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# Uncovered workers in plants covered by collective bargaining: Who are they and how do they fare?*

Boris Hirsch[a], Philipp Lentge[a] and Claus Schnabel[b]

Abstract: In Germany, employers used to pay union members and non-members in a plant the same union wage in order to prevent workers from joining unions. Using recent administrative data, we investigate which workers in firms covered by collective bargaining agreements still individually benefit from these union agreements, which workers are not covered anymore, and what this means for their wages. We show that about 9 percent of workers in plants with collective agreements do not enjoy individual coverage (and thus the union wage) anymore. Econometric analyses with unconditional quantile regressions and firm-fixed-effects estimations demonstrate that not being individually covered by a collective agreement has serious wage implications for most workers. Low-wage non-union workers and those at low hierarchy levels particularly suffer since employers abstain from extending union wages to them in order to pay lower wages. This jeopardizes unions' goal of protecting all disadvantaged workers.

Zusammenfassung: In Deutschland zahlen Arbeitgeber traditionell den gleichen Tariflohn für Gewerkschaftsmitglieder und -nichtmitglieder im selben Betrieb, um letztere von einem Gewerkschaftsbeitritt abzuhalten. Mit aktuellen Daten aus der Verdienststrukturerhebung untersuchen wir, welche Arbeitnehmer in tarifgebundenen Betrieben heute noch individuell von tariflich vereinbarten Gewerkschaftslöhnen profitieren, welche Arbeitnehmer davon nicht mehr abgedeckt werden, und was dies für deren Entlohnung bedeutet. Wir zeigen, dass ungefähr 9 Prozent der Arbeitskräfte in tarifgebundenen Betrieben keine individuelle Abdeckung (und damit keinen Gewerkschaftslohn) mehr erfahren. Ökonometrische Analysen mit unbedingten Quantilsregressionen und Firmenfixe-Effekte-Schätzungen machen deutlich, dass das Fehlen einer individuellen Abdeckung durch Tarifverträge für die meisten Arbeitskräfte substanzielle Auswirkungen auf ihre Entlohnung hat. Nicht gewerkschaftlich organisierte Niedriglöhner und solche auf unteren Hierarchieebenen leiden besonders, weil ihre Arbeitgeber davon absehen, die Tariflöhne auf sie anzuwenden, um geringere Löhne zahlen zu können. Dieses Vorgehen gefährdet das gewerkschaftliche Ziel, alle benachteiligten Arbeitskräfte zu schützen.

JEL-Classification: J31, J53

Keywords: collective bargaining, union wage, uncovered workers, Germany

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# 1. INTRODUCTION

In recent decades, unionization has been on the decline worldwide, and collective bargaining coverage has fallen in many countries, including Germany (Visser 2019, OECD 2019, Schnabel 2020). What is more, in Germany fewer and fewer employers seem to extend the terms of the collective agreements they negotiated with unions to non-union members (which was first noted by Fitzenberger et al. 2013 but has been largely neglected in public discussions). In the past, it was a long-standing employer policy to treat union members and non-members in the same plant equally in order to prevent workers from joining unions. Abandoning this policy (plus the ongoing reduction in union membership) would imply that the effective coverage of workers by collective agreements is on the retreat, and that this retreat is more pronounced than usually assumed. In consequence, the German system of collective bargaining would become less comprehensive and probably instable, the protection of workers via collective agreements would weaken, and inequality between different groups of workers may rise.

In addressing these topics, it is a major problem that we do not know how many and which workers currently still benefit from being covered by collective agreements – either directly by being union members who are entitled to receive the union wage or indirectly by extension of the union wage to non-union members in a plant. It is also unknown how (non-union) workers in firms covered by a collective agreement are affected if their employer decides not to extend the terms of the collective agreement to them. More specifically, it would be interesting to see what this (non-)coverage implies in terms of wages. When investigating this hitherto neglected aspect, our main focus will not be comparing the wages of similar individuals in plants that are covered or not covered by union agreements – a question which has been analysed before in the literature. We rather prefer to look at differences in (non-)coverage within a plant and analyse the resulting heterogeneity among various groups of workers.

Briefly screening the extant literature for Germany, we see that the extent of bargaining coverage as well as its fall over time in the private sector has been documented in various studies (e.g., Addison et al. 2017, Oberfichtner and Schnabel 2019, Ellguth and Kohaut 2021). Usually such studies use survey data from the IAB Establishment Panel and they report the percentage of workers covered by collective bargaining under the assumption that all workers in plants bound by collective agreements receive the union wage (and employers do not differentiate between unionized and non-unionized workers). In contrast, using administrative data from the 2001 wave of the

German Structure of Earnings Survey, Fitzenberger et al. (2013) show that many plants in Germany that are bound by collective agreements do not pay all their workers according to the wage laid down in the collective agreement. The authors consequently distinguish between bargaining coverage at the firm level and at the individual level, and this distinction (and a more recent, expanded version of this dataset) will also be at the heart of our subsequent analysis.

Concerning the wage effects of bargaining coverage, there is some empirical evidence that workers receive higher wages in plants covered by collective bargaining, ceteris paribus, with estimates of the mean wage premium ranging from 2 to 8 percent and that this connection seems to reflect rent-sharing (e.g., Gürtzgen 2009, Addison et al. 2010, Hirsch and Müller 2020). Fitzenberger et al. (2013) find that a higher share of employees in a plant covered by a collective agreement is associated with higher wages, but – holding coverage at the plant level constant – individual coverage is associated with lower wages (and less wage dispersion). Their cross-sectional study, however, is restricted to the year 2001, to West Germany, and to prime-age male employees working full-time hours in jobs without managerial duties. Hence, it does not fully elaborate on the heterogeneity of groups of workers in terms of individual coverage and wage effects.

Against this background, the present study investigates which workers still benefit from collective agreements, which workers are not covered anymore, and what this means for their wages. Using a recent and representative administrative data set and applying unconditional quantile regressions and firm-fixed-effects estimations, we contribute to the literature by addressing the following research questions:

1) How large is the share of workers in plants covered by collective bargaining who do not enjoy effective individual coverage anymore? And who are the workers who are not individually covered?
2) What are the wage implications of not being individually covered (at the mean and across the wage distribution)? And do they differ for various types of workers?
3) Do unions still achieve their goal of protecting the most disadvantaged workers, such as low-skilled and low-paid workers (e.g. Blau and Kahn 1996)?

