Received: 13 February 2023 | Revised: 6 July 2023 | Accepted: 14 July 2023

DOI: 10.1111/kykl.12354

KYKLOS WILEY

ORIGINAL ARTICLE

Free riding on short-time work allowances? Results from an experimental survey design

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Abstract

Short-time work (STW) is a policy measure whose prominence increases during economic crises and is intended to stabilize the labor market. Employers can temporarily reduce employees' working hours, which are in turn paid by the social security system in the meantime. Although short-time work—by design—saves employers a fraction of their wage costs, little is known about free riding behavior when using this option. Accordingly, we analyze the employee-reported free riding experience with respect to longer actual working hours than accounted for in employees' short-time work allowances, the unchanged workloads experienced by these employees, and announced lay-off decisions. Since these questions are certainly sensitive, we employ the crosswise model, a privacy-preserving technique, in a random half of the sample. Our results show significant employee-reported prevalences across all dimensions and a significant association between free riding and workers' job dissatisfaction. These findings thus highlight the importance of the crosswise model in uncovering these findings and demonstrate a specific drawback in the application of short-time work.

1 | INTRODUCTION

The COVID-19 pandemic emerged in the first quarter of 2020 and caused a heavy shock to labor markets worldwide, which was caused by the pandemic itself as well as political interventions restricting economic interactions (Juranek et al., 2021). In the United States, employment dropped sharply by 13% and vacancies by 40% within only a few weeks (Forsythe et al., 2020a). In contrast to previous crises, this massive job loss was accompanied by a decline in job search by the unemployed (Forsythe et al., 2020b). Although the German economy was hit very similarly, as its GDP dropped by 9.9% (as compared to 8.9% in the United States) in the second quarter of 2020, its labor market's reaction was relatively modest (Herzog-Stein et al., 2022). A major difference between the U.S. and the German labor market is often ascribed to the latter's generous use of short-time work (STW), which allows employers to put workers on hold instead of engaging in massive job terminations.

STW is a working time reduction (full or partial reduction) that is subsidized by unemployment insurance. Employers can put employees in a "waiting room." The latter are then paid a part of their regular salary by unemployment insurance while working less or not having to work at all. Employers are only obliged to continue to pay these employees' social security contributions.[1] In May 2020, 20% of all employees who were subject to social security contributions (approximately 6 million employees) were thus affected by STW in Germany. These were unprecedented numbers (Fitzenberger & Walwei, 2023; Kruppe & Osiander, 2020).

Previous research has shown that STW was largely effective in protecting jobs during the previous financial crisis in 2007/2008 (Kopp & Siegenthaler, 2021). The same positive effects seem to have emerged during the COVID-19 pandemic (Herzog-Stein et al., 2022). However, during the times when STW has been used most extensively, media reports have claimed that STW is exploited by employers. For example, the news magazine *Focus* reported that 1.4% of employers' STW registrations during the financial crisis were officially suspected of fraudulence, whereas experts have claimed that the true number may be 12 times higher (Focus, 2020). However, the German government claims that there is no official statistical accounting of such cases that could be published. In April 2020, *Spiegel-Online* also reported that it has never been easier for employers to obtain the STW subsidy: Such loose access opens up the opportunity to collect subsidies while making employees work full-time (Spiegel-Online, 2020). Moreover, the *Sueddeutsche Zeitung* reported that labor law attorneys were experiencing a sudden increase in clients who felt exploited by their employers' STW use, as they had been compelled to work extra hours while receiving STW allowances (Sueddeutsche Zeitung, 2020).

Accordingly, inspired by the media reports of fraudulent STW use and the fact that official figures on suspected fraud are unavailable, in this study, we provide a survey-based assessment of free riding with respect to STW. Specifically, we quantify the employee-reported prevalences of three particular kinds of free riding behavior. First, employees in STW work more than stated in their STW allowance. In this case, these employees still provide working hours that are in fact paid through the STW allowances of unemployment insurance. These STW payments are hence exploited by the respective employer. Second, employees in STW have an unchanged workload when placed on an STW allowance. This is not intended by the STW regulation, as a crucial requirement for the use of STW is a significant loss of work at the respective workplace that is due to external circumstances, for example, an unexpected crisis. Third, we aim to quantify the workers receiving a dismissal while on STW. Although it is totally legitimate to dismiss employees *after* they had been on an STW allowance, STW is designed to save jobs. Therefore, it is not designed to extend the entitlement period of unemployment insurance benefits, yet the latter is especially the case if a dismissal has already been announced to a worker while on an STW allowance.

Since these three cases of free riding with STW allowances are socially undesirable, simply asking about their respective prevalences in direct survey questions could certainly result in an underestimation. This problem of underreporting in sensitive survey questions is well established in the methodological literature (Krumpal, 2013;

[1]During the COVID-19 pandemic, employers' social insurance contributions were reimbursed by the Federal Employment Agency (see Section 2 for more details).

Tourangeau & Yan, 2007). Accordingly, to address the sensitivity of our research question, we use the crosswise model, a randomized response technique (RRT) (Jann et al., 2012; Yu et al., 2008). The crosswise model conceals the respective individual's response to a sensitive question by asking for a joint response to the latter (e.g., free riding on STW) and an auxiliary nonsensitive question whose distribution in the population is known (e.g., one's mother's month of birth). In this way, we provide each respondent the requisite anonymity to provide us with a true combined response. The population prevalence of the sensitive question is then easily calculated with the combined responses, whereas the anonymity of every individual respondent is preserved.

The crosswise model has been criticized in the literature for resulting in an overestimation of true prevalence, possibly due to the mistrust of respondents in this technique, resulting in erratic response strategies (Höglinger & Diekmann, 2017; Wolter & Diekmann, 2021). In contrast, direct questions likely result in an underestimation. We thus combine both approaches in an experimental survey design to reveal the boundaries of true prevalences from both below (direct questions) and above (crosswise method). We included our method mix in two consecutive waves of the high-frequency online personal panel "IAB-HOPP" (Haas et al., 2021) designed to track changes in individuals' social and work-related life during the COVID-19 pandemic. During our survey, all the individuals who stated that they had been in STW at some point during the pandemic were randomly assigned to one of the survey methods. Importantly, within these randomized groups, individuals were asked about all three focal dimensions of free riding.

Our results show that the employee-reported prevalence of working more than accounted for in an STW allowance is 17.6% on average and that the estimated prevalence ranges between 14.3 and 22.1 across various methods and groups of STW workers. A total of 38.3% of STW workers reported having an unchanged workload, with estimates ranging between 36.1% and 42.2%. Finally, the average employee-reported prevalence of dismissal announcements to STW workers is 4.3, ranging between 2.0% and 10.3%. The latter is the only free riding behavior for which some of our prevalence estimates are close to zero. While the crosswise method typically yields larger prevalences than direct survey questions, this is not the case with all the comparisons we can conduct with our design. We therefore conclude that the differences between the two methods are fairly small, thereby ensuring that our estimated prevalences include only small biases.

