus on the possibility rather than the actual use of remote work.

[3]The LPP data only cover private-sector companies with more than 50 employees subject to social insurance contributions and, therefore, only a portion of all employees.

[4]In their survey of working from home, Kosteas et al. (2022) do not mention collective bargaining or co-determination.

Evidence on the time of the pandemic and the period afterwards remains scarce and inconclusive for collective bargaining, while the few studies on co-determination in Germany suggest a positive association. Our study contributes by examining the actual use of remote work, focusing on Germany, and distinguishing between the roles of collective bargaining and works councils.

In the remainder of the paper, Section 2 outlines the expected effects of collective bargaining and works councils on working from home in Germany. We describe the data and the empirical approach in Section 3. In Section 4, we present descriptive evidence, the results of our main specifications, robustness checks, and subsample analyses. We further examine two potential channels through which co-determination and collective bargaining may influence working from home. Section 5 concludes the paper.

2 Conceptual Framework

2.1 Industrial Relations in Germany

In Germany, currently around 40% of private sector employees are covered by collective bargaining agreements, largely negotiated at the sectoral or industry level. In the public sector, the coverage rate is much higher. In addition to specifying wages, collective bargaining agreements typically define pay scales, contain provisions on fringe benefits, and regulate working conditions. Firms not covered by collective agreements determine wages and working conditions individually with their staff. However, for about 50% of uncovered employees, pay and possibly other elements of their contracts are aligned to a collective agreement (Hohendanner and Kohaut, 2025). Union membership is not directly linked to collective bargaining. This distinction is illustrated by the feature that union density is about 14%, and much lower than collective bargaining coverage (OECD and AIAS, 2025). Bargaining agreements apply to all firms covered by the contract, and in most cases, firms pay all employees the negotiated wage, irrespective of an individual's union membership status, which the employer may not be aware of. Therefore, there are substantial incentives to free-ride.

Co-determination at the plant level via works councils constitutes a second essential element of industrial relations in Germany. According to the Works Constitution Act (WCA, *Betriebsverfassungsgesetz*), works councils are to be established in basically all private-sector establishments with at least five employees. Since this requires a vote that is not compulsory, about 35% of private-

sector employees are 'covered' by this type of co-determination.[5] Works councils have information, consultation and co-determination rights. The law stipulates that "(t)he employer and the works council work together in a spirit of mutual trust ... for the good of the employees and of the establishment" (WCA §2(1)).[6] Co-determination is most pronounced concerning personnel policy and social affairs. The relevant paragraph establishes co-determination entitlements, for example, concerning "matters relating to the rules of operation of the establishment" (WCA §87(1),1), working hours, and "the introduction and use of technical devices designed to monitor the behaviour or performance of the employees" (WCA §87(1),6). These regulations give the works council an indirect say about working from home. Since June 2021, the WCA contains an explicit reference to the "structuring of mobile work performed by means of information and communication technology" (WCA §87(1),14). It establishes co-determination rights concerning the design of remote work, though not the decision to establish it, which remains at the management's discretion.

In the public sector, the equivalent of works councils are personnel or staff councils. They are much more widespread than their private sector counterparts. The legal basis of personnel councils are laws either applicable in a federal state (*Bundesland*) or at the national level, broadly comparable in their content to the WCA.

2.2 The Effect of Collective Bargaining and Co-determination on Working from Home

Working from home—rather than working onsite—can occur under several conditions: if the employer requires it, if employees wish to do so, if both parties mutually agree to the work location, or if it is legally mandated, as was the case during the COVID-19 pandemic. In the latter scenario, industrial relations are unlikely to affect the extent of working from home. Similarly, collective bargaining and co-determination will probably have no impact if a job cannot be performed at home. In all other cases, the effect of industrial relations on the likelihood of working from home and its frequency depends on which side of the employment contract benefits, the relative bargaining power to enforce the preferred set-up, and the means of a party benefiting from working-from-home

[5] See Hohendanner and Kohaut (2025). Voting generally occurs every four years, and the last regular elections took place in the spring of 2022. In the private sector, there is also mandatory co-determination at the enterprise level in companies with at least 500 employees. It grants the workforce representation on company boards, and its extent varies with firm size (Addison, 2009; Jäger et al., 2022).

[6] This and subsequent translations of the law into English stem from a document provided by the Federal Ministry of Labour and Social Affairs. See: https://www.gesetze-im-internet.de/englisch_betrvg/englisch_betrvg.pdf (accessed on 01.04.2026).

arrangements to compensate the other party that is adversely affected.

Suppose that firms do not want their workforce to work from home, while employees favour this opportunity. In this case, collective bargaining could establish an entitlement for employees to work from home and thereby increase its extent because collective bargaining enhances employees' bargaining power. For example, unions can negotiate specific clauses in collective wage agreements that guarantee the option to work from home under certain conditions and define the eligibility and frequency. These clauses can make remote-work practices enforceable rights. Assume, conversely, that firms would like their staff to work from home, while employees do not benefit from such an arrangement or find the conditions inadequate under which working from home takes place. In this case, collective bargaining could result in restrictions on the use of working from home.

Moreover, collective bargaining may facilitate the adoption of working from home and help employers and employees reach mutually beneficial agreements. If firms perceive remote work as costly, collective bargaining can support negotiations over compensation elements that offset these costs through lower labour costs or higher productivity. Alternatively, if employees do not benefit from remote work while firms do, collective bargaining could help establish improvements in working conditions that make staff more willing to accept working from home. If collective bargaining enhances the applicability of such 'Coasean' bargains or 'mutual gains' approaches (Kochan, 1993; O'Brady et al., 2025), it will increase the likelihood of working from home.

Prima facie, the attitude of German trade unions on working from home seems to be fairly positive. In November 2020, based on a draft circulated already before the start of the pandemic, the German Trade Union Federation (*DGB*) proposed a legal entitlement for employees for "self-determined mobile work including working from home" (DGB (2020), own translation). However, this entitlement is to be designed "by collective agreement and co-determination" (ibid.). The document then contains a list of restrictions for mobile work that the trade union federation regards as desirable or even indispensable. They include the demands that employees cannot be forced to work from home, working time has to be documented comprehensively, working time restrictions have to be adhered to, employees only have to be available for supervisors at restricted times and that the access of trade unions to employees working from home must be guaranteed (DGB, 2020). This restrictionist approach indicates the concern that primarily firms and, to a lesser extent, employees benefit from working from home. The restrictionist perspective is also reflected in collective agreements, such as the one signed by the largest industrial union *IG Metall* and the

employer association *Südwestmetall* for the metal and electrical industries in the federal state of *Baden-Württemberg* in 2021, which allows for agreements at the firm level on working from home only if a number of requirements are fulfilled (see IG Metall (2021)). These restrictions tend to increase the costs of working from home for firms subject to collective agreements compared to those that are not.

In sum, it is not straightforward to predict whether trade unions in Germany will promote working from home or rather try to limit its use. On the one hand, trade unions are likely to negotiate arrangements that are favourable to employees, which may make the introduction or expansion of working from home more costly for firms covered by collective bargaining agreements than for uncovered firms. On the other hand, collective bargaining enhances the possibility of establishing mutually beneficial agreements about remote work because such negotiations enlarge the scope for compensatory measures and can limit free-riding.

Since it is not obvious which of the above arguments carries the day, it is uncertain whether the positive effect of collective bargaining coverage on working from home dominates the negative impact, or vice versa. Therefore, we state our first expectation:

> ***Hypothesis 1:*** **The relationship between collective bargaining coverage and an employee's likelihood of working from home is ambiguous.**

Works councils have co-determination rights relating to the organisation of the work. As outlined above, since 2021, the relevant law has contained an explicit entitlement concerning working from home. Therefore, at first glance, it appears as if works councils have substantial scope to impose restrictive conditions for working from home. This would imply that works councils could raise the firms' costs of implementing working from home. However, this interpretation neglects the obligation of works councils to cooperate with the firm to the benefit of both employees and the establishment. Accordingly, works councils have the task of helping set up frameworks facilitating working from home, irrespective of whether the firm or the workforce desires such an opportunity. This obligation is not only a legal requirement but is also reflected in actual behaviour: employees are more likely to report the existence of formal regulations concerning working from home when working in a co-determined establishment, compared to those employed in establishments without a works council (as documented in Section 4.6.1 below; see also Behrens (2022) and Grunau and Wolter (2024)). Moreover, works councils can act as a voice mechanism (Freeman and Lazear, 1995) and provide management with information that helps to improve the scope, productivity,

and employee satisfaction associated with working from home.[7]

Co-determination at the establishment level also expands the employees' bargaining power. This is exemplified by the feature that wages in establishments with a works council tend to be higher than in firms without co-determination (Addison, 2009; Jirjahn, 2017; Schnabel, 2020; Mohrenweiser, 2022; Jäger et al., 2022). Higher employee bargaining power makes it more likely that the workforce's preferences are realised. A final argument why co-determination can enhance working from home relates to the legal entitlement of works councils to negotiate so-called works agreements at the establishment level (*Betriebsvereinbarung*). Such agreements can establish working from home and include compensatory elements to ensure that all employees and the firm benefit from remote work.

Accordingly, there are various arguments suggesting that co-determination at the establishment level makes working from home more likely. This leads to:

> ***Hypothesis 2:*** **An employee working in an establishment with a works council is more likely to work from home than a comparable individual employed in an establishment without a works council.**

The different institutional roles of collective bargaining and co-determination suggest that their relationship with working from home may differ. It is often argued that collective bargaining, especially at the sectoral level, has the predominant objective of dividing rents between firms and their workforce, whereas co-determination primarily serves to establish mechanisms for an efficient organisation of production at the plant level to benefit employees and the firm (Freeman and Lazear, 1995; Hübler and Jirjahn, 2003; Behrens and Pekarek, 2023). Collective bargaining may either facilitate or restrict remote work, depending on whether the emphasis is placed on accommodating employee preferences or on regulating potential risks associated with working from home. Works councils, by contrast, are directly involved in workplace organisation and may be particularly important for translating employee preferences and firm-specific needs into concrete working-from-home arrangements. These differential roles provide a rationale for the diverging expectations concerning the relationship between working from home and the two main institutions constituting the system of industrial relations in Germany.

Because collective bargaining and works councils may co-exist, their effects on working from

[7] See Belloc et al. (2023) for a comparable argument, who consider the relationship between employee representation at the shop-floor level and digitisation.

home can reinforce or mitigate each other. The direction of such an interaction effect is ex-ante ambiguous. Therefore, we will look at the different facets of industrial relations not only in isolation but also jointly.

Furthermore, we expect the impact of industrial relations on working from home to vary across groups of employees. The effect is likely to be more pronounced for those types of jobs for which working from home can be established easily, such as many white-collar jobs, relative to work that is not suitable for such a shift in location, as is the case for many blue-collar jobs. In addition, given school closures during the pandemic and a lack of full-day childcare facilities in Germany, opportunities for working from home were especially important for employees with children or females who are responsible for child care to a larger extent than males. The role of collective bargaining and co-determination can also vary with age or firm tenure, as it may be easier to establish working-from-home arrangements for younger, more IT-affine staff and for employees better known to management and, hence, regarded as more trustworthy and less likely to exploit a reduction in supervision. In addition, the effect of industrial relations on remote work may depend on firm and industry characteristics. If the bargaining power of trade unions and works councils is greater in larger firms, firm size will be a relevant criterion. In line with the blue-collar-white-collar distinction at the individual level, we can expect differences in the role of industrial relations in production and non-production industries. Collective bargaining and co-determination are much more widespread in the public than the private sector. This suggests that uncovered establishments in the public sector have stronger incentives to adopt similar rules concerning remote work as covered establishments, potentially blurring the impact of industrial relations. Finally, the impact of industrial relations on the use of remote work may vary over time because there were few blueprints for agreements regulating the implementation of working from home at the beginning of the pandemic. We will analyse all these aspects in Section 4.