The paper is organized as follows: Section 2 sketches the institutional background of industrial relations and bargaining coverage in Germany and describes our rich data. Section 3 presents some descriptive evidence indicating that a substantial share of workers in plants covered by a collective agreement do not enjoy effective individual coverage (and thus not the union wage). Individual non-coverage is found to be more prevalent among men, managers, and workers in the bottom and the top quarter of the

wage distribution. Empirical evidence how individual (non-)coverage by collective agreements relates to workers' wages is presented in section 4. The results of our econometric analyses with unconditional quantile regressions and firm-fixed-effects estimations demonstrate that not being individually covered by a collective agreement has serious wage implications for most workers. Low-wage non-union workers and those at low hierarchy levels particularly suffer since employers abstain from extending union wages to them, in such a way jeopardizing unions' goal of protecting all disadvantaged workers. Section 5 concludes with a discussion why non-union workers do not react to being individually uncovered by simply joining unions.

## 2. INSTITUTIONAL BACKGROUND AND DATA

In Germany, the constitutionally protected principle of bargaining autonomy gives organizations of employers and employees the right to regulate wages and working conditions without state interference. Unions and employers negotiate regional or nationwide collective agreements that are legally binding and may be set up either as multi-employer agreements at industry level or as single-employer agreements at firm level. Firms may decide to be covered by these agreements, but they can also abstain from collective bargaining with unions and negotiate wages individually with their workers. If firms are bound by (single- or multi-employer) collective agreements, they cannot undercut, only improve upon the minimum terms and conditions laid down in these agreements, through voluntary premiums such as higher wages or more holidays. The concrete implementation and monitoring of collective agreements is often relegated to management and works councils. The latter are worker representatives that a plant's workforce may elect and that have substantial consultation and co-determination rights – albeit not concerning wage setting (for details on the German system of industrial relations and wage setting, see Gartner et al. 2013 or Keller and Kirsch 2021).

Collective bargaining agreements regulate wages, working hours and working conditions for all blue-collar workers and for most white-collar workers up to a certain hierarchy level, typically lower management, whereas for higher hierarchy levels contracts are negotiated individually between the employee and the employer. The wages and working conditions agreed in collective agreements apply only to the firms bound by the agreements (either directly or via membership in an employers' association) and to those of their workers who are members of the unions that signed the agreements. Non-union workers in a plant are not entitled to be paid the union

wage laid down in the collective agreement.[1] But employers are free to extend the agreed wages to workers who are not union members, in such a way reducing these workers' incentive to join the union in order to receive the union wage.[2] For many years, most employers have adopted such a strategy that intends to keep unionization low, so that the bargaining coverage of a firm was assumed to be equivalent to the bargaining coverage of its workers.

In fact, the most frequently used indicator of the bargaining coverage rate in Germany, which is based on an annual survey of about 16,000 plants in the IAB Establishment Panel (for details, see Ellguth and Kohaut 2021), follows this reasoning. It asks plants whether they are covered by a multi- or single-employer collective agreement and then reports the percentage of workers covered in the economy or in a sector under the premise that all workers in plants bound by collective agreements receive the union wage (assuming that firms do not differentiate between union members and non-unionized employees).

The picture differs if firms decide to pay the wage laid down in a collective agreement only to union members who are directly entitled to this wage, but do not extend this wage to non-union members.[3] This increasingly seems to be the case in Germany. Fitzenberger et al. (2013) show that among those plants in Germany that are bound by collective agreements, the large majority does not pay all their workers according to the wage laid down in the collective agreement. This insight is based on the German Structure of Earnings Survey (SES henceforth) for the year 2001, an administrative data set that allows a finer distinction in terms of worker coverage and that we also use in our empirical analysis.

We make use of the two latest surveys of the SES for the years 2014 and 2018, which are provided as scientific use files by the Federal Statistical Agency (*Statistisches Bundesamt*) of Germany (for details, see Federal Statistical Agency 2016, 2020). The SES 2014 and SES 2018 are representative surveys of all German firms with at least

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1 This principle of "double affiliation", i.e. that collective agreements directly cover only employees who are members of the union signing the agreement and work in a firm member of the signatory employer association, also applies in several other countries such as Sweden, Japan, and Korea. In contrast, in many countries there exist *erga omnes* clauses that extend the terms set in collective agreements to all employees, not restricted to the members of the signatory unions. For details, see OECD (2019, p. 49).

2 When joining a union, workers must pay a membership fee of about one percent of gross wages (Goerke and Pannenberg 2011).

3 If employers bound by a collective agreement do not want to pay the union wage to all workers in the plant, they either have to ask workers whether they are members of the union that concluded the agreement and are thus entitled to receive the union wage or they wait for workers declaring their union status. Refusing to pay union members the union wage would be a legal offence and could be easily detected since the terms of the collective agreement become public knowledge.

one worker, and each survey contains information on about 70,000 firms and one million workers. The data quality of these rich employer–employee data is high because most observations originate from firms' personnel records and because firms are obliged by law to answer the survey correctly, so that the SES differs from the IAB Establishment Panel in terms of its mandatory nature. It also differs from the latter in that it surveys all plants employing at least one worker and not just those plants with at least one worker subject to social security contributions. The survey's wider population, in turn, means that the SES also contains, for instance, small owner-led firms with only marginally employed among their workforce such as restaurants, shops, etc., which are absent from the IAB Establishment Panel.

Crucial for our purpose, the SES not only asks whether a plant is bound by a single-or multi-employer collective agreement, but covered plants also have to report for a random sample of their workers whether these are paid according to a collective agreement.[4] Consequently, the information from the SES allows us to identify uncovered workers in covered plants and thus to observe the effective individual coverage of workers by collective agreements. That said, two drawbacks of our data are that the surveys are repeated cross sections rather than panel data and that they do not include information on the existence of works councils which form the second backbone of the German model of industrial relations (Oberfichtner and Schnabel 2019).

Apart from the information about collective agreement coverage, the SES data include a wide set of worker and plant characteristics. Worker characteristics comprise, *inter alia*, information on workers' earnings, sex, age, job tenure, working hours, educational attainment as well as on hierarchy levels, temporary (as opposed to permanent) contracts, and occupations.[5] The SES data thus differ from other administrative data for Germany, in particular the linked employer–employee data provided by the IAB, in that they contain detailed information on working hours and thus accurate hourly wages, and in that the included earnings information is not subject to censoring,

[4] Specifically, in the survey's questionnaire, plants report (based on their personnel files) whether for each selected worker a multi-employer or a single-employer agreement applies or no collective agreement at all. As the data further include information on whether the plant is bound by a collective agreement or not, we can combine these two pieces of information to identify individual coverage or non-coverage of a worker employed by a covered plant.

[5] The SES 2014 and 2018 distinguish five different hierarchy levels: workers with simple tasks, workers without decision-making, experienced workers, specialists, and workers with managerial duties. Workers are assigned into these levels based on the occupational grouping in the collective agreement or, if no collective agreement applies, based on a grouping by the firm along the same dimensions laid down in collective agreements.

thereby permitting us to analyse top earners' wages.[6] Plant characteristics include information on firm size, workplace size, industry, location in either West or East Germany, and coverage by collective wage agreements as detailed above. We use these data to build up a sample of workers aged 18 to 65 years employed in the private sector excluding apprentices, marginally employed, partial retirees, and temporary agency workers.