Interestingly, when we correlate the reported prevalences of free riding with worker characteristics using the regression method proposed by Jann et al. (2012), we do not find any correlation with free riding. Hence, we cannot state that one group of workers (or jobs) is more affected by free riding than others. We note, however, that STW itself is not randomly distributed across the workforce. Most importantly, low-educated and low-income workers are more likely to engage in STW; consequently, they are also significantly affected by free riding behavior. In addition, using regressions, we find a negative correlation between job satisfaction and free riding, demonstrating that STW workers with lower job satisfaction are more likely to be affected by free riding. This significant relationship is robust across all free riding types and holds when adding other control variables. Moreover, since the relationship between job dissatisfaction and free riding is only uncovered by the crosswise method, this demonstrates the benefit of this method in uncovering important relationships. We thereby show that dissatisfied workers are more likely to report free riding with STW in a survey when their anonymity is preserved.

While our analysis concentrates on free riding with STW, the economic literature concentrates on the effectiveness of STW in saving jobs (e.g., Kopp & Siegenthaler, 2021). By estimating this effect on job retention, the literature is able to distinguish between the number of saved jobs and deadweight loss. The latter captures individuals who are in STW whose job is not retained through the application thereof, whether their job was terminated or their job would also be retained in the counterfactual absence of STW. In an evaluation of STW during the 2007/2008 financial crisis, Hijzen and Venn (2011) apply a difference-in-differences cross-country comparison and find that while a significant number of jobs were saved, "the deadweight losses accounted for over one third of the subsidy." Similarly, Boeri and Bruecker (2011) estimate the effects of STW during the financial crisis. While the policy continued to play a significant role in protecting jobs, they estimate a deadweight loss of up to 80%. In a macroeconomic study, Balleer et al. (2016) show a positive job-saving effect of STW. As an important heterogeneity in their analyses, they consider the eligibility criteria that were relaxed during the crisis, adding a discretionary component to the

application of STW for which they find no job-saving effect. Hence, Balleer et al. (2016) conclude that policy-makers should adopt only strict rule-based eligibility criteria. Therefore, they corroborate the public concern that during an economic crisis, it is particularly easy to receive STW subsidies, opening up the potential for free riding (Spiegel-Online, 2020).

In this study, we therefore contribute to the STW literature by providing insights into deadweight losses. We are the first to quantify the prevalence of three specific cases of free riding, which can be sources of deadweight loss. Our analysis does not deny the positive job-saving effects of STW, which are well established in the literature. However, our findings extend the discussion of the drawbacks of STW and can help improve policy design and overcome challenges in regard to the application of STW in future economic crises.

In addition, we contribute to how the survey literature measures the true prevalence of sensitive survey questions, where direct questions are likely to result in a downward bias. We apply the relatively new crosswise method, first proposed in Yu et al. (2008) and further formalized in Jann et al. (2012). Since our method mix includes a randomized assignment of direct questions and the crosswise method, it allows us to compare both methods while shedding some light on the lower and upper bounds of free riding in the context of STW.

We discuss and acknowledge two specific limitations of our approach. First, our empirical analysis is based on the employees' perspectives only. Second, the level of STW may be overestimated in our survey data, which we elaborate when discussing the absolute magnitude of our effects. However, there is no indication that an overestimation in STW allowances affects the estimated relative prevalences of free riding in our method mix.

The article proceeds as follows: In Section 2, we describe how STW is designed in Germany, including its eligibility criteria and subsidy size (i.e., the replacement rate). In Section 3, we describe our data, the IAB-HOPP panel survey that included our survey questions concerning free riding. Our individual-level survey tracks individuals during the COVID-19 pandemic; hence, it includes a significant number of workers who received STW allowances during the pandemic. In addition, we explain our randomized method mix, which we use to quantify the prevalence of free riding. In Section 4, we present the results of our empirical analysis, including descriptive regressions that describe selection into STW. We also analyze the randomization properties of our method mix. Most importantly, we present the estimated prevalences of employee-reported free riding along with potential correlations with job and worker characteristics. Finally, Section 5 provides a discussion of our results and concludes the study.

2 | INSTITUTIONAL BACKGROUND OF STW IN GERMANY

In Germany, the use of STW is not limited to general economic crises. Firms can apply for an STW allowance if a negative external shock leads to a significant but temporary reduction in their working hours, accompanied by a loss of pay. According to the legislation in the German Third Code of Social Law (*Sozialgesetzbuch Drittes Buch* or SGB III), this loss in working hours must be for "economic reasons" and "unavoidable." Therefore, STW is an instrument of labor market policies that allows firms to reduce their workers' hours and, proportionally, their wages instead of laying them off.[2]

2.1 | Important STW regulations prior to COVID-19

In any calendar month (i.e., entitlement period), at least one-third of a firm's employees must be affected by a loss of pay of more than 10% of their monthly gross pay; this loss of pay may also amount to 100% of monthly gross pay if working hours are reduced to 0. This is the case, for example, when orders are postponed or canceled, the

[2]While being on STW allowances, workers are temporarily nonemployed receiving STW benefits. However, employers can use this time to train the respective employees, for example, to gain in terms of an increased future organizational flexibility (Campaner et al., 2022).

government imposes plant closures (during the pandemic) or supply shortages restrict business. Hence, mismanagement or recurring seasonal and/or industry-specific fluctuations in labor demand are not valid reasons for STW. A crisis is also considered avoidable if a firm can deal with it by temporarily reducing working hours within the limits of labor law, for example, by reducing hours on working time accounts or preventing overtime.

Firms that have at least one employee subject to social insurance contributions may register for STW at the German Federal Employment Agency (FEA). Only employees subject to social insurance contributions are entitled to receive STW benefits.[3] Marginal employment (so-called minijobs) with a maximum monthly pay of 450 euros[4] is excluded from STW regulations, as are employees

- whose employment contract has already been terminated,
- who receive sick pay or financial benefits from the FEA, or
- are in temporary agency employment.

Finally, the maximum benefit duration is 12 months.

STW allowances are based on a worker's net income. The wage replacement rate is 60% of workers' last net wage or 67% for workers with at least one child. Income up to a certain threshold is considered in the calculation of STW allowances, that is, the share of income on which contributions to unemployment insurance must be paid (in 2021: 7100 euros in Western Germany and 6700 euros in Eastern Germany). The amount of STW allowances is thus essentially the same as the net wage replacement rate of unemployment benefits in the German unemployment insurance system. An employer can also top up STW allowances voluntarily to (partially or fully) compensate for its employees' losses. Sometimes, collective bargaining agreements or firm-internal agreements contain regulations on topping up STW allowances (Schulten & Müller, 2020).