3 Data and Empirical Approach

3.1 SOEP Core and SOEP-CoV Data

For the empirical analysis, we use the German Socio-Economic Panel (SOEP), version 40.1. The core of the SOEP is an annual survey of persons living in private households in Germany conducted since 1984. These surveys have resulted in a high-quality and representative longitudinal dataset

(Goebel et al., 2019). We refer to this data as the Core sample. It includes interviews conducted throughout the year using various formats. We use information collected in 2020 to 2023. In 2020, approximately 40% of respondents completed the survey by the end of March, and around 90% had done so by the end of September. In other waves, the interviews were spread out more evenly over the course of the year.

During 2020 and 2021, the SOEP also interviewed some respondents from the Core sample in special surveys concentrating on topics related to the pandemic (Kühne et al., 2020). The resulting SOEP-CoV sample results from two sets of interview periods. The first was divided into nine tranches to capture temporal variations in the effects of the pandemic and lasted primarily from April 2020 to June 2020. A total of 6,694 households were surveyed. All of the respondents participated in the Core survey, so that information from the respective surveys can be combined. The respondents who responded in the first SOEP-CoV survey were re-interviewed in January and February 2021. In total, this second round of interviews resulted in 6,038 observations.

In 2020, the SOEP Core survey asked all employed respondents: "Do you ever carry out your work activity at home?" The answer could be "yes" or "no". In the former case, interviewees additionally had to specify the frequency, the possible answers being "daily", "several times a week", "once every 2 to 4 weeks", "rarely, only when needed". The questions in 2021–2023 are slightly different: "Have you worked from home in your current job in the last 6 months?" and "How often have you worked from home in your current job in the last 6 months?" The possible answers were comparable to the ones provided in 2020, with the addition of "once a week". From this information, we construct two variables. The first is a dummy variable, WFH^I, measuring the incidence of working from home, which equals one if a respondent answered "yes", and zero otherwise. The second variable, WFH^F, quantifies the frequency of working from home and takes the value zero if not working from home at all, one if working from home "once every 2 to 4 weeks" or "rarely", and two if the response was "daily", "several times a week", or "once a week".[8]

In the SOEP-CoV sample, employed respondents were asked: "Have there been recent changes to your work situation due to the coronavirus?" In contrast to the questions in the Core data, this question emphasises the *changes* in working-from-home behaviour. Among the answers are two of particular interest, namely "I am partly working from home" and "I am entirely working

[8]In the estimation sample with the Core data, 5.41% of employees reported working from home daily, 17.68% once or several times a week, 5.09% every 2 to 4 weeks, and 9.84% rarely. We combined responses to obtain a sufficient number of observations for each of the two categories. As a robustness check, we use the original definition and re-estimate the baseline specification.

from home". The other answers mostly relate to working time and paid leave periods. From the responses, we again construct two variables, employing the superscript C to indicate that the data stem from the SOEP-CoV sample. The first variable, $WFH^{I,C}$, equals one if respondents stated that they worked either partly or entirely from home and zero otherwise. The second variable, $WFH^{F,C}$, takes the value of zero if not working from home at all, one if working partly from home and two if working entirely from home.

The outcome variables in the SOEP Core and SOEP-CoV data are not fully identical. While the SOEP Core data measure the general incidence and frequency of working from home, the SOEP-CoV questions emphasise changes in working arrangements due to the coronavirus pandemic. As a result, the SOEP-CoV measures are more closely linked to pandemic-related adjustments in remote-work behaviour. Despite these differences, employing both datasets is advantageous. The SOEP-CoV data provide detailed information on working-from-home arrangements during the acute phase of the pandemic in 2020 and 2021, whereas the SOEP Core data allow us to analyse a longer time horizon extending to 2023 and thus to assess whether the observed relationships persist beyond the most restrictive phase of the pandemic.

Turning to the independent variables, we commence our description with those concerning industrial relations. For 2019, 2021, and 2023, the questionnaire contains the question: "Are you paid according to a collectively agreed wage agreement?" Based on this enquiry, we construct a dummy variable *CWA* which equals one if an employee responds affirmatively and zero if the answer is "no". In 2019 and 2022, there is information about the existence of a works council, derived from the enquiry: "Does a works or a personnel council exist at your place of work?" The dummy variable *WkC* is set equal to one (zero) if the response is "Yes" ("No"). In the Core sample, we use the information on both institutions from 2019 for individuals surveyed in 2020. Moreover, the information on collective bargaining in 2022 is sourced from the 2021 wave and the information on co-determination in 2021 and 2023 from the 2022 wave. To ensure a plausible and reasonably accurate imputation, we restrict the sample to employees who remained with the same firm between 2019 and 2020, 2021 and 2022, and 2022 and 2023, respectively. We perform the same imputation procedure for the SOEP-CoV sample (see Appendix A for more details).

The further independent variables are the survey year, survey month, and demographic information related to age, gender, being a foreigner, being married, years of schooling, the number of children living in the same household, and living in Western Germany. There are relatively more

missing values for demographic variables in 2021–2023 than in 2020. Therefore, when information on foreign nationality, marital status, years of schooling, or the number of children is unavailable in 2021, 2022, or 2023, we impute these variables using the corresponding responses from 2020, thereby assuming that these demographic characteristics remain unchanged over time.[9] Moreover, labour market aspects are captured by information concerning tenure, four firm size dummies,[10] the (natural logarithm of) gross labour income in the previous month, dummy variables for being a blue-collar worker and working in the public sector, and dummy variables indicating (eight) industries and (nine) occupations. The relevant information is contained in the Core survey and can easily be merged to respondents from the SOEP-CoV sample, as they have been drawn from the Core sample.

We focus on employed workers aged 20 to 60 and exclude self-employed, marginally employed, and civil servants.[11] Given these restrictions, there are 15,200 observations in the Core sample and 3,313 observations in the SOEP-CoV sample. Due to the reduced number of respondents in 2021 and the requirement that respondents must work for the same firm in 2021 and 2022, the number of observations in 2021 and 2022 is significantly lower than in 2020 and 2023.[12] Table 1 provides summary statistics.

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The mean incidence and frequency of working from home are comparable in both samples. Moreover, the means of most covariates are broadly the same, with the exception of the share of females.[13] Table B-1 in Appendix B shows the distribution of employees across the four possible combinations of collective bargaining coverage and works council presence. In the sample based on the SOEP Core (SOEP-CoV) data, approximately 55% (58%) of observations are covered by a collective wage agreement, and about 61% (64%) work in establishments with a works council (see also Table 1). Moreover, a total of 4,500 (900) observations are neither covered by a collective wage

[9] In a robustness check, documented in Section 4.3, we exclude individuals with imputed demographic information from the estimation sample.

[10] We distinguish between firms with fewer than 20, 20 to less than 200, 200 to less than 2000, and 2000 and more employees. In a robustness check, we additionally use the information that the establishment has fewer than five staff members, the size threshold for setting up a works council.

[11] Employees in the SOEP Core sample include both full-time and part-time workers across all four years, as well as short-time (*Kurzarbeit*) workers in 2021–2023. The SOEP-CoV sample also includes all three types of workers.

[12] The number of respondents decreased by one-third in 2021 compared to 2020. In 2022, a new refresher sample of 6,000 households was added, selected from a random sample of the German population (SOEP, 2023).

[13] Interviews for the SOEP-CoV sample were conducted via telephone. Females may have been more likely to stay home to care for children during the pandemic than males. Therefore, the share of females is relatively higher in the SOEP-CoV sample than in the SOEP Core sample.

agreement nor employed in a firm with a works council. In contrast, 6,917 (1,653) observations are covered by both institutions. 2,407 (475) observations work in establishments with a works council but are not covered by a collective wage agreement, while 1,376 (285) observations are covered by a collective wage agreement but do not work in establishments with a works council. These patterns indicate that collective bargaining and works councils represent two distinct dimensions of industrial relations.

3.2 Empirical Model

We estimate the following linear model:

$$W_{it} = \beta_0 + \beta_1 CWA_{it} + \beta_2 WkC_{it} + \boldsymbol{\beta_3 X}_{it} + \lambda_t + \lambda_m + \varepsilon_{it}, \tag{1}$$

where W_{it} measures whether an employee i interviewed in year t works from home or not ($W_{it} = WFH^{I}_{it}, WFH^{I,C}_{it}$) or employee i's frequency of working from home ($W_{it} = WFH^{F}_{it}$, $WFH^{F,C}_{it}$). CWA_{it} indicates whether respondent i was covered by a collective bargaining agreement in year t, while WkC_{it} captures whether the respondent worked in an establishment with a works or personnel council in year t. $\boldsymbol{X}_{it}$ is a vector of covariates that have been introduced in Section 3.1. λ_t indicates the year fixed effects and λ_m the month fixed effects. ε_{it} is the error term. Standard errors are clustered at the individual level.

We estimate equation (1) using pooled OLS models. There is insufficient within-individual variation in the industrial relations variables to estimate individual fixed effects specifications. Additionally, for the baseline specification, we provide results from a Probit model when the outcome variable is binary and from an Ordered Probit model when the dependent variable is categorical.

4 Results

4.1 Descriptive Findings

In Table 2, we depict the means of all outcome variables separately for employees covered and not covered by a collective wage agreement and employees working in firms with and without a works council.

- - - - Table 2 about here - - - -

The SOEP Core data suggest that employees covered by a collective wage agreement are less likely to work from home than those who are not covered. In contrast, employees in firms with a works council are more likely to work from home than those in firms without a works council, and they do so more frequently. The SOEP-CoV data give rise to similar conclusions. Therefore, the positive association with works councils aligns with *Hypothesis 2*. Although *Hypothesis 1* does not make a directional prediction, the descriptive evidence suggests that the negative channel may dominate any positive effects of collective bargaining.

4.2 Main Results

Columns (1) to (3) in Panel A of Table 3 show the findings for the probability of working from home based on OLS models for the Core sample. The estimated coefficients on the collective bargaining dummy are significantly negative. Working in a firm with a works council is not significantly associated with the incidence of working from home in column (2). However, the association becomes significantly positive once both industrial relations indicators are included simultaneously in the regression model (column (3)).[14] In the SOEP-CoV sample, collective bargaining is negatively correlated with the incidence of working from home, while works councils exhibit a positive association (see columns (1)–(3) in Panel B of Table 3). When considering the frequency of working from home, the results are qualitatively similar to those for the incidence, as demonstrated by the comparison between columns (1)–(3) and columns (5)–(7). Therefore, although *Hypothesis 1* does not specify the direction of the relationship, our results indicate that the negative impact of collective wage agreement coverage outweighs any positive effects. At the same time, the evidence does not allow us to reject *Hypothesis 2*.[15]

- - - - Table 3 about here - - - -

Table B-2 in Appendix B contains results for Probit and Ordered Probit specifications. All results are qualitatively the same as in the linear model.[16] Based on the Probit specifications and

[14]The variables of the two industrial relations may be strongly correlated with each other. Including both into one regression model may lead to a multicollinearity problem. However, a test for multicollinearity, i.e. variance inflation factor, does not support the existence of such a problem.

