Preserving job matches during a pandemic:
firm-level evidence on the role of government aid[*]

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Abstract

How effective are government aid programs in preserving job matches? We estimate the effects
of COVID-19 aid by combining unique fast-response administrative and survey data from

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Denmark. First, we document the heterogeneity in aid take-up with a representative sample of firms across all industries. Second, based on our survey eliciting firm managers' actual firing decisions and their counterfactual decisions in the absence of aid programs, we estimate aid induced 81,000 fewer layoffs and 285,000 more furloughs. We find the policy was effective in preserving job matches at a cost of under US$2,000 per job, per month.

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1   Introduction

Government efforts to limit economic damage from recessions often operate via policies that change firms' incentives and constraints. As in other crises, the economic shock resulting from the COVID-19 pandemic was met with a policy response aimed at helping people and businesses weather the economic damage. Unlike other crises, however, governments also had a goal of containing the virus by limiting interpersonal contact, often by slowing down or stopping face-to-face commerce. As such, a central theme of this dual-goal type of policy has been to put the economy "on pause" by smoothing consumption while maintaining the viability of ongoing economic relationships between firms, their customers, and their employees.

Whether these policies are successful depends on the decisions of firm managers, who must apply for different aid packages, decide which workers lose their jobs, and how to rearrange their operations to remain viable. Their choices thus affect the allocation of trillions of dollars in aid globally. Yet, there is scant evidence of how firms have reacted to government aid programs designed to combat the pandemic-driven recession, and about how counter-cyclical policies affect firm's management decisions more generally.

To address these questions, we study how Danish firms have responded to government aid and ask whether their responses align with the goals of supporting public health and economic stability in a cost-effective manner. Ex-ante, it is not clear that they would: the pandemic has generated considerable uncertainty (Altig et al.; 2020) and anxiety (Fetzer et al.; 2020), both of which could compromise managerial decision-making. Indeed, in the United States, Bartik et al. (2020) find that uncertainty about policy affected decision-making by small businesses and Chetty et al. (2020) report policy had "little impact on employment rates at small businesses" — a finding they attribute to aid being taken up by firms that did not experience large job losses. About 60 percent of workers in high-income countries have jobs that do not allow them to work from home (Dingel and Neiman; 2020) and workers have faced unprecedented drops in labor demand (Del Rio-Chanona et al.; 2020; Coibion et al.; 2020; Forsythe et al.; 2020; Marinescu et al.; 2020). These pandemic-related layoffs

risk becoming permanent (Barrero et al.; 2020; Alstadsæter et al.; 2020) and the time to rebuild the match-specific capital lost in those jobs could contribute to prolonged recession (Lise and Robin; 2017). However, Danish aid policies were designed so firms could simply recall most of their previous workforce into employment without high hiring costs (Friebel et al.; 2019), while helping workers forego the costs of job displacement (Lachowska et al.; 2018).

We have assembled the most detailed data available to examine the impact of the unprecedented economic shock of the pandemic on firms and their responses to government policy. In May 2020, we completed a representative survey of over 10,000 Danish firms accounting for one quarter of the entire population of firms, and linked their responses to administrative register data on all furlough records from May to June 2020, as well as 2019 firm accounting data. During the survey, we collected information on firms' actual layoff and furlough decisions, but also elicited the number of workers they would have furloughed or laid off had they not taken up aid. Those counterfactual decisions were salient for managers since they had made the calculation to apply for aid within days of taking the survey. We compare firms' actual and stated counterfactual outcomes to help estimate the causal effect of different aid packages.

Our main finding is that firms furloughed significantly more workers than they had planned to lay off, suggesting that the policy not only saved employment matches, it also encouraged firms to put workers on leave who might have otherwise stayed on the job. Our preferred estimates indicate that government aid packages helped to reduce the number of workers laid off by approximately 81,000 and increased the number of workers furloughed by 285,000. While under normal circumstances inducing furloughs would be undesirable, it is certainly not so in the context of the pandemic, where a key goal is to encourage social distancing.

Moreover, furloughs were concentrated in firms where the economic damage from the pandemic was most severe, and in industries with significant face-to-face contact. Thus, at least in its initial phase, the policy appears to have been successful in mitigating both economic damage and public health risk by encouraging firms to pay infection-prone workers to stay home. We charac-

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terize the furloughs using the government register data and document that the average worker is furloughed for approximately 77 days out of a maximum of 90. The workers most likely to be furloughed were those that have part time and low wage contracts, working in an industry experiencing a large negative shock. Workers that had full time contracts in lesser-hit industries made up a substantially smaller share of furloughed workers.

Our paper provides the most thorough information to date on how firms have responded to public policy in the wake of the COVID-19 pandemic. With our representative sample spanning firms of all sizes and in all sectors of the economy, we can draw conclusions about the effects of policies nationally without the need to extrapolate from the behavior of small firms or from only one particular industry. Further, we show evidence that firms are reliable reporters of their outcomes, which we use to estimate the causal effects of aid policy. Specifically, firms are reliable reporters of their actual outcomes when we compare them with administrative records and there is no evidence that firms distort their counterfactual reports toward thresholds used to determine eligibility for aid. To be sure, estimates that only use observed outcomes and assume selection on observable characteristics yield similar findings.

As the economic ramifications of the pandemic continue to evolve, so will the need of policymakers and economists to understand how businesses act and react. The policies enacted in Denmark and firm's responses to them may provide lessons for other countries that have, or plan to implement similar policies. More generally, the pandemic shock offers a rare lens to understand how firms behave during an economic crisis.

2   Institutional setting

As in most other countries, Denmark earmarked billions for firm subsidies to retain employees, fixed cost grants and deferrals of tax obligations.[1] Policies are generally not mutually exclusive,

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[1]The costs of the first wave of programs in Denmark were nearly US$ 15 billion, with US$1.5B in employment subsidies for firms.

and any firm meeting the thresholds of eligibility for a type of policy can apply for government support. We briefly describe the labor-based and non-labor based policies in turn.[2] The unemployment insurance system in Denmark is such that the furlough support policy is unambiguously more expensive to the government than supporting unemployed workers on the traditional programs, suggesting the policy goal is to maintain as many job matches as possible.

Labor-related support: furlough support and sick leave

Furlough is an arrangement where workers are effectively placed on leave — normally unpaid — for a limited period of time. Furloughed workers *do not work*, even from home, but are still paid their full salary. The government subsidized 75 percent of salary costs for furloughed workers, subject to a cap. In most cases, it was unambiguously less costly for firms to furlough workers for three months instead of firing them. The requirement for a company to be eligible is that it otherwise would have laid off a minimum of 30 percent of its employees, though this does not seem to have been binding.[3] This is a known crisis-time policy, and during the COVID-19 pandemic it has used across most European countries with varying degrees of government commitment, as well as with some variations in the rules by countries in North and South America such as the US and Brazil.

Non-labor related support: fixed costs and tax payments

To help firms survive and cover their immediate costs, non-salary cost subsidies were offered for hard hit firms. Some countries offer to cover a share of fixed costs up to a cap, such as Denmark and the UK, while others offer a lump sum, such as Germany and France. Tax forgiveness and deferrals have also been a common policy.

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[2]See Appendix B for a detailed description of the policies and global comparisons.

[3]The amount of severance payment for fired workers varies based on tenure and contract type, and can be as high as three months of full salary. Our survey elicits predictions of the share of employees that would be laid off without aid, and we do not observe a discontinuity at 30 percent.

3 Data and methodology

To study firm responses to government labor market aid, we build a rich new dataset consisting of accounting data for the universe of firms in Denmark, matched to government records of all furloughed workers in the economy between April and June and novel survey data from a representative sample of nearly one-quarter of Denmark's private-sector firms.

3.1 Danish register data

We used two sources of administrative data from the Danish government. First, we have firm accounts for 40,358 firms and employment data for 2016-2019, including annual revenue and employment, which we use for validation and benchmarking. Second, we have the government register of labor aid support requests from 9 March 2020 to 8 June 2020. The register data included 242,126 unique employee furlough requests from 29,471 firms. We matched 3,002 firms from this register with our surveyed firms. The register data provides a rich characterization of the types of jobs that are furloughed, and allows us to verify our survey data. In particular, we address the two main potential issues with our survey data: truthfulness and accuracy of reports.