A firm must report its need for STW to the responsible local employment agency. This employment agency then checks whether the requirements have been met. Afterward, a firm can apply for STW allowances every month. STW is billed retrospectively, that is, only for months in which the actual loss of work has already been identified. Firms have a maximum of 3 months to retrospectively apply for STW allowances and settle accounts with the salient employment agency. At the end of a month, firms calculate both their paid wages and STW allowances, and they must document both on their employees' payroll.

2.2 | Important STW regulations during the COVID-19 pandemic

During the pandemic, STW regulations were adjusted and relaxed in several respects to make it more accessible to both firms and employees.[5] These changes concerned the (facilitated) access, duration, and generosity of STW allowances. In the following list, we highlight some important changes affecting these regulations up to the end of our survey period, February 2021:

1. Since March 1, 2020, firms could apply for STW if at least 10% of their employees (instead of one-third) have a loss of pay of more than 10% of their monthly gross income.
2. Temporary agency workers may also receive STW allowances.
3. Employees could receive STW allowances for up to 28 months (instead of 12) if their firm applied for STW before December 31, 2020. The maximum benefit duration was reduced to 12 months after June 30, 2022.
4. The social security contributions to be paid by a firm during STW are reimbursed by the unemployment insurance system on a lump-sum basis. The extent of this reimbursement depends on the period in which the firm applied

[3]Apprentices are entitled to their regular pay during the first 6 weeks. From the seventh week, STW allowance may also be paid for them.
[4]In 2021, these minijobs were initially defined by a monthly wage below 450 euros. Since October 2022, the threshold has been 520 euros.
[5]Similar facilitations were also enacted during the financial crisis 2008/09.

for STW. Thus, from January 1, 2021, to December 31, 2021, the reimbursement rate was 100%, and from January 1, 2022, to March 31, 2022, 50%. Finally, any social security contributions made after April 2022 will not be reimbursed.

5. Between March 1, 2020, and December 31, 2021, if employees had a loss of hours of at least 50%, their net wage replacement rate increased from 60% to 70% from the fourth month and to 80% from the seventh month onward. Correspondingly, employees with at least one child received 67% of their last net wage in the first 3 months, 77% from the fourth month, and 87% from the seventh month onward (see Figure A1 of the Supporting Information). Hence, this increased benefit entitlement came into effect in June 2020 at the earliest. This regulation also ensured that employees who were on STW for a longer period were in fact better off than unemployed individuals.
6. As of May 1, 2020, income from an additional job acquired during STW does not reduce an STW allowance as long as the previous monthly income total is not exceeded.

2.3 | Forms of unintended STW use

There are different forms of unintended STW use (see, for some examples, Cahuc et al., 2021). The more obvious forms are criminal fraud, for example, firms can register (fictitious) employees to receive STW benefits for them. Moreover, STW can be registered for employees who are actually on sick leave. It is thus the responsibility of the FEA to detect these types of fraud and to investigate them accordingly, but they are not within the scope of our survey. In economic terms, deadweight losses occur from the perspective of unemployment insurance. In this case, deadweight losses occur when STW supports jobs that even without STW would not have been at risk or lost.

In the following paragraphs, we briefly describe the three forms of economic free riding that we analyze in our study (for the exact wording of the questions, see the Supporting Information). We discuss under what circumstances these measures might or might not be consistent with the goals of STW policy. Notably, our empirical analysis is based on employees' perspectives, and we have no way of verifying their impressions with employer-level or administrative FEA data.

First, economic free riding can occur when employees work more hours while receiving an STW allowance than reported to the FEA by their firm. This employer exaggerates the intensive margin and is compensated more than intended by unemployment insurance via STW allowances. Therefore, this can be considered free riding. However, a lack of information on the employee's side can notably lead to a misconception in this regard: STW benefits are initially paid with reservation and are reviewed when the salient reduction in working hours ends. For instance, STW could be implemented and reported in a different way than initially announced to the relevant employee. In addition, employees could indicate they have worked more hours, even though their employer has not yet reported their time sheets to the FEA. This could result in the mistaken impression that time sheets do not match hours worked. In these cases, the employees' answers in our survey would not measure free riding correctly.

Second, economic free riding could apply when workers' workloads remain unchanged even though they receive STW benefits. The implicit assumption of STW is that workers are receiving less pay due to a temporarily decreased demand for their labor, which leads to fewer hours worked. Consequently, unchanged workloads can be considered free riding because the requisite firm receives an STW allowance for its employees even though their productivity has not been reduced and their intensity of work has actually increased.

Third, we consider economic free riding when workers receive an STW allowance although their dismissal or end of contract has already been communicated to them. A key requirement of STW regulations is that any reduction in working hours is only temporary. Employees are thus no longer eligible for an STW allowance as soon as their termination is communicated to them. While it is legitimate to announce layoffs after their STW episode had expired and the economic situation of their firm has not improved, it is unlawful to do so during STW. From an economic point of view, then, announced layoffs during STW artificially extend the maximum benefit duration of

unemployment benefits for workers who are entitled to them.[6] Employers, in turn, transfer their wage costs to the unemployment insurance system during the remaining period of the employment of their workers. However, there could also be a misunderstanding in the communication between employers and employees: Some employees might therefore falsely interpret an announcement of STW as an announcement of their dismissal.

3 | DATA AND METHODS

We use data from a German high-frequency online personal panel survey, IAB-HOPP (Haas et al., 2021).[7] IAB-HOPP was developed and administered at the Institute for Employment Research (IAB) in Germany. This study was designed to address developments in the labor market and related topics, such as family life, life satisfaction, and health, during the COVID-19 pandemic. The questionnaire contains both recurring questions as well as specific one-time survey modules, regarding, for example, consumer decisions, work–life balance, trust in institutions, or unintended STW use. It consists of nine survey waves that cover the period from May 2020 to June 2022.

The gross sample of the panel was drawn from the so-called Integrated Employment Biographies (IEB, IEB V14.01.00–190927). The IEB comprises the administrative information that employers, job centers, and employment agencies report to the German FEA on a regular basis. Individual labor market biographies are included in the IEB in spell format. All historic labor marker periods are included in the IEB if they meet at least one of the following criteria: employment subject to social security contributions, marginal part-time employment ("minijobs"), unemployment, benefit receipt, or participation in measures of active labor market policy, such as training or activation programs (Antoni et al., 2019). The IEB does not contain spells in which individuals are self-employed or civil servants, as they do not pay unemployment insurance contributions during these periods.[8]

The sampling frame contains individuals with at least one data entry in the IEB during 2018 who were at least 18 years old on May 1, 2020. The IAB-HOPP is based on a stratified sample with simple random sampling within strata, the latter defined by region, age, gender, and employment status in 2018. Initially, a sample of 200,000 potential participants was contacted for the first wave in May 2020. For wave five in September/October 2020, a refreshment sample of 99,188 cases was drawn using the same sampling design. In both cases, approximately 5% of contacted individuals who completed the first survey were invited to *and* gave their consent to be contacted again for future survey waves. The whole sample was randomly divided into four subsamples. These were in turn interviewed at intervals of 2 weeks in waves 6 and 7, which we use in our analysis. Hence, our data were collected on a bi-monthly basis.[9]

Additionally, we implemented three questions on free riding with STW allowances in waves 6 (invitations sent in November/December 2020) and 7 (2 months later) of the IAB-HOPP panel survey:

Q1: Did you work more hours during your receipt of a short-time work allowance than was reported to the agencies?