## 3. DESCRIPTIVE EVIDENCE

Using the SES data, Table 1 provides various coverage rates of collective agreements for the years 2014 and 2018 where we weight observations for individual workers using the SES sample weights. The first coverage rate reports the percentage of workers employed by a plant that is bound by a collective agreement and thus implicitly assumes that all workers in a covered plant are also covered at individual level. In 2014, 43 percent of workers hold jobs at a covered plant where 34 percent of workers are employed by a plant covered by a multi-employer agreement and 9 percent by a plant covered by a single-employer agreement. Four years later in 2018, only 38 percent of workers hold jobs at covered plants which amounts to a fall in the coverage rate by 5 percentage points. Furthermore, in 2018, 31 percent or 6 percent of workers, respectively, are employed by a plant covered by a multi-employer or single-employer agreement.

Comparing these numbers to numbers obtained from the IAB Establishment Panel, which also allows to calculate the share of workers employed by covered plants, we find that coverage rates from the IAB data are generally higher (but the downward trend is quite similar). In 2014, 58 percent of workers in the IAB data work in plants covered by collective agreements, and 54 percent of workers do so in 2018 (Ellguth and Kohaut 2015, 2019). This discrepancy, however, is hardly surprising because the population of the IAB Establishment Panel is restricted to plants with at least one worker subject to social security contributions and thus misses all those small plants unlikely to be covered by collective agreements that only employ workers who are not subject to social security contributions, for example owner-led plants with only marginally employed workers.

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[6] The exception is a negligible number of workers with exceptionally high earnings, i.e. yearly earnings exceeding € 750,000, whose earnings are censored and whom we, for this reason, exclude from our analysis.

(Table 1 about here)

The second coverage rate in Table 1 reports the percentage of workers who are individually covered by a collective agreement, that is workers who work at a covered plant and receive the union wage. In 2014, 39 percent of workers are covered by collective agreements and this number falls by 5 percentage points to 34 percent four years later. These numbers are lower than the percentages of workers employed by covered plants and thus make clear that a non-negligible number of workers are indeed uncovered by collective agreements despite working for a covered plant. In other words, we have clear evidence that employers do not extend union wages to all non-union members and that the prevalence of such exemptions is non-trivial in magnitude.

Specifically, in 2014, 8 percent of workers employed by a covered plant are uncovered, and this number even rises somewhat to 9 percent in 2018 (Table 1). What is more, we see that the prevalence of exemptions is smaller for single-employer than for multi-employer collective agreements which suggests that single-employer agreements are more often extended to non-unionized workers (though we lack information on individual union membership to substantiate this point because we do not know whether unionization rates are different across plant with single- and multi-employer collective agreements). That exemptions are larger for multi- than for single-employer agreements seems plausible given that the latter are tailor-made for the specific employer at hand.

Next, Table 2 shows for the most recent SES 2018 survey coverage rates across different groups of workers. Both the percentage of workers employed by a covered plant and the prevalence of workers who are individually covered by a collective agreement vary substantially across these groups of workers considered, but the patterns of both are in general very similar. We thus focus on the rate of individual coverage. Individual coverage is larger in West (35 percent) than in East Germany (29 percent), and it varies substantially among firms of different size and among sectors. Individual coverage is substantially rising with firm size and, among sectors, it is highest in agriculture, mining, energy, and water (49 percent) and lowest in services (31 percent).

(Table 2 about here)

Turning to worker characteristics, we find that individual coverage is higher for workers aged 50 or older compared to younger workers, but similar for men and women and for workers on full-time and on part-time hours. We further find substantial differences in individual coverage along hierarchy levels. 43 percent of specialists, which is the second-highest category, are individually covered followed by workers on simple tasks at the bottom of the hierarchy where 38 percent are individually covered. For workers on the other three hierarchy levels the individual coverage rate ranges from 30 to 35 percent. Moreover, individual coverage is much higher in the upper half of the wage distribution (46 to 47 percent in the two top quarters of the wage distribution) than in the bottom half (15 percent in the lowest and 30 percent in the second quarter of the distribution). If individual coverage leads to wage gains, we expect to see more covered workers in the upper part of the wage distribution, in line with these patterns.

Our main interest is analysing the non-extension of collective agreements reported in the last column of Table 2. Although there are some differences across subgroups in the number of workers that are uncovered by collective agreements despite working for covered plants, on which we will comment in a moment, the general impression is that the non-extension of collective agreements is pervasive. For only few groups of workers, we find substantial deviations from the average share of uncovered workers in covered plants of 9 percent.

Turning to the differences across groups of workers, we find little such differences among East and West Germany, among firms of different size, and among workers of different age. However, there exist some non-trivial differences across some groups. Among sectors, exemptions are most often found in construction (12 percent) and least often among agriculture, mining, energy, and water (7 percent). Men (11 percent) are more often uncovered by collective agreements despite working for a covered plant than women (8 percent) and full-time workers (10 percent) more often than part-time workers (7 percent); in other words, these groups of workers are more often exempt from collective agreements. Moreover, we see that workers at higher hierarchy levels are much more often exempt than workers at lower hierarchy levels. Whereas 24 percent of workers with managerial duties and 11 percent of specialists are exempt, the same holds true for only 6 to 7 percent of experienced workers, workers with no decision-making, and workers with simple tasks. The high share of workers with managerial duties who are not covered by collective agreements is not surprising given the fact (mentioned above) that for higher hierarchy levels contracts are often negotiated individually between the employee and the employer rather than collectively with the union.

Finally, we see clear differences in exemption rates along the wage distribution. Whereas 13 percent of workers in the bottom quarter of the wage distribution and 14 percent of workers in the top quarter are exempt from collective agreements, just 5 percent of workers in the second and 8 percent of workers in the third quarter are uncovered by collective agreements despite working for a covered plant. This latter finding not only documents that low-wage and high-wage workers are more often exempt from collective agreements, but it also suggests that employers' decision not to extend union wages is specifically targeted at these two groups. It is tempting to suspect that firms do not extend the collective agreement to low-wage workers to pay lower wages to these workers, which would, in turn, mean that particularly vulnerable low-wage workers would suffer more from not getting the union wage. On the other hand, employers often exempt high-wage workers from collective agreements to negotiate their pay individually which may result in even higher wages to these workers than to covered workers. We will investigate these possibilities in more detail in the following section.

Answering our first research question, the descriptive evidence presented here makes clear that a substantial share of about 9 percent of workers in plants covered by a collective agreement do not enjoy effective individual coverage (and thus not the union wage). Individual non-coverage is more pronounced among some groups of workers such as men, managers, and workers in the bottom and the top quarter of the wage distribution.