[15]Note that individual-level weighting factors are available in the SOEP Core data, but only for 2020 in the SOEP-CoV data. We re-estimate the model using the Core dataset with weighting factors. Our results broadly show that the probability and frequency of working from home and the coverage by collective bargaining are negatively correlated. Results are available upon request from the authors.

[16]Table B-3 in Appendix B presents the results using the original definition of the frequency of working from home, which includes five categories for the Core sample. The findings suggest that our chosen definition of the outcome variable does not impact the results.

the Core sample, our estimations indicate that the probability of working from home for employees working in establishments covered by a collective agreement is about 6.8% lower than in the absence of bargaining coverage, while the respective value is the same for the SOEP-CoV sample (see column (2) in Panels (A) and (C) of Table B-2). Given an average incidence of working from home of 38%, respectively 38.5% (see columns (1) and (5) of Table 1), this is a sizeable impact. The marginal effect associated with works councils is positive and statistically significant, with larger effect sizes observed in the SOEP-CoV sample. Moreover, the Ordered Probit estimates reported in Panels (B) and (D) yield qualitatively similar findings.

The relationship between works councils and firm-specific outcomes, such as wage levels and productivity, may depend on whether firms are covered by collective bargaining agreements (see, for example, Jirjahn (2017)). A similar interaction could also arise in the context of working from home, since collective bargaining and workplace co-determination represent distinct but related dimensions of industrial relations in Germany that do not perfectly overlap. Therefore, we re-estimate equation (1) including an interaction term between the two industrial relations indicators. The estimated interaction effects are statistically insignificant (see columns (4) and (8) in Table 3). Moreover, the main variables (CWA and WkC) retain the same signs as in columns (3) and (7). Working from home mainly concerns the organisation of work at the establishment level. Therefore, while collective bargaining coverage may influence the broader institutional environment of remote work, works councils are likely to affect workplace-level arrangements through separate mechanisms.

While our results in Table 3 reveal systematic relationships between industrial relations indicators and working from home, they should not be interpreted as causal effects. In particular, the observed correlations may partly reflect differences in sectoral composition, job task structures, or monitoring requirements across firms and occupations. For example, firms covered by collective bargaining agreements are more prevalent in traditional manufacturing and in workplaces with more standardised production processes. Therefore, working from home may be less feasible for employees covered by collective agreements, irrespective of industrial relations institutions. Similarly, establishments with works councils tend to be larger and may differ systematically in organisational structures and management practices, which may affect the implementation of remote work. Although our empirical analysis controls for industry and occupation categories, these controls cannot fully eliminate concerns about unobserved differences in job tasks or workplace organisation.

4.3 Robustness Checks

4.3.1 Alternative Estimation Samples

Our baseline estimates are based on a sample that includes the maximum number of available observations. One might argue that this broad approach could influence the findings. To address this concern, we estimate equation (1) using four more restrictive samples.

According to the legal framework governing the election of works councils, an establishment must have at least five employees for a works council to be set up. As a first robustness check, we re-estimate the baseline specifications using a subsample of employees who work in firms with at least five employees. As outlined in Section 3.1, we have imputed some demographic characteristics for observations lacking relevant information in the 2021–2023 data. In a second robustness check we, therefore, exclude observations from the estimation sample for which some covariates are imputed. Finally, there may be a concern that the negative correlation between collective bargaining and working from home may be driven by individuals with high incomes or advanced qualifications. These individuals are less likely to be covered by a collective agreement but more likely to work from home. To address this issue, we conduct a third robustness check by excluding individuals in the top 10% of the income distribution, and a fourth by excluding individuals with high qualifications.

We present the results of the four robustness checks in Table B-4 in Appendix B. For all subsamples and both datasets, we find that collective bargaining is negatively associated with the incidence and frequency of working from home, while there is a positive correlation with being employed in a co-determined establishment. Therefore, the results are qualitatively the same as those in columns (3) and (7) of Table 3.

Another concern related to sample selection is that our results may be more representative of individuals with stable employment relationships, as we restrict the sample to respondents who did not switch firms between 2019 and 2020, 2021 and 2022, or 2022 and 2023. We address this concern in three different ways. First, we compare the means of key variables between firm stayers (i.e., individuals in the original estimation sample) and firm switchers (i.e., individuals who changed firms between 2019 and 2020, 2021 and 2022, or 2022 and 2023). Table B-5 in Appendix B shows no significant differences in remote-work behaviour between the two groups. However, stayers are more likely to be covered by a collective wage agreement or employed in a firm with a works council. They also tend to be older, more likely to be married, have higher incomes, work in larger firms, and, by construction, have longer job tenure.

Second, we expand the estimation sample to include job switchers, assuming that collective agreement coverage and works council presence remain unchanged year over year. The results, presented in Table B-6 in Appendix B, are qualitatively consistent with our baseline findings.

Third, we restrict the sample to 2021 and 2023 when looking at collective bargaining and to 2022 when considering co-determination. Therefore, we refrain from employing observations with imputed information on industrial relations features. Moreover, we distinguish a sample from which we exclude observations from individuals who change firms and a second sample that includes them. Table B-7 in Appendix B shows that the negative relationship between collective bargaining coverage and working from home remains qualitatively similar to the one observed for the baseline sample and is statistically significant in seven out of eight specifications. The estimated coefficients for works councils are positive but are statistically insignificant. One reason could be that the variation in the outcome variable becomes much smaller in 2022. We discuss this issue in more detail in Section 4.4, where we scrutinise temporal aspects of the relationship between the features of the German industrial relations system and working from home in more detail.

4.3.2 Alternative Estimation Strategy

To address potential selection bias, we apply a matching approach that pairs treated and control individuals with similar observable characteristics. Information on collective bargaining coverage, works councils, socio-demographic, and labour market characteristics is taken from 2019, the year before the dramatic increase in remote work. We conduct propensity score matching separately for both industrial relations indicators, collective wage agreements and works councils, based on their relevant determinants, including gender, age, number of children, education, region (East/West Germany), firm size, blue-collar status, public-sector employment, industry, and occupation. For both matching procedures, the mean standardised bias decreases substantially, Rubin's B statistic falls below 25, and Rubin's R statistic lies between 0.5 and 2, indicating that the matched samples are sufficiently balanced. We then merge the two matched samples back into the main estimation sample and retain only individuals who appear in both matched groups. Although matching is conducted separately for each industrial relations indicator, the resulting overlap sample provides a conservative robustness check. The corresponding estimation results are reported in Table B-8 in Appendix B and are qualitatively comparable to those in Table 3, indicating that our main findings are not driven by selection on observables.

4.3.3 Working-from-Home Feasibility and Detailed Occupation and Industry Controls

One concern regarding the baseline specification is that the estimated associations between industrial relations and working from home partly reflects differences in occupational task composition and technological feasibility across industries and occupations. To address this concern, Table B-9 in Appendix B presents several additional robustness checks.

First, we incorporate an occupation-level measure of working-from-home feasibility based on Dingel and Neiman (2020). Second, we replace the broad baseline occupation and industry controls with more detailed 2-digit occupation and industry fixed effects. Finally, we estimate specifications including 1-digit occupation-by-industry fixed effects.[17]

In columns (1) and (2) in Table B-9, we control for occupation-level working-from-home feasibility. The estimated coefficients on the industrial relations indicators are attenuated in comparison to the baseline estimates depicted in Table 3. The differences suggest that technological feasibility explains part of the observed correlations. However, collective bargaining coverage continues to be negatively associated with both the incidence and frequency of working from home. Similarly, the positive association between works councils and working from home remains statistically significant.

In columns (3) and (4), we additionally control for 2-digit occupation and industry fixed effects. While the coefficients in Panel (B) remain statistically significant, the coefficient on works councils in Panel (A) becomes statistically insignificant. There are two potential explanations for this pattern. First, the wording of the SOEP Core working-from-home question changed in 2021. Second, the positive association between works councils and working from home may have emerged only gradually after the initial phase of the pandemic, as organisational adjustment to establish remote-work arrangements likely required time. Therefore, columns (5)–(8) in Panel (A) in Table B-9 additionally restrict the SOEP Core sample to the years 2021–2023. Columns (5) and (6) show that the positive association between works councils and working from home remains statistically significant in the 2021–2023 sample after controlling for detailed measures of working-from-home feasibility as well as 2-digit occupation and industry fixed effects.

[17] We do not adopt 2-digit occupation-by-industry fixed effects as our preferred specification because the resulting number of fixed effects is very large relative to the sample size, especially in the SOEP-CoV sample. Consequently, the identification relies on comparisons within occupation-industry cells that contain only a limited number of observations. Nevertheless, we also performed an analysis using 2-digit occupation-by-industry fixed effects. The results remain qualitatively similar to the findings in Table B-9, although some coefficients on the coverage by a collective wage agreement become statistically insignificant, particularly in the SOEP-CoV sample.

Finally, in columns (7) and (8) of Panel (A) and in columns (5) and (6) of Panel (B), we additionally control for occupation-by-industry fixed effects. The estimated coefficients on the two industrial relations indicators are statistically significant, indicating that the main findings are robust to controlling for more detailed combinations of occupational and industrial characteristics.

Overall, these findings suggest that the estimated associations between industrial relations and working from home are not driven by differences in occupational task composition or technological feasibility across industries and occupations.

4.4 Temporal Patterns in Working from Home

The share of employees working from home increased dramatically with the onset of the pandemic and the first lockdown in March 2020 (Ahrendt et al., 2020; Aksoy et al., 2022). Consequently, the role of collective bargaining and works councils may have changed. Our data allows us to investigate whether the correlation between working from home and indicators of industrial relations adjusted with the onset of the pandemic. This is feasible because the SOEP already included a question on working from home in 2014 that was comparable to the one used in 2020.[18] Moreover, we can divide the 2020 Core sample into two groups: responses collected between January and March 2020, which were almost entirely completed before the first lockdown, and interviews conducted from April onward. As noted in Section 3.1, approximately 40% of the questionnaires were completed by the end of March. The SOEP-CoV data consist of responses collected between April and December 2020.[19] For 2021, the SOEP-CoV data cover only January and February, a period with strict lockdown restrictions. In contrast, in the Core data, only very few observations from the estimation sample were interviewed during these two months. As a result, we do not divide the 2021 Core data into lockdown and non-lockdown periods. We do not divide the years 2022 and 2023 into sub-periods either, as no strict lockdown regulations were implemented during those years. Table 4 contains the findings for the incidence and frequency of working from home from OLS specifications for the five subsamples.

- - - - Table 4 about here - - - -

The findings are striking since we observe a consistently negative association between collective

[18]The SOEP asked for collective bargaining in 2014 and the existence of a works council in 2016. Therefore, we imputed the information for co-determination from 2016 to the responses from employed individuals in 2014, proceeding in the same manner as described in Appendix A.

[19]Six individuals were interviewed in March 2020. These observations are excluded from the analysis.

bargaining coverage and the probability of working from home, as well as its intensity in all years but 2022. Works councils play a role in 2021 and 2023. One reason for the insignificant correlation in 2022 could be that the variation in the outcome variable was much lower than in other years. About 70% of respondents in the sample reported working from home in 2022. In consequence, differences across institutional environments may have become more difficult to detect statistically that year.

