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The Effectiveness of Job-Retention Schemes: COVID-19 Evidence From the German States

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The Effectiveness of Job-Retention Schemes: COVID-19 Evidence From the German States

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[1]

Abstract

Kurzarbeit (KA), Germany's short-time work program, is widely credited with saving jobs and supporting domestic demand during the COVID-19 recession. We quantify the impact by exploiting state-level variation in exposure to the pandemic shock and KA take-up. We construct a shift-share measure of the labor demand shock and instrument KA take-up using the pre-existing, state-specific share of workers *eligible* for KA. We find, first, that KA was crucial in mitigating unemployment: absent its expansion the unemployment rate would have increased by an additional 3 pp on average at the trough of the recession. Second, KA also bolstered domestic demand: the contraction in consumption could have been 2 to 3 times larger absent the program. Finally, we provide preliminary evidence on the sensitivity of the medium-run reallocation of resources to the prevalence of job-retention schemes during the Global Financial Crisis.

JEL Classification Numbers: J08, J20, J38, J60, J68

Keywords: Kurzarbeit, Short-time work, Unemployment, Covid-19

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I. INTRODUCTION

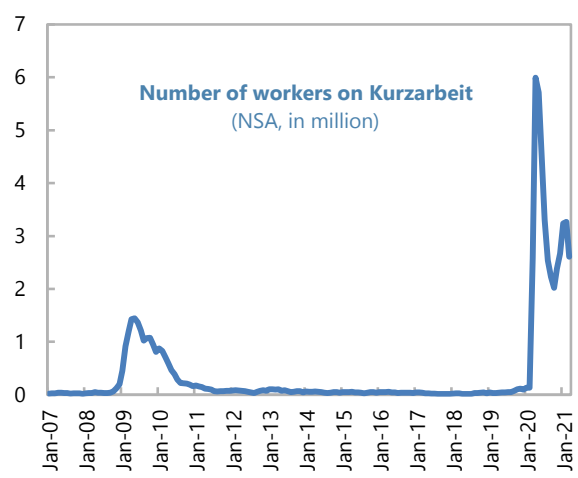
Consider, for a moment, a tale of two countries. Both have suffered a severe recession and lost jobs as a result but not on the same scale. In Country A, employment has fallen more than 5 percent, and the unemployment rate has more than doubled. In Country B, employment has fallen only half a percent, and unemployment is only slightly higher than it was before the crisis.

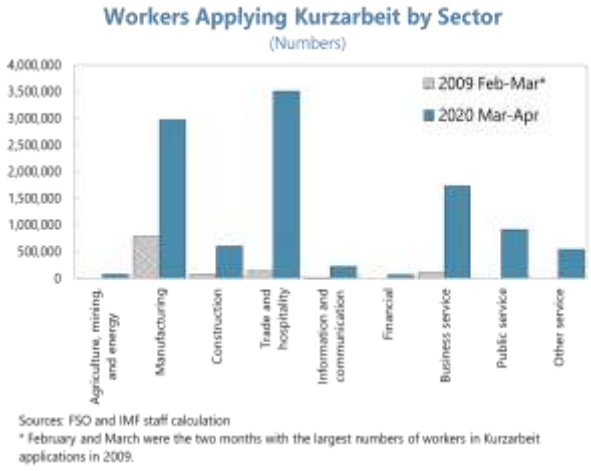
Don't you think Country A might have something to learn from Country B?

Krugman, 2009

The comparison between the US and Germany made above by Nobel Laureate Paul Krugman pertains to the Global Financial Crisis (GFC). But it applies with even greater force to the Covid-19 crisis, where employment in the second quarter of 2020 (the trough of the recession) fell by over 13% in the US and by only 1.4% in Germany—despite an output contraction that was slightly larger in Germany than in the US over the same period.[2] Once again, Germany turned to its short-time work (STW) program, Kurzarbeit, as the central plank of its strategy to stabilize labor markets. Kurzarbeit provides a government subsidy to employees working reduced hours, channeled through the employer who undertakes to place them on a reduced schedule rather than laying them off. The worker earns regular wages for the hours worked, and some percentage of the regular wage (the replacement rate) for the hours not worked. Kurzarbeit take-up rose to unprecedented levels during the pandemic, much higher than during the GFC, and was far more widespread across sectors of the economy (Figure 1).

Figure 1. Take-up of Kurzarbeit: COVID-19 vs. GFC





Nor was Germany alone in this policy orientation. By May 2020, about 50 million jobs across advanced economies were being supported by some form of job-retention scheme, a tenfold increase from the GFC (OECD, 2020). Like Germany, several countries loosened the

[2] Real GDP in 2020Q2 fell by 11.5 percent relative to 2019Q4 in Germany, and by 10.1 percent in the US.

parameters of existing programs to allow easier access and more generous benefits during the worst of the crisis, while others, such as Australia and Denmark, introduced entirely new schemes. European countries led the trend; by May 2020, firms' applications for job retention support amounted to more than 50% of all dependent employees in France, over 40% in Italy and Switzerland, and about 30% in Austria, Belgium and Portugal.

Despite the policy consensus around job-retention schemes as the first port of call in crisis in many countries, the subject is surprisingly understudied. This could be because identifying the impact of such programs on macroeconomic outcomes such as unemployment and consumption presents a number of challenges. Cross-country empirical studies are hampered by the fact that both program design and other labor market institutions vary enormously across countries. Boeri and Brucker (2011), building on work by Hijzen and Venn (2011), point to very large differences among countries with respect to eligibility criteria, entitlement criteria (i.e. the conditions that must be fulfilled by firms or workers to remain eligible, such as job search requirements for workers or a requirement for the employer to provide some kind of training), generosity of benefits and cost to employers. In addition, there is substantial cross-country variation in supporting institutions, such as the degree of centralized wage bargaining, the strength of employment protection legislation and the generosity of unemployment benefits. These institutions not only have a direct effect on unemployment, but more importantly, will tend to affect the relationship between unemployment and take-up of the job-retention program.

Studies using firm-level data for a single country or region also face several challenges. First, many firm-level datasets, such as ORBIS, are weighted towards manufacturing and towards larger firms, with much poorer coverage for the smaller, service industry firms that tend to be hard hit by economic downturns, most especially the Covid-19 recession. Country-specific datasets, such as Germany's IAB Establishment Panel used by a handful of studies (e.g. Balleer and others, 2016; Boeri and Bruecker, 2011; Bohachova et al 2011), may be available only at an annual frequency. This complicates the analysis of short-time work schemes for which take-up can rise and fall substantially across different months in a single calendar year; the pandemic being an excellent case in point. Second, any given shock is bound to affect firms heterogeneously and prompt different degrees of KA take-up, introducing strong selection bias (see e.g. Calavrezo et al, 2009). Finally, firm level analysis cannot capture general equilibrium effects on employment and consumption arising from the demand side, or from the cross-firm substitutability of workers.

In this paper we adopt a different strategy, focusing on a single country—Germany—and exploiting high-frequency regional variation in the exposure of industries to the Covid-19 shock. Since the parameters of Kurzarbeit are set at the Federal level, they are common to all the German states. However, industrial structure—and, in particular, the share of contact-intensive industries most affected by Covid-19 mobility restrictions—varies considerably across states. This allows us to construct a shift-share measure of the labor demand shock by interacting the national fall in mobility in contact-intensive sectors with the pre-existing state-specific share of those sectors in the economy.

Even with a time-varying, state-specific measure of the labor demand shock, there remains the challenge that take-up of Kurzarbeit is endogenous to the size of the shock. To account for this endogeneity, we need an instrument that is correlated with Kurzarbeit take-up but unrelated to the labor demand shock. Such an instrument is provided by the share of the state-level workforce that participates in Germany's social security system, and is therefore eligible for Kurzabeit; a share that exhibits considerable variation across states. Since the ex-ante share of Kurzarbeit eligible workers should not be correlated with the size of the labor demand shock, this provides a valid instrument for take-up of short-time work.

We find that Kurzarbeit take-up significantly dampened the response of unemployment to the labor demand shock. On average, unemployment in the second quarter of 2020—the trough of the recession--would have been 2.9 percentage points higher in the absence of the program's expansion. Since actual unemployment in this quarter was 6.2%, this implies that the scheme cut unemployment by about a third on average. The average number masks significant heterogeneity among states; unemployment would have been almost 4 percentage points higher in Hamburg, and only about 2 percentage points higher in Saxony-Anhalt.

Our study design also allows us to directly investigate the impact of STW take-up on consumption, which has received even less attention in the literature. The subsidies received by workers on Kurzarbeit are broadly comparable to the unemployment benefits that they would have received otherwise, but it is plausible that their motive for precautionary saving is reduced because they keep their job. We find that the fall in retail trade turnover would have been 15 percent greater in the second quarter of 2020 absent Kurzarbeit, and more than three times as large in the lockdown month of April. Again, there is considerable heterogeneity among states.

While the literature acknowledges the potential of job-retention schemes to save jobs in the short-run, the concern is frequently voiced that they can preserve inefficient job matches and prevent optimal reallocation of resources over time (Boeri and Bruecker, 2011). To the best of our knowledge this trade-off has not been empirically studied. We make some preliminary progress by examining the record of a number of OECD countries—with heterogenous usage of job-retention schemes during the Global Financial Crisis—for several years following the crisis. We measure resource misallocation in a country using the cross-sectoral dispersion of the marginal revenue product of labor, in the spirit of Hsieh and Klenow (2009). We find that for those countries with an initially high level of resource misallocation, job-retention schemes are associated with rising misallocation following the crisis. But for countries with an initially modest level of resource misallocation, job-retention scheme usage is even associated with lower future misallocation.