## 4. WAGE EFFECTS

We now turn to how individual coverage by collective agreements relates to workers' wages. To that end, we run several wage regressions on the most recent 2018 SES survey.[7] Specifically, we regress the log hourly wage $\ln w_{ij}$ of worker $i$ employed by plant $j$ on a dummy indicating individual coverage of the worker $workercovered_i$, a dummy indicating a plant covered by a collective agreement $plantcovered_j$, and a set of worker and plant controls $\mathbf{x}_i$ and $\mathbf{z}_j$, respectively. Hence, our baseline regression model reads:

$$\ln w_{ij} = \beta_0 + \beta_1 workercovered_i + \beta_2 plantcovered_j + \mathbf{x}_i'\boldsymbol{\gamma} + \mathbf{z}_j'\boldsymbol{\delta} + u_{ij} \qquad (1)$$

[7] We decided against pooling observations from the 2014 and 2018 SES cross sections because the large sample size of the 2018 survey alone guarantees sufficient power in estimation. Besides, our insights do not change when running the wage regressions on the 2014 SES survey instead, which we do in a later robustness check.

where $u_{ij}$ denotes the regression model's error term. Note that by construction the dummy $workercovered_i$ will only be one if the individual worker is covered by a collective agreement and also works for a covered plant meaning that $plantcovered_j$ is one, too. Hence, $\beta_2$ informs us on the wage consequences of plant coverage, that is the difference of wages of uncovered workers at covered and uncovered plants, whereas $\beta_1$ gives the wage consequences of individual coverage in covered plants.[8]

To estimate how individual coverage relates to wages along the wage distribution, we estimate equation (1) for the mean of the wage distribution by OLS and we run unconditional quantile regressions for various quantiles of the wage distribution using the recentred influence function (RIF) approach (Firpo et al. 2009).[9] In all these regressions, $\beta_1$ is identified from both between-plant and within-plant variation in wages that is left after controlling for worker and plant characteristics.

Since our focus is on the wage consequences of individual coverage by collective agreements, an alternative approach is to use within-plant variation in wages only, that is to just compare covered and uncovered workers within plants that are covered by collective agreements (remember that in uncovered plants $workercovered_i$ is zero by construction). For that purpose, we also run fixed-effects regressions:

$$\ln w_{ij} = \alpha_j + \tilde{\beta}_1 workercovered_i + \mathbf{x}_i'\tilde{\boldsymbol{\gamma}} + \epsilon_{ij} \qquad (2)$$

where $\alpha_j$ denotes the fixed effect belonging to plant $j$, which thus both absorbs the dummy for covered plants $plantcovered_j$ and all other plant controls $\mathbf{z}_j$, and $\epsilon_{ij}$ is the error term. The big advantage of regression model (2) over model (1) is that comparing workers within plants means controlling for all plant observables and unobservables, in particular for the existence of works councils, which we do not observe in our data and which has been found to matter significantly for wages (e.g. Addison et al. 2010, Hirsch and Müller 2020). In the fixed-effects regression (2), $\tilde{\beta}_1$ is identified solely from wage differences between covered and uncovered workers who are employed by the same plant and thus informs us on the wage advantage of covered over uncovered workers within covered plants. Again, we estimate equation (2) for the mean of the wage distribution by OLS and for various quantiles of the unconditional wage distribution in RIF regressions.

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[8] Note that our specification does not distinguish plants covered by single-employer and plants covered by multi-employer collective agreements. In regressions that include both groups separately, we find little differences that do not change our insights. Besides, estimates for coverage by single-employer agreements are much less precise, which is hardly surprising given that multi-employer agreements are still the norm in Germany.

[9] We estimate the RIF regressions in Stata using the user-written programs by Rios-Avila (2020).

Table 3 reports the baseline estimates of regression models (1) and (2) for the mean of the wage distribution and beyond. In terms of worker characteristics, the models control for workers' educational attainment, sex, age (linearly and squared), job tenure (linearly and squared), two-digit occupation as well as for the hierarchy level, a temporary contract, and working full-time. In terms of plant characteristics, the models without plant fixed effects control for firm size, plant size, two-digit industry, and plant location in East Germany (which will be otherwise absorbed by the fixed effect).

(Table 3 about here)

In the regressions without plant fixed effects in the upper panel of Table 3, we see that plant coverage by collective agreements is associated with higher wages at the mean and particularly in the upper part of the wage distribution, *ceteris paribus*.[10] The OLS estimate of the coefficient of plant coverage of 0.086 implies that a 10 percentage points larger rate of covered plants is associated with an increase in the mean wage by about 0.9 percent, which is statistically significant at the 1 percent level. The associated increase is of similar magnitude for the third quartile and amounts to even 3.1 percent for the ninth decile, whereas it is much smaller in magnitude for lower quantiles. Although the positive correlation between wages and plant coverage could reflect that plant coverage per se is driving up wages, it is no less consistent with the view that covered plants perform better and, for this reason, pay higher wages.

Turning to the wage consequences of workers' individual coverage by collective agreements in covered plants, we see no significant association (neither in economic nor in statistical terms) of individual coverage with the mean wage. Yet, this finding obscures divergent impacts of individual coverage on the lower and the upper part of the wage distribution that together compress the wage distribution without altering its centre. A 10 percentage points larger rate of individual coverage by collective agreements is associated with a statically significant rise in the first decile, the first quartile, and the median of wages in the range of 0.8–1.3 percent. This finding

[10] As detailed in Firpo et al. (2009), RIF regressions approximate the impact of an infinitesimal change in the distribution of a regressor on the respective unconditional quantile of the outcome distribution. For dummy variables, such as the dummy for a plant covered by a collective agreement in our wage RIF regressions, a unit change would refer to a very large change, i.e. from no coverage of any plant to complete coverage of all plants, and consequently the impact of such a large change in the coverage rate on the outcome distribution may be badly approximated by the RIF regression. For this reason, we will all the time consider, as a thought experiment, an increase in the coverage rate by 10 percentage points, which for example means that the rate of plant coverage increases from its mean of 38 percent of workers to 48 percent of workers.

suggests that employers abstain from extending union wages to low-wage non-union workers in order to pay lower wages to this group.[11] Yet, these results for the lower half of the wage distribution contrast with what we find for high-wage workers at the top of the distribution. A 10 percentage points larger rate of individual coverage is associated with significant drop in the third quartile by 0.4 percent and a significant drop in the ninth decile by even 3.8 percent. These findings suggest that for uncovered high-wage workers union wages are considerably lower than the wages paid to them outside the collective agreement, in line with our previous reasoning.