Q2: Are you or were you on a short-time work allowance during the COVID-19 crisis, even though your amount of work and tasks were unchanged?

Q3: Are you or were you on a short-time work allowance during the COVID-19 crisis, even though you were previously told that you would be displaced afterward?

Since we are evaluating socially undesirable or even illegal behavior, these clearly constitute sensitive questions. It is well established that respondents tend to underreport such behavior if asked directly (Krumpal, 2013;

[6]We assume that a large majority of the employees with regular contracts in a firm are entitled to unemployment benefits from the unemployment insurance system due to their past employment spells.

[7]High-frequency Online Personal Panel, wave 1–7 v2 (IAB-HOPP). DOI: 10.5164/IAB.HOPP_W01-W07.de.en.v2

[8]Notably, self-employed persons and civil servants are not a major interest in our analyses, as they are not eligible for STW allowances.

[9]The IAB-HOPP provides survey weights to account for unequal selection probabilities as well as unequal response propensities (Volkert et al., 2021, Chapter 5). We use the survey weights in the Supporting Information to assess the robustness of our results.

Tourangeau & Yan, 2007). Several techniques, such as the RRT (Warner, 1965) or item count technique (ICT; Droitcour et al., 1991), have been developed to address this problem. These either use randomization devices (RRT) or combine the answer to a sensitive question with answers to other questions (ICT), of which the researcher does not know the individual answers. For example, a study by Kirchner et al. (2013) applies the RRT and ICT in the context of undeclared work in Germany and estimates the prevalence between 1% and 10% across different samples.

One such technique that has recently shown promising results is the crosswise model (Jann et al., 2012; Yu et al., 2008). In the crosswise model, the sensitive question (to which the answer is either *yes* or *no*) is combined with an innocuous question (to which the answer is also *yes* or *no*) for which the distribution is known (i.e., the percentage of *yes* answers in the population), but the true value of each respective respondent is unknown. Existing studies have used, for example, the respondent's mother's month of birth for this purpose. Respondents are then asked whether their answer to the two questions is A: the same (both *no* or both *yes*) or B: different (one *yes* and one *no*). The probability of a *yes* answer to the sensitive question can then be estimated with these responses.

This method produces higher estimates than direct questioning with regard to sensitive behavior, such as plagiarism (Jann et al., 2012), tax evasion (Korndörfer et al., 2014), or prejudice (Hoffmann & Musch, 2019). A recent meta-analysis by Schnell and Thomas (2021) suggests, on average, a five-percentage point higher estimate with this technique than direct questions. However, recently, some publications have shown that this technique might actually lead to an overestimation of the sensitive trait (Höglinger & Diekmann, 2017; Wolter & Diekmann, 2021), for example, when the trait is rare (which is mostly the case for socially undesirable items) and some respondents select their answer randomly because they presumably do not trust the researchers.

Accordingly, these results suggest that while the estimate for a sensitive trait from direct questioning is likely to be downward biased, the crosswise estimate of the same trait might be upward biased. Therefore, when both estimates are available for the same trait, it is reasonable to assume that they open up a range in which the true value lies.

Following this reasoning, we randomly assigned respondents to either direct questioning or the crosswise model. This method remained stable across all three items. We also surveyed each respondent twice, once in wave 6 and once in wave 7, 2 months later. Moreover, we applied an orthogonal design. Each target person in the IAB-HOPP wave 6 sample was assigned, with equal probability, to one of four groups. Group 1 was surveyed with the crosswise model in both waves, group 2 was surveyed with the crosswise model in wave 6 and directly in wave 7, group 3 was surveyed directly in both waves, and group 4 was surveyed directly in wave 6 and with the crosswise model in wave 7. For group 1, the innocuous items remained stable across all waves. Finally, wave 7 respondents who did not respond to wave 6 were randomly assigned to one of the two question formats with equal probability.[10]

As innocuous items, we used whether the respondent's mother's month of birth was January or February for Q1, the father's month of birth was January or February for Q2, and mother's year of birth was a leap year.[11] In the Supporting Information, we provide the exact wording of these questions in both survey modes.

Following the usual procedure in the literature (Jann et al., 2012), we assume the probability of the mother's or father's birthday to be in either January or February to be 1/6.[12] Furthermore, we assume the probability of the mother being born in a leap year to be 1/4.

1. The estimation of prevalence $\widehat{\pi_{CW}}$ is then straightforward: There are two pathways that lead to answer A (i.e., that the answer to both questions is the same). Either the answer to the sensitive question is yes and the answer to the innocuous question is also yes (the latter with probability p) or the answer to the sensitive question is no and the answer to the innocuous question is also no (the latter with probability $1 - p$). Therefore, the

[10]In fact, individuals who entered in wave 7 were randomly assigned to one of the four randomization groups and thereby had to respond to either the DIRECT questions or the CROSSWISE questions.

[11]For simplicity, we provided the respondents with a comprehensive list of leap years.

[12]We checked the total number of births by month using German Statistical Office data for the 1950s, 1960s, and 1970s and can support this assumption, as the observed average share of births in January and February is exactly 0.167. The yearly shares range from a minimum of 0.158 to maximum of 0.179.

probability of answer A, which we denote by $\widehat{\phi}$, is equal to the sum of $p \cdot \widehat{\pi_{CW}}$ and $(1-p) \cdot (1-\widehat{\pi_{CW}})$. Solving this equation for $\widehat{\pi_{CW}}$ provides us with $\widehat{\pi_{CW}} = \left(\widehat{\phi}+p-1\right)/(2p-1)$.

where $\widehat{\phi}$ is the (estimated) probability of answer A and p is the population prevalence of insensitive items, which we assume to be 1/6 or 1/4, respectively (Jann et al., 2012).

2. Again, following Jann et al. (2012), the sampling variance in this estimator is $Var(\widehat{\pi_{CW}}) = \frac{\widehat{\phi} \cdot \left(1-\widehat{\phi}\right)}{n \cdot (2p-1)^2} = \widehat{\pi_{CW}} \cdot \frac{\left(1-\widehat{\pi_{CW}}\right)}{n} + p \cdot \frac{1-p}{n \cdot (2p-1)^2}$.