Our work contributes to the literature in at least three ways. First, we provide the first quantitative estimates of the powerful impact of the oldest and most well-known short-time work program during its unprecedented expansion at the time of the Coivd-19 recession. Second, as described above, we make a methodological advance by combining the study of a Federally-mandated STW scheme with state-level variation in labor demand. This enables us to plausibly estimate the impact of Kurzarbeit on macroeconomic variables such as employment, the unemployment rate and consumption. Third, we provide some preliminary

evidence on the trade-off between the use of job-retention schemes during the GFC, and future resource misallocation.

The remainder of the paper is structured as follows. In the next section we briefly review the literature, with a focus on the main theoretical predictions for the impact of short-time work on employment and consumption. In section III, we give an overview of the institutional setup of the Kurzarbeit program, and how it was expanded during the COVID-19 crisis. Section IV details the empirical strategy, and Section V provides baseline results. Section VI examines robustness. Section VII provides some preliminary cross-country evidence on the trade-off between the use of STWs during the GFC and resource misallocation in subsequent years. Section VIII concludes.

II. THEORY AND LITERATURE REVIEW

The rationale for firms offering workers implicit insurance by reducing hours worked during temporary downturns but maintaining stable incomes goes back to a long-standing result on efficient contracts in the labor market literature. As shown by Azariadis (1975), the optimal contract entails some risk-sharing between the (risk-neutral) firm and (risk-averse) worker, with the firm choosing to insure the worker against income fluctuations in return for a lower average wage. However, private work-sharing and job-retention schemes are not ubiquitous, perhaps due to the presence of various frictions, such as financing and liquidity constraints facing firms. Instead, when firms face borrowing constraints and imperfect contract enforceability, a simple cost-minimization problem would predict that firms choose the opposite adjustment margin in response to demand fluctuations—the headcount (or extensive) margin. The stylized cost-minimization outcome in the absence of perfect markets is illustrated below.

Suppose the production function is multiplicatively separable and allows for decreasing marginal returns to both hours (working longer hours reduces marginal productivity) and workers (due to limited office space or management attention).

$$\mathrm{y} = n^{\alpha}\mathrm{h}^{\beta}$$

The firm chooses the combination of hours per worker (h) and number of workers (n) to minimize the cost function for a given level of output $\bar{y}$, which includes variable wage costs *w(h)* and fixed costs associated with overhead or office space *F*:

$$min_{n,h}\Lambda = n(F + \omega(h)h), \text{s.t.}\, \bar{y} = n^{\alpha}h^{\beta}$$

The first order conditions are:

$$h = \frac{\beta}{\alpha}\frac{F}{\varepsilon_h^{\omega}} \text{ and } n = \bar{y}^{\frac{1}{\alpha}}\left(\frac{\beta}{\alpha}\frac{F}{\varepsilon_h^{\omega}}\right)^{\frac{-1}{\alpha}}$$

where $\varepsilon_h^{\omega} = \frac{d\omega}{dh}\frac{h}{\omega}$ is the wage elasticity with respect to average working hours. This implies that changes in the scale of production $\bar{y}$ lead to changes in the number of workers only, while the hours worked per worker remains fixed. Therefore, given the inability of the firm

to borrow against fluctuations in demand $\bar{y}$, there will be excessive layoffs during downturns by the firms relative to the first best outcome with optimal contracts. Additional inefficiencies from excessive job losses result from the negative fiscal externality on the unemployment benefit insurance system which is financed by all firms and the loss of human capital that reduces economy-wide productivity.[3] This result implies a welfare-enhancing role for the government, by means of either subsidizing a reduction in hours in lieu of layoffs (short-time work benefits) or by taxing the firm for firing workers (employment protection policies). In reality, many countries combine these two complementary policies (see Cahuc and Carcillo, 2011).[4]

The theoretical argument in favor of STW schemes was early recognized by works such as Hall and Lazear (1984) and Burdett and Wright, (1985). An early empirical study of such schemes was conducted by Abraham and Houseman (1994), documenting that European countries with STW schemes have more employment adjustment along the intensive margin than the US, for the same level of fluctuation in total hours. But it was only in the wake of the GFC that there was a renewed research interest in understanding the stabilizing role of short-time work programs. Hijzen and Venn (2011) were among the first to provide empirical estimates of the job-preserving benefit of STW schemes across OECD countries using cross-country data. Boeri and Bruecker (2011) also provide an overview of the design and job-saving impact of STW programs across major OECD countries during the GFC, but complement cross-country analysis with German firm-level data and instrument STW take-up to address endogeneity. Brey and Hertweck (2020) find that the unemployment dampening impact of STW is non-linear—diminishing with higher take-up rates and operating more strongly at the start of deep recessions.

Germany's use of its STW program, especially during the GFC, has been studied by a number of papers. Burda and Hunt (2011) attribute Germany's employment resilience to pre-GFC trends and shifts in the German labor market, such as wage moderation, the use of working time accounts, and to a lesser extent, the use of STW. Bohachova et al (2011) also find that the use of working time accounts had been providing an employment-stabilizing role before the GFC, while during the GFC, STW benefits facilitated additional labor hoarding especially among firms in the manufacturing sector. Using a calibrated macroeconomic model, Balleer et al. (2016) argue that it is only the rule-based component of the German STW scheme that contributed toward saving jobs during the GFC, while the discretionary component (introduced during crises by expanding program parameters) led to dead weight loss. In contrast, Gehrke and Hochmuth (2021) find that discretionary STW program expansions in Germany have positive employment effects when implemented in deep recessions.

[3] There is a substantial literature on the long-lasting negative impact on the productivity of workers graduating into a recession (see von Wachter (2020) for a review). And a broader literature on the role of luck in determining various labor market outcomes (Barnsley, Thompson and Legault (1985), Aiyar and Ramcharan (2010), Amore and Schwenen (2020),).

[4] In terms of the previous notation, the KA benefits which include payroll tax subsidy would reduce labor costs to firms which reduce hours per worker, hence increase ε_h^ω and for given $\bar{y}$, lower h and increase n. Moreover, a larger subsidy in large recessions (increased ε_h^ω with lower $\bar{y}$) dampens the response of n with respect to $\bar{y}$.

III. INSTITUTIONAL SETUP

Kurzarbeit is one of the oldest documented job-retention programs in the world, whose origins date back at least to the Weimar Republic. At its core is a government subsidy provided to employees working reduced hours. The program is permanent; it is not simply a scheme deployed during economic downturns. However, many of its features are designed to encourage greater use during a downturn, and the parameters of the program can be swiftly adjusted by the Federal government to make it temporarily more attractive, as was done both during the GFC and the Covid-19 recession. In this section we very briefly review some of the main features of the program, noting whenever these features were altered in response to the pandemic.

Eligibility: Only workers contributing to the social security system are eligible for KA. This excludes so-called marginal workers and some of the self-employed. There is also a minimum threshold for a firm to access Kurzarbeit: at least one-third of its employees must be placed on reduced hours with a loss of income amounting to at least 10 percent of gross monthly earnings. The minimum threshold was fully waived in March 2020, and will not be reinstated until end-September 2021; making access to the program possible for firms who wish to reduce hours for a smaller fraction of their workforce, or to reduce fewer hours per worker.

Replacement rate: The replacement rate for workers—the share of net income that they obtain for the hours not worked—is normally 60 percent (rising to 67 percent for employees with children). During the pandemic, the replacement rate was raised to 70 percent (77 percent for parents) starting from the fourth month under STW, and to 80 percent (87 percent for parents) starting from the seventh month. This is substantially more generous than the unemployment benefit, which pays 60 percent of net income and is therefore comparable to the usual replacement rate of Kurzarbeit.

Cost to employers: To encourage risk-sharing and mitigate the fiscal cost to the government, employers must normally pay 80 percent of the social security contributions owed on the reduced work hours. The cost to employers thus increases non-linearly the greater the reduction in hours worked (relative to laying off the worker and not paying any social security contributions). During the pandemic, this requirement was waived; employers need not make any social security contributions on reduced hours.

Private work-sharing: Many German firms create “working-time accounts” for their employees, under which workers can accumulate overtime balances when production needs are high and run them down when production needs are low. Normally, firms can only apply for KA when working-time accounts and other leave balances have been fully exhausted first. This requirement was waived during the pandemic.

Duration: Normally KA can be taken for a maximum of 6 months. This was changed to 24 months during the pandemic.

Taken together then, the changes to the parameters of Kurzarbeit during the pandemic represented a very considerable loosening of requirements, making it much easier and less costly for firms to access the program. Benefits became substantially more generous and prolonged for workers. Conversely, the cost per reduced working hour increased sharply for the government compared to normal times.

IV. EMPIRICAL STRATEGY AND DATA

The main question we seek to answer is whether and by how much the Kurzarbeit scheme reduced unemployment during the COVID-19 crisis. The answer is not obvious. While the set-up of the program is directly geared toward preserving jobs, it is possible that in a counterfactual scenario without the program, employers may still have resorted to labor hoarding or limited layoffs for other reasons—in other words, the impact of the subsidy on saving jobs cannot be directly measured by the number of employees on Kurzabeit.