3.2 Survey methodology and characteristics

We developed a self-respondent survey that was sent out on 23 April 2020 to 44,374 firms; effectively the entire population of private-sector firms with more than 3 employees in Denmark. [4] We received 10,642 responses by 1 June 2020 yielding a response rate of 24 percent — an unusually high rate for voluntary online surveys.[5] With register data, we verify that the respondents are representative of the population of firms with respect to both firm size and industry. We provide substantial evidence of the representative nature of the sample in the accompanying Data

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[4]Participation was voluntary, and no financial compensation was offered to respondents. The survey was carried out by Epinion, a private survey firm in Denmark.

[5]The common response rate for such voluntary survey is between 5 to 10 percent.

Appendix. In particular, the resulting distribution of firm shares across industries is nearly identical to the distribution of firm shares in the population. To be sure, we use the firm population register data to build and include sampling weights to account for any remaining respondent selection bias and the results are exceedingly similar.

The survey included a total of 23 questions, including basic firm characteristics (such as employment in January, revenue change since January) and a series of questions on government aid take-up and labor demand choices. The survey asked respondents to indicate which aid packages they used from the list of available options. All firms were asked to report the number of employees they furloughed and laid off as a result of the pandemic, and firms that reported taking aid were also asked to report the number of furloughs and layoffs that they would have expected to enact if they had not taken aid. Our main results are based on survey data and the figures reported by the respondents. We include the questionnaire in the Data Appendix.

Survey validation: reported actual values. We can proxy for truthfulness and accuracy by verifying the reported firm characteristics and actual furlough responses against accounting and register data. The June 2020 aid take-up register data lists all employees for which each firm requested government support for furlough payments, allowing for direct verification of our survey reported values. We find that the values reported by managers in terms of their employment and furlough counts as well as aid take-up status match the government records the vast majority of the time. The median difference between the reported employment count and the accounting records is 1 employee, while the 10th percentile difference is -2 (lower employee count reported in the survey) and the 90th percentile difference id 16 (higher employee count reported in the survey). For the furloughed employee counts, we find that the reported number of workers furloughed relative to the register data is within 5 workers for nearly 80% of firms, and exactly the same for nearly half of the firms.[6]

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[6]Table A.3. The Data Appendix includes details on the verification process.

Survey validation: reported counterfactual expectations. The high level of alignment between the responses in our survey and the government registers suggests the managers were truthful and accurate in their responses. While it is impossible to directly test whether the counterfactual statements on furloughs and layoffs are accurate, we can consider the respondent's decision authority and the resulting distribution of responses. Over 90 percent of the respondents were owner-managers or CEOs and thus know — or make — the financial and labor choices in the firm, so it is a reasonable assumption that these managers are in the best position to make these sorts of predictions for their firms.[7] We can proxy for the quality in predictions by considering the distributions of the responses relative to aid thresholds, as bunching around these levels could be a result of managers defaulting to a response. In particular, considering the distribution of the expected layoffs, the McCrary (2007) test of the continuity of the density at the policy cutoff of 30% is not significant. We leave a more detailed discussion to the Data Appendix, but take this as reassuring evidence that managers in our sample were deliberate, careful and accurate in their reports of the current and expected levels of labor choices within their firms.[8]

4 Results

The majority of firms — 66 percent — reported a negative impact of COVID-19 on their revenue, while 26 percent report no change and 8 percent report an increase in revenue. When firms take up aid, they are much less likely to lay workers off, and more likely to place workers on furlough. Workers most likely to be furloughed work in lower paying jobs and in industries with significant interpersonal contact, though we do not observe a gender differential.

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[7]The remainder of the respondents were non-managing owners or other administrative staff.

[8]Note that the support of the distribution spans 0 to 1, including responses that report expected layoff levels below the threshold that would have, in principle, rendered the firm ineligible for aid.

4.1 The reported impact of COVID-19 on firm revenue

Figure 1 plots the distribution of revenue change for the population of similar firms between 2016-2017 in the outlined bars, and for the surveyed firms from January to April in the shaded bars.[9] While in any given year many firms experience revenue declines, the hit in April 2020 is unprecedented. Overall, 30 percent more firms faced declines in revenue relative to 2017, and one quarter more firms face declines in revenue beyond 35 percent (a common threshold for aid). The pattern is similar across firm size bands, though the magnitude of the reported impact is heterogeneous across industries. While nearly all industries have over half of the firms reporting expected decreases in revenue, some industries are particularly hard hit — such as accommodation and food services, arts and entertainment and retail.

4.2 Firm decisions about aid packages

We find that the bulk of firms taking up government aid in Denmark are, in fact, those in the most need. Most firms reporting no expected change in revenues also report not being aid recipients.[10] Approximately 56 percent of firms in our survey reported taking advantage of one or more government aid programs, with nearly all firms experiencing revenue decreases beyond 50 percent taking some form of aid. Figure 2 summarizes the aid take-up relationship with revenue change impact at the industry level. Each circle represents an industry at the 1-digit NACE level, and the size of the circle shows the relative share of firms accounted for by each industry. Firms in accommodation and food — the hardest-hit industry — are the firms most likely to take on aid. Retail and manufacturing firms report revenue declines that are at the median, with approximately 60 percent of them taking on aid.

Several non-mutually exclusive aid packages were available to firms. Table 1 reports the set of firm characteristics that correlate with aid take-up of each type and combination of packages.

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[9]The "normal times" data is the latest available date in Danish Statistics server.

[10]The median firm reporting not receiving any aid has an expected revenue change of zero.

Linear probability models estimate which characteristics predict take-up of each type of package, starting with general aid take-up, and iterating through the possible package combinations. Column (1) includes all firms in the sample, while the remaining columns include only the firms that took on aid, with the outcome variable taking on a value of one if the firm took on each type of aid bundle. The last rows in the table indicate the share of firms and employment that account for each of the policy types.

Column (1) reports that 56 percent of firms took on aid at all, and these firms were more likely to have experienced decreases in revenue. Larger firms were slightly more likely to take on aid, and more affected industries were more likely to take on aid. Column (2) shows that nearly 11 percent of all firms took on all three aid types (about 20 percent of aid-taking firms), and this was more common for hard-hit sectors.

The outcome variables of Columns (3) through (5) take on a value of one if the firm took on only labor, cost or fiscal aid. While a sizeable share of aid-takers chose only labor aid (about 19 percent) or only fiscal aid (22 percent), a much smaller share (4 percent) took on only cost aid. Revenue change is not correlated with take-up of labor-only aid when controlling for industry, as the industries experiencing the steepest declines in revenue tended to take on labor aid in conjunction with either cost aid, fiscal aid, or both. Firms not experiencing a decrease are less likely to take up cost-only aid and more likely to take up fiscal-only aid. The most affected industries are also much less likely to take up fiscal-only aid. The patterns are relatively consistent when we consider the bundles including two types of aid in Columns (6) through (8).

These correlations suggest that firms not experiencing distress are less likely to take up most types of aid bundles, with the exception of only fiscal aid. The relationship with firm size is economically small and mixed, while industry is most often the strongest predictor of aid bundle choice.

4.3   The effects of aid on employment decisions

Aid-taking firms had more furloughs and fewer layoffs relative to non aid-takers, and share of furloughed workers increases with revenue losses. However, we cannot draw conclusions about the effectiveness of aid policies from a simple comparison between aid takers and non-takers, as taking aid is naturally a choice and not a random assignment.[11] If firms taking aid were more likely to furlough workers in response to a revenue shock instead of laying them off, the observed differences in employment decisions could overstate the policy's effects.

Employment effects based on stated counterfactuals

To address the self-selection of firms into the different aid packages, we asked respondents to report their expected counterfactual choices. Among firms that took aid, we asked the number of workers they would have laid off and furloughed if aid was not available.