Turning to the lower panel of Table 3 that shows fixed-effects wage regressions, we see that the wage consequences of individual coverage in covered plants change little when we rest identification exclusively on the comparison of wages of covered and uncovered workers within covered plants. The only exception are workers at the very top of the wage distribution. A 10 percentage points larger individual coverage rate is now associated with a significant drop in the ninth decile by 5.6 percent (compared to 3.8 percent in the model without the fixed effects). This more pronounced wage compression of individual coverage at the top of the wage distribution, in turn, means that such an increase in individual coverage is now associated with a slightly lower mean wage by 0.5 percent. Figure 1 clearly shows that individual coverage is accompanied by higher wages up to the seventh decile of the wage distribution whereas it associated with lower wages for top earners.

(Figure 1 about here)

Next, we run separate fixed-effects OLS and RIF regressions for West and East Germany, for men and women, and for workers at different hierarchy levels. Table 4 shows the core estimates for the impact of workers' individual coverage by collective agreements in covered plants. It corroborates the general patterns found in Table 3 for most groups, but it also points at some rather suggestive differences across groups. To start with, we find little differences between West and East Germany and between men and women. For all these groups, an increase in individual coverage is accompanied by higher wages in the lower half of the wage distribution and by smaller wages at the top of the wage distribution, so that individual coverage significantly

[11] Keep in mind, though, that we found mean wages and all unconditional wage quantiles to be significantly higher in covered than in uncovered plants, which means that overall, i.e. when summing up $\hat{\beta}_1$ and $\hat{\beta}_2$, uncovered workers in covered plants are still not worse off than their counterparts in uncovered plants. The only exception are high-wage workers at the top of the wage distribution as for the ninth decile the sum of these two is slightly negative.

compresses the unconditional wage distribution. The only difference across groups is that the negative impact of individual coverage on wages in the upper part of the wage distribution occurs at lower quantiles for West German compared to East German workers and for men compared to women. This finding may reflect that we observe fewer top earners in East Germany and among women who for this reason are exempt from collective agreements (i.e. are individually uncovered despite working for a covered plant).

(Table 4 about here)

Turning to workers at different hierarchy levels, we find clear differences in the wage consequences of individual coverage (see also Figure 2). For workers with simple tasks and workers without decision-making, higher individual coverage lifts the entire wage distribution and even more so the distribution's upper part, so that an increase in individual coverage not only improves wage outcomes generally but also widens the wage distribution of these low-hierarchy workers. In other words, uncovered low-hierarchy workers in covered plants lose substantially compared to their covered counterparts and high earners among low-hierarchy workers even more so. This implies that joining a union in order to obtain the union wage is particularly attractive to higher-wage low-hierarchy workers.[12]

(Figure 2 about here)

These findings for low-hierarchy workers contrast with workers at higher hierarchy levels. For experienced workers in the middle of the hierarchy, the wage consequences of individual coverage look quite similar to what we found for all workers in Table 3, that is individual coverage is associated with higher wage quantiles up to the median and a drop in the wage quantiles at the top. Finally, for specialists and workers with

[12] That low-hierarchy workers would gain most from individual coverage may arouse concerns that these workers respond by joining a union, thereby rendering individual coverage endogenous in the wage regressions. Although we cannot rule out ?some such? endogenous responses of individual coverage, we see little evidence in our data suggesting a big role for this concern. As we saw before, low-hierarchy workers are not less often uncovered by collective agreements despite working for a covered plant than workers at higher levels. Moreover, we do not find that the rise in the exemption rate from collective agreements over time is absent for low-hierarchy workers. In short, our data do not suggest (much) endogenous responses in individual coverage.

managerial duties at the top of the hierarchy, the negative impact of individual coverage for wages occurs at considerably lower quantiles. These contrasting wage impacts of individual coverage for workers at different hierarchy levels suggest that employers abstain from extending the union wage to low- and high-hierarchy workers for different reasons: to pay even lower wages for low-wage workers at the bottom of the hierarchy, who would thus gain from individual coverage; and to pay even higher wages to high-wage workers at the top of the hierarchy, who would thus receive lower wages when individually covered and, in turn, gain from being exempt from the collective agreement.

To check the robustness of our findings, we now turn to the SES 2014 survey and run our preferred fixed-effects wage regressions on this sample, too. Table 5 reports fixed-effects OLS and RIF regressions akin to those from Tables 3 and 4 for the 2018 SES survey. Comparing the estimates for all workers and the separate estimates for East and West Germany as well as for men and women, we only find little differences across the SES 2014 and SES 2018 surveys. Turning to the separate estimates by workers' hierarchy level, however, we see some changes in the impact of individual coverage for the two lowest hierarchy levels. For workers with simple tasks and for workers without decision-making, individual coverage has a much bigger positive impact on the lower wage quantiles (up to the median) in the SES 2014 than in the SES 2018 survey (see also Figure 3). One likely explanation for this difference is that the introduction of the statutory minimum wage in Germany in 2015 lifted the wages of uncovered low earners among the low-hierarchy workers to such an extent that for this group individual coverage is no longer accompanied by substantial wage gains in 2018, thereby also weakening the incentives for this group of workers to join a union. That said, this difference in the estimates for low-wage, low-hierarchy workers does not change any of our insights from the SES 2018 survey.

(Table 5 about here)

In terms of our second research question, the econometric analyses have shown that not being individually covered by a collective agreement has substantial wage implications for most workers. In particular, it is low-wage non-union workers who suffer since employers abstain from extending union wages to them, probably to be able to pay lower wages to this group. In terms of hierarchy level, we find corresponding evidence for workers who perform simple tasks and who are not involved in decision-making. With respect to our third research question, these findings imply that the

German unions' goal of protecting the most disadvantaged workers (not only union members) seems to be jeopardized by employers not extending the wages and working conditions laid down in collective agreements to non-union workers.

## 5. Conclusions

Using representative administrative data for Germany, this study has investigated which workers in firms covered by collective bargaining agreements still individually benefit from these agreements, which workers are not covered anymore, and what this means for their wages. Substantiating and updating an early insight by Fitzenberger et al. (2013), we show that many plants bound by collective agreements do not pay all their workers according to the wage laid down in these agreements, so that the effective individual coverage of workers by collective agreements is much lower than usually assumed. In 2018, a substantial share of about 9 percent of workers in plants covered by a collective agreement did not enjoy individual coverage (and thus the union wage) anymore. Individual non-coverage concentrates among men, managers, and workers in the bottom and the top quarter of the wage distribution.