To provide an answer to this empirical question, we start with the following relationship. Let labor market outcome *z* (change in the unemployment rate or employment growth) in each state *s*, and time period *t*, depend on the regional labor demand shock $y_{s,t}$ and other state- and time-varying variables $X_{s,t}$ as well as a state fixed effect γ_s:

$$z_{st} = \alpha_z + \eta_{z,st} y_{st} + \alpha_3' X_{st} + \gamma_s + \epsilon_{st}, \quad (1)$$

where $\eta_{z,st} = \frac{\partial z_{st}}{\partial y_{st}}$ is the state- and time-varying elasticity of employment/unemployment with respect to labor demand. If working as intended, the take-up of Kurzarbeit (KA) should reduce the fluctuation of employment in response to business cycle shocks, that is, when the outcome variable *z* measures employment growth:

$$\eta_{z,st} = \alpha_1 + \alpha_2 KA_{st}, \text{ where } \alpha_1 > 0\,, \alpha_2 < 0.$$

Substituting into equation (1) above yields

$$z_{st} = \alpha_z + \alpha_1 y_{st} + \alpha_2 y_{st} \times KA_{st} + \alpha_3' X_{st} + \gamma_s + \epsilon_{st} \quad (2)$$

Estimating this equation allows us to test whether and by how much the take-up in KA stabilized the labor market in response to the demand shock engendered by the pandemic. That is, we test the hypothesis:

- $\alpha_1 > 0,\ \alpha_2 < 0$ if $\mathrm{z} = \text{employment growth}$
- $\alpha_1 < 0,\ \alpha_2 > 0$ if $\mathrm{z} = \text{change in unemployment}$

The key challenges to estimating the model's parameters are twofold. First, we need to identify an exogenous labor demand shock variable *y* that varies across states and is orthogonal to state-specific labor supply. Often, GDP growth is used for *y* (see e.g. Hijzen and Venn, 2011). But labor market outcomes (*z)* and GDP respond to each other endogenously, biasing estimates of α_1 & α_2.

Second, the take-up of Kurzarbeit itself is highly endogenous to labor market conditions. Firms tend to place workers in Kurzarbeit when underlying conditions are bad and correspondingly, reduce the share of the workforce on Kurzarbeit when business conditions improve. Such pro-cyclical behavior strongly biases the estimate of our variable of interest α_2 toward zero, as the unobservable business conditions would be part of the residual and negatively correlated with the KA take-up variable. This fundamental identification problem is present in both aggregate and firm-level data and is commonly the reason why the impact of short-time work programs is hard to estimate empirically (see e.g. Cahuc and Carcillo, 2011).

We address both identification challenges by leveraging sub-national/regional data at a monthly frequency. First, we use monthly unemployment and employment data, as well as monthly retail trade turnover index at the state level from the Federal Employment Agency and National Statistical Agency to construct the dependent variables. We focus on monthly changes in labor market variables and KA take-up during 2020. This period covers both the dramatic rise in KA take-up between March and April, when the first and most stringent lockdown was imposed, and the subsequent fall back to lower—albeit still elevated levels—from May onwards (see Figure 2). The final two months of the year saw another modest increase in KA take-up, as the economy entered a new "lockdown light".[5]

To address the first identification challenge, we measure monthly state-level labor demand shock during the pandemic by exploiting regional variation in exposure to a common shock, constructing a so-called "Bartik shock", see e.g. Bartik (1991), Dao et al. (2017). During the COVID pandemic, contact intensive services had to shut down everywhere in Germany, but the extent of the de-facto shutdown varied regionally, as different states vary considerably in the relative size of contact-intensive sectors in their economy.

We construct two alternative shift-share metrics:

i. The first (baseline) shift-share variable captures labor demand shocks resulting from **exposure to contact-intensive sectors**. Specifically, we construct the following variable:

$$y_{st}^{CI} = \Delta Retail\&Rec\ Mobility_t \times\ emp\text{shr}_{s,t-1}^{CI},$$

That is, we interact the Germany-wide change in retail and recreation mobility (from aggregated Google Community Mobility Report data) with the pre-existing state-level employment share in contact-intensive sectors (comprising employment in

[5] For a description of the various infection waves and the accompanying lockdown measures in Germany, see e.g. IMF (2021)

Accommodation & Food, Retail & Wholesale Trade, and Culture & Arts), available at annual frequency from the National Statistical Agency.[6]

ii. The second shift-share variable zooms in on one of the most affected contact-intensive sectors, namely Accommodation and Food services, for which we have high-frequency turnover data at the national level.[7] Labor demand shocks driven by exposure to accommodation and food services are measured as:

$$y_{st}^{AF} = \Delta \ln Turnover\_A\&F_t \times empshr_{s,t-1}^{A\&F},$$

where Germany-wide monthly changes in volume turnover in accommodation and food services (A&F) is interacted with the pre-existing state-level employment share in the A&F industry.

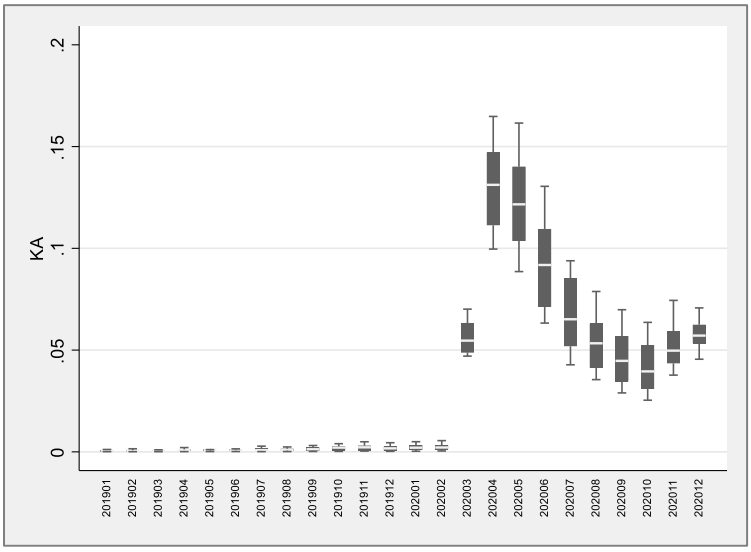
The series for both retail and recreation mobility and accommodation and food services turnover show a sharp decline at the onset of the pandemic in Germany in March 2020 and a partial recovery over the third quarter, followed by a renewed slump toward the end of the year (Appendix Figure 1). By interacting these "shift" variables capturing the impact of the pandemic shock on contact-intensive services activity with regional "shares" or magnitudes of exposure, we can measure each state's effective labor demand shock resulting from the curtailment in activity (both mandatory and voluntary) in sectors most affected by the pandemic.

To address the second challenge of identifying exogenous variation in Kurzarbeit take-up across states, we start with the observation that, as COVID hit Germany in the spring of 2020, both the level and the cross-state variation in KA take-up increased dramatically starting in March (Figure 2). An unprecedented share of 10-15 percent of employed workers across states were placed in the short-time work program in April. This share declined by roughly half by the third quarter, as a recovery took hold, but rose again toward the end of the year as the second COVID infection wave emerged. A corresponding chart showing the dispersion over time of the change in the unemployment rate across states is given in Appendix Figure 2.

[6] The Google Community Report data tracks mobility over time by geographical location and across different categories of places such as retail and recreation, groceries and pharmacies, parks, transit stations, workplaces, and residences, using aggregated, anonymized user data from Google Maps and other applications.

[7] High frequency turnover data from official sources is not available for the other two contact intensive sectors, Retail and Wholesale Trade, and Culture and Arts.

Figure 2. Share of workers on KA (as a fraction of total employment), January-December 2020



Source: Federal employment agency (Bundesanstalt für Arbeit). Box plots present the variation in KA take-up across 16 states for each given month.

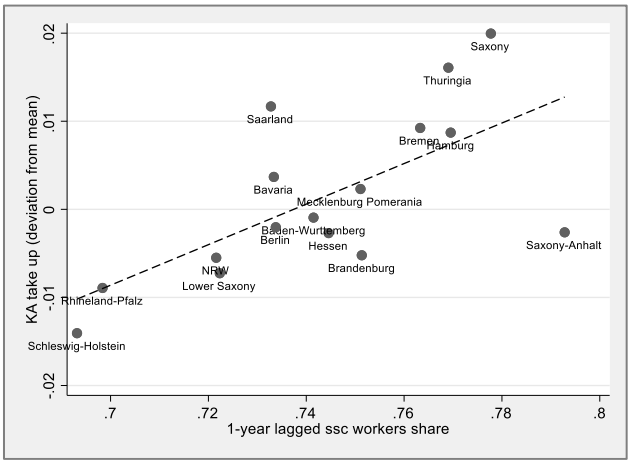
The strong correlation between KA take-up and the business cycle during the course of 2020 underlines the identification challenge. An OLS regression of unemployment on KA take-up (or its interaction, as in equation (2)) will typically underestimate any mitigating impact of KA, biasing the co-efficient of interest towards zero (see also the discussion in Cahuc and Carcillo, 2011; Boeri and Bruecker, 2011). We therefore introduce an instrumental variable that predicts variation in KA take-up across states but is exogenous to the pandemic shock. Specifically, we instrument KA take-up rate in each state and each month in 2020 by the share of workers subject to social security contributions in the same month one year earlier, in 2019. Only contributors to the social security system are eligible to receive KA benefits. Therefore, the relative size of the pre-existing eligibility pool across states in 2019 should predict the state-specific KA take-up given the labor demand shock, while being plausibly unrelated to the severity of the pandemic shock on regional labor markets in 2020. Importantly, the exclusion restriction should hold as state-specific exposure to contact-intensive sectors is controlled for.