Overall, 6659 (wave 6) and 6334 (wave 7) respondents participated in the respective waves. However, the three focal questions only applied to those who indicated that they had received STW allowances at some point during the COVID-19 crisis. This included 1094 respondents in wave 6 and 1126 respondents in wave 7. Of these, 957 respondents received the questions in both waves, 137 received them in wave 6 but not in wave 7 (mostly due to panel attrition), and 169 only received them in wave 7. The latter comprises both temporary dropouts in wave 6 and respondents who newly received an STW allowance between waves 6 and 7.

Jann et al. (2012) have also derived how responses to the crosswise model can be used in logit models as well as linear probability models. To investigate free riding, we adopted their method for linear probability models. This replaces the binary response variable R with the crosswise question via $(R+p-1)/2(p-1)$ and applies least squares estimation to the transformed response variable using cluster-robust inference (see Jann et al., 2012, p.42f).

4 | EMPIRICAL ANALYSIS

Our data analysis consists of five steps. In the first step, we describe the demographic characteristics and job characteristics of respondents who reported having received STW allowances during the COVID-19 pandemic and thus constitute the population of all further analyses. We estimate an ordinary least squares regression of STW allowance receipt on gender, migration status, age, education, region, income, working time, temporary agency work, temporary contract, and occupation.

In the second step, we conduct regression-based balancing tests for the treatments to demonstrate that our randomization worked as intended, that is, we perform ordinary least square regressions of survey variables and demographic characteristics on the randomization groups. In the third step, we estimate prevalences for all three types of employee-reported free riding with our method mix. We present these estimates both pooled (taking clustering of responses within respondents into account) and separately, by wave and method. In the fourth step, we investigate the predictors of free riding for all three items using the same predictors as step 1. To combine the responses from both techniques into one regression equation, we use the formula presented by Jann et al. (2012) and again estimate cluster-robust standard errors when pooling data from both waves. Finally, we regress free riding on job satisfaction (with and without control of the other predictors) and differentiate these regressions by data collection method.

4.1 | Description of short-time workers

First, we describe the respondents who are subject to STW in Germany based on observable characteristics. The population of short-time workers is the group of interest in our free riding analysis. Hence, it contains the workers and jobs that we analyze and thereby addresses potential worker selection into STW. Selection into our population of interest may be relevant, as previous research has documented differences in the magnitude of STW in Germany when comparing different data sources (Kagerl et al., 2022).

Table 1 presents two descriptive OLS specifications that show the regressions of an STW dummy on observable worker and job characteristics. The only difference between the two specifications is that only the latter includes occupation categories and job tenure; this may be important, as some workers (e.g., females) may sort into specific occupations. Since these models are estimated by OLS, Table 1 presents a linear probability with which the partial effects are directly interpretable as (conditional) differences between short-time workers and workers who were not in STW.

TABLE 1 Workers in STW.

	(1) Short-time work dummy	(2) Short-time work dummy
Female	−0.023***	−0.006
	(0.008)	(0.009)
First generation immigrant	0.030*	0.018
	(0.018)	(0.021)
Age (in years)	0.000	0.000
	(0.000)	(0.000)
College graduate	−0.046***	−0.027***
	(0.008)	(0.008)
Eastern Germany	−0.011	−0.008
	(0.010)	(0.011)
Net hh income (reference = at least 4000 euros)		
Below 1000 euros	0.162**	0.137*
	(0.064)	(0.076)
Between 1000 and 2000 euros	0.115***	0.097***
	(0.018)	(0.018)
Between 2000 and 4000 euros	0.026***	0.020**
	(0.008)	(0.008)
Working hours	0.000	0.000
	(0.000)	(0.000)
Temporary contract	−0.031**	−0.019
	(0.013)	(0.015)
Temporary agency worker	0.176**	0.152*
	(0.078)	(0.083)
Tenure (logarithmic)		0.005
		(0.003)
Occupation: (reference = production)		
Military service		−0.100***
		(0.029)
Agriculture		−0.135***
		(0.029)
Construction and planning		−0.127***
		(0.017)

(Continues)

TABLE 1 (Continued)

	(1) Short-time work dummy	(2) Short-time work dummy
Sciences		−0.094***
		(0.016)
Logistics and security		0.012
		(0.030)
Services, sales jobs		0.073***
		(0.024)
Organization and management		−0.085***
		(0.014)
Health services and education		−0.108***
		(0.014)
Arts		−0.018
		(0.026)
Constant	0.085***	0.127***
	(0.024)	(0.029)
Observations	9098	7460
R-squared	0.030	0.068

Note: OLS regression coefficients and cluster-robust standard errors are in parentheses (cluster = employee). Asterisks indicate the respective significance levels. Dependent variables are indicators for employees who are in STW, as indicated by the column titles. Data: IAB-HOPP, waves 6 and 7.
*$p < .1$, **$p < .05$, and ***$p < .01$.

These results show that female workers are slightly less likely and that migrant workers are slightly more likely to be subject to STW. An intuitive explanation for this might be that females select jobs that are less prone to STW. These include social and public sector jobs, which were considered essential during the pandemic and hence less likely to be affected by closures during it. In line with this argument, the second specification, which controls for occupation, no longer shows a gender difference.

Perhaps, most interestingly, highly educated and high-income individuals are less prone to be in STW, which demonstrates that STW is used to protect lower income groups from layoffs during crises. However, this may lead to increased inequality, as a reduction in remuneration comes along with STW. Hence, economic free riding is more likely to affect more disadvantaged groups in the labor market, even if it is evenly distributed within the group of short-time workers.

Temporary agency workers are very prone to be in STW. This is plausible because the borrowing firms primarily terminated their most flexible contracts, while the agencies did not have the opportunity to place these workers elsewhere. In contrast, regular workers with temporary contracts were less prone to be in STW. That is, employers were able to save their respective salaries by simply not extending these employees' contracts.

4.2 | Tests of randomization

Since the free riding analysis is based on a method mix, as described in Section 3, we test the randomization of the method mix before discussing our results. We refer to this as balancing tests. Since workers are assigned to four experimental groups, we conduct regression-based tests in which we regress observable variables on group

dummies. Group 1 was surveyed with the crosswise model in both waves, group 2 was surveyed with the crosswise model in wave 6 and directly in wave 7, group 3 was surveyed directly in both waves, and group 4 was surveyed directly in wave 6 and with the crosswise model in wave 7.