The results indicate that the negative relationship between collective bargaining coverage and working from home is not unique to the pandemic period but follows a relatively persistent pattern. By contrast, the positive association between works councils and working from home mainly emerges from 2021 onward. The timing is consistent with a process of institutional adaptation during the pandemic. In the early phase of the COVID-19 crisis in 2020, many firms introduced remote-work arrangements rapidly in response to public health restrictions, which potentially leaves limited scope for firm-level co-determination to influence these arrangements. By 2021, however, remote work had become more established and increasingly required formal coordination and regulation within firms. This interpretation also coincides with the 2021 amendment to the Works Constitution Act, which explicitly strengthened co-determination rights regarding mobile work arrangements.

To further examine whether industrial relations shaped the adjustment of working arrangements during and after the COVID-19 period, we estimate interaction specifications combining pre-pandemic institutional status with an indicator for interviews conducted since April 2020. Specifically, we interact the indicators for collective bargaining coverage and the existence of a works council in 2019 with a dummy variable that captures interviews conducted after the outbreak of COVID-19, i.e., since April 2020. In additional specifications, we also incorporate triple interaction terms with an indicator for occupations feasible for working from home.

The results in Table B-10 in Appendix B show that employees covered by collective bargaining agreements remained less likely to work from home after the outbreak of COVID-19. Moreover, workers in establishments with works councils experienced a significantly stronger increase in working from home during and after the COVID-19 period. This pattern is consistent with the view that establishments with works councils exhibited stronger adjustment toward remote-work arrangements.

The triple-interaction specifications further indicate that the negative association between collective bargaining coverage and the expansion of working from home becomes less pronounced in

occupations that are technologically feasible for remote work. By contrast, the interaction terms involving works councils and working-from-home feasibility are statistically insignificant, suggesting that the stronger post-COVID adjustment observed in co-determined establishments was not limited to occupations with high technological feasibility for remote work.[20]

4.5 Group-specific Heterogeneities

The role of industrial relations for working from home may depend on individual characteristics. Collective bargaining can promote gender equality by supporting family-friendly policies, which benefit women more, as they are more likely to take career breaks to care for their children. The demand for working from home is likely to be greater for parents compared to employees without children (see, e.g., Aksoy et al. (2022)). In addition, the relationship between industrial relations and working from home may vary between age groups, as younger and older workers differ in digital skills and preferences for flexible work arrangements. Similarly, differences may arise by firm tenure, since long-tenured employees may enjoy greater trust from employers and stronger integration into workplace representation structures. Finally, some types of jobs—broadly defined as those of white-collar workers—are more suitable for working from home than others, such as jobs held by blue-collar (see, e.g., Beck and Hensher (2022)). Therefore, we analyse whether collective bargaining and co-determination are associated differently with the incidence and frequency of working from home for these groups of employees.

The relationship between industrial relations and working from home may also differ across firm-level characteristics. Institutional arrangements vary between the public and private sectors. Firm size may affect the implementation and regulation of remote work. Technological and organisational constraints differ substantially across industries. To investigate these issues, we report separate estimations by firm size, sector, and industry group.

4.5.1 Individual-Level Characteristics

Gender. Working from home was often interpreted as a component of family-friendly work schedules before the pandemic (see, e.g., Felstead et al. (2002); Budd and Mumford (2004, 2006); Hey-

[20]Due to the limited number of observations before the outbreak of the pandemic, we cannot assess whether employees with and without collective bargaining coverage, or employees working in firms with and without a works council, exhibit similar pre-pandemic trends in working from home. Furthermore, the treatment variables are not exogenous but reflect employees' employment in firms with particular industrial relations institutions. Therefore, the estimates should not be interpreted as causal difference-in-differences effects. Instead, they provide evidence on whether the association between industrial relations and remote work changed following the outbreak of the pandemic.

wood and Jirjahn (2009)). During the pandemic, many schools were closed in Germany. Hence, the effects of collective bargaining and works councils could have been different for employees with and without children. In Germany, females are responsible for childcare to a larger extent than males. Therefore, we first estimate equation (1) separately for females and males. The results depicted in Panel (A) of Table 5 reveal that the negative correlation between being covered by a collective wage agreement and working from home is comparable for females and males. However, works councils are associated with an increased probability and frequency of working from home only among female employees.

- - - - Table 5 about here - - - -

Second, we re-estimate equation (1) separately for employees with and without young children aged 0–13. Using the Core data, we observe a pattern similar to that found in the gender-specific analysis: the negative correlation with collective wage agreement coverage is comparable for employees with and without children. However, the positive correlation with the presence of a works council is more pronounced for employees with children, particularly in 2021 and 2023. In contrast, we do not find such a difference when using the SOEP-CoV data. One possible explanation is that the SOEP-CoV survey question focuses on changes in remote work before and during the pandemic. Employees with children may have already worked remotely before the pandemic, resulting in a smaller change in their working-from-home behaviour.[21] These findings imply that childcare responsibilities may partially explain the gender differences observed in the main correlations.

Age. Younger and older workers are likely to vary in job characteristics, digital skills, and preferences for flexible working arrangements. Younger employees may place greater value on flexible work arrangements because they are more likely to combine work with caring responsibilities for children or other family members. In addition, younger workers may adapt more easily to digital forms of work organisation. By contrast, older employees may possess fewer digital skills, which could make remote work less feasible for them.

The results in Panel (B) of Table 5 indicate that the negative relationship between collective bargaining coverage and working from home is comparable for younger workers (aged below 50, accounting for about 60% of observations) and older workers (aged 50 or above) in the SOEP Core sample. However, it is more pronounced among younger workers in the SOEP-CoV sample.

[21] Estimation results are available upon request from the authors.

Moreover, the positive association between works councils and working from home is observed consistently only among younger employees.

Tenure. Employees with longer tenure are likely to have accumulated more firm-specific human capital and established stronger relationships with employers, which may increase employers' willingness to allow remote work. Firms may place greater trust in long-tenured employees when implementing remote-work arrangements because their productivity and work practices are better known to management. In addition, the preferences of long-tenured employees may be more likely to be taken into account in workplace decision-making.

The results reported in Panel (C) of Table 5 suggest that the negative relationship between collective bargaining coverage and working from home is broadly comparable between longer- and shorter-tenured workers in the SOEP Core sample, though somewhat stronger among workers with longer tenure in the SOEP-CoV sample. Moreover, the positive association between works councils and working from home tends to be more pronounced for employees with longer tenure.

Blue- and white-collar workers. Blue-collar workers are less likely to be able to work from home than white-collar employees. The results in Panel (D) of Table 5 show that the negative correlation between collective bargaining and working from home is stronger for white-collar workers than for blue-collar workers. Additionally, there is a positive association between the presence of a works council and working from home for white-collar employees. In contrast, for blue-collar workers, we see no significant correlation between co-determination and working from home.

While the distinction between blue- and white-collar workers is broad, we can assess the role of job characteristics more narrowly by re-estimating equation (1) for different occupations. The negative association between collective bargaining and working from home is smaller in magnitude and often statistically insignificant in occupations where working from home is not feasible (see Table B-11 in Appendix B for details on the occupation definitions). Once again, the negative correlation with collective bargaining is more pronounced for employees in WFH-feasible occupations. Moreover, the positive correlation with works councils is observed only within this group.

4.5.2 Firm and Sector Characteristics

Firm size. Panel (A) of Table 6 presents heterogeneity by firm size. The negative relationship between collective bargaining coverage and working from home is observable in both large and small

firms, although it tends to be somewhat stronger in larger establishments. At the same time, the positive relationship between works councils and working from home is primarily observed in larger firms in the SOEP Core sample. One possible explanation is that industrial relations institutions generally exert a stronger influence on workplace practices in larger firms. Personnel policies are more formalised, and collective regulations are more likely to be implemented consistently.

- - - - Table 6 about here - - - -

Public and private sectors. Panel (B) of Table 6 shows estimation results for samples of public and private sector employees. The negative relationship between collective bargaining coverage and working from home is generally more pronounced in the private sector. The estimated coefficients for the public sector are mostly statistically insignificant. The correlation between co-determination and working from home tends to be more pronounced in the private sector and is mostly statistically insignificant in the public sector. One possible explanation is that collective bargaining coverage and co-determination are considerably more widespread in the public sector. The SOEP Core sample shows that 92% of observations in the public sector are covered by a collective wage agreement, and 90% are employed in establishments with a works or personnel council. Therefore, there is relatively little variation in these industrial relations indicators. In addition, working-from-home arrangements in the public sector may largely be governed by uniform administrative regulations, which reduces the importance of establishment-level differences in industrial relations.

Production and non-production industries. Panel (C) of Table 6 distinguishes between production and non-production industries. The negative relationship between collective bargaining coverage and working from home is observed in both industry groups. By contrast, the estimated coefficients for works councils are positive and significant in non-production industries and mostly statistically insignificant in production sectors in the SOEP Core sample. In the SOEP-CoV sample, however, the estimated coefficients are more comparable across production and non-production industries. Workplace-level co-determination is more strongly associated with working from home in environments where remote work is technically feasible and more widely adopted. This interpretation is consistent with our earlier findings showing stronger positive associations between works councils and working from home among white-collar workers and in occupations with higher working-from-home feasibility.

4.5.3 Heterogeneity: A Summary

We observe a negative correlation between collective bargaining coverage and working from home for most groups of employees. While the strength of the relationship varies by individual, firm, and sector characteristics, it tends to be weaker in occupations that are difficult to perform at home. By contrast, the relationship between co-determination and working from home differs more markedly across subgroups. Strikingly, we find no correlation between industrial relations features and remote work in the public sector in Germany.

4.6 Mechanisms

As the final part of our analysis, we examine potential channels linking industrial relations and working from home. Specifically, we investigate whether the estimated associations become weaker after accounting for workplace characteristics that are plausibly related to remote-work arrangements. Since these workplace characteristics may themselves be jointly determined with working-from-home practices and potentially be endogenous, the estimates should not be interpreted as identifying causal mediation effects. Instead, the results constitute suggestive evidence on potential channels.

4.6.1 Contractual Arrangements

We have argued in Section 2.2 that collective bargaining may restrict the use of working from home, whereas co-determination facilitates it. One mechanism that can enhance working from home is the existence of contractual agreements that guide its use. If such formal rules facilitate working from home, our results suggest that they are more likely to be observed for employees working in co-determined establishments and less likely in firms covered by collective bargaining. To investigate whether the different effects of collective bargaining and co-determination on working from home stem from their influence on the existence of such contractual agreements, we make use of a question contained in the SOEP Core data in 2020–2022. Respondents were asked: "*Is it stated in your employment contract or elsewhere that you are allowed to work from home?*"

We first analyse the correlation between the coverage by a collective wage agreement or the presence of a works council and the likelihood that such regulations are in place. Specifically, we regress the dummy variable for a contractually regulated working-from-home arrangement on both industrial relations indicators. Our results show that collective wage agreement coverage

is negatively associated with the likelihood of formal regulations regarding working-from-home arrangements, whereas the presence of works councils is positively associated with such regulations (see Panel A of Table B-12 in Appendix B).