Figure 3 illustrates the correlation between the take-up of KA in March 2020 and the share of social security contributing (ssc) workers in March 2019 across states, conditional on each state's exposure to the shock to contact-intensive sectors.[8] Some categories of workers are excluded from the obligation to contribute to the social security system, such as workers who are marginally employed, the self-employed and public civil servants. In particular, the share of ssc workers is inversely related to the share of marginally employed workers, who make up around 12 percent of total employment in Germany. The share of marginal employment

[8] In other words, the scatter plot shows the correlation between the 1-year lagged ssc share and the residual of a regression of monthly KA take-up on y_{st}^{CI}.

varies greatly across regions, owing to the industry mix (which we partly control for), but also due to demographics, behavioral patterns and complementary public services. For example, the propensity to work full-time is more pronounced among East German than West German women, owing possibly to historical and cultural reasons, contributing to a higher share of ssc workers in Eastern states on average.[9]

Figure 3. Conditional correlation between share of workers subject to SSC and KA take-up In March 2020



Notes: The correlation is conditional on the contact-intensive labor demand shock y_ci, obtained by regressing the KA take-up on y_ci and plotting the residuals against 1-year lagged ssc share.

For the purpose of our identification strategy, the variation in ssc workers stemming from regional differences in demographics, institutions and behavioral patterns is exactly what we aim to exploit to instrument for the take-up in KA as these differences predict the take-up but are unrelated to the pandemic-related shock to the labor market. It is crucial that we control for the employment share in hard-hit sectors in both regression stages, so that the remaining variation in the IV is not driven by the severity of the shock resulting from the region's sectoral composition. The aim is to compare states with similar sectoral composition, but where some states have a higher share of ssc workers due to pre-existing preferences or social structures.

V. Results

A. Labor Market Impact

We first present OLS regression results for equation (2), using two different dependent variables--the change in the monthly unemployment rate, and the rate of growth of

[9] Women in West German states tend to engage in more marginal employment than their peers in East Germany (see Social Security Administrations' press note). Within West Germany, the share of female marginal workers has been shown to be predominantly driven by the local availability of childcare (Harten, 2015).

employment--and, using two alternative shift-share measures of the state-specific labor demand shock (Table 1).

Both measures of the regional labor demand shock deliver similar qualitative results. That is, a decrease in labor demand resulting from mobility restrictions in contact-intensive sectors (columns 1 and 3), or the shutdown of non-essential businesses in the Accommodation and Food sector (column 2 and 4), significantly increases the unemployment rate and reduces employment growth. At the same time, a stronger take-up of KA mitigates the adverse demand impact on the labor market—the coefficient estimate for the interaction terms is positive and statistically significant for the unemployment rate specifications, and negative and statistically significant for the employment growth specifications.

The estimated magnitudes are also economically significant. For the median shock to contact-intensive labor demand in 2020Q2, an increase in KA take-up of 10 percentage points (the average take-up across states over 2020Q2) dampened the rise in the unemployment rate by 1.1 ppt and raised employment growth by 1.3 ppt during the same period. Similarly, for the median shock to the hospitality sector, the same average increase in KA take-up is estimated to have dampened the rise in unemployment by 1.2 ppt and boosted employment growth by 1.3 ppt.

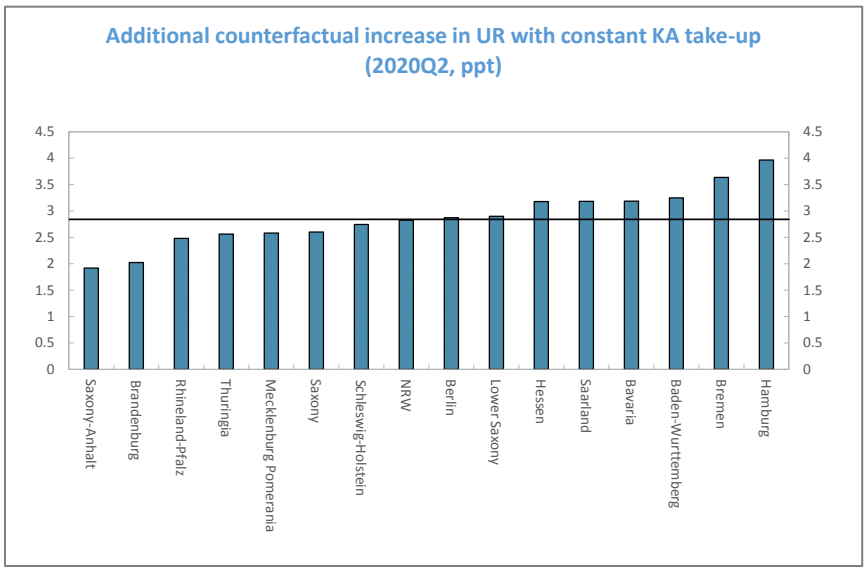
While these OLS estimation results imply a significant mitigating impact of KA, the estimates are likely to be downwardly biased (in absolute value) due to endogeneity: firms in states that were more adversely affected by the pandemic would be likely to expand KA take-up more than firms in other states. We therefore proceed with a two-stage least squares (2SLS) estimation of equation (2) where we instrument the interaction term with the state-specific share of workers who contribute to the social security system, as well as an interaction of this share with each labor demand shock.

The results of the second and first stage regressions are summarized in Table 2. The endogenous variable is indeed strongly positively correlated with the pre-existing share of workers subject to social security contributions. The first-stage F-statistics are high, close to thirty. As we also use the interaction of the labor demand shock with the share of workers subject to social security contributions as an additional instrument, an over-identification test can be performed, suggesting the instruments are valid. The second stage results in turn conform to our prior on the direction of the OLS bias. The coefficient estimates on the interaction term between the labor demand shock and KA take-up, properly instrumented, are more than twice as large (in absolute value) using 2SLS compared to OLS. A Hausman test for endogeneity rejects the null hypothesis of OLS validity at the 5 percent significance level.

The 2SLS regressions deliver qualitatively similar results using either the labor demand shocks resulting from contact-intensive exposure (y_{st}^{CI}) or from accommodation and food services exposure (y_{st}^{AF}). There is also consistency between the unemployment rate and employment growth results. The economic significance of the estimates can be best illustrated by constructing a counterfactual increase in the unemployment rate absent an increase in KA take-up. To this end, we calculate the predicted contribution of KA take-up to the increase in the unemployment rate for each state during 2020Q2--the trough of the crisis--

relative to the pre-crisis baseline of January 2020. By applying the estimated coefficient of the main interaction term (in column 1 of Table 2) to the observed change in KA take-up between January 2020 and 2020Q2 as well as the observed labor demand shock (measured by the baseline metric y_{st}^{CI}) during 2020Q2, we can calculate the counterfactual increase in unemployment if KA take-up were kept at the pre-crisis level. These counterfactual changes in unemployment for all states are presented in Figure 4.

Figure 4.



Notes: The counterfactual increase in UR is computed by applying the estimated coefficient from 2SLS of the unemployment regression on the key interaction term to the observed labor demand shock and the difference between actual KA take-up and the pre-crisis take-up level in February 2020

The unemployment rate would have increased by an additional 2.9 percentage point on average across states if KA take-up was unchanged during 2020Q2 relative to pre-crisis levels. Unsurprisingly, the impact is largest in those states dominated by a single metropolis with a correspondingly large services sector—Hamburg and Bremen—where the unemployment rate would have increased by an additional 3.5 - 4 percentage points. More rural, less densely populated states and/or states with a lower share of ssc workers would have seen a less pronounced, though still significant increase in unemployment in the absence of KA expansion. The counterfactual results are similar when using the alternative shift-share metric y_{st}^{AF} for labor demand instead (Appendix Figure 3).

B. Impact on domestic demand

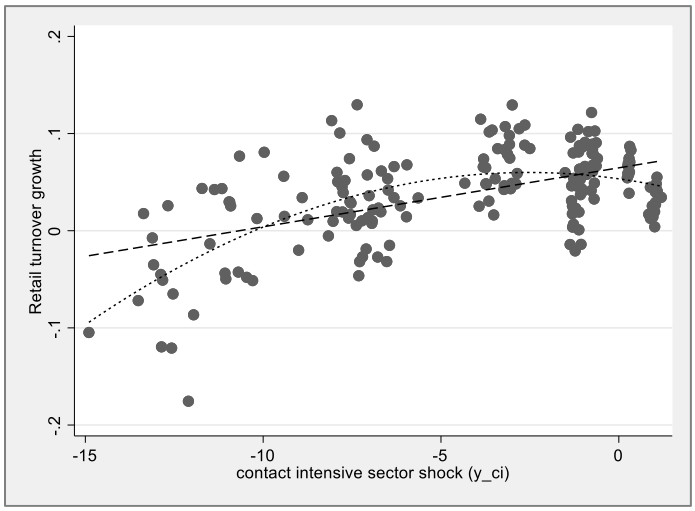
In addition to reducing unemployment, does the use of short-time work schemes during a downturn also boost consumption and, by extension, support domestic demand? Policy makers often cite this argument as an additional rationale for the use of short-time work programs and their expansion in times of crisis. However, in principle there need not be any additional impact from short-time work benefits in the context of other labor market

institutions, notably the existence of unemployment insurance benefits. Consider the situation of a firm with 2 workers with identical incomes, which needs to reduce total hours by half. The firm can either lay off one worker, who would then receive income replacement through unemployment benefits, or reduce hours worked per worker by half, with each worker receiving short-time work benefits for the reduced hours. If the net replacement rate is similar across the unemployment and short-time work benefits systems, as is the case in Germany, the total income of both workers is the same under both scenarios.