Our analysis requires an assumption that the reported counterfactuals are correct. While inherently un-testable, we provide substantial evidence that this is a reasonable assumption: managers provide accurate information on the verifiable reported data, and also do not bunch their reported counterfactuals near the policy threshold. Economic models of selection are predicated on the notion that firms know their business, and as such should be able to foresee immediate alternative outcomes. In this sense, our approach can be superior to a quasi-experimental design as we do not have to rely on a proxy for counterfactual outcomes of aid takers using non-aid takers with similar characteristics. Still, in this section we use both data on the within-firm reported counterfactuals and more conventional between-firm actual reported outcomes to estimate the likely impact of government aid on furloughs and layoffs. Comparing the various methods allows for a rich set of estimates that shed light on different possible biases and help, at a minimum, set bounds on the true effect.

Table 2 reports estimates of the effects of labor aid, cost aid, and fiscal aid on the share of

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[11]In time we may be able to observe identifying thresholds of eligibility, but our data suggests that 53 percent of firms that were eligible to take aid chose not to do so.

workers furloughed and laid off. Columns (1) through (4) focus only on aid-takers and use the actual versus reported counterfactual outcomes, while Columns (5) and (6) include all firms and use only actual outcomes. The dependent variable for Columns (1) and (3) is the difference between the actual and counterfactual furlough and layoff outcomes, and we run a simple OLS model with indicators for each type of aid taken, along with industry and firm controls. For Columns (2) and (4), the data is organized such that each firm has two observations: one corresponding to their actual furloughs and layoffs, and one corresponding to their counterfactual furloughs and layoffs.[12] As such, the number of firms for this exercise is 5270 and the number of observations is 10540. Using these data, we estimate the following model:

$$Y_{jT} = \alpha + \theta^L L_j + \theta^C C_j + \theta^F F_j + T \times \left(\beta_0^L L_j + \beta_0^C C_j + \beta_0^F F_j \right) + X_j \gamma + \varepsilon_{js} \qquad (1)$$

where firms are indexed by j, and $T = 0$ if the observation measures the firm's reported outcomes in the absence of aid, and $T = 1$ if it measures the firm's actual outcomes. The key variables are binary indicators for whether the firm took labor aid (L_j), cost aid (C_j), or fiscal aid (F_j). Recall that these aid packages are not mutually exclusive; firms can take up any combination of the three. The coefficients $\theta^L, \theta^C, \theta^F$ measure differences in counterfactual outcomes for firms that took up particular aid packages. The coefficients $\beta_0^L, \beta_0^C, \beta_0^F$ measure the difference in observed outcomes, relative to counterfactuals, for a given aid package. Firm-specific controls, X_j, include log of January employment, the size of the revenue change, and industry at the 2-digit NACE level.[13] The term ε_{jT} captures idiosyncratic reporting error and other factors that affect layoff and furlough decisions.

The two methods estimate similar average effects, but help shed light on the source of the variation. The simple model with the difference between actual and counterfactual outcomes as the dependent variable suggests that, relative to other aid-taking firms, those that took on labor aid

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[12]The two sets of columns are not direct analogues to each other because in Columns (1) and (3) only the outcome variable is the first difference.

[13]The inclusion of the size of the revenue change does not drive the results. We thank an anonymous referee for the suggestion of being explicit about this point.

increased their share of furloughs by about 26 percentage points and decreased their layoffs by about 19 percentage points. The fully specified model in Equation (1), however, decomposes the relationship into the effect driven by what the firms did (reported outcomes) and what they would have done without aid (reported counterfactuals). Specifically, we interpret $\beta_0^L, \beta_0^C, \beta_0^F$ as effects of treatment on the treated — that is, the average effect of each policy on the firms that take them up. Columns (2) and (4) then suggest that firms taking labor aid increased the share of furloughs by about 26 percentage points, but only decreased layoffs by about 6 percentage points. Our estimates of $\theta^L, \theta^C, \theta^F$ measure selection into treatment on the basis of counterfactual outcomes, and suggest that firms taking labor aid would have expected to only furlough about 4.5 percentage points more workers, but expected to layoff about 14 percentage points more workers relative to firms that also took aid but chose different packages. In short, the higher furlough difference share is driven by firms enacting furloughs they did not expect to do, and not enacting layoffs they had expected to do.

The other types of aid had less of an impact on furloughs but some impact on layoffs. Firms taking cost aid increase furloughs slightly by about 2 percentage points and reduces layoffs by almost 5 percentage points on average. While the furloughs are entirely driven by increases in actual rather than expected furloughs, the lower layoff difference is driven by high expected layoffs that were avoided. Fiscal aid, however, is estimated to increase furloughs by 3 percentage points and decrease layoffs by also almost percentage points. Firms taking fiscal aid had lower actual furloughs relative to expectations, and relatively higher layoff expectations relative to actual layoffs. However, these estimates relatively small and could be simply reflecting selection into this type of aid.

Estimates based on selection on observables

Columns (5) and (6) in Table 2 are based on comparisons of actual reported outcomes between firms that took aid and firms that did not. These are identified under the assumption that firms'

counterfactual outcomes in the absence of aid are well-proxied by the actual outcomes of the firms that did not take aid. While not our preferred specification, this is a useful benchmark model to compare against our analysis based on stated counterfactuals.

For this analysis, we are estimating a standard cross-sectional model:

$$Y_j = \alpha + \beta_1^L L_j + \beta_1^C C_j + \beta_1^F F_j + X_j \gamma + \varepsilon_j \tag{2}$$

where the variables and parameters have interpretations analogous to equation (1). We assume $E[\varepsilon_j | L_j, C_j, F_j, X_j] = 0$.

The estimated effects are somewhat similar to those estimated based on stated counterfactuals in Columns (2) and (4). The exercise of comparing the two sets of estimates is useful to help us understand the nature of the selection bias introduced by firms' choice of aid packages. Under both models, labor aid leads to large increases in the share of workers furloughed and substantial, albeit smaller, reductions in the share of workers laid off. This is what the policy is intended to do: firms that take labor aid would have laid off more workers without aid, but they cut layoffs roughly in half and substantially increased furloughs. If the counterfactuals are accurate, firms furloughed significantly more workers than they had planned to lay off, suggesting that the policy not only saved employment matches, it also encouraged firms to put workers on leave who might have otherwise stayed on the job. While under normal circumstances inducing furloughs would be undesirable, it is certainly not so in the context of the pandemic, where a key goal is to encourage social distancing.

With regard to cost aid, the picture is less clear. Both models indicate that cost aid increases the furlough share by 3 to 5 percentage points, but disagree about the effect on layoffs. In the model based on stated counterfactuals (Columns 2 and 4), cost aid is estimated to reduce layoffs by almost 7 percentage points. In the model of selection on observables (Columns 5 and 6), cost aid has no discernible effect on layoffs. One interpretation is that taking cost aid allowed firms to offset payments of rent or other fixed costs, which encouraged them to redirect funds to keep

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workers on the job whom they might otherwise have been forced to lay off. It is worth noting that less than 1 percent of workers are employed in firms that only take cost aid, as most firms that take cost aid bundle it with another policy (see Table 1).

The results for fiscal aid consistently indicate that it has little — if any — effect on furloughs, and a small effect on layoffs. Furthermore, taking fiscal aid alone is more likely among firms that did not experience revenue declines, and that are not in the most affected industries (see Table 1, Column 5). Still, the mechanism through which increased fiscal aid would lead firms to lay off a larger share of their workforce is not clear. Perhaps firms that defer tax payments or take government-backed loans lay workers off to restructure in anticipation of future loan payments. As the goal of fiscal-type aid is targeted at non-labor outcomes — such as, for example, firm survival and longevity. We will only be able to evaluate these relationships with additional data in due time, but it is useful to see that such aid does not seem to have a short term relationship with labor outcomes.[14]

4.4 Characterizing the furloughs

While 242,126 people are registered and receiving government aid under the furlough scheme, the patterns of furlough activity are not uniform. Across the entire population of furloughed workers, the median number of furloughed days is 77 — the maximum allowable is 90 days. The average monthly salary of a furloughed worker is approximately DKK 25,000 (US$3,700), and the average hours worked pre-pandemic was 28 hours per week. Non-full-time workers make up 42 percent of the total furloughed workers, and have a higher average number of days furloughed, at 73 days, relative to full-time workers who are furloughed for an average of 65 days.