Second, we re-estimate equation (1), adding a control variable for whether working from home is contractually regulated (*WFH in contract*).[22] The results are presented in Table 7. We first replicate the baseline results using this restricted sample in columns (1), (3), (5), and (7), to ensure comparability and confirm that the main findings remain robust.[23] The even columns (2), (4), (6), and (8) show the results for the specification including *WFH in contract* as a control variable. While the coefficients on works councils and collective wage agreements decrease in absolute magnitude, their significance levels remain largely unchanged. These findings indicate that the contractual regulation of working-from-home arrangements may serve as a channel through which industrial relations influence working from home.

- - - - Table 7 about here - - - -

4.6.2 Flexible Working Time

Another potential channel linking working from home and industrial relations is the availability of flexible working time. Flexible working time can serve as a proxy for work autonomy. Employees with greater autonomy over their schedules are more likely to work from home. Works councils represent employee interests, including work autonomy. Under the Works Constitution Act (§87 WCA), they hold co-determination rights over working time arrangements, such as start and end times, break schedules, and shift plans. As a result, co-determination may increase the likelihood of flexible working time. In contrast, unions may emphasise job security and standardised working hours over flexibility, potentially reducing the availability of flexitime.

We use the survey question: "*There are very different working time arrangements today. Which of the following options applies most to your work?*" The possible answers are: "*My work day has fixed starting and ending times*", "*My working hours are set by my employer and vary to some extent from day to day*", "*No formal working hours arrangement, I set my working hours myself*", and "*Flexitime with working time account and a certain amount of freedom to set daily working*

[22] Due to non-responses, the estimation sample is smaller than the one on which Table 3 is based.

[23] The information on contractual working-from-home arrangements is available for the years 2020–2022. As shown in Section 4.4, the positive association between co-determination and remote work is statistically significant only in 2021. Consequently, when pooling the three years, we do not observe a statistically significant association on average.

hours myself". This information is available in 2021 and 2023 in our observation period. We construct a dummy variable for flexible working time, which equals one if the respondent selects either of the last two options, and zero otherwise. We then regress this dummy on the two industrial relations indicators. The results, shown in Panel B of Table B-12 in Appendix B, indicate that co-determination is positively associated with flexible working time, whereas coverage by a collective wage agreement is negatively associated.

Next, we re-estimate equation (1) and additionally control for whether the employee has flexible working time. The results are presented in Table 8. The even columns show that employees with flexible working time are more likely to work from home. Moreover, the coefficients on works councils and collective wage agreements decrease in absolute magnitude. This suggests that flexible working time may function as an additional channel linking industrial relations and remote work.

- - - - Table 8 about here - - - -

5 Conclusion

Working from home has attracted significant attention in recent years, especially during the COVID-19 pandemic and its aftermath, due to its perceived benefits for employees and firms. It reduces employees' stress and the time associated with commuting and enables them to better balance familial and professional obligations. Furthermore, working from home has been linked to increased employee satisfaction and, potentially, higher productivity. Despite the increasing popularity of working from home, limited research has been conducted on the impact of labour relations on the prevalence of this phenomenon. In addition, previous studies often focus on earlier periods, not capturing the unique context of the pandemic and the subsequent years. They tend to examine the opportunity to work from home, rather than its actual use, and ultimately provide ambiguous findings.

This study examines the relationship between industrial relations and both the incidence and frequency of working from home in Germany during the COVID-19 pandemic and in the post-pandemic period. Specifically, we examine whether remote work is more pronounced among employees who are covered by a collective bargaining agreement and those employed in co-determined establishments. Our analysis is based on data from the SOEP Core survey from 2020 to 2023 and special COVID surveys from 2020 to 2021. We find that employees covered by collective bargaining

agreements are less likely to work from home and do so less frequently than comparable employees whose wages and working conditions are not negotiated collectively. Co-determination at the plant level is positively associated with the incidence and frequency of working from home.

The observed negative correlation between being paid based on a collective bargaining agreement and working from home may be attributable to the formalised regulations typically employed by companies with collective bargaining agreements, which could potentially limit opportunities for working from home. However, the association can be observed already six years prior to the pandemic. Therefore, further analysis is necessary to understand the cause of the negative correlation. It is plausible that the formalisation argument would be more applicable to sectoral-level agreements than those negotiated at the firm level, as the latter would be more likely to reflect the preferences of the firm and its employees. Unfortunately, the SOEP dataset does not provide consistent information on the existence or content of company-level agreements.

Concerning the role of works councils, we observe a positive correlation in 2021 and 2023. Furthermore, we identify heterogeneous effects for employees with different characteristics, such as gender and working from home feasibility. It would be interesting to explore whether there are further heterogeneities related to the nature of the work, the structure of compensation, or difficult-to-observe factors such as work motivation, on which the data set we use provides only limited information.

While our analysis does not claim to establish causal relationships, the results are robust to a range of specifications and matching procedures that reduce concerns about selection on observables. Nonetheless, alternative explanations cannot be fully ruled out. For example, firms covered by collective agreements or establishments with works councils may differ systematically in sectoral composition, job task structures, or working conditions, which could also influence the feasibility or desirability of working from home. Although our regressions control for industry and occupation categories and include heterogeneity analyses based on working-from-home feasibility, they cannot fully eliminate these concerns. In addition, we cannot entirely rule out the possibility that individuals with a stronger preference for working from home self-select into firms offering more remote-work opportunities. If such preferences correlate with collective bargaining coverage and co-determination, the true impact of industrial relations may be biased. To investigate this issue, we included information about personality traits (from the 2019 survey), risk attitudes, and respondents' worries concerning social problems and their own issues (such as health and finan-

cial situation) as additional covariates into the regression model. If these indicators are correlated with preferences concerning working from home, their inclusion as covariates would likely affect the findings for the industrial relations variables. However, we find that the estimated coefficients on industrial relations indicators remain quantitatively and qualitatively similar.[24] Therefore, we obtain no indication that such self-selection affects our results. Future research could explore strategies to identify causal effects, which would provide deeper insights into the impact of industrial relations on working from home.

The new normal of using remote work goes hand in hand with an increasing polarisation in the labour market. Skill-biased technological change (see Card and DiNardo (2002)) implies that the demand for highly qualified employees continues to increase, which also improves these employees' negotiating opportunities with regard to wages and working conditions. The latter includes the possibility of working from home. This also reflects an increasing desire of employees for individual and flexible labour relations. This increasing individualisation of labour relations poses new challenges for all parties concerned. It is likely to become increasingly difficult for both trade unions and works councils to negotiate collective solutions and, thus, signal their importance. On the employers' side, individual labour relations are associated with greater complexity and, thus, ultimately, with higher costs. For employees who have a strong bargaining position vis-à-vis employers, individual employment contracts can lead to greater degrees of freedom, while employees with a weak bargaining position can find themselves significantly worse off vis-à-vis other employees. Working from home can, therefore, be seen as a symptom of this increasing individualisation of labour relations.

[24]The estimation results are available from the authors upon request.

Table 1: Summary statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SOEP Core data 2020–2023				**SOEP-CoV data 2020–2021**			
	Mean	S. D.	Min	Max	Mean	S. D.	Min	Max
Outcome variables								
WFH^{I}	0.380	0.485	0	1				
WFH^{F}	0.611	0.836	0	2				
$WFH^{I,C}$					0.385	0.487	0	1
$WFH^{F,C}$					0.570	0.786	0	2
Main independent variables								
CWA	0.546	0.498	0	1	0.585	0.493	0	1
WkC	0.613	0.487	0	1	0.642	0.479	0	1
Other covariates								
age	45.072	9.987	20	60	46.602	9.063	21	60
female	0.516	0.500	0	1	0.609	0.488	0	1
foreigner	0.084	0.278	0	1	0.050	0.219	0	1
married	0.582	0.493	0	1	0.555	0.497	0	1
education in years	13.275	2.649	7	18	13.290	2.560	7	18
# of children	0.754	0.983	0	8	0.784	0.985	0	5
Western Germany	0.755	0.430	0	1	0.782	0.413	0	1
tenure	11.470	9.996	0	44.667	12.150	10.091	0	44.667
ln(income)	8.044	0.686	0	11.290	7.962	0.726	0	10.127
blue-collar worker	0.140	0.347	0	1	0.121	0.326	0	1
public sector	0.254	0.435	0	1	0.285	0.451	0	1
Firm size: < 20	0.160	0.367	0	1	0.151	0.358	0	1
Firm size: $[20, 200)$	0.243	0.429	0	1	0.244	0.430	0	1
Firm size: $[200, 2000)$	0.259	0.438	0	1	0.270	0.444	0	1
Firm size: ≥ 2000	0.337	0.473	0	1	0.335	0.472	0	1
Professionals	0.249	0.433	0	1	0.237	0.425	0	1
Elementary occupations	0.041	0.198	0	1	0.046	0.210	0	1
Craft and related trades workers	0.072	0.259	0	1	0.062	0.242	0	1
Skilled agricultural, forestry and fishery workers	0.006	0.079	0	1	0.003	0.055	0	1
Managers	0.067	0.251	0	1	0.056	0.231	0	1
Plant and machine operators, and assemblers	0.045	0.208	0	1	0.041	0.199	0	1
Clerical support workers	0.125	0.331	0	1	0.129	0.335	0	1
Service and sales workers	0.092	0.288	0	1	0.098	0.297	0	1
Technicians and associate professionals	0.302	0.459	0	1	0.327	0.469	0	1
Industry (1)	0.008	0.090	0	1	0.007	0.085	0	1
Industry (2)	0.224	0.417	0	1	0.212	0.409	0	1
Industry (3)	0.060	0.237	0	1	0.046	0.209	0	1
Industry (4)	0.092	0.289	0	1	0.089	0.285	0	1
Industry (5)	0.121	0.326	0	1	0.111	0.314	0	1
Industry (6)	0.146	0.353	0	1	0.137	0.344	0	1
Industry (7)	0.313	0.464	0	1	0.358	0.479	0	1
Industry (8)	0.036	0.186	0	1	0.040	0.195	0	1
Observations	15,200				3,313			

Notes: This table shows the summary statistics for the SOEP Core data 2020–2023 sample and for the SOEP-CoV data 2020–2021 sample.
Industries: (1) Agriculture, forestry and fishing; Mining and quarrying; (2) Manufacturing; (3) Electricity, gas, steam and air conditioning supply; Water supply, sewerage, waste management and remediation activities; Construction; (4) Wholesale and retail trade; repair of motor vehicles and motorcycles; (5) Transportation and storage; Accommodation and food service activities; Information and communication; (6) Financial and insurance activitie; Real estate activities; Professional, scientific and technical activities; Administrative and support service activities; (7) Public administration and defence; compulsory social security; Education; (8) Arts, entertainment and recreation; Other service activities; Activities of households as employers ; Activities of extraterritorial organisations and bodies.