Our econometric analyses with unconditional quantile regressions and firm-fixed-effects estimations demonstrate that not being individually covered by a collective agreement has serious wage implications for most workers. Low-wage non-union workers particularly suffer since employers abstain from extending union wages to them, arguably to be able to pay lower wages. In terms of hierarchy level, we find corresponding evidence for workers who perform simple tasks and who are not involved in decision-making. Although unions in Germany still pursue their goal of protecting the most disadvantaged workers, such as low-skilled and low-paid workers, and also achieve this goal for their members (because collective agreements directly apply to members if they work for an employer covered by such an agreement), employers increasingly seem to counteract by not extending the wages and working conditions laid down in collective agreements to non-union workers. This behaviour may be a reaction to long-standing employer complaints that union wages are too high, in particular for less qualified workers (discussed, e.g., by Schnabel 2003). It also suggests that some employers have given up their traditional policy of treating union members and non-members equally to prevent workers from joining unions.

Given this unequal treatment, it is an open question why non-union workers do not react to the fact (or threat) of being individually uncovered by simply joining unions. Although union membership dues are about one percent of gross wages (Goerke and

Pannenberg 2011), these additional costs are in many cases lower than the earnings foregone when not receiving the union wage. Of course, some workers may still be free-riding successfully if their employers do not differentiate between unionized and non-unionized workers and pay the same wage to all of them. But we have shown that in particularly many of the most disadvantaged non-union workers would get higher wages if they became union members. Nevertheless, like in many other countries, union membership and density are steadily falling in Germany, and the share of low-skilled workers among union members is lower than their share in employment (Biebeler and Lesch 2015). Union recruiting probably should focus more on these disadvantaged workers and make clearer to them what the economic benefits from joining the union are. That said, it is not only rational choice considerations but also social, political, and psychological factors that influence individuals' decision (not) to become a union member (see the survey by Schnabel 2020).

One policy option discussed in Germany is promoting union membership by making membership dues tax-deductible to a greater extent than currently possible. To avoid unequal treatment of workers, Germany could adopt *erga omnes* clauses that automatically extend coverage by a collective agreement by applying it to all workers in a firm, not only members of the signatory union, which (*de jure* or *de facto*) is the case in many other countries (see OECD 2019, p. 49). However, German employers generally oppose statutory bargaining extensions, which contrasts with other countries such as the Netherlands (see the comparison of these two countries by Paster et al. 2020). Finally, unequal treatment of (low-wage) workers will also be reduced to some extent by the substantial increase in the statutory minimum wage to 12 Euros per hour which is planned for 2022 by the new government in Germany.

A certain limitation of our analysis is that we only have cross-sectional and not panel data, so we cannot claim to have identified causal effects of individual non-coverage for affected workers. Despite this caveat, our detailed administrative data allow us to provide fresh evidence on how individual non-coverage and the resulting negative wage effects are related to personal and workplace characteristics. Once panel data are available, a promising area of further research may be analysing which factors have played a role over time in explaining firms' decision not to extend the terms of collective agreements to all workers in a plant and how this has affected individuals' earnings and employment paths as well as overall wage inequality.

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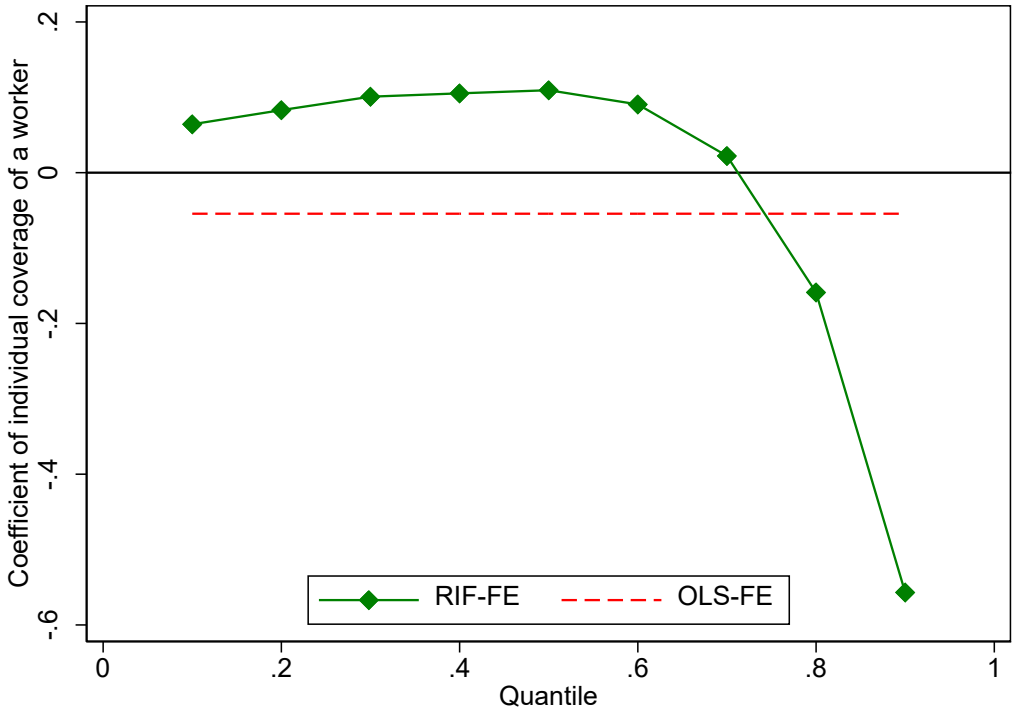


**Figure 1:** Estimated coefficient of individual coverage of a worker by a collective agreement in a covered plant from fixed-effects OLS and RIF regressions