At the firm level, most firms choose to furlough employees for similar amounts of time. The standard deviation of within-firm count of furlough days is 1.58, and nearly half of the firms fur-

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[14]Our survey included questions on cost changes, cost shares and firm liquidity. However, these questions had much lower response rates relative to the rest of the survey. As such, we leave exploring this type of outcome to future work including register data and leave some exploratory basic descriptive statistics in our Data Appendix.

lough groups of employees for the same amount of time. At the industry level, Figure A.7b summarizes the relationship between average furlough days, hourly wage, and revenue shock. The size of the circle indicates the sum of the number of furloughed workers in the industry. Firms in harder hit industries tend to have lower wages, lower incidence of full-time workers, and larger average number of furloughed days (especially for non-full-time workers). Firms in less hard hit industries furloughed fewer workers but for a similar length of time to other firms.

Firms in our survey have approximately 30 percent white collar and 6 percent blue collar employees working from home who are thus excluded from the furlough decision. If we assume workers are paid their marginal product and higher wage workers are also more productive, it makes sense that firms choose to furlough part-time workers with lower wages. For these groups, we see both a higher overall number of furloughs and longer durations conditional on being furloughed. Finally, furloughs are more concentrated in service and direct-contact industries. Unlike the evidence from other countries that layoffs have been more likely among female workers (Montenovo et al.; 2020), we do not see a difference across gender in the likelihood of being furloughed.

5   Conclusion

The COVID-19 pandemic has caused widespread disruption to lives and livelihoods across the world. On many margins, Danish policies intended to mitigate the economic damage have worked as intended. Firms that took aid were also those in the most need, and their decisions bolstered business survival and consumption of their employees. Because furlough aid covered 75 percent of the salary firms paid to workers, employers still had non-trivial financial commitments to consider when deciding who to lay off and who to put on temporary leave. They were more likely to furloughed those whose productivity was temporarily reduced by the pandemic, as well as allowing a large share of the most at-risk employees to remain home. These outcomes stands in contrast with evidence from the United States' Paycheck Protection Program, where Chetty et al. (2020) report "little impact on employment rates at small businesses". They attribute this lack of impact to aid

being taken up by firms that did not experience large job losses. The differences across the two countries have many sources, but certainly illustrate the importance of managerial decision-making and the need to bear it in mind when designing policy.

During the Great Recession, government programs encouraged firms to find alternative work arrangements rather than lay workers off (Cahuc et al.; 2018). While these short-time work policies are effective in preserving employment, they can also prevent workers from being reallocated to more productive jobs (Giupponi and Landais; 2018). In a more standard business cycle downturn, active labor market programs may prevent unproductive matches from dissolving and obstruct the reallocation of employment toward more productive uses. In the early phases of the pandemic, such concerns are less relevant as the economic shock is unrelated to productivity or other market fundamentals. Further, the public health benefits make it optimal to borrow against the future to preserve job matches while providing people uninterrupted payments facilitates compliance with stay-at-home orders.

This calculus is evolving as the pandemic moves into the next phase and countries attempt to take their economies "off pause". Barrero et al. (2020) argue that the COVID-19 shock will ultimately lead to reallocation of employment both across and within sectors, and that as a result policies that prevent workers from moving to new employment opportunities are increasingly distortionary. As the social cost of going to work decreases, such policies are being re-evaluated and perhaps become more targeted to minimize distortions to the labor market reallocation decisions. For instance, firms should be creative in finding new ways to provide services and keep workers safe on the job, and over the medium run, workers may be in greater demand in certain sectors. Policy might adjust to facilitate some reallocation while supporting consumption and longer-run job matches.

We have one of the best datasets available today to examine the impact of the COVID-19 pandemic on firms and their responses to government policy, with a representative sample, high response rate and links to administrative data. In the present, our analysis can help consider these

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decisions and their implications, and can be useful for policymakers in this turbulent time as the policy program implemented in Denmark is exceedingly similar to policy programs in many other countries. More generally, our work adds an important piece of evidence to the understanding of the effects of short-time work government policies on firm decision-making and, ultimately, labor and economic outcomes.

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Exhibits

Figure 1: Distribution of revenue change in "normal" and COVID times
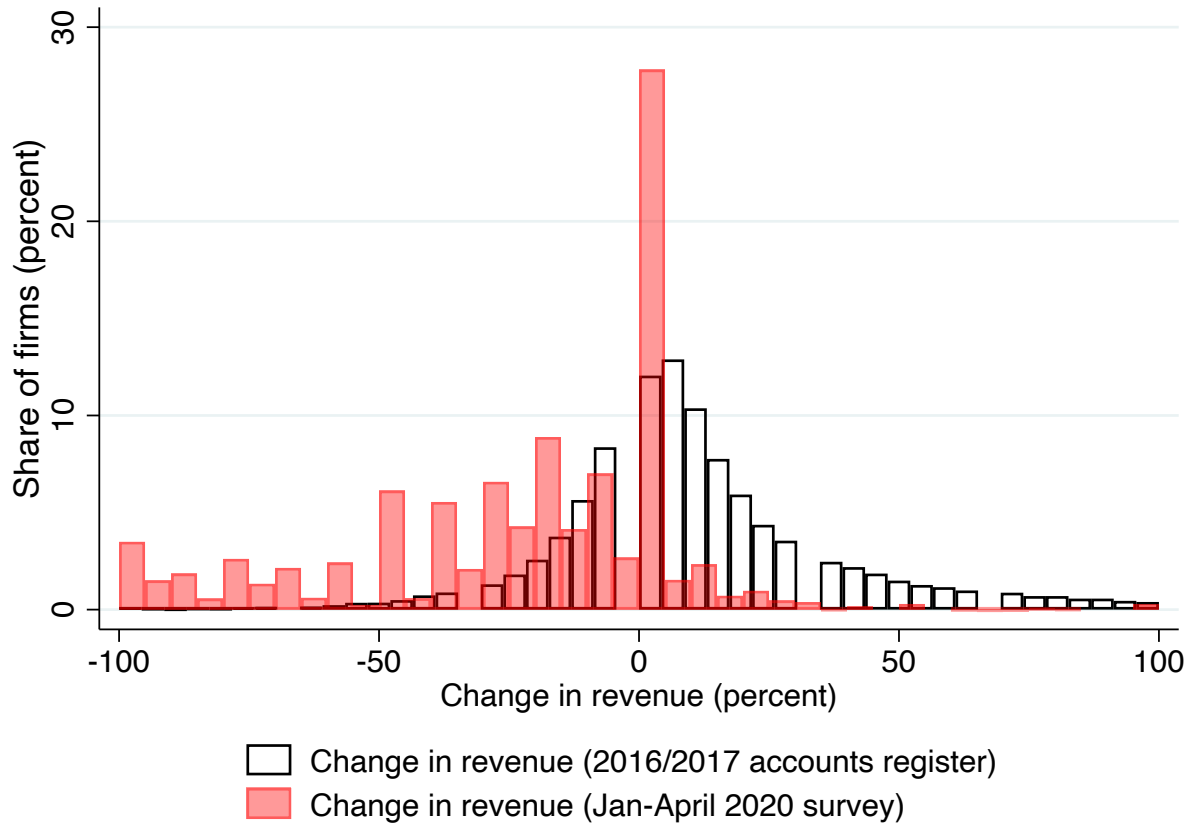
Notes: The outlined black bars plot the distribution of the firm level change in revenue between 2016 and 2017, using Danish register data for the universe of firms with more than 3 employees in both 2016 and 2017 (N = 40,077). The shaded bars plot the distribution of the reported revenue change from the authors' survey of firm managers responding to the effect of COVID-19 on their firms (N = 10,642). The COVID-19 survey was sent to over 44,000 firms with more than 3 employees, had a 24 percent response rate and yielded a representative sample along firm size and industry categories.