Table 2: Summary statistics of working from home

	(1)	(2)	(3)	(4)	(5)	(6)
	Collective wage agreement			Works council		
	Covered	Not covered	Difference	With	Without	Difference
Panel (A): SOEP Core data 2020–2023						
WFH^{I}	0.327	0.444	-0.116***	0.413	0.328	0.086***
WFH^{F}	0.524	0.716	-0.191***	0.670	0.518	0.152***
Observations	8,293	6,907		9,324	5,876	
Panel (B): SOEP-CoV data 2020–2022						
$WFH^{I,C}$	0.368	0.407	-0.039**	0.434	0.295	0.139***
$WFH^{F,C}$	0.529	0.629	-0.100***	0.648	0.430	0.218***
Observations	1,938	1,375		2,128	1,185	

Notes: This table shows the mean of the outcome variables for employees covered and not covered by a collective wage agreement and employees in firms with and without a works council using the SOEP Core data (in Panel (A)) and the SOEP-CoV data (in Panel (B)). The differences in means for both industrial relations indicators are also depicted. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Correlation between working from home and industrial relations (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel (A): SOEP Core data 2020–2023								
Outcome variable:	WFH^{I}				WFH^{F}			
CWA	-0.066***		-0.072***	-0.081***	-0.118***		-0.129***	-0.132***
	(0.009)		(0.010)	(0.014)	(0.016)		(0.017)	(0.023)
WkC		-0.002	0.023**	0.017		-0.002	0.043**	0.041*
		(0.010)	(0.011)	(0.014)		(0.018)	(0.019)	(0.024)
CWA × WkC				0.014				0.004
				(0.017)				(0.030)
Observations	15,200							
Panel (B): SOEP-CoV data 2020–2021								
Outcome variable:	$WFH^{I,C}$				$WFH^{F,C}$			
CWA	-0.051***		-0.075***	-0.049*	-0.095***		-0.132***	-0.074*
	(0.019)		(0.019)	(0.029)	(0.031)		(0.032)	(0.043)
WkC		0.054**	0.084***	0.103***		0.078**	0.131***	0.172***
		(0.022)	(0.023)	(0.029)		(0.036)	(0.038)	(0.049)
CWA × WkC				-0.043				-0.094
				(0.036)				(0.058)
Observations	3,313							

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in Panel (A)) and the SOEP-CoV data (in Panel (B)). The outcome variables in columns (1)–(4) are dummy variables for working from home, while the outcome variables in columns (5)–(8) are categorical variables, indicating the frequency of working from home. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. As covariates, we account for being a female, age (level & squared term), being a foreigner, being married, the number of children, years of education, living in the Western Germany, years of tenure, firm size, the (natural) logarithm of income, being a blue-collar worker, working in the public sectors, dummy variables for industries and occupations, and year as well as month fixed effects. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Before and during the pandemic (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	2014		**2020 Jan. – Mar.**		**2020 Apr. – Dec.**		**2021**		**2022**		**2023**	
Panel (A): SOEP Core data 2014, 2020–2023												
Outcome variable:	WFH^I	WFH^F	WFH^I	WFH^F	WFH^I	WFH^F	WFH^I	WFH^F	WFH^I	WFH^F	WFH^I	WFH^F
CWA	-0.065***	-0.078***	-0.103***	-0.149***	-0.080***	-0.118***	-0.069***	-0.113***	-0.023	-0.060	-0.069***	-0.166***
	(0.014)	(0.022)	(0.016)	(0.024)	(0.015)	(0.025)	(0.016)	(0.026)	(0.023)	(0.043)	(0.017)	(0.031)
WkC	-0.013	-0.022	0.013	0.024	0.000	-0.011	0.043**	0.061**	0.013	0.043	0.056***	0.115***
	(0.016)	(0.025)	(0.018)	(0.026)	(0.018)	(0.030)	(0.017)	(0.028)	(0.027)	(0.052)	(0.019)	(0.035)
Observations	3,319		3,191		3,437		2,890		2,207		3,475	
Panel (B): SOEP-CoV data 2020–2021												
Outcome variable:					$WFH^{I,C}$	$WFH^{F,C}$	$WFH^{I,C}$	$WFH^{F,C}$				
CWA					-0.066***	-0.115***	-0.093***	-0.164***				
					(0.022)	(0.037)	(0.029)	(0.045)				
WkC					0.034	0.082*	0.175***	0.224***				
					(0.027)	(0.044)	(0.034)	(0.054)				
Observations					2,055		1,252					

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in Panel (A)) and the SOEP-CoV data (Panel (B)) for individuals interviewed before, during and after the pandemic. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3, except that the year fixed effects drop out. Robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: Heterogeneity: Individual-level characteristics (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SOEP Core data 2020–2023				**SOEP-CoV data 2020–2021**			
Outcome variable:	WFH^I		WFH^F		$WFH^{I,C}$		$WFH^{F,C}$	
Panel (A): Gender								
	Female	Male	Female	Male	Female	Male	Female	Male
CWA	-0.070***	-0.069***	-0.126***	-0.126***	-0.067***	-0.073**	-0.132***	-0.111**
	(0.014)	(0.013)	(0.024)	(0.023)	(0.026)	(0.030)	(0.042)	(0.052)
WkC	0.046***	0.001	0.085***	0.006	0.105***	0.042	0.173***	0.051
	(0.015)	(0.015)	(0.026)	(0.026)	(0.030)	(0.038)	(0.048)	(0.065)
Observations	7,836	7,364	7,836	7,364	2,016	1,297	2,016	1,297
Panel (B): Age								
	Old	Young	Old	Young	Old	Young	Old	Young
CWA	-0.064***	-0.076***	-0.111***	-0.139***	-0.048	-0.093***	-0.092**	-0.158***
	(0.016)	(0.012)	(0.027)	(0.020)	(0.029)	(0.026)	(0.047)	(0.044)
WkC	0.017	0.028**	0.027	0.056**	0.049	0.107***	0.089*	0.160***
	(0.018)	(0.013)	(0.031)	(0.023)	(0.033)	(0.032)	(0.052)	(0.054)
Observations	6,117	9,083	6,117	9,083	1,468	1,845	1,468	1,845
Panel (C): Tenure								
	Long	Short	Long	Short	Long	Short	Long	Short
CWA	-0.064***	-0.077***	-0.124***	-0.131***	-0.123***	-0.037	-0.188***	-0.087**
	(0.016)	(0.012)	(0.027)	(0.021)	(0.030)	(0.026)	(0.051)	(0.040)
WkC	0.046**	0.011	0.066**	0.030	0.146***	0.048*	0.238***	0.064
	(0.018)	(0.013)	(0.031)	(0.023)	(0.040)	(0.029)	(0.064)	(0.048)
Observations	6,511	8,689	6,511	8,689	1,495	1,818	1,495	1,818
Panel (D): Blue- vs. white-collar workers								
	Blue-collar	White-collar	Blue-collar	White-collar	Blue-collar	White-collar	Blue-collar	White-collar
CWA	-0.041***	-0.074***	-0.074***	-0.133***	-0.012	-0.069***	-0.010	-0.120***
	(0.012)	(0.011)	(0.019)	(0.019)	(0.023)	(0.022)	(0.027)	(0.036)
WkC	0.012	0.027**	0.019	0.051**	-0.008	0.094***	-0.012	0.148***
	(0.013)	(0.012)	(0.023)	(0.021)	(0.022)	(0.026)	(0.025)	(0.043)
Observations	2,123	13,077	2,123	13,077	401	2,912	401	2,912

Notes: This table presents the relationship between working from home and industrial relations in Germany using the SOEP Core data (columns (1)–(4)) and the SOEP-CoV data (columns (5)–(8)), separately by individual characteristics. Panel (A) reports results for females and males, Panel (B) for older workers (aged 50 or above) and younger workers (aged under 50), Panel (C) for workers with long tenure (10 years or more) and short tenure (fewer than 10 years), and Panel (D) for blue- and white-collar workers. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3, except that the dummy variable for being female drops out in Panel (A) and the dummy variable for being a blue-collar worker is excluded from the model in Panel (D). Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: Heterogeneity: Firm and sector characteristics (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SOEP Core data 2020–2023				**SOEP-CoV data 2020–2021**			
Outcome variable:	WFH^I		WFH^F		$WFH^{I,C}$		$WFH^{F,C}$	
Panel (A): Firm size								
	Big	Small	Big	Small	Big	Small	Big	Small
CWA	-0.078***	-0.057***	-0.140***	-0.098***	-0.110***	-0.035	-0.185***	-0.060
	(0.013)	(0.014)	(0.023)	(0.023)	(0.026)	(0.029)	(0.045)	(0.044)
WkC	0.036**	-0.005	0.066**	-0.010	0.062*	0.075**	0.100*	0.112**
	(0.015)	(0.016)	(0.026)	(0.026)	(0.033)	(0.034)	(0.056)	(0.053)
Observations	9,068	6,132	9,068	6,132	2,004	1,309	2,004	1,309
Panel (B): Public vs. private sector								
	Public	Private	Public	Private	Public	Private	Public	Private
CWA	-0.031	-0.075***	-0.067	-0.131***	-0.078	-0.076***	-0.111	-0.132***
	(0.030)	(0.010)	(0.054)	(0.017)	(0.058)	(0.021)	(0.092)	(0.035)
WkC	0.033	0.021*	0.080*	0.035*	0.040	0.078***	0.067	0.121***
	(0.025)	(0.012)	(0.042)	(0.020)	(0.054)	(0.026)	(0.080)	(0.044)
Observations	3,865	11,335	3,865	11,335	944	2,369	944	2,369
Panel (C): Production vs. non-production industries								
	Prod.	Non-prod.	Prod.	Non-prod.	Prod.	Non-prod.	Prod.	Non-prod.
CWA	-0.073***	-0.074***	-0.115***	-0.145***	-0.115***	-0.054**	-0.177***	-0.114***
	(0.013)	(0.014)	(0.022)	(0.024)	(0.027)	(0.027)	(0.046)	(0.044)
WkC	0.007	0.030**	0.020	0.053**	0.093**	0.068**	0.121**	0.124**
	(0.016)	(0.014)	(0.028)	(0.025)	(0.038)	(0.030)	(0.062)	(0.049)
Observations	5,837	9,363	5,837	9,363	1,174	2,139	1,174	2,139

Notes: This table presents the relationship between working from home and industrial relations in Germany using the SOEP Core data (columns (1)–(4)) and the SOEP-CoV data (columns (5)–(8)), separately by firm-level characteristics. Panel (A) for big firms (more than 200 employees) and small firms (fewer than 200 employees), Panel (B) reports results for the public and private sectors, and Panel (C) for production and non-production industries. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Channels: Working from home regulated in the contract (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SOEP Core data 2020–2022				**SOEP-CoV data 2020–2021**			
Outcome variable:	WFH^I		WFH^F		$WFH^{I,C}$		$WFH^{F,C}$	
CWA	-0.073***	-0.058***	-0.116***	-0.089***	-0.076***	-0.062***	-0.134***	-0.108***
	(0.010)	(0.009)	(0.017)	(0.015)	(0.020)	(0.019)	(0.032)	(0.030)
WkC	0.015	0.002	0.024	0.000	0.086***	0.075***	0.134***	0.114***
	(0.011)	(0.010)	(0.019)	(0.017)	(0.023)	(0.022)	(0.038)	(0.036)
WFH in contract		0.348***		0.614***		0.288***		0.530***
		(0.011)		(0.021)		(0.022)		(0.038)
Observations	11,682				3,293			

Notes: This table reports the association between working from home and industrial relations using SOEP Core (columns (1)–(4)) and SOEP-CoV data (columns (5)–(8)). Main independent variables are dummies for works council presence and collective wage agreement coverage. Columns (2), (4), (6), and (8) control for WFH in contract. Covariates match those in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8: Channels: Flexible working time (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SOEP Core data 2021 & 2023				**SOEP-CoV data 2021**			
Outcome variable:	WFH^I		WFH^F		$WFH^{I,C}$		$WFH^{F,C}$	
CWA	-0.070***	-0.041***	-0.143***	-0.097***	-0.093***	-0.065**	-0.164***	-0.125***
	(0.013)	(0.012)	(0.023)	(0.021)	(0.029)	(0.027)	(0.045)	(0.043)
WkC	0.051***	0.031**	0.091***	0.059**	0.175***	0.138***	0.224***	0.169***
	(0.015)	(0.014)	(0.026)	(0.025)	(0.034)	(0.033)	(0.054)	(0.052)
Flexible working time		0.326***		0.526***		0.317***		0.464***
		(0.013)		(0.023)		(0.028)		(0.040)
Observations	6,352				1,252			

Notes: This table reports the association between working from home and industrial relations using SOEP Core (columns (1)–(4)) and SOEP-CoV data (columns (5)–(8)). Main independent variables are dummies for works council presence and collective wage agreement coverage. Columns (2), (4), (6), and (8) control for flexible working time. Covariates match those in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Industrial Relations and Working from Home in Germany During the COVID-19 Pandemic

Supplementary Material

Appendix A Data Imputation

In our main analysis, we examine employees' working-from-home behaviour between 2020 and 2023. In a robustness check, we additionally exploit corresponding information for 2014. However, information on the existence of a works council and coverage by a collective wage agreement is not available for all of the years considered above. Table A-1 summarizes the availability of the outcome variables, the main independent variables, and the corresponding survey years between 2014 and 2023.