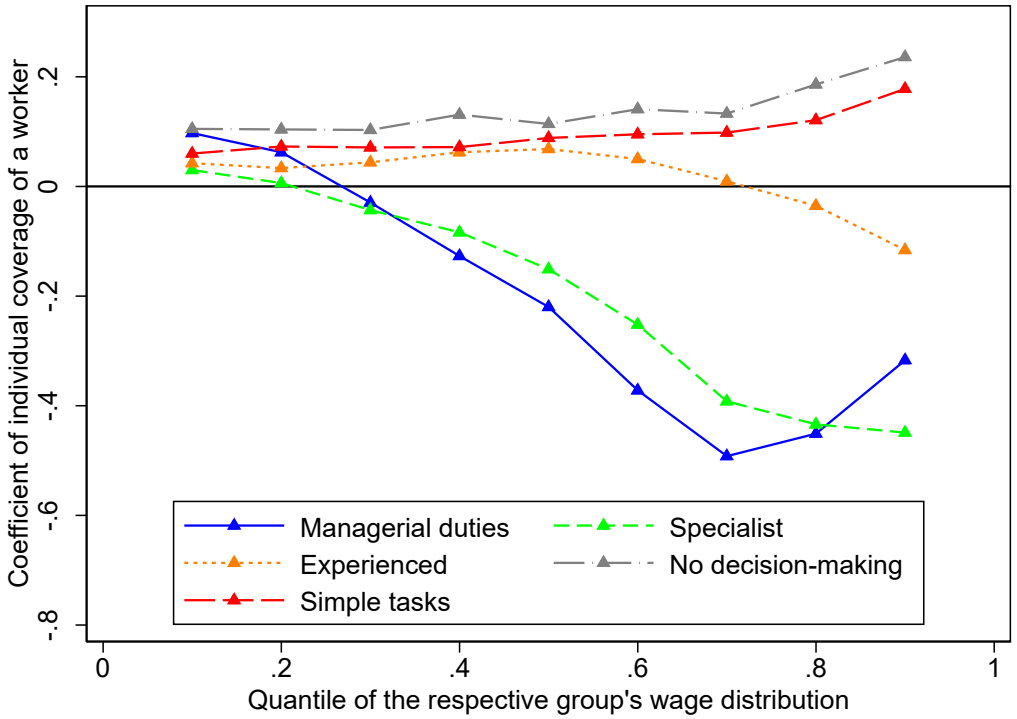


**Figure 2**: Estimated coefficient of individual coverage of a worker by a collective agreement in a covered plant from fixed-effects RIF regressions by hierarchy level (SES 2018)

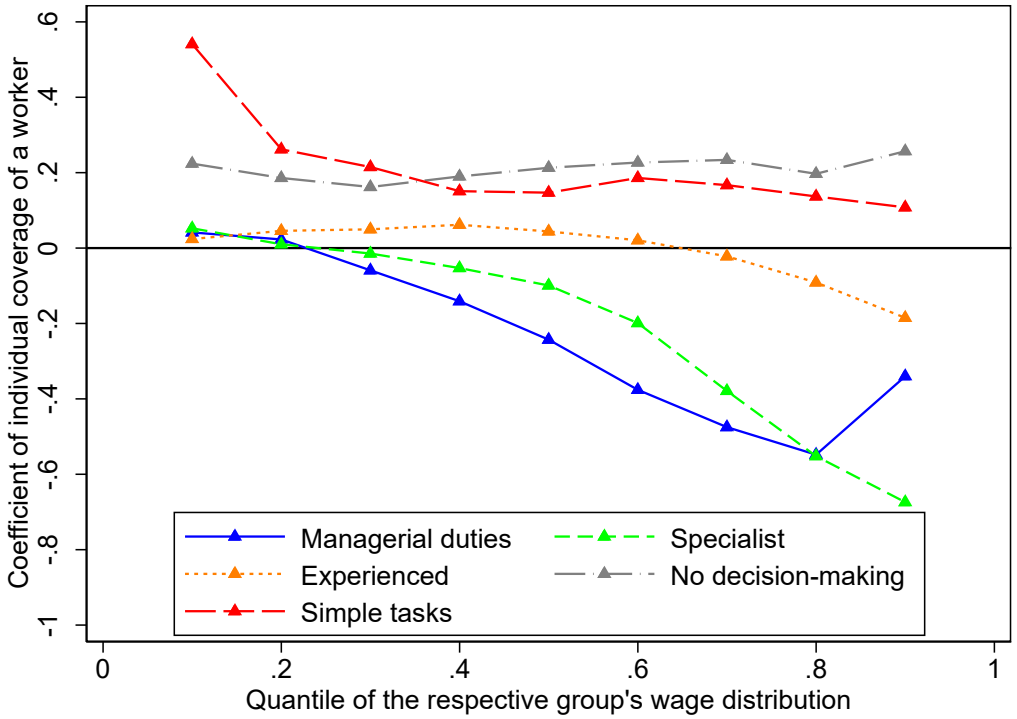


**Figure 3**: Estimated coefficient of individual coverage of a worker by a collective agreement in a covered plant from fixed-effects RIF regressions by hierarchy level (SES 2014)

**Table 1: Worker coverage rates**

| | Year | | |
|---|---|---|---|
| | 2014 | 2018 | |
| | coverage rate (%) | | Δ pp |
| Worker works in a covered plant | | | |
| Overall | 42.85 | 37.91 | -4.94 |
| Multi-employer agreement | 33.85 | 31.48 | -2.37 |
| Single-employer agreement | 9.00 | 6.43 | -2.57 |
| Worker is individually covered by a collective agreement | | | |
| Overall | 39.37 | 34.37 | -5.00 |
| Multi-employer agreement | 30.93 | 28.38 | -2.55 |
| Single-employer agreement | 8.44 | 5.99 | -2.45 |
| Share of uncovered workers among workers in covered plants | | | |
| Overall | 8.12 | 9.34 | 1.22 |
| Multi-employer agreement | 8.63 | 9.85 | 1.22 |
| Single-employer agreement | 6.22 | 6.84 | 0.62 |

*Notes*: SES 2014 and 2018. Weighted using sample weights.

**Table 2: Worker coverage for subgroups in 2018**

| | Worker works in a covered plant (%) | Worker is individually covered by a collective agreement (%) | % of uncovered workers among workers in covered plants |
|---|---|---|---|
| West | 38.91 | 35.21 | 9.51 |
| East | 31.45 | 28.89 | 8.14 |
| Agriculture, Mining, Energy, and Water | 52.76 | 49.23 | 6.69 |
| Construction | 44.12 | 39.02 | 11.56 |
| Manufacturing | 45.08 | 41.08 | 8.87 |
| Services | 34.69 | 31.38 | 9.54 |
| Firm size | | | |
| 1-49 | 16.33 | 14.84 | 9.12 |
| 50-250 | 30.98 | 27.88 | 10.01 |
| 250 and more | 64.75 | 58.80 | 9.19 |
| Men | 37.57 | 33.50 | 10.83 |
| Women | 38.30 | 35.37 | 7.65 |
| Full-time | 38.17 | 34.23 | 10.32 |
| Part-time | 37.38 | 34.65 | 7.30 |
| Age | | | |
| 18-29 | 34.09 | 31.28 | 8.24 |
| 30-49 | 36.34 | 32.89 | 9.49 |
| 50 and older | 41.46 | 37.50 | 9.55 |
| Hierarchy level | | | |
| Managerial duties | 45.89 | 34.72 | 24.34 |
| Specialist | 47.92 | 42.59 | 11.12 |
| Experienced worker | 34.30 | 32.24 | 6.01 |
| No decision-making | 32.32 | 30.08 | 6.93 |
| Simple tasks | 41.31 | 38.31 | 7.26 |
| Wage quartiles | | | |
| Wage<Q1 | 16.88 | 14.74 | 12.68 |
| Q1<Wage<Median | 32.18 | 29.69 | 7.74 |
| Median<Wage<Q3 | 48.45 | 46.24 | 4.56 |
| Wage>Q3 | 54.11 | 46.78 | 13.55 |

*Notes*: SES 2018. Weighted using sample weights.