However, there are several reasons why the implications for household consumption could be different with short-time work benefits. First, the replacement rate through KA was significantly increased during the pandemic to levels substantially above the unemployment benefit replacement after four months on short-time work (see section III above). Second, KA participation comes with the important benefit of job retention for both employee and firm. For the firm, this retention preserves valuable firm-specific human capital while for the worker, job stability implies less idiosyncratic risk and less need for precautionary saving, potentially supporting the worker's consumption.

Figure 5 provides a scatter plot of the monthly growth in retail trade turnover in each state over the course of 2020 versus the shock to contact intensive labor demand in the same month. The positive slope of the correlation, steepening in the left tail where demand contraction was deepest (concentrated in April 2020), suggests that the adverse labor demand shock had an important impact on private consumption.

Figure 5. Retail trade turnover and shock to contact intensive sectors



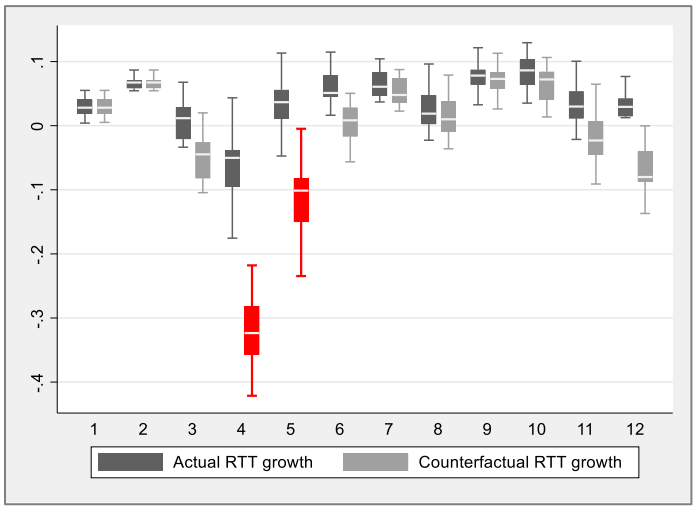
Notes: Each dot represents a state-month observation during 2020. Source: Destatis, BA.

To answer the empirical question of whether this demand impact was dampened by the KA program, we rerun the state-level panel regression from equation (2) using the same OLS and 2SLS identification strategies, but replacing the dependent variable with a monthly proxy for state-level consumption, namely the volume turnover index for retail trade. The results are summarized in Tables 3 using the two alternative measures of labor demand shocks.

Using the baseline contact intensive demand in column 1 and 2, the estimates again show that KA take-up is highly endogenous to demand conditions, yielding opposite signs across OLS and 2SLS estimates for the key interaction term. The IV continues to be strong, valid, and OLS is rejected at 5 percent significance level. To illustrate the economic magnitudes, Figure 6 plots the cross-sectional distribution of actual retail trade turnover growth for each month of 2020. These monthly box plots of cross-state observations are plotted against the counterfactual distribution of retail trade growth in the absence of increased KA take-up, applying the estimated coefficients from the 2SLS regression.

The mitigating impact of KA on domestic demand is very substantial: absent an expanded take-up of KA, retail trade turnover would have declined by three times as much as it actually did in April, while for 2020Q2 as a whole, turnover would have been 15 percent lower than actual. In other words, the KA program not only contributed toward stabilizing the labor market but also to a considerable extent to stabilizing domestic demand. These results are consistent with the hypothesis that in addition to providing income support to households, KA also acted to reduce uncertainty for both firms and workers, sustaining private sector demand amid a deep output contraction.

Figure 6. Actual and counterfactual retail turnover growth across states (Jan-Dec 2020)



Notes: The counterfactual retail turnover growth is computed by applying the estimated coefficient from 2SLS of the retail demand regression on the key interaction term to the observed labor demand shock and the difference between actual KA take-up and the pre-crisis take-up level in February 2020. Box plots show variation across states for each given month in 2020.

VI. Robustness and Additional Results

Alternative export demand shock

The COVID-19 crisis was unprecedented in terms of the lockdowns imposed on service sector activity. However, as the pandemic started spreading in the spring of 2020, disruptions to global value chains and a synchronized demand contraction among most of Germany's trading partners also led to a profound collapse in exports. As an alternative measure for the regional demand shock, we therefore construct a shift-share variable that exploits the fact that the sharp export contraction in the initial months of the pandemic affected states differently, depending on each region's export orientation. That is, this shift-share variable captures the exposure to cross-border exports:

$$y_{st}^{\mathrm{Ex}} = \Delta \ln exp_t \times \ expshr_{s,t-1},$$

by interacting Germany-wide export growth with the pre-existing state-level export share (in state-level GDP). The results using this state-level demand shock are summarized in Table 4. The OLS estimates imply that subject to the median export shock in 2020Q2, the observed average take-up in KA dampened the unemployment rate by 0.4 pp and boosted employment growth by 1.2 pp. Using coefficients estimated with 2SLS, the KA impact amounts to a somewhat larger impact of 0.8 pp for unemployment and 1.4 pp for employment growth. Compared to the baseline results using the services sector demand shock, the alternative identification with export demand shock delivers consistent, but quantitatively smaller results for the dampening impact of KA. This may be because the export shock was not as

pronounced and persistent as the shock to contact intensive sectors. In addition, the same instrumental variable approach using the pre-existing share of ssc workers does not exhibit strong first stage results, preventing a proper direct comparison with the baseline 2SLS results.

Month-by-month panels

The baseline regressions results are obtained by pooling observations across all months in 2020. Since the year-on-year changes in monthly variables are likely serially autocorrelated, the error terms could be autocorrelated and impart bias to the estimates. In Table 5, we present OLS estimations using a panel of separately pooled March, April and May observations across all 12 years (2009-2020) with available data on the accommodation and food as well as export shock (the contact-intensive shock based on Google mobility data is only available for 2020).

While the coefficient estimate on the main interaction term $y_{st}^{CI} \times KA_{st}$ is similar to the baseline OLS result when using the April and May panels, the estimated dampening impact of KA on unemployment is much larger using the March panel. This suggests that the mitigating benefit of KA was most pronounced at the beginning of the downturn, consistent with findings in the literature which highlight the automatic stabilizing role of KA early in a downturn (Brey and Hertweck, 2020; Balleer et al., 2016). Overall, these month-by-month pooled panels deliver results that are similar or stronger than the baseline specification using consecutive months in 2020, suggesting that the results are likely not biased by autocorrelation to any significant extent.

Including pre-shock trends

Our baseline specification includes monthly observations from January to December 2020. We relied on this sample period for two main reasons: First, the mobility data required to construct the contact-intensive sector shock are only available starting January 2020. Second, the COVID pandemic engendered unprecedented shocks to the economy, both in terms of its magnitude and sectoral mix. In light of possible non-linearities in the impact of KA, it is therefore reasonable to focus on the crisis months to disentangle the dynamics during the crisis. However, it is possible that there are pre-crisis trends in labor market dynamics and KA eligibility which could affect our estimates of the KA impact during the crisis, for example, if states which increased KA more due to a larger eligibility pool were also those whose labor markets were stronger before the crisis.

To control for such pre-crisis trends in state-level labor market outcomes and KA take-up, we add to the sample period an equal number of months preceding the pandemic (that is, the sample runs from May 2019 to December 2020, comprising ten months before and ten months during the crisis). Columns 1-2 of Table 6 report estimates of the baseline 2SLS regression of labor market outcome variables using this extended sample period and the accommodation and food shock. The coefficient estimates on the key interaction term are similar to the baseline sample, and slightly larger in magnitude: 7.4 compared to 6.5 for

unemployment rate and -9.6 compared to -7.1 for employment growth. These results suggest that the baseline estimates are robust to controlling for pre-crisis dynamics.
In addition, we also restricted the sample to only March – December 2020, during which the parameters of the KA program were substantially relaxed and expanded (as elaborated in section II). This is to explore whether differences in program parameters change the estimated impact of KA. Column 3-4 in Table 6 show the corresponding results, which are qualitatively consistent with the baseline specification but smaller in absolute magnitude. Together with the results in column 1-2, they imply that the largest benefits of KA in terms of dampening unemployment occurs at the beginning of the downturn (here March 2020) and that the inclusion of some months prior to the surge in KA and unemployment is important to capture this early variation, during which the *change* in KA take-up was most pronounced.

Greater control of regional industry mix

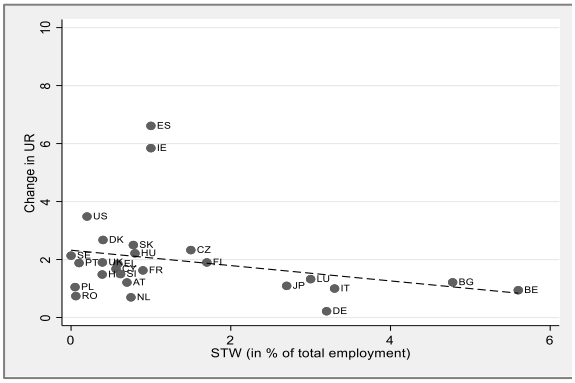
A possible argument against the exclusion restriction of our instrumental variable is that variation in the pre-existing share of ssc workers is driven by regional differences in the industry mix; differences that also render regional labor markets more or less exposed to the pandemic lockdown. As explained previously, some of the variation in the pre-existing share of ssc workers is accounted for by demographic and behavioral differences between German states, which have deep-rooted societal origins. This is the variation that we wish to exploit, making it important to control for variation that arises simply due to the industry mix. Therefore in both our OLS and IV specifications, we also control for the share of employment in the sector that is subject to the shock. For the baseline contact-intensive sector shock, this was the share of employment in contact-intensive sectors. For the accommodation and food services shock, it was the share of employment in hospitality sectors. For the export shock, it was the share of exports in regional GDP. Each of these measures, however, could be capturing complementary structures of regional labor markets so that the exclusion restriction would be strengthened by including all of them jointly. This is what we do in Table 7, where all three employment shares and in addition, the share of employment in manufacturing are also included as additional controls. The first stage regression reveals that the employment share in manufacturing has a strong positive impact KA take-up but does not affect the first stage coefficients on the instrumental variable, nor the main coefficient estimates of the second stage. Although we cannot rule out that other structural differences in regional economies may be correlated with the instrument, we show that the main regional characteristics which may determine a state's exposure to the pandemic shock are not spuriously captured by the IV.