An F test on the joint significance of the experimental group dummies shows whether the randomization must be rejected. We test the balanced assignment based on the survey variables and also with respect to worker and job characteristics. The respective regression results are presented in the Supporting Information. None of the survey variables are significantly different among randomization groups (insignificant F tests); see Table D1 of the Supporting Information. The *week of invitation* to participate in the survey does not differ significantly among groups, which is important, as it ensures that all groups adopt the same time window for being affected by potential free riding during the pandemic. The survey participation in wave 7, compared to wave 6, is not selective across randomization groups. Although panel entrants in wave 7 were assigned randomly to the four groups, such as the full sample of wave 6, panel attrition could have been selective, thereby affecting the randomization across both waves of analysis. Additionally, for the *consent to merge* the survey data with administrative data, for which we needed respondents' permission, the *date of response*, and *item nonresponse* to the free riding questions of interest, the balancing tests do not reject random assignment.

The balancing tests for worker and job characteristics only show significant differences at the 10% significance level for the age of workers; see Table D2 of the Supporting Information. Both groups that switch methods between waves (groups 2 and 4) are on average slightly younger than the group that receives DIRECT in both waves. Based on statistical chance (two out of 36 tests being significant at the 10% level are even less than we would expect by pure chance), we have to accept this deviation and interpret the results with caution in regard to heterogeneities by age.

4.3 | Prevalence of free riding

Table 2 presents the baseline prevalences of the three free riding measures of interest, as indicated by the following column titles:

1. Worked more than stated in the STW allowance
2. Unchanged workload despite STW
3. Job terminated despite STW

For these three types of free riding, we present pooled prevalences from both modes, the DIRECT survey questions and the CROSSWISE survey questions, and by mode and for the two survey waves, separately.

Table 2 shows an employee-reported prevalence regarding workers in STW who "worked more than stated in the STW allowance" in column (1). A total of 17.6% of the workers report that this free riding behavior occurred in their respective cases. The highest prevalence is observed for unchanged workload despite STW, which is reported by 38.3%. Finally, only 4.3% report that their job was announced to be terminated after being in STW.[13]

The reported differences across the methods and survey waves displayed in the lower parts of Table 2 are not very pronounced. In wave 6, for all types of free riding, the CROSSWISE estimates are higher than the estimates from DIRECT survey questions, although the difference is not statistically significant in the second item "unchanged workload."[14] The differences by survey mode thus suggest that the CROSSWISE model yields higher prevalences of free riding, possibly because this behavior is sensitive and employees are not willing to report it openly. Notably,

[13]Notably, the asterisks in Table 2 indicate statistical significance against the null hypothesis that the true value is 0. However, in DIRECT, even a single positive answer in the sample trivially implies a population proportion greater than 0.

[14]The p values on the difference between CROSSWISE and DIRECT in wave 6 are as follows: "worked more" $p = .048$, "unchanged workload" $p = .711$, and "job terminated" $p = .039$.

TABLE 2 Employee-reported prevalence of free riding.

	(1) Worked more than stated in short-time work allowance	(2) Unchanged workload despite short-time work	(3) Job terminated despite short-time work
Pooled:			
Estimate	0.176***	0.383***	0.043***
	(0.014)	(0.015)	(0.015)
Observations	2197	2183	2178
Number of clusters	1253	1248	1246
By wave and method:			
Wave 6, DIRECT	0.154***	0.368***	0.020***
	(0.015)	(0.021)	(0.006)
Wave 6, CROSSWISE	0.221***	0.382***	0.103***
	(0.024)	(0.024)	(0.037)
Wave 7, DIRECT	0.143***	0.422***	0.028***
	(0.015)	(0.021)	(0.007)
Wave 7, CROSSWISE	0.187***	0.361***	0.022
	(0.024)	(0.024)	(0.036)

Note: Prevalences with standard errors in parentheses. For the pooled and DIRECT prevalences standard errors are cluster-robust (cluster = employee), and for the CROSSWISE estimates, standard errors are calculated as described in equation (2). Asterisks indicate the respective significance levels. Dependent variables depicting free riding are indicated by column titles. Observations and clusters correspond to the pooled sample but vary across subgroups. These numbers are available on request. Data: IAB-HOPP, waves 6 and 7.
*p < .1, **p < .05, and ***p < .01.

however, the prevalences from the CROSSWISE model are not always larger. Regarding the estimates from wave 7, the difference by method is less clear across the three columns. However, other effects may come into play when surveying individuals on the same aspects twice. In the second wave, individuals' reports may have been affected by a priming effect, as they already responded to the same issue. Moreover, there may have been free riding behavior within the 2 months between these survey waves, which may also have affected individuals' responses. Both of these intervening effects follow an ambiguous direction. Nevertheless, despite these differences by methodology, we can conclude that free riding reporting is fairly robust, that is, it is similar in size across waves and methodologies, particularly since both methods arguably bound the true prevalences from above and below (see Section 3).

It is economically interesting to quantify the absolute size of our free riding effects.[15] For this purpose, we calculate the absolute number of employees on STW allowances (including all retrospective STW employees during the COVID-19 crisis) and multiply it by the prevalence estimates of free riding. The accumulative number of employees on STW allowances during the COVID-19 crisis up to November/December, when our survey module was conducted, can be estimated using calibrated survey weights. This exercise yields a total accumulative number of 7.53 million STW workers. Given the (weighted) prevalence of free riding,[16] it results in 1.02 million workers who report having worked more than stated in their STW allowance (item 1). Moreover, a projected number of 2.48 million employees report that they have had an unchanged workload while on STW (item 2).[17] Unfortunately, there is no comparable official statistic on the cumulative number of STW workers during the COVID-19 crisis, but the

[15]Note that our approach only allows to quantify the extensive margin, that is, the number of STW employees affected by free riding but not the intensive margin or a budgetary quantification.
[16]The weighted prevalence estimates are reported in Table C2 of the Supporting Information.
[17]We do not project a total number for the third item of free riding since estimates of the relative prevalences are close to 0.

magnitude of 7.53 million STW workers for the cumulative prevalence seems plausible given a maximum monthly incidence of 5.97 million in April 2022 according to official statistics. Although there is evidence that IAB-HOPP survey overestimates official figures of STW receipt by on average about 30% on the monthly level, this is unlikely the case for our separate question about ever having received STW during the crisis. Moreover, there is no indication that this overestimation affects our prevalence estimates of free riding. In fact, our results remain fully robust, when we restrict the sample to employees of firms that signed up for STW based on administrative data; see Supporting Information. This check addresses the possibility of respondents misreporting their receipt of STW allowances.

4.4 | Heterogeneities in the prevalence of free riding

Table 3 presents a regression analysis in which employee-reported free riding behavior is regressed on worker and job characteristics. This analysis provides insights into the heterogeneities of free riding behavior. That is, it shows whether there are certain types of workers and jobs that are more likely to report free riding than others. This analysis could also uncover economic incentives with respect to free riding if it is easier to implement such behavior among specific types of workers, for example, workers with few external options. However, based on the regression coefficients in Table 3, none of these covariates seem to be predictive for employee-reported free riding with respect to STW allowance. Hence, we cannot reject that it is fairly random across different types of workers and jobs. Notably, however, short-time workers are themselves a selective group among all the workers in the workforce, as demonstrated in Section 4.1.[18]

In addition to worker and job characteristics, we also look at the specific STW arrangement of employees. First, STW largely differs between employees because employees can be on STW allowances by any fraction of their working time, and the reported free riding may differ between employees who are on STW just for a small fraction of their working time and employees who are fully placed on STW allowances, that is, with their full working time. We define a variable that captures the share of working time of each employee that is on STW allowances. Second, STW arrangements can differ in their financial generosity since some employers pay a premium on top of the STW replacement rate. For this reason, we define an indicator variable that captures the information on whether such top-up payments were provided.