**Table 3: OLS, Fixed-effects and RIF regressions (SES 2018)**

OLS regression for the mean and RIF regressions for different quantiles of workers' log wage

| | Mean | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|
| Worker covered | -0.00825 | 0.0783 | 0.128 | 0.114 | -0.0416 | -0.376 |
| | (0.00634) | (0.00624) | (0.00725) | (0.00705) | (0.0109) | (0.0216) |
| Plant covered | 0.0862 | 0.00964 | 0.0413 | 0.0202 | 0.0895 | 0.312 |
| | (0.00674) | (0.00654) | (0.00752) | (0.00721) | (0.0110) | (0.0221) |

Fixed-effects OLS regression for the mean and RIF regressions for different quantiles of workers' log wage

| | Mean | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|
| Worker covered | -0.0544 | 0.0643 | 0.0936 | 0.109 | -0.0432 | -0.557 |
| | (0.00609) | (0.00590) | (0.00639) | (0.00707) | (0.0128) | (0.0254) |

*Notes:* SES 2018. Standard errors clustered at plant level in parentheses. Further controls included in the regressions are a worker's age (linearly and squared), tenure (linearly and squared); dummies for the worker's education, sex, two-digit occupation, hierarchy level, for working on full-time hours and on a temporary contract; and, in the regressions without plant fixed effects, dummies for firm size, plant size, and plant location in East Germany.

**Table 4: Fixed-effects and RIF regressions for subgroups (SES 2018)**

Fixed-effects OLS regression for the mean and RIF regressions for different quantiles of workers' log wage (estimates of the coefficient of worker covered)

| | Mean | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|
| West | -0.0570 | 0.0706 | 0.0924 | 0.100 | -0.0786 | -0.556 |
| | (.00653) | (0.00754) | (0.00684) | (0.00775) | (0.0139) | (0.0267) |
| East | -0.0372 | 0.0688 | 0.0701 | 0.126 | 0.0860 | -0.269 |
| | (0.0159) | (0.0117) | (0.0144) | (0.0169) | (0.0280) | (0.0518) |
| Men | -0.0766 | 0.0663 | 0.0898 | 0.0927 | -0.144 | -0.630 |
| | (0.00675) | (0.00739) | (0.00728) | (0.00979) | (0.0160) | (0.0310) |
| Women | -0.0185 | 0.0616 | 0.0734 | 0.100 | 0.0571 | -0.320 |
| | (0.00888) | (0.00980) | (0.0115) | (0.00921) | (0.0149) | (0.0349) |
| Hierarchy level | | | | | | |
| Managerial duties | -0.192 | 0.0973 | 0.0212 | -0.220 | -0.537 | -0.317 |
| | (0.0117) | (0.0184) | (0.0178) | (0.0238) | (0.0362) | (0.0431) |
| Specialists | -0.195 | 0.0299 | -0.0159 | -0.151 | -0.441 | -0.449 |
| | (0.00830) | (0.0127) | (0.0129) | (0.0157) | (0.0224) | (0.0356) |
| Experienced | 0.0128 | 0.0424 | 0.0442 | 0.0683 | -0.0124 | -0.116 |
| | (0.00990) | (0.0139) | (0.0151) | (0.0151) | (0.0213) | (0.0265) |
| No decision-making | 0.166 | 0.105 | 0.101 | 0.114 | 0.166 | 0.236 |
| | (0.0588) | (0.0392) | (0.0385) | (0.0471) | (0.0554) | (0.118) |
| Simple tasks | 0.118 | 0.0600 | 0.0613 | 0.0885 | 0.120 | 0.178 |
| | (0.0337) | (0.0171) | (0.0271) | (0.0393) | (0.0582) | (0.110) |

*Notes:* SES 2018. Standard errors clustered at plant level in parentheses. Further controls included in the regressions are a worker's age (linearly and squared), tenure (linearly and squared); dummies for the worker's education, sex, two-digit occupation, hierarchy level, for working on full-time hours and on a temporary contract; and, in the regressions without plant fixed effects, dummies for firm size, plant size, and plant location in East Germany.

**Table 5: Fixed-effects and RIF regressions (SES 2014)**

Fixed-effects OLS regression for the mean and RIF regressions for different quantiles of workers' log wage (estimates of the coefficient of worker covered)

| | Mean | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|
| All workers | -0.0595 | 0.0878 | 0.102 | 0.107 | -0.0242 | -0.622 |
| | (0.00693) | (0.00658) | (0.00655) | (0.00663) | (0.0133) | (0.0341) |
| West | -0.0676 | 0.0817 | 0.0991 | 0.0902 | -0.0593 | -0.664 |
| | (.00752) | (0.00629) | (0.00679) | (0.00720) | (0.0157) | (0.0333) |
| East | 0.00129 | 0.115 | 0.0837 | 0.126 | 0.114 | -0.153 |
| | (0.0140) | (0.0163) | (0.0137) | (0.0182) | (0.0275) | (0.0399) |
| Men | -0.0930 | 0.0935 | 0.0928 | 0.0869 | -0.125 | -0.787 |
| | (0.00766) | (0.00817) | (0.00666) | (0.00909) | (0.0177) | (0.0322) |
| Women | 0.0016 | 0.0882 | 0.0735 | 0.111 | 0.0577 | -0.197 |
| | (0.0108) | (0.0112) | (0.0103) | (0.0101) | (0.0146) | (0.0384) |
| Hierarchy level | | | | | | |
| Managerial duties | -0.224 | 0.0415 | -0.0152 | -0.243 | -0.527 | -0.340 |
| | (0.0115) | (0.0127) | (0.0257) | (0.0308) | (0.0444) | (0.0421) |
| Specialists | -0.215 | 0.0525 | -0.00330 | -0.0992 | -0.445 | -0.674 |
| | (0.00986) | (0.0145) | (0.0122) | (0.0180) | (0.0293) | (0.0572) |
| Experienced | -0.0129 | 0.0241 | 0.0395 | 0.0442 | -0.0501 | -0.185 |
| | (0.0100) | (0.0136) | (0.0125) | (0.0118) | (0.0182) | (0.0315) |
| No decision-making | 0.237 | 0.224 | 0.172 | 0.213 | 0.174 | 0.257 |
| | (0.0463) | (0.0509) | (0.0287) | (0.0376) | (0.0412) | (0.105) |
| Simple tasks | 0.262 | 0.541 | 0.232 | 0.147 | 0.149 | 0.108 |
| | (0.0474) | (0.0865) | (0.0383) | (0.0312) | (0.0490) | (0.0761) |

*Notes:* SES 2014. Standard errors clustered at plant level in parentheses. Further controls included in the regressions are a worker's age (linearly and squared), tenure (linearly and squared); dummies for the worker's education, sex, two-digit occupation, hierarchy level, for working on full-time hours and on a temporary contract; and, in the regressions without plant fixed effects, dummies for firm size, plant size, and plant location in East Germany.

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