Figure 2: Aid take up aid by industry and expected change in revenue
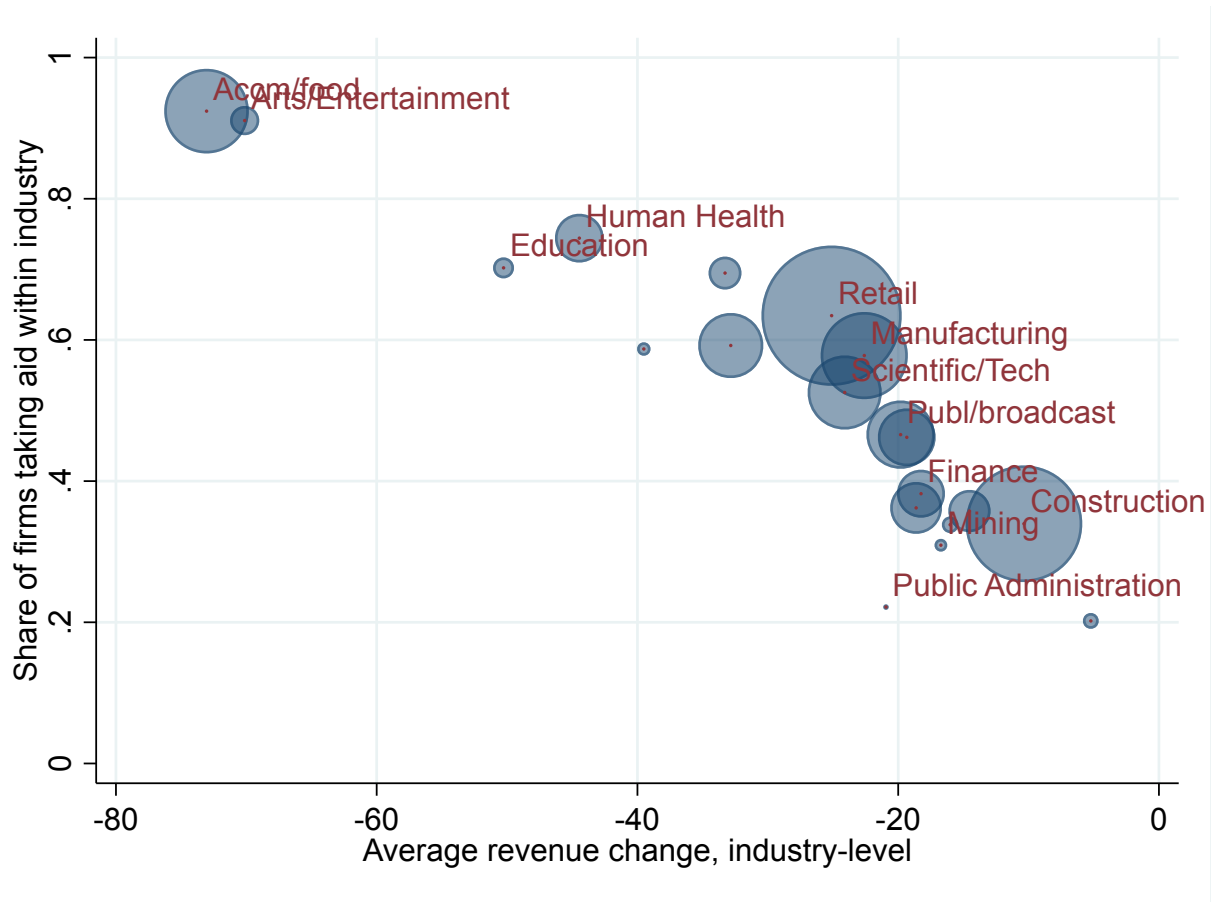
Notes: Data from author's COVID-19 firm survey. This graph reports the industry-level average revenue change (x-axis) and the industry-level average aid take-up (y-axis), weighted by industry size. Each circle represents an industry at the 1-digit NACE level, and the size of the circle shows the relative share of the economy accounted for by each industry. Observations weighted by the inverse probability of responding to the survey relative to the population of firms.

Table 1: The characteristics of firms choosing each aid policy package

	All types		Only one type			2 types		
	(1) Any aid	(2) Labor+Cost + Fiscal	(3) Only Labor	(4) Only Cost	(5) Only Fiscal	(6) Labor + Cost	(7) Labor + Fiscal	(8) Cost + Fiscal
Revenue change								
Increase	-0.466***	-0.180***	0.034	-0.034***	0.341***	-0.137***	0.015	-0.038***
	(0.016)	(0.013)	(0.031)	(0.008)	(0.037)	(0.007)	(0.030)	(0.012)
No change	-0.439***	-0.171***	0.019	-0.047***	0.384***	-0.126***	-0.004	-0.055***
	(0.011)	(0.008)	(0.018)	(0.004)	(0.021)	(0.007)	(0.016)	(0.004)
Characteristics								
Ln(employment)	0.023***	0.009**	0.006	-0.014***	0.006	-0.036***	0.042***	-0.012***
	(0.003)	(0.004)	(0.004)	(0.002)	(0.004)	(0.003)	(0.004)	(0.002)
Industry								
Most affected (top 5)	0.196***	0.227***	-0.094***	0.009	-0.172***	0.147***	-0.115***	-0.002
	(0.011)	(0.019)	(0.012)	(0.009)	(0.007)	(0.017)	(0.010)	(0.010)
Least affected (bottom 5)	-0.116***	-0.084***	0.057***	0.008	0.108***	-0.063***	-0.022	-0.003
	(0.012)	(0.011)	(0.020)	(0.009)	(0.021)	(0.011)	(0.015)	(0.009)
# firms	10504	5868	5868	5868	5868	5868	5868	5868
Share of firms (total)	0.555	0.107	0.106	0.023	0.124	0.077	0.092	0.027
Share of empl (total)	0.569	0.101	0.141	0.006	0.159	0.028	0.127	0.007
Share of firms (aid-takers)	1.000	0.193	0.190	0.041	0.223	0.138	0.165	0.049
Share of empl (aid-takers)	1.000	0.177	0.248	0.010	0.280	0.049	0.223	0.012
Sample	**All firms**	**Aid takers**	**Aid takers**	**Aid takers**	**Aid takers**	**Aid takers**	**Aid takers**	**Aid takers**

Notes: ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels. Standard errors in parentheses. All columns are linear probability models, estimated with OLS. Each outcome variable is an indicator for each type of aid. The omitted category from revenue impact is "experienced a decrease in revenue". Log of employment is calculated based on reported employment in January. Regressions include industry dummies at the 1-digit NACE level, reporting only selected industries based on relevance (share of the economy) and relative impact.