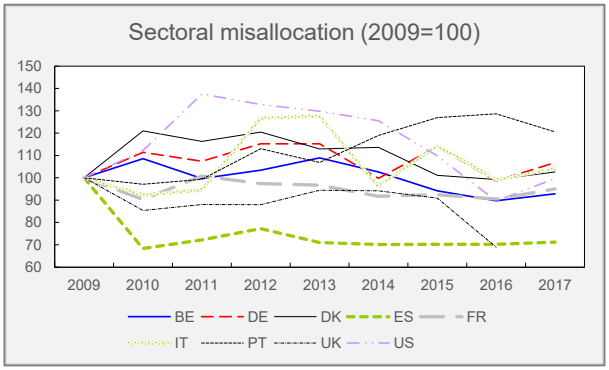
VII. POST-CRISIS REALLOCATION: LESSONS FROM THE GFC

We have presented new evidence on the effectiveness of short-time work program in Germany for its labor market and economic resilience during the COVID-19 crisis. However, a frequent critique of such programs is that, while they might help stabilize the economy in the short run, they prevent efficient reallocation of resources between sectors and hence can have negative medium-run consequences such as lower productivity growth (Boeri and Bruecker, 2011, Burdett and Wright, 1989).

We look back at the aftermath of the GFC across major OECD countries for guidance. The simple correlation between short-time work take-up and the change in unemployment is negative (Figure 7). However, the medium and long-term implication for the post-crisis reallocation dynamics have not yet been studied.

Figure 7. STW take-up vs. change in UR in 2009 and sectoral misallocation 2009-2017





Notes: Sectoral misallocation is computed as the change in the standard deviation of log dispersion of MRPL across 2-digit sectors within each country. Sources: STW take-up in 2009 are taken from Hijzen and Venn (2011); OECD, EU-KLEMS, IMF WEO and authors' calculations.

We take a preliminary look at this question by exploring the dynamics of sectoral misallocation in major OECD countries in the decade following the GFC. Building on the assumptions in Hsieh and Klenow (2009), we proxy the degree of labor misallocation across sectors in a country by the cross-sectoral dispersion in the log marginal revenue product of labor (MRPL). Intuitively, in an economy where factors of production are free to move across sectors without impediment, they will do so until the MRPL is equalized. Thus, perfect equality of the MRPL across sectors represents zero misallocation of labor. But the prolonged use of STW in some sectors could result in inefficient job matches being retained, impeding labor (and other factors of production) from moving optimally between sectors. The problem may be particularly acute if STWs are used to shore-up employment in sectors with pre-existing overcapacity (such as the construction sector during the GFC), or which might be expected to shrink due to long-term structural forces (such as automation).

The cross-sectoral dispersion of (log) MRPL therefore provides a simple and intuitive measure of the degree of misallocation of labor across sectors within an economy, and the evolution over time of this dispersion allows us to compare the dynamics of labor misallocation across countries. This comparison is presented for a set of OECD countries in Figure 5 (right panel). For the three OECD countries with the highest take-up of STW schemes (Belgium, Italy, Germany) we do not observe a systematically larger widening of labor misallocation relative to countries with little use of STW (such as Portugal, the UK and the US). More formally, a simple cross-sectional regression of the change in misallocation at all time horizons after 2009 on STW usage in 2009 for a set of 26 OECD countries does not deliver any statistically significant correlation (see Appendix Figure 4 for the 5-year horizon correlation as an illustration).

Conceptually, a subsidized job retention program could inhibit efficiency-enhancing resource reallocation, particularly if there is substantial underlying misallocation to start with, that is, if there are larger pre-existing needs for some sectors (and firms) to shrink and others to expand. On the other hand, STW use during a temporary business cycle downturn could also be productivity-enhancing, especially if firm and industry-specific human capital is preserved as a result. STW support could also help firms to maintain liquidity, thus facilitating investment and hiring during the recovery.

We examine this empirically by running a cross-section regression of changes (over j years) in misallocation on the initial extent of misallocation, the use of STW during 2009, and the interaction between the two.

$$\Delta Misallocation_{c,t\rightarrow t+j} = c + \alpha Misallocation_{c,t} + \beta STW_{c,t} + \gamma Misallocation_{c,t} \times STW_{c,t} + \varepsilon_{c,t+j},$$

where *t=2009* and the change in misallocation is measured by the change in country-level sectoral standard deviation in log MRPL. The results are summarized in Table 8. Consistent with our prior, if pre-existing misallocation is high, high STW take-up is associated with greater subsequent misallocation; the coefficient on the interaction term is positive while that on the standalone STW variable is negative. The magnitude of the estimated interaction term is largest for j=6 and j=7. In other words, there is a threshold of initial misallocation above which higher STW take-up in 2009 led to greater misallocation after 6-7 years (and vice versa). On the other hand, if initial misallocation is below the threshold—as it was for Germany—STW usage is not associated with greater subsequent misallocation of resources. Although we view these results as exploratory, the estimated non-linearity does suggest that economies that suffer from misallocation when they enter a crisis do indeed face the much-discussed trade-off between STW usage to curb unemployment and medium-run allocative efficiency.

VIII. CONCLUSION

Despite the policy consensus on the efficacy of job-retention programs in a recession, the subject has received relatively little empirical attention, most notably in comparison to the enormous literature on the impact of unemployment insurance schemes. This paper provides early evidence of the impact of Germany's short-time work program, *Kurzarbeit*, on employment and consumption outcomes during the COVID-19 pandemic. In contrast to cross-country or firm-level studies, we use state-level variation in KA take-up to identify the impact of the federally administered and parameterized program. Our results suggest that the program was indeed very powerful in reducing unemployment and stabilizing aggregate demand.

The medium-term trade-off between the use of job-retention programs during a crisis and labor misallocation has been even less studied. We make preliminary progress in this direction by establishing that greater use of such programs during the GFC is indeed

associated with greater misallocation several years later, but only in those economies above a certain threshold of initial misallocation. Taken together, these results suggest that a well-designed job-retention program can be an excellent policy tool to stabilize labor markets and aggregate demand in a crisis. However, if the economy is characterized by initial large differences in labor market productivity across sectors, then policy makers need to be aware of the potential trade-off with medium-term rigidities. We would suggest that future research focus on how best to mediate this trade-off.

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Table 1. OLS Results

	(1)	(2)	(3)	(4)
	DV: Change in UR		DV: Employment growth	
y^{ci}_st	-0.124***		0.315***	
	(0.033)		(0.082)	
y^{ci}_st*KA_st	**1.450*** **		**-1.667*** **	
	(0.145)		(0.153)	
y^{af}_st		-0.218***		0.253***
		(0.023)		(0.042)
y^{af}_st*KA_st		**2.935*** **		**-3.247*** **
		(0.259)		(0.409)
Observations	192	192	192	192
R-squared	0.643	0.654	0.726	0.720

Robust standard errors clustered at state level in parentheses
KA=short-time workers in pct of total state employment
*** p<0.01, ** p<0.05, * p<0.1

Notes: Table entries show main coefficient estimates of equation (2) using two alternative measures of state-specific labor demand y: contact-intensive demand shock (y_ci) and accommodation & food demand shock (y_af), as defined in the main text. State fixed effects are included in all specifications. Other regressors not reported are the components of the main interaction term, i.e. recreation and retail mobility and lagged state-level employment share in contact-intensive sectors for columns 1 and 3; the change in monthly nation-wide turnover index for accommodation and food services and the lagged state-level employment share in accommodation and food for column 2 and 4. The estimation sample period covers January to December 2020 for 16 states.

Table 2. 2SLS Results

	(1)	(2)	(3)	(4)
	DV: Change in UR		DV: Employment growth	
y^{ci}_st	-0.308		0.535*	
	(0.242)		(0.302)	
y^{ci}_st*KA_st	**3.841*** **		**-4.531*** **	
	(0.750)		(0.816)	
y^{af}_st		-0.820***		0.790***
		(0.109)		(0.133)
y^{af}_st*KA_st		**6.535*** **		**-7.059*** **
		(1.022)		(1.245)
Observations	192	192	192	192
	First-stage results			
	DV: $y^{af/ci}$_st*KA_st			
sscshr_s,t-1	**14.753*** **	**8.568** **	**14.753*** **	**8.568** **
	(2.268)	(1.251)	(2.268)	(1.251)
$y^{af/ci}$_st*sscshr_s,t-1	0.014	0.073	0.014	0.073
	(0.277)	(0.193)	(0.277)	(0.193)
F-stat (p-val)	28 (0.00)	29 (0.00)	28 (0.00)	29 (0.00)
Sargan overid test	0.794	0.767	0.907	0.503

Notes: State fixed effects are included in all specifications. The first stage panel shows the coefficient estimates of the first stage regression of the endogenous variable on the excluded instruments. Other regressors for both stages not reported are the components of the main interaction term, i.e. recreation and retail mobility and lagged state-level employment share in contact-intensive sectors for columns 1 and 3; the change in monthly nation-wide turnover index for accommodation and food services and the lagged state-level employment share in accommodation and food for column 2 and 4. The first stage regression also includes the stand-alone labor demand shocks. The estimation sample period covers January to December 2020 for 16 states.