Table 4 presents the free-riding prevalences in regressions on the two additional variables capturing heterogeneities in the STW arrangements. The results show that an unchanged workload (item 2) is more likely observed when the respective employees are on STW allowances with a relatively smaller fraction of their working time. This correlation is intuitive because STW workers are more likely to notice to have an unchanged workload if they are on STW allowances only by a small fraction of their working time. The results also show some (statistically weak) evidence that workers are more likely to be terminated after STW if their share in STW was relatively large, which is in line with the argument that the respective firms suffered comparatively more from the crisis. With respect to employer's top-up payments, we do not find significant heterogeneities in any of the free riding dimensions. Hence, we can conclude that the faction of working time in STW is a crucial dimension for heterogeneities in employee-reported free riding.

Table 5 displays heterogeneities concerning workers' self-reported job satisfaction. The regression coefficients are significantly negative for all three types of free riding, and the point estimates also remain unchanged when controlling for worker and job characteristics, as in Table 1 or 3. Hence, there seems to be a negative association between job satisfaction and the reported prevalence of free riding. Although this is interesting in itself, we cannot conclude which of the two causes the other, that is, whether the least satisfied are subject to the free riding behavior of their employers or whether free riding affects their job satisfaction.

[18]The numbers of observations shrink when we control for tenure and occupations, as these variables require us to link the survey data with administrative employment information. Therefore, we refrain from adding these variables in Tables 4–6.

TABLE 3 Free riding and worker and job characteristics.

	(1) Worked more	(2) Worked more	(3) Unchanged workload	(4) Unchanged workload	(5) Job terminated	(6) Job terminated
Female	0.073**	0.051	−0.024	−0.041	−0.021	−0.046
	(0.033)	(0.039)	(0.036)	(0.043)	(0.036)	(0.042)
First-generation immigrant	−0.042	0.001	−0.032	−0.043	0.000	0.010
	(0.060)	(0.076)	(0.066)	(0.078)	(0.068)	(0.078)
Age	−0.003**	−0.005***	−0.002*	−0.003*	0.001	0.001
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
College graduate	0.070**	0.068*	0.016	0.043	−0.057*	−0.035
	(0.033)	(0.037)	(0.036)	(0.041)	(0.034)	(0.038)
Eastern Germany	−0.042	−0.054	−0.015	0.008	−0.013	−0.007
	(0.040)	(0.044)	(0.047)	(0.051)	(0.047)	(0.052)
Net hh income (reference = at least 4000€)						
Below 1000€	−0.144	−0.060	−0.102	0.133	−0.039	0.081
	(0.152)	(0.191)	(0.165)	(0.158)	(0.171)	(0.194)
Between 1000 and 2000€	−0.082*	−0.065	−0.082	−0.028	−0.036	−0.020
	(0.044)	(0.049)	(0.052)	(0.056)	(0.053)	(0.056)
Between 2000 and 4000€	−0.033	−0.024	−0.019	0.008	0.025	0.056
	(0.033)	(0.036)	(0.037)	(0.040)	(0.037)	(0.037)
Working time	0.004**	0.003	0.004*	0.002	−0.002	−0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Temporary contract	0.013	0.030	0.072	0.187	−0.059	−0.020
	(0.109)	(0.127)	(0.138)	(0.161)	(0.122)	(0.171)
Temporary agency worker	0.116*	0.099	0.077	0.040	0.084	0.078
	(0.070)	(0.079)	(0.072)	(0.080)	(0.080)	(0.089)
Occupation (nine categories) and tenure	No	Yes	No	Yes	No	Yes
Observations	1964	1650	1951	1637	1952	1637
R-squared	0.022	0.030	0.010	0.016	0.005	0.011
Number of clusters	1102	962	1096	957	1098	959

Note: OLS regression coefficients and cluster-robust standard errors in parentheses (cluster = employee). Asterisks indicate the respective significance levels. Dependent variables depicting free riding are indicated by column titles. Data: IAB-HOPP, waves 6 and 7.
*$p < .1$, **$p < .05$, and ***$p < .01$.

The results in Table 6, however, show that the association between free riding and job satisfaction is only uncovered when free riding is surveyed via the CROSSWISE model. The relationship becomes insignificant (along with smaller regression coefficients) when free riding is surveyed via direct questions. This methodological heterogeneity is interesting in regard to two aspects. First, this difference by methodology provides some confidence that the relationship between free riding and job satisfaction is truthful. Since the relationship disappears in the DIRECT

TABLE 4 Free riding and the STW arrangement.

	(1) Worked more	(2) Worked more	(3) Unchanged workload	(4) Unchanged workload	(5) Job terminated	(6) Job terminated
Share of time in STW	−0.042	−0.021	−0.197***	−0.223***	0.106	0.146*
	(0.061)	(0.070)	(0.067)	(0.075)	(0.071)	(0.080)
Employer-top up to STW	−0.024	−0.037	−0.001	0.037	0.046	0.060
	(0.038)	(0.039)	(0.040)	(0.042)	(0.042)	(0.044)
Controls	No	Yes	No	Yes	No	Yes
Observations	1451	1338	1441	1329	1439	1329
Number of clusters	804	735	801	732	801	733

Note: OLS regression coefficients and cluster-robust standard errors (cluster = employee). Asterisks indicate the respective significance levels: Dependent variables depicting free riding are indicated by column titles. Control variables as in column (1) of Table 1. Data: IAB-HOPP, waves 6 and 7.
*p < .1, **p < .05, and ***p < .01.

TABLE 5 Free riding and job satisfaction.

	(1) Worked more	(2) Worked more	(3) Unchanged workload	(4) Unchanged workload	(5) Job terminated	(6) Job terminated
Job satisfaction	−0.130**	−0.119**	−0.106*	−0.095	−0.174***	−0.200***
	(0.055)	(0.059)	(0.060)	(0.063)	(0.065)	(0.071)
Controls	No	Yes	No	Yes	No	Yes
Observations	2172	1964	2158	1951	2154	1952
Number of clusters	1252	1102	1247	1096	1245	1098

Note: OLS regression coefficients and cluster-robust standard errors (cluster = employee). Asterisks indicate the respective significance levels. Dependent variables depicting free-riding are indicated by column titles. Control variables as in column (1) of Table 1. Data: IAB-HOPP, waves 6 and 7.
*p < .1, **p < .05, and ***p < .01.