Figure 3: Characterizing furloughed workers from the population of wage support aid-takers
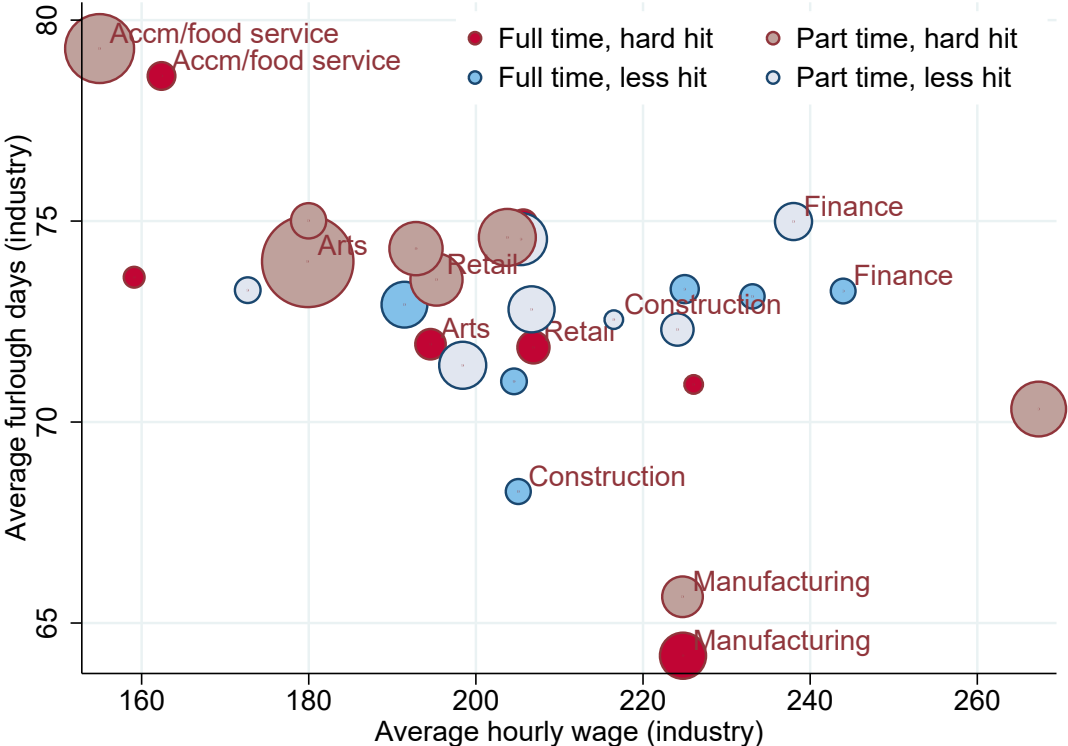
Notes: Data from the Danish government registry of disbursement of wage support for furloughed workers from March 9 to June 9 2020. The data includes 242,126 workers across 29,471 firms. This graph reports the industry-level average hourly wage of furloughed workers (x-axis) and the industry-level average number of furloughed days of furloughed workers (y-axis). Each circle represents an industry at the 1-digit NACE level, and the size of the circle shows the relative number of furloughed employees accounted for by each industry and worker type. Full time refers to workers who were reported to work a 37-hour week pre-pandemic, while part time refers to anyone who works fewer than 37 hours. The lighter shades depict part-time worker data and the darker shade depicts full-time worker data.

Table 2: Relationship between aid type and labor decisions

	Only Aid Takers				All firms	
	(1) Furlough Share Difference	(2) Furlough Share Total	(3) Layoff Share Difference	(4) Layoff Share Total	(5) Furlough Share Total	(6) Layoff Share Total
Aid eligible=1					-0.020*** (0.004)	0.015*** (0.003)
Reported outcomes						
Labor aid taken=1 (β_0^L, β_1^L)	0.264*** (0.011)	0.265*** (0.009)	-0.190*** (0.009)	-0.062*** (0.006)	0.285*** (0.007)	-0.048*** (0.004)
Cost aid taken=1 (β_0^C, β_1^C)	0.022* (0.013)	0.030*** (0.010)	-0.048*** (0.010)	-0.068*** (0.006)	0.052*** (0.010)	0.001 (0.004)
Fiscal aid taken=1 (β_0^F, β_1^F)	0.030*** (0.012)	-0.016* (0.008)	-0.047*** (0.009)	0.009** (0.004)	-0.008 (0.006)	0.007*** (0.003)
Reported counterfactuals						
If labor not taken=1 (θ^L)		0.045*** (0.009)		0.140*** (0.008)		
If cost aid not taken=1 (θ^C)		0.000 (0.011)		0.122*** (0.008)		
If fiscal aid not taken=1 (θ^F)		0.011 (0.008)		0.025*** (0.007)		
Firm controls	✓	✓	✓	✓	✓	✓
Industry	✓	✓	✓	✓	✓	✓
Observations	5270	10540	5199	10398	9266	9266
# Firms	5270	5270	5199	5199	9266	9266

Notes: ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels. Standard errors in parentheses. Columns (1) through (4) are estimated on a sample that only includes firms who actually took aid. Each firm has two observations: one with its actual outcomes, and one with the outcome in the absence of aid, as reported in the survey. The coefficient estimates for labor, cost, and fiscal aid in the top panel correspond to firms' reported actual outcomes. The bottom panel corresponds to firms' reported counterfactual outcomes, as described in Equation (1). Columns (5) and (6) use data on reported actual outcomes for all firms. All models also include controls for revenue loss, log of January employment, and industry (2-digit NACE level).

"Preserving job matches during a pandemic: firm-level evidence on the role of government aid," August 12, 2020

A   Data Appendix

A.1   Sample characteristics

The Danish COVID-19 survey was sent to 44,374 firms; effectively the entire population of firms with more than 3 employees in Denmark. The survey was sent out on 23 April 2020, and by 1 June 2020 we had received 10,642 responses, yielding an overall response rate of 24 percent. This Data Appendix provides details on the sample characteristics and how representative the sample is relative to the Danish population of firms with more than 3 employees.

Table A.1: Distribution of Survey Responses

	Resp N	Popn N	Response rate	Share in sample	Share in popn
Firm size					
3-5 emp	3202	15768	0.20	0.30	0.36
6-9 emp	2283	10488	0.22	0.22	0.24
10-25 emp	2817	10860	0.26	0.27	0.24
26-50 emp	1063	3801	0.28	0.10	0.09
51+ emp	1200	3457	0.35	0.11	0.08
Industry					
Accommodation/Food	472	2840	0.17	0.04	0.06
Construction	1477	7182	0.21	0.14	0.16
Manufacturing	1561	5416	0.29	0.15	0.12
Other	2406	10497	0.23	0.23	0.24
Professional/Technical	1116	3892	0.29	0.11	0.09
Publishing/Broadcasting	788	3001	0.26	0.07	0.07
Wholesale/Retail	2745	11546	0.24	0.26	0.26
Total	10565	44374	0.24	1.00	1.00

Notes: This table reports the sample counts and response rate for our COVID-19 impact survey. The top panel reports the respondent numbers across firm size bands, and the bottom panel reports the respondent numbers across different industries. Column "Resp N" reports the total number of survey respondents. Column "Popn N" reports the total number of firms in the population. Column "Response rate" reports the response rate as the difference between the number of respondents and the population within the firm size band or industry. Column "Share in sample" reports the share of firms represented in each size band or industry relative to the entire sample — the number of respondents divided by the total sample. Column "Share in popn" reports the share of firms represented in each size band or industry relative to the entire population of firms — the number of respondents divided by the total population count.

Table A.1 shows the number of respondents within each employment size band, the response rate and the proportion of each set of firms in our sample and in the population. While we had a higher response rate among larger firms relative to smaller firms, the final share of firms sampled from each size band is not vastly different from the share of firms in the total population. Figure A.1 shows the cumulative distribution function for our sample and the population firm size. In all, approximately 45 percent of the firms in our sample have fewer than 10 employees, while 40 percent have between 10 and 50, and 15 percent have more than 50 employees.

Figure A.1: Cumulative distribution function of firm employment
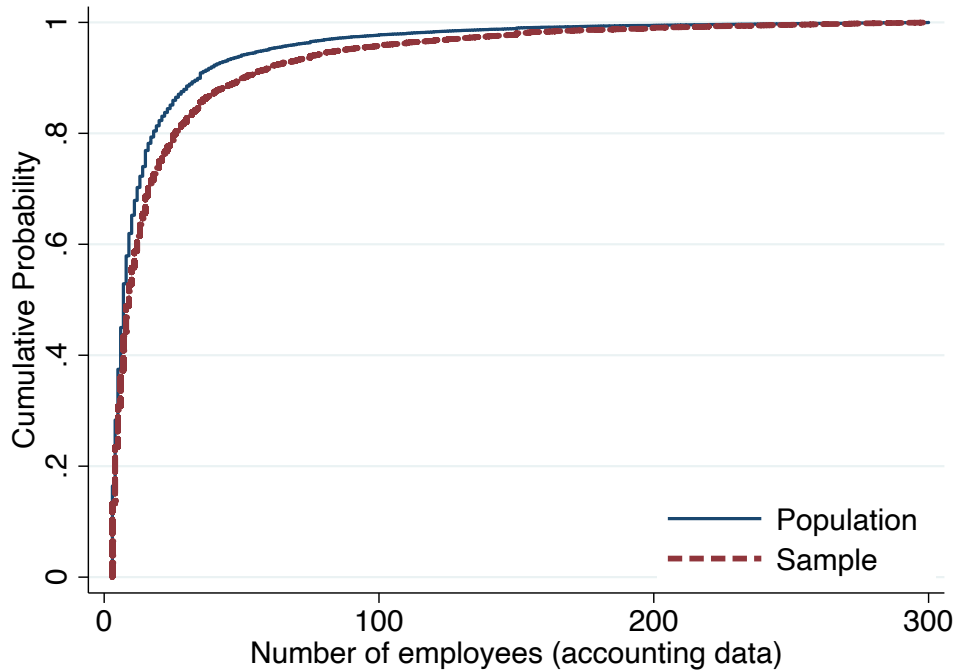
Notes: The red line represents the cumulative distribution function of firm employment in our survey sample. The blue line represents the cumulative distribution function of the remainder of the population of firms in Denmark with more than 3 employees. Employment truncated at 99th percentile (300 employees) for exposition. Population N = 33,513. Sample N = 10,642.