Table 3. OLS and 2SLS results for KA impact on retail trade turnover

	(1)	(2)	(3)	(4)
	DV: Growth in Retail Trade VolumeTurnover			
	OLS	2SLS	OLS	2SLS
y^{ci}_st	0.005	0.024**		
	(0.006)	(0.012)		
y^{ci}_st*KA_st	0.054***	-0.159*		
	(0.013)	(0.088)		
y^{af}_st			-0.000	0.071**
			(0.004)	(0.032)
y^{af}_st*KA_st			0.098***	-0.663*
			(0.029)	(0.343)
1-st stage F-stat (p.val)		9.1 (0.00)		3.7 (0.03)
Sargan overid. Test (p-val)		0.35		0.59
Hausman (p-val)		0.04		0.04
Observations	188	188	188	188
R-squared	0.704	0.289	0.742	0.531
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Notes: Table entries show main coefficient estimates of equation (2) using the baseline measure of state-specific labor demand y: contact-intensive demand shock (y_ci) and hospitality sector shock (y_af) as defined in the main text. State fixed effects are included in all specifications. Other regressors not reported are the components of the main interaction term, i.e. recreation and retail mobility and lagged state-level employment share in contact-intensive sectors in column 1-2 and the change in monthly nation-wide turnover index for accommodation and food services and the lagged state-level employment share in accommodation and food for column 3-4. The estimation period covers January to December 2020 for 16 states. Year on year monthly percentage change in retail trade turnover index at the state-level as dependent variable, both proxying for domestic demand.

Table 4. Using alternative export shock to regional labor demand

	(1)	(2)	(3)	(4)
	Dependent variable:			
	dUR	Emp growth	dUR	Emp growth
	OLS		2SLS	
y^{ex}_st	-0.089***	0.218***	-0.062	0.173
	(0.022)	(0.037)	(0.122)	(0.173)
y^{ex}_st*KA_s,t-1	0.550***	-1.748***	1.116	-2.011
	(0.129)	(0.261)	(0.937)	(1.354)
Observations	192	192	192	192
R-squared	0.308	0.684	0.549	0.655
			First-stage results	
			DV: y^{ex}_st*KA_st	
sscshr_s,t-1			0.952	
			(1.208)	
y^{ex}_st*sscshr_s,t-1			0.293	
			(0.204)	
F-stat (p-val)			1.5 (0.24)	
Sargan overid test			0	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Table entries show main coefficient estimates of equation (2) using the alternative, export-based measure of state-specific labor demand y_ex, composed of the national rate of export growth in a given month interacted with the 1-year lagged state-level export to GDP share. Other regressors not reported are the components of the main interaction term, i.e. the monthly growth in aggregate volume of exports and the lagged annual average state-level exports to GDP ratio. State fixed-effects are included in all specifications. The estimation period covers January to December 2020 for 16 states. Column 1-2 are estimated with OLS, columns 3-4 with 2SLS.

Table 5. Robustness: March-May month-by-month panels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dep. Variable: Change in UR								
	March (pooled)			April (pooled)			May (pooled)		
y^{af}_st	**-0.786*** **		**-0.730*** **	**-0.335*** **		**-0.519*** **	**-0.459*** **		**-0.466*** **
	(0.124)		(0.133)	(0.090)		(0.120)	(0.107)		(0.107)
y^{af}_st*KA_st	**14.250*** **		**13.402*** **	**2.480*** **		**3.589*** **	**2.394*** **		**2.005***
	(1.731)		(1.918)	(0.612)		(0.872)	(0.799)		(0.990)
y^{ex}_st		-0.022***	-0.014*		-0.015*	-0.011		-0.027**	-0.022*
		(0.007)	(0.007)		(0.008)	(0.007)		(0.010)	(0.010)
y^{ex}_st*KA_st		0.442***	0.040		0.171*	-0.137*		0.380*	-0.040
		(0.138)	(0.176)		(0.083)	(0.068)		(0.206)	(0.160)
Observations	192	192	192	192	192	192	192	192	192
R-squared	0.285	0.226	0.319	0.555	0.546	0.585	0.659	0.646	0.694
Number of state_id	16	16	16	16	16	16	16	16	16

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Table entries show main coefficient estimates for the OLS regression of equation (2) in the text using a panel of pooled March, April and May observations over 2009-2020 respectively. State fixed-effects are included in all regressions. Labor demand shock is measured using either the accommodation and food services shock (y_af) or the export shock (y_ex). Other regressors not reported are the components of the main interaction term, i.e. the monthly growth in aggregate volume of exports and the lagged annual average state-level exports to GDP ratio for specifications using export shock, and the change in monthly nation-wide turnover index for accommodation and food services and the lagged state-level employment share in accommodation and food for specifications using the hospitality shock (y_af).

Table 6. Robustness: Including and excluding pre-trends.

	(1)	(2)	(3)	(4)
	Sample period:			
	May 2019 - Dec 2020		March 2020 - Dec 2020	
	Dependent variable:			
	dUR	Emp growth	dUR	Emp growth
y^{af}_st	-0.972***	1.236***	-0.456***	0.565***
	(0.117)	(0.152)	(0.120)	(0.128)
y^{af}_st*KA_st	7.399***	-9.636***	3.896***	-4.707***
	(1.225)	(1.609)	(0.899)	(0.969)
Observations	320	320	160	160
	First stage results			
	DV: y^{af}_st*KA_st			
sscshr_s,t-1	4.758***	4.758***	8.870***	8.870***
	(0.771)	(0.771)	(1.671)	(1.671)
y^{af}_st*sscshr_s,t-1	-0.055	-0.055	-0.117	-0.117
	(0.166)	(0.166)	(0.244)	(0.244)
F-stat (p-val)	22 (0.00)	22 (0.00)	20.4 (0.00)	20.4 (0.00)
Overid test (p-val)	0.725	0.586	0.725	0.589
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Notes: Table entries repeat the baseline 2SLS regression of labor market outcomes on the demand shock to accommodation and food services and its interaction with KA take-up, which is instrumented with the 1-year lagged share of ssc workers. Column 1-2 extend the sample period to include equal number of months before and during the pandemic (May 2019-December 2020). Column 3-4 exclude all months before the pandemic (March 2020 – December 2020). State fixed-effects are included in all specifications. Other first and second-stage regressors included but not reported are the change in monthly nation-wide turnover index for accommodation and food services and the lagged state-level employment share in accommodation and food. First stage regression also includes the labor demand shock y_af standalone.

Table 7. Additional sectoral composition controls

	(1)	(2)	(3)
	Dependent variable:		
	dUR	Emp growth	RTT growth
y^{ci}_s,t	-0.279	0.507*	0.024**
	(0.242)	(0.308)	(0.012)
y^{ci}_s,t*KA	3.855***	-4.529***	-0.163*
	(0.763)	(0.852)	(0.085)
$empshr^{ci}$_t-12	8.311	19.507*	0.567*
	(9.672)	(11.573)	(0.318)
$empshr^{af}$_s,t-12	37.844	-28.437	-2.304
	(37.504)	(44.296)	(1.897)
expshr_s,t-12	2.984	4.989	0.398*
	(5.148)	(6.084)	(0.239)
$empshr^{man}$_s,t-12	15.574	-15.006	-0.270
	(12.729)	(15.247)	(0.392)
	First stage results		
	DV: y^{ci}_st*KA_st		
sscshr_s,t-1		14.662***	
		(2.417)	
y^{ci}_st*sscshr_s,t-1		0.005	
		(0.275)	
$empshr^{ci}$_t-12		24.015***	
		(4.352)	
$empshr^{af}$_s,t-12		3.951	
		(6.952)	
expshr_s,t-12		-0.824	
		(0.965)	
$empshr^{man}$_s,t-12		10.644***	
		(2.951)	
F-stat (p-val)		24 (0.00)	
Overid test (p-val)	0.748	0.876	0.24
Observations	192	192	188

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Table entries repeat the baseline 2SLS regression of labor market outcomes on the contact-intensive labor demand shock instrumented with the lagged share of social security contributing workers (sscshr). In addition to the baseline controls, the first and second stage also control for the state-specific share of employment in accommodation and food services, export/GDP share and the employment share in manufacturing.