TABLE 6 Free riding and job satisfaction by mode.

	(1) Worked more	(2) Worked more	(3) Unchanged workload	(4) Unchanged workload	(5) Jobterminated	(6) Job terminated
Job satisfaction	−0.197*	−0.029	−0.177*	−0.020	−0.371***	−0.019
	(0.101)	(0.050)	(0.103)	(0.068)	(0.136)	(0.032)
Crosswise	Yes		Yes		Yes	
Direct		Yes		Yes		Yes
Observations	993	971	980	971	992	960
Number of clusters	768	756	760	756	766	749

Note: OLS regression coefficients and cluster-robust standard errors are in parentheses (cluster = employee). Asterisks indicate the respective significance levels: Dependent variables depicting free riding are indicated by column titles. Control variables as in column (1) of Table 1. Data: IAB-HOPP, waves 6 and 7.
*p < .1, **p < 0.05, and ***p < .01.

survey method, we can rule out the explanation that dissatisfied workers simply report free riding because of dissatisfaction with their job (and maybe their employer). An intentional reporting bias would—by the design of the two methodologies—especially emerge in direct reporting. Second and more generally, the difference by methodology demonstrates that the crosswise model may be useful not only in uncovering the magnitude of prevalences in sensitive survey questions but also in uncovering the relationships among these sensitive outcomes and other covariates. Indeed, this may be the case if certain types of workers are not willing to truthfully report incidences of negative experiences, such as free riding, with STW allowances.

5 | DISCUSSION AND CONCLUSION

The German labor market developed remarkably smoothly during the early period of the pandemic, with only a few layoffs and a rather modest increase in the number of unemployed. The stability of its labor market during this very sudden economic shock has often been ascribed to the effectiveness of STW as a job-saving instrument. In fact, up to 20% of regular employees were on an STW allowance by May 2020. This positive descriptive assessment is affirmed by positive STW evaluations with data on the financial crisis (Boeri & Bruecker, 2011; Hijzen & Venn, 2011). However, these studies also point to a significant deadweight loss via STW, that is, a significant number of jobs are not saved through STW use. This raises the question of whether there is free riding in the use of STW. Accordingly, since there are no public figures on free riding or suspected fraudulent behavior, we contribute to the literature by quantifying three specific forms of free riding as reported by employees. First, we find that employees report working more than specified by their STW allowance. Second, we show that STW workers report unchanged workloads, implying that there was no significant loss of work. Third, we demonstrate that workers report having been placed on STW even though their dismissal had already been announced. In the latter case, their respective job could not be saved by STW.

To quantify the specific forms of free riding, we apply a method mix, that includes (1) direct questions, which likely result in an underestimation, and (2) a crosswise model, which likely results in an overestimation of true prevalence. All STW workers in our survey were thus randomly assigned to one of these two methods to bound the estimated prevalences from below and above. We included our survey module in the IAB-HOPP survey designed to track individuals during the COVID-19 pandemic, including a significant number of STW workers. We have found a prevalence of working more hours than specified in an STW allowance of 17.6%, a prevalence of STW workers reporting having an unchanged workload of 38.3%, and a prevalence of dismissal announcements to STW workers of 4.3%; only the latter includes insignificant estimates.

The magnitudes of these prevalences for employee-reported free riding are economically relevant. Using the population weights from our survey, we project a total number of employees on STW allowances of 7.5 million at some point during 2020. Of these, 1 million projected employees report to have worked more than stated in their STW allowance. Moreover, a projected number of 2.5 million employees report that they have had an unchanged workload while on STW. The first case captures a typical free riding effect, as employers collect their STW allowance from unemployment insurance (which is then paid to their respective employees) while making employees work extra hours. The second case demonstrates that a crucial eligibility condition, that is, a significant loss of work, was not fulfilled for the respective STW workers. Hence, these employees did not experience the loss of work required to receive an STW allowance. Both prevalences of free riding demonstrate an unintended use of the policy instrument. Accordingly, these concrete STW drawbacks must be contrasted with the positive job-saving effects of this policy, which are well established in the literature (Boeri & Bruecker, 2011; Hijzen & Venn, 2011). Although our results show that its control mechanisms may be improved, it is unclear whether stricter control mechanisms would in turn decrease the positive effects of STW. However, given the findings of Balleer et al. (2016), that is, STW has the most positive effects when it is strictly rule-based, we suggest that a strict application of STW could improve its job-saving effect and limit the negative externalities of free riding. Therefore, we conclude that the generous

implementation of STW during times of crisis should be carefully considered, as also suggested by Fitzenberger and Walwei (2023) since it could create incentives for free riding.

The method mix that we have applied in our analysis has been proven useful in bounding the estimated prevalences from above (crosswise model) and below (direct question). Although the crosswise model tends to show larger estimates than direct questions, the difference between the two methods is small; hence, this suggests that we have captured fairly accurate estimates. The crosswise model has enabled us to reveal a negative relationship between free riding and job satisfaction, which would not have been detected by using only direct questions.

However, we also want to note some specific limitations of our approach. First, the crosswise model cannot account for the intensive margin of free riding. Hence, we cannot quantify the number of working hours affected by free riding and therefore cannot project the financial burden from free riding. Second, we have conducted an employee-level analysis, thereby ignoring the perspective of employers. If employees have limited information about the true intentions of their employers, that is, they do not know the exact number of hours being paid by their STW allowance, these employees' responses may be biased. However, even if we capture misperceptions of employees to a significant extent, this implies miscommunication between employees and their respective employers, which is also problematic in regard to the application of important policies such as STW. Overall, our results should encourage future research on employers' perspectives with respect to free riding, although it is difficult to pin down a particular employer's responses to specific employees. Future work may use administrative records of STW to further explore the importance of this limitation.

ACKNOWLEDGEMENTS

Open Access funding enabled and organized by Projekt DEAL.

DATA AVAILABILITY STATEMENT

This study is based on data from the High-Frequency Online Personal Panel "Life and Employment in Times of Corona" (IAB-HOPP). The Scientific Use File is available via the Research Data Centre of the Institute for Employment Research (see https://fdz.iab.de/ and iab.fdz@iab.de). All the baseline results can be produced from the data available at the RDC. For the specifications that include tenure or occupations, additional data protection precautions must be clarified for data linkage with process data. To access the administrative process data, an application must be submitted to the Ministry of Labor and Social Affairs. The RDC of the IAB provides instructions for such an application.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Bossler, M., Osiander, C., Schmidtke, J., & Trappmann, M. (2023). Free riding on short-time work allowances? Results from an experimental survey design. *Kyklos*, *76*(4), 882–901. https://doi.org/10.1111/kykl.12354