Similarly, the industry mix in our sample is relatively similar to the industry mix in the total population, and with fairly similar response rates across industries. The bottom panel of Table A.1 reports the response rates, sample and population shares for the largest industries in the sample. The representative nature of our sample in terms of industry composition is depicted in Figure A.2, where we plot the share of firms within each of the NACE 1-digit industries in our sample and in the population. Some industries were slightly over-sampled (like manufacturing and professional/technical services) while others were slightly under-sampled (like construction), but all are quite close to the 45-degree line.

Figure A.2: Industry composition of sample firms
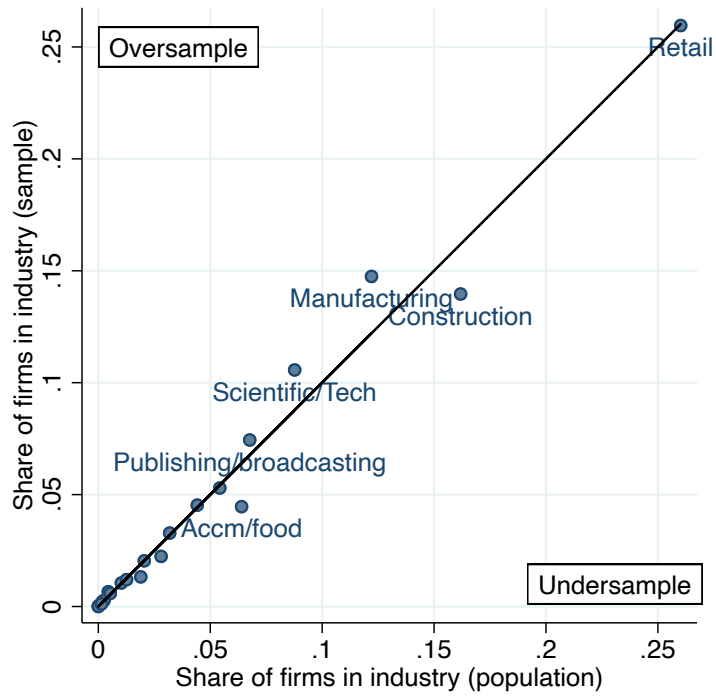
Notes: Each circle marker in the graph represents an industry-level share of firms, as they appear in the sample and in the full population. Industry markers above the 45-degree line mean industry is over-sampled. Industry markers below the 45-degree line mean the industry is under-sampled. Population N = 33,513. Sample N = 10,642.

Figure A.3: Firm size distribution within industry, population

(a) Population
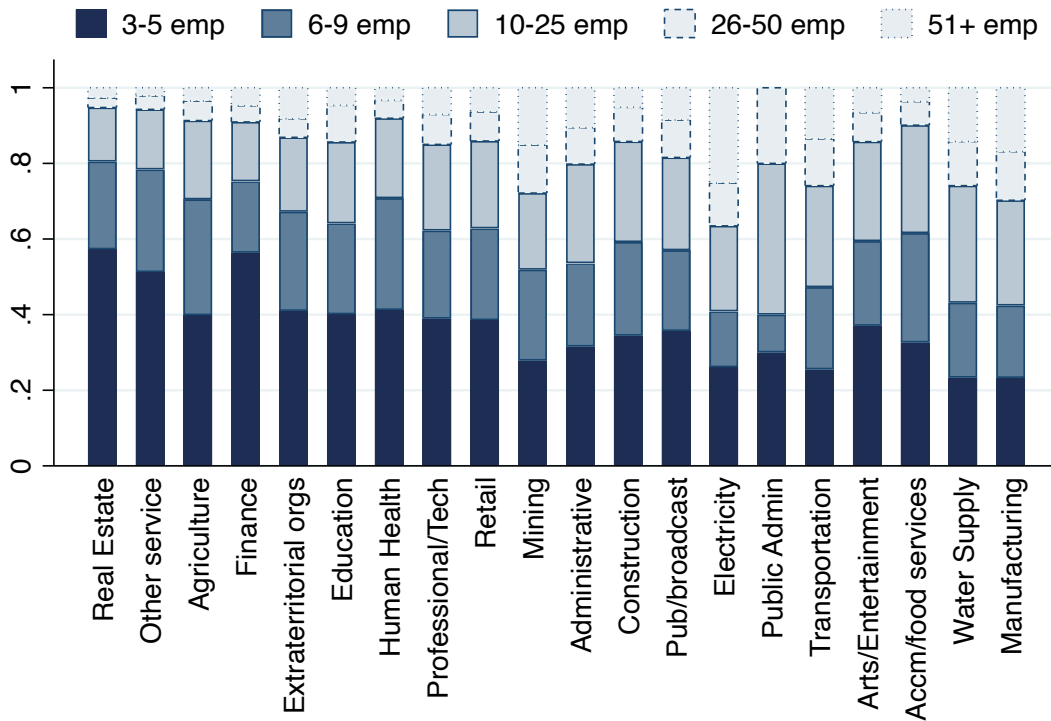
(b) COVID-19 Survey Sample

App. 4
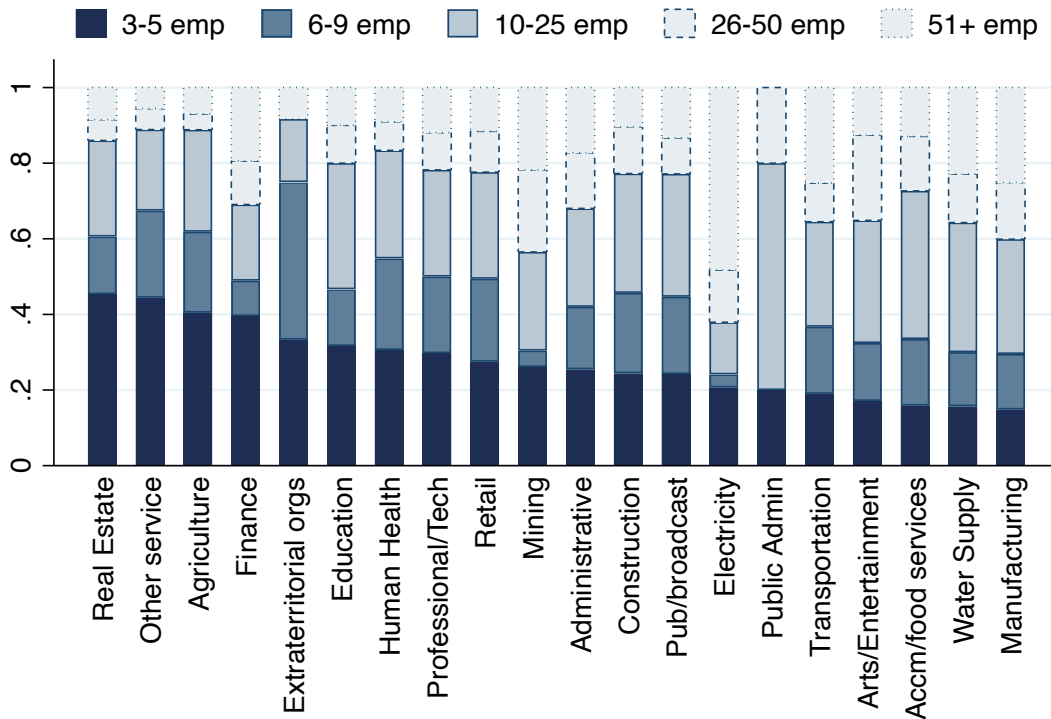
Notes: Population N = 33,513. Sample N = 10,642. Industry defined by 1-digit NACE codes. Graph shows the distribution of firm size (number of employees) in the population and in the sample for each industry.