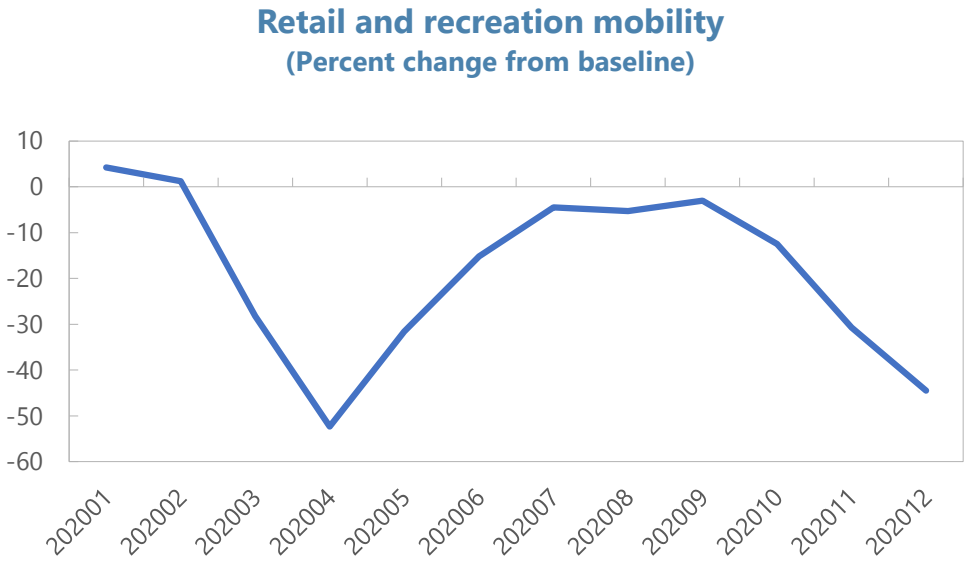
Table 8. STW take-up in 2009 and subsequent change in misallocation

Dep. Var: Change in misalloc. btw. t & t+j	(1) t+3	(2) t+5	(3) t+6	(4) t+7	(5) t+8
Misalloc_t	-0.614***	-0.925***	-0.706***	-0.967***	-0.681**
	(0.146)	(0.133)	(0.175)	(0.280)	(0.293)
STW_t	**-0.019**	**-0.105*** **	**-0.110*** **	**-0.117*** **	**-0.074** **
	(0.032)	(0.030)	(0.022)	(0.036)	(0.032)
Misalloc_t*STW_t	**0.001**	**0.230*** **	**0.293*** **	**0.274*** **	**0.166** **
	(0.091)	(0.070)	(0.050)	(0.083)	(0.075)
Observations	26	26	26	25	23
R-squared	0.441	0.534	0.322	0.423	0.238
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

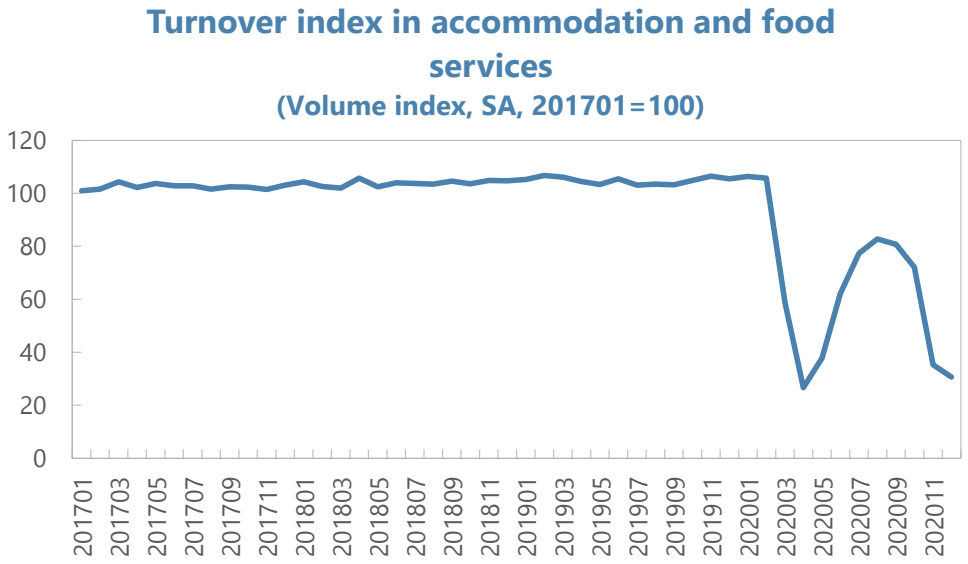
Notes: Table entries summarize coefficient estimates of equation (x) in the text—a cross-sectional model of long-term changes (over *j* years) in dispersion of MRPL, with *t=2009.* Misallocation is measured by the standard deviation of log MRPL and STW take-up is measured by the share of total employment participating in a STW program, as documented by Hijzen and Venn (2011). Sources: EU-KLEMS.

Appendix Figure 1. Evolution of retail mobility and turnover in accommodation and food services

A.

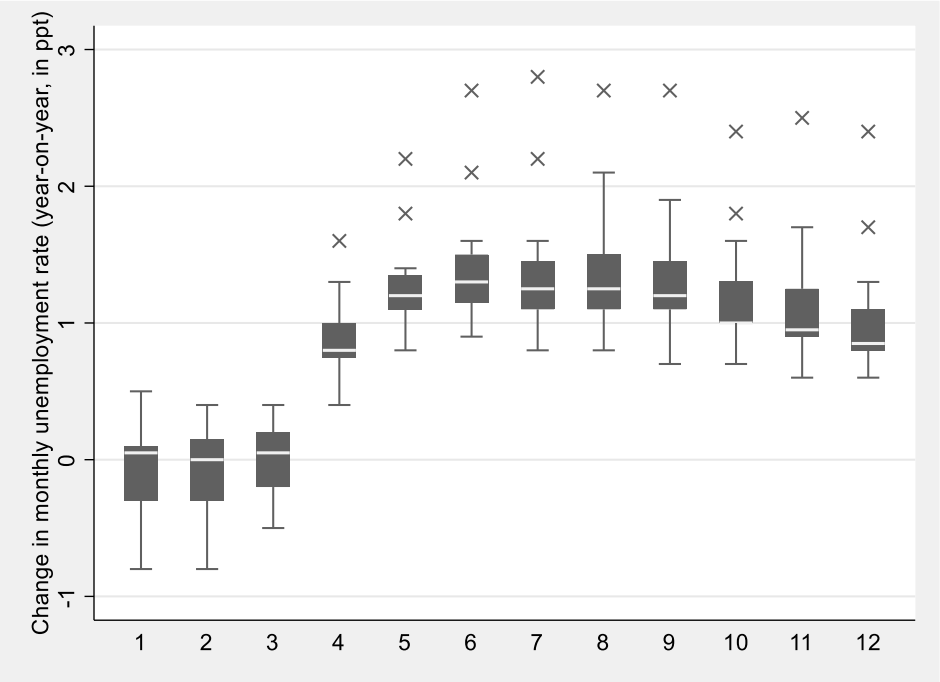


B.



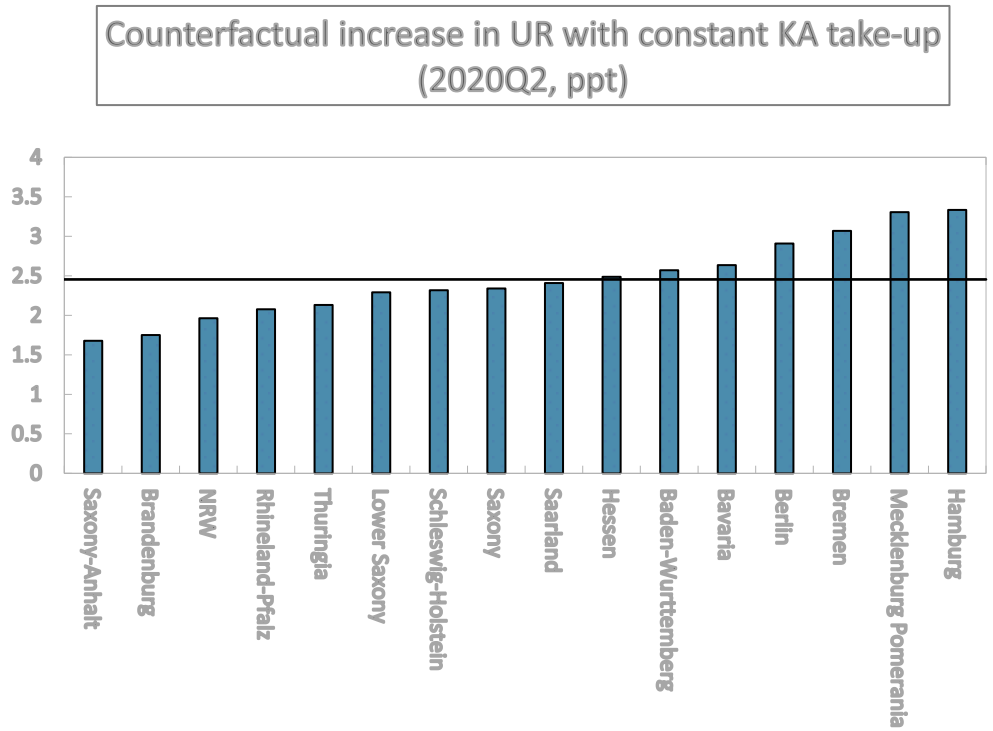
Notes: Sourced from Google Community Mobility Report (Panel A) and DESTATIS/Haver (Panel B).

Appendix Figure 2. Monthly change in the Unemployment Rate across states during 2020



Notes: Each box plot represents the cross-sectional deistribution of the change in unemployment rate across 16 German states for each given month in 2020 relative to the same month in 2019. "x" denotes the outside values (i.e. 1.5 times above the upper interquartile range).

Appendix Figure 3. KA impact on mitigating labor demand shock using the accommodation and food services shock.



Notes: The bars illustrate by how much the unemployment rate in each state would have been higher if the KA take-up would have remained constant to pre-crisis levels, using the 2SLS estimated coefficients. States are subject to the measured demand shock in accommodation and food services (y_af) as defined in the main text. Black line is the simple average across 16 states.

Appendix Figure 4. Change in misallocation 2009-2014 versus STW take-up in 2009