Table A-1: Data availability

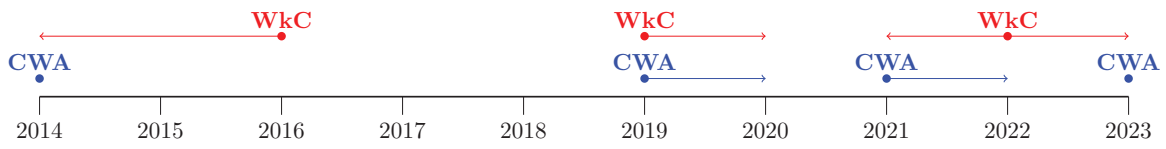
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
WFH^{I}, WFH^{F}	X						X	X	X	X
$WFH^{I,C}$, $WFH^{F,C}$							X	X		
CWA	X	X	X	X	X	X		X		X
WkC			X			X			X	

Notes: This table shows the survey years when information on working from home, the existence of a works council, and the coverage by a collective wage agreement are available.

Figure A-1 illustrates the imputation procedure. For the analysis using working-from-home data for 2020, we impute the two industrial relations indicators from 2019 to 2020. For the 2021 analysis, we use information on works councils from 2022. For the 2022 analysis, we employ information on collective wage agreement coverage from 2021. For the 2023 analysis, we again use information on works councils from 2022. To ensure the validity of these imputations, we restrict the sample to respondents who remained with the same firm, as indicated by an increase in firm tenure between 2019 and 2020, 2021 and 2022, and 2022 and 2023, respectively.

For the analysis using working-from-home data for 2014, we impute information on works councils from 2016 to 2014 and retain only individuals who stayed in the same firm between 2014 and 2016.

Figure A-1: Data imputation



Notes: This figure illustrates how information on the existence of a works council and coverage by a collective wage agreement is imputed across survey years. Solid points indicate the years for which the information is directly available. Arrows indicate the years to which the information is imputed.

Appendix B Tables Cited in the Main Text

Table B-1: Distribution of observations across industrial relations regimes

Panel (A): SOEP Core data 2020–2023			
		Collective wage agreement	
		0	1
Works council	0	4,500	1,376
	1	2,407	6,917
Panel (B): SOEP-CoV data 2020–2021			
		Collective wage agreement	
		0	1
Works council	0	900	285
	1	475	1,653

Notes: This table reports the distribution of observations across combinations of collective wage agreement coverage and the presence of a works council in the estimation samples based on the SOEP Core data (Panel (A)) and the SOEP-CoV data (Panel (B)).

Table B-2: Working from home and industrial relations
(Probit & Ordered Probit estimates)

	(1)	(2)
	Coefficient	Marginal effect
Panel A: SOEP Core data 2020–2023; Outcome – WFH^I		
CWA	-0.282***	-0.068***
	(0.041)	(0.010)
WkC	0.092*	0.022*
	(0.047)	(0.011)
Observations	15,200	
Panel B: SOEP Core data 2020–2023; Outcome – WFH^F		
CWA	-0.245***	
	(0.037)	
$WFH^F = 0$		0.061***
		(0.009)
$WFH^F = 1$		-0.011***
		(0.002)
$WFH^F = 2$		-0.051***
		(0.008)
WkC	0.080*	
	(0.042)	
$WFH^F = 0$		-0.020*
		(0.010)
$WFH^F = 1$		0.004*
		(0.002)
$WFH^F = 2$		0.016*
		(0.008)
Observations	15,200	
Panel C: SOEP-CoV data 2020–2021; Outcome – $WFH^{I,C}$		
CWA	-0.246***	-0.068***
	(0.076)	(0.021)
WkC	0.305***	0.083***
	(0.088)	(0.024)
Observations	3,313	
Panel D: SOEP-CoV data 2020–2021; Outcome – $WFH^{F,C}$		
CWA	-0.221***	
	(0.069)	
$WFH^{F,C} = 0$		0.061***
		(0.019)
$WFH^{F,C} = 1$		-0.016***
		(0.005)
$WFH^{F,C} = 2$		-0.045***
		(0.014)
WkC	0.284***	
	(0.081)	
$WFH^{F,C} = 0$		-0.078***
		(0.022)
$WFH^{F,C} = 1$		0.023***
		(0.007)
$WFH^{F,C} = 2$		0.055***
		(0.015)
Observations	3,313	

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in Panels (A) and (B)) and the SOEP-CoV data (in Panels (C) and (D)). The outcome variables in Panels (A) and (C) are dummy variables for working from home, while the outcome variables in Panels (B) and (D) are categorical variables, indicating the frequency of working from home. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-3: Using original definition of the frequency of working from home (OLS & Ordered Probit estimates)

	(1)	(2)
Panel A: SOEP Core data 2020–2023; Outcome – $WFH^{F}_{original}$; OLS estimates		
CWA	-0.221***	
	(0.028)	
WkC	0.061*	
	(0.031)	
Observations		15,200
Panel B: SOEP Core data 2020–2023; Outcome – $WFH^{F}_{original}$; Ordered Probit estimates		
	Coefficient	Marginal effect
CWA	-0.246***	
	(0.034)	
$WFH^{F}_{original} = 0$		0.064***
		(0.009)
$WFH^{F}_{original} = 1$		-0.006***
		(0.001)
$WFH^{F}_{original} = 2$		-0.005***
		(0.001)
$WFH^{F}_{original} = 3$		-0.032***
		(0.004)
$WFH^{F}_{original} = 4$		-0.021***
		(0.003)
WkC	0.055	
	(0.039)	
$WFH^{F}_{original} = 0$		-0.014
		(0.010)
$WFH^{F}_{original} = 1$		0.001
		(0.001)
$WFH^{F}_{original} = 2$		0.001
		(0.001)
$WFH^{F}_{original} = 3$		0.007
		(0.005)
$WFH^{F}_{original} = 4$		0.005
		(0.003)
Observations		15,200

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data 2020–2023. The outcome variables are categorical using the original definition of the frequency of working from home. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-4: Robustness checks (OLS estimates)

	(1)	(2)	(3)	(4)
	SOEP Core data 2020–2023		**SOEP-CoV data 2020–2021**	
Outcome variable:	WFH^{I}	WFH^{F}	$WFH^{I,C}$	$WFH^{F,C}$
Panel A: Firms with at least 5 employees				
CWA	-0.073***	-0.132***	-0.073***	-0.129***
	(0.010)	(0.017)	(0.020)	(0.033)
WkC	0.023**	0.044**	0.081***	0.124***
	(0.011)	(0.019)	(0.023)	(0.038)
Observations	14,679		3,220	
Panel B: No imputation of demographic information				
CWA	-0.073***	-0.131***	-0.073***	-0.128***
	(0.010)	(0.017)	(0.020)	(0.032)
WkC	0.024**	0.045**	0.084***	0.129***
	(0.011)	(0.019)	(0.023)	(0.038)
Observations	15,019		3,291	
Panel C: Drop individuals in the top 10% income				
CWA	-0.065***	-0.111***	-0.055***	-0.098***
	(0.010)	(0.017)	(0.021)	(0.033)
WkC	0.021*	0.044**	0.075***	0.104***
	(0.011)	(0.019)	(0.023)	(0.038)
Observations	13,701		3,005	
Panel D: Drop individuals with high qualifications				
CWA	-0.069***	-0.127***	-0.072***	-0.125***
	(0.010)	(0.017)	(0.021)	(0.033)
WkC	0.029***	0.058***	0.089***	0.137***
	(0.011)	(0.020)	(0.025)	(0.040)
Observations	13,125		2,677	

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in columns (1) and (2)) and the SOEP-CoV data (in columns (3) and (4)). Panel (A) shows results for individuals working in firms with at least five employees. In Panel (B), individuals with imputed information on demographic characteristics are excluded from the sample. In Panel (C), individuals in the top 10% income are excluded from the sample. In Panel (D), we drop individuals who are foreman, master craftsman, skilled worker, employees with highly qualified tasks or managerial functions, employees with comprehensive leadership responsibilities, managing partner in their own business/company. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-5: Summary statistics of firm stayers and switchers

	(1)	(2)	(3)	(4)	(5)	(6)
	SOEP Core data 2020–2023			**SOEP-CoV data 2020–2021**		
	Stayers	Switchers	Difference	Stayers	Switchers	Difference
Outcome variables						
WFH^{I}	0.380	0.363	0.017			
WFH^{F}	0.611	0.593	0.019			
$WFH^{I,C}$				0.385	0.340	0.045
$WFH^{F,C}$				0.570	0.510	0.061
Main independent variables						
CWA	0.546	0.429	0.117***	0.585	0.393	0.192***
WkC	0.613	0.447	0.167***	0.642	0.432	0.210***
Other covariates						
age	45.072	39.369	5.703***	46.602	41.922	4.680***
female	0.516	0.578	-0.062***	0.609	0.689	-0.081**
foreigner	0.084	0.123	-0.039***	0.050	0.073	-0.022
married	0.582	0.437	0.146***	0.555	0.447	0.108***
education in years	13.275	13.420	-0.145*	13.290	13.104	0.185
# of children	0.754	0.677	0.077***	0.784	0.840	-0.056
Western Germany	0.755	0.758	-0.003	0.782	0.777	0.006
tenure	11.470	1.165	10.305***	12.150	2.765	9.385***
ln(income)	8.044	7.886	0.158***	7.962	7.809	0.153***
blue-collar worker	0.140	0.114	0.026***	0.121	0.068	0.053**
public sector	0.254	0.201	0.053***	0.285	0.252	0.033
Firm size: < 20	0.160	0.221	-0.060***	0.151	0.252	-0.102***
Firm size: $[20, 200)$	0.243	0.265	-0.022*	0.244	0.291	-0.047
Firm size: $[200, 2000)$	0.259	0.234	0.025**	0.270	0.170	0.100***
Firm size: ≥ 2000	0.337	0.280	0.058***	0.335	0.286	0.049
Professionals	0.249	0.307	-0.058***	0.237	0.252	-0.015
Elementary occupations	0.041	0.040	0.001	0.046	0.063	-0.017
Craft and related trades workers	0.072	0.052	0.020***	0.062	0.034	0.028*
Skilled agricultural, forestry and fishery workers	0.006	0.005	0.002	0.003	0.010	-0.007
Managers	0.067	0.047	0.021***	0.056	0.049	0.008
Plant and machine operators, and assemblers	0.045	0.036	0.009	0.041	0.034	0.007
Clerical support workers	0.125	0.109	0.016*	0.129	0.073	0.056**
Service and sales workers	0.092	0.108	-0.016*	0.098	0.131	-0.033
Technicians and associate professionals	0.302	0.296	0.006	0.327	0.354	-0.027
Industry (1)	0.008	0.006	0.002	0.007	0.024	-0.017***
Industry (2)	0.224	0.171	0.053***	0.212	0.146	0.067**
Industry (3)	0.060	0.052	0.008	0.046	0.058	-0.013
Industry (4)	0.092	0.114	-0.022***	0.089	0.107	-0.018
Industry (5)	0.121	0.147	-0.026***	0.111	0.117	-0.006
Industry (6)	0.146	0.151	-0.005	0.137	0.136	0.001
Industry (7)	0.313	0.326	-0.013	0.358	0.383	-0.026
Industry (8)	0.036	0.033	0.003	0.040	0.029	0.010
Observations	15,200	1,301		3,313	206	

Notes: This table presents summary statistics for firm stayers and switchers in the SOEP Core (2020–2023) and SOEP-CoV (2020–2021) samples. Columns (1) and (4) report the means for stayers, while Columns (2) and (5) show the means for switchers. Columns (3) and (6) display the differences in means between the two groups.

Table B-6: Robustness checks: Including individuals changing firms (OLS estimates)

	(1)	(2)	(3)	(4)
	SOEP Core data 2020–2023		**SOEP-CoV data 2020–2021**	
Outcome variable:	WFH^{I}	WFH^{F}	$WFH^{I,C}$	$WFH^{F,C}$
CWA	-0.073***	-0.132***	-0.065***	-0.117***
	(0.009)	(0.016)	(0.019)	(0.030)
WkC	0.023**	0.043**	0.076***	0.116***
	(0.010)	(0.017)	(0.022)	(0.035)
Observations	16,501		3,519	

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in columns (1)–(2)) and the SOEP-CoV data (in columns (3)–(4)). The sample includes individuals who changed jobs between 2019 and 2020, as well as those who switched between 2021 and 2022. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-7: Robustness checks: Sample Without Imputations (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)
	SOEP Core data 2021–2023				**SOEP-CoV data 2021**	
Outcome variable:	WFH^{I}		WFH^{F}		$WFH^{I,C}$	$WFH^{F,C}$
	2021 & 2023	2022	2021 & 2023	2022	2021	2021
Panel A: Original estimation sample						
CWA	-0.058***		-0.121***		-0.044	-0.102**
	(0.012)		(0.022)		(0.028)	(0.044)
WkC		0.005		0.023		
		(0.027)		(0.050)		
Observations	6,365	2,207	6,365	2,207	1,252	1,252
Panel B: Including individuals changing firms						
CWA	-0.062***		-0.129***		-0.037	-0.090**
	(0.012)		(0.021)		(0.027)	(0.042)
WkC		0.008		0.030		
		(0.025)		(0.048)		
Observations	6,977	2,420	6,977	2,420	1,331	1,331

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in columns (1)–(4)) and the SOEP-CoV data (in columns (5)–(6)). The main independent variable for the years 2021 and 2023 is a dummy indicating whether an individual is covered by a collective wage agreement, while for 2022 it is a dummy indicating whether the individual works in a firm with a works council. In Panel A, we use the original estimation sample. In Panel B, we extend the sample to include individuals who changed firms between 2019 and 2023. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-8: Robustness checks: Matching (OLS estimates)

	(1)	(2)	(3)	(4)
	SOEP Core data 2020–2023		**SOEP-CoV data 2020–2021**	
Outcome variable:	WFH^{I}	WFH^{F}	$WFH^{I,C}$	$WFH^{F,C}$
CWA	-0.084***	-0.149***	-0.073***	-0.125***
	(0.011)	(0.019)	(0.021)	(0.034)
WkC	0.024*	0.044**	0.072***	0.117***
	(0.012)	(0.021)	(0.025)	(0.041)
Observations	12,408		3,058	

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in columns (1)–(2)) and the SOEP-CoV data (in columns (3)–(4)). The estimation samples are restricted to individuals retained after propensity score matching, resulting in smaller sample sizes. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-9: Robustness checks: Controlling for WFH feasibility and 2-digit occupation and industry FE (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel (A): SOEP Core data 2020–2023								
					2021–2023			
Outcome variable:	WFH^{I}	WFH^{F}	WFH^{I}	WFH^{F}	WFH^{I}	WFH^{F}	WFH^{I}	WFH^{F}
CWA	-0.052***	-0.098***	-0.042***	-0.077***	-0.021*	-0.055**	-0.025**	-0.063***
	(0.009)	(0.016)	(0.009)	(0.016)	(0.013)	(0.023)	(0.013)	(0.023)
WkC	0.021*	0.038**	0.005	0.013	0.025*	0.054**	0.030**	0.061**
	(0.011)	(0.018)	(0.011)	(0.018)	(0.015)	(0.027)	(0.015)	(0.027)
Observations	14,903				8,290			
WFH feasibility	✓	✓	✓	✓	✓	✓	✓	✓
2-digit occupation FE			✓	✓	✓	✓	✓	✓
2-digit industry FE			✓	✓	✓	✓	✓	✓
1-digit occupation × industry FE							✓	✓
Panel (B): SOEP-CoV data 2020–2021								
Outcome variable:	$WFH^{I,C}$	$WFH^{F,C}$	$WFH^{I,C}$	$WFH^{F,C}$	$WFH^{I,C}$	$WFH^{F,C}$		
CWA	-0.053***	-0.095***	-0.057***	-0.096***	-0.062***	-0.096***		
	(0.019)	(0.031)	(0.020)	(0.031)	(0.020)	(0.031)		
WkC	0.074***	0.116***	0.061***	0.094**	0.066***	0.102***		
	(0.023)	(0.037)	(0.023)	(0.037)	(0.023)	(0.037)		
Observations	3,289							
WFH feasibility	✓	✓	✓	✓	✓	✓		
2-digit occupation FE			✓	✓	✓	✓		
2-digit industry FE			✓	✓	✓	✓		
1-digit occupation × industry FE					✓	✓		

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in Panel (A)) and the SOEP-CoV data (Panel (B)). The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All specifications include the same covariates as the baseline regressions reported in Table 3, except that the occupation and industry fixed effects are omitted in columns (3)–(8). In addition, all specifications control for occupation-level WFH feasibility. Columns (3)–(8) in Panel (A) and columns (3)–(6) in Panel (B) further include 2-digit occupation and industry fixed effects. Finally, columns (7)–(8) in Panel (A) and columns (5)–(6) in Panel (B) additionally include 1-digit occupation-by-industry fixed effects. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-10: Industrial relations and working-from-home adjustment after the COVID-19 outbreak (OLS estimates)

	(1)	(2)	(3)	(4)
	SOEP Core data 2020–2023			
Outcome variable:	WFH^I	WFH^F	WFH^I	WFH^F
CWA in 2019	-0.089***	-0.102***	-0.068***	-0.094***
	(0.015)	(0.024)	(0.016)	(0.023)
WkC in 2019	-0.024	-0.071***	-0.046***	-0.092***
	(0.016)	(0.025)	(0.016)	(0.024)
Post	0.018	0.116	-0.039	-0.009
	(0.090)	(0.157)	(0.086)	(0.152)
CWA in 2019 × Post	0.017	-0.045*	-0.010	-0.042
	(0.017)	(0.027)	(0.019)	(0.029)
WkC in 2019 × Post	0.049***	0.139***	0.052***	0.107***
	(0.017)	(0.027)	(0.019)	(0.028)
CWA in 2019 × Post × WFH feasible			0.132***	0.133**
			(0.040)	(0.064)
WkC in 2019 × Post × WFH feasible			-0.059	-0.032
			(0.040)	(0.065)
Observations	13,399		13,260	

Notes: This table reports estimates from interaction specifications exploiting interview timing relative to the first COVID-19 lockdown using the SOEP Core data. In columns (1) and (2), we include dummy variables indicating coverage by a collective wage agreement, employment in a firm with a works council, and interviews conducted since April 2020, as well as the interaction terms between the industrial-relations indicators and the post-lockdown dummy. In columns (3) and (4), we additionally incorporate triple interaction terms with an indicator for occupations feasible for working from home. All specifications include the same covariates as the baseline regressions reported in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-11: Heterogeneous effects: WFH-feasible vs. WFH-non-feasible occupations (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SOEP Core data 2020–2023				**SOEP-CoV data 2020–2021**			
Outcome variable:	WFH^I		WFH^F		$WFH^{I,C}$		$WFH^{F,C}$	
	Feasible	Non-feasible	Feasible	Non-feasible	Feasible	Non-feasible	Feasible	Non-feasible
CWA	-0.081***	-0.018**	-0.147***	-0.028**	-0.084***	0.001	-0.134***	0.002
	(0.013)	(0.008)	(0.023)	(0.012)	(0.026)	(0.019)	(0.044)	(0.024)
WkC	0.033**	-0.004	0.061**	-0.005	0.116***	0.004	0.179***	0.004
	(0.015)	(0.009)	(0.025)	(0.014)	(0.031)	(0.020)	(0.051)	(0.029)
Observations	11,304	3,896	11,304	3,896	2,483	830	2,483	830

Notes: This table shows the relationship between working from home and industrial relations in Germany using the SOEP Core data (in columns (1)–(4)) and the SOEP-CoV data (in columns (5)–(8)) for individuals in WFH-feasible and WFH-non-feasible occupations. WFH-feasible occupations include: (1) Professionals; (2) Managers; (3) Clerical support workers; and (4) Technician and associate professionals. The main independent variables are dummy variables for working in a firm with a works council and being covered by collective wage agreements. All covariates are the same as in the baseline regression in Table 3. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B-12: Channel variables and industrial relations (OLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)
	SOEP Core data 2020–2023			**SOEP-CoV data 2020–2021**		
Panel A: WFH in contract (2020–2022)						
CWA	-0.034***		-0.044***	-0.037**		-0.048***
	(0.009)		(0.009)	(0.016)		(0.017)
WkC		0.023**	0.038***		0.019	0.038**
		(0.010)	(0.011)		(0.018)	(0.019)
Observations		11,682			3,293	
Panel (B): Having flexible working time (2021 & 2023)						
CWA	-0.074***		-0.088***	-0.053*		-0.086***
	(0.014)		(0.014)	(0.030)		(0.031)
WkC		0.033**	0.060***		0.085**	0.117***
		(0.016)	(0.017)		(0.036)	(0.037)
Observations		6,352			1,252	

Notes: This table shows the correlation between industrial relations and WFH regulated in the contract (Panel A) or flexible working time (Panel B), using SOEP Core (columns (1)–(3)) and SOEP-CoV data (columns (4)–(6)). Main independent variables are dummies for works council presence and collective wage agreement coverage. Covariates match those in Table 3. Panel B covers 2021 only. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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