A.2 Response rates

The overall response rate we received was high for this type of non-incentivized, voluntary survey. As all questions were voluntary, not all survey questions had the same response rate. Table A.2 reports the response rates by firm size and industry for our main variables. Effectively all respondents provided answers to the establishment employment size, share of furloughed workers and share of laid-off workers. Less than half, however, responded to the labor cost share, fixed cost share and liquidity questions. If there was selection in the type of firm that chose to respond to these questions, it does not seem to have been across firm size and industry. The share of respondents across the various size bands and industry categories is relatively similar.

Table A.2: Survey response rates

	N	Empl	Furlough	Layoff	Labor Costs	Fixed Costs	Liq
Firm size							
3-5 emp	2652	1.00	0.99	0.99	0.39	0.38	0.38
6-9 emp	2039	1.00	0.99	0.99	0.40	0.39	0.41
10-25 emp	3110	1.00	1.00	1.00	0.39	0.38	0.37
26-50 emp	1217	1.00	0.99	0.99	0.40	0.39	0.40
51+ emp	1534	1.00	1.00	1.00	0.37	0.36	0.35
By industry							
Accommodation/Food	472	0.99	0.98	0.98	0.51	0.51	0.44
Construction	1477	0.99	1.00	1.00	0.27	0.26	0.31
Manufacturing	1560	0.99	1.00	1.00	0.33	0.32	0.37
Other	2419	0.99	0.99	0.99	0.39	0.38	0.36
Professional/Technical	1118	0.99	0.99	0.99	0.50	0.48	0.43
Publishing/Broadcasting	787	1.00	1.00	1.00	0.54	0.52	0.47
Wholesale/Retail	2746	0.99	1.00	1.00	0.38	0.36	0.38
Total	1511	0.99	0.99	0.99	0.42	0.41	0.40

Notes: As survey questions cannot be mandatory, the response rates of individual questions vary. This table reports the response rates of the main variables in our analysis for each size band and industry group. Column "N" reports the number of observations in each group. "Empl" reports the share of firms that responded to the question on the number of employees question. "Furlough" reports the share of firms that responded to the question on the share of employees that were furloughed. "Layoff" reports the share of firms that responded to question on the share of employees that were laid off. "Labor costs" reports the share of firms that responded the question on labor cost shares. "Fixed costs" reports the share of firms that responded the question on fixed cost shares. "Liq" reports the share of firms that responded the question on liquidity availability.

Figure A.4: Furlough numbers: reported in survey vs register data
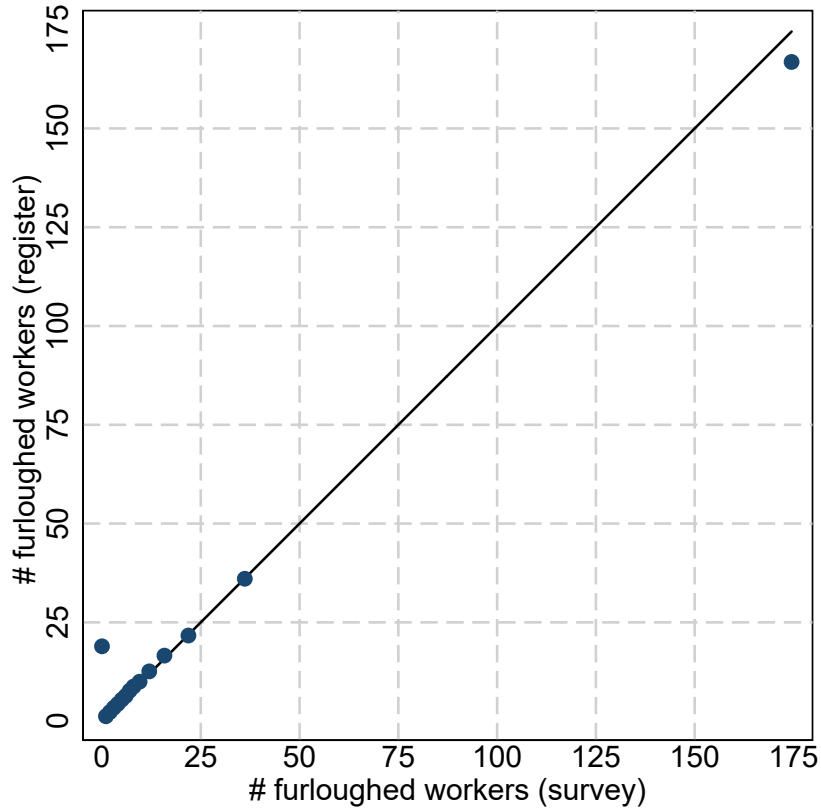
Notes: Register data refers to the data from the Danish government registry of disbursement of wage support for furloughed workers from March 9 to June 9 2020. The data includes 242,126 workers across 29,471 firms. Survey data refers to data from the authors' Danish COVID-19 survey from 23 April 2020 to 1 June 2020. The data includes 10,642 responses, covering approximately one quarter of the Danish economy and forming a representative sample of firms in the country. This graph reports the binned scatterplot comparison of the number of furloughed workers registered in the Danish government's records with the number of furloughed workers reported by firms surveyed. Firms were matched by their tax number such that a direct comparison of responses was made. The 45 degree line implies exact matches, with dots above the line implying under-reporting and below the line impling over-reporting.

A.3   Data validity

There is an inherent trade-off in using administrative register data and survey data: register data are official and while the reports are verified by the government, data are not timely and are equally susceptible to biased responses.[15] Survey data, on the other hand, are more flexible on timing and can be responsive, though the data relies on truthful reporting with no downside to misreporting. As such, the onus is on the researchers to validate the survey responses. We briefly outline the steps we took to verify our data.

Table A.3: Number of firms reporting furloughs/no furloughs in the administrative register and the COVID survey

| | Survey | | |
	No furloughs	Furloughs	Total
No furloughs	6972	633	7605
Furloughs	543	2459	3002
Total	7515	3092	10607

Notes: Register data refers to the data from the Danish government registry of disbursement of wage support for furloughed workers from March 9 to June 9 2020. The data includes 242,126 workers across 29,471 firms. Survey data refers to data from the authors' Danish COVID-19 survey from 23 April 2020 to 1 June 2020. The data includes 10,642 responses, covering approximately one quarter of the Danish economy and forming a representative sample of firms in the country. 7,515 firms reported having no furloughs in the survey, and 6,972 of them indeed had no records of furlough requests with the government. 543 firms that reported no furloughs did have such records. 3,092 firms reported having furloughed workers in the survey, and 2459 of them also had furloughs recorded in the government register while 633 did not. This implies a high level of accuracy of the information reported in the survey relative to government records.

First, the survey respondent is crucial in the quality of the data. In our survey, over 90 percent of the respondents were owner-managers or CEOs, and thus know (or make) the financial and labor choices in the firm.[16] Furthermore, all firms have a unique firm identifier with links to accounting data data up to 2019 and Danish Statistics register data up to 2017, allowing for further verification.

Second, the two main concerns regarding the quality of the reporting are truthfulness in reports of actual furloughs and layoffs, and accuracy in the predictions of the counterfactual figures. We can directly test the veracity of the reported actual furloughs against government register data on aid requests, but the veracity of the counterfactual predictions are inherently un-testable. We have to assume that the responding firm managers are in the best position to make these sorts of predictions for their own firms. If we were to see bunching at the aid threshold levels in the data, this might suggest managers did not carefully answer the question and simply defaulted to the

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[15]For example, when there are thresholds for reporting requirements (Garicano et al.; 2016).

[16]The remainder of the respondents were non-managing owners or other administrative staff.

value they thought was the minimum acceptable. However, we do not see evidence of this in the reports.

Figure A.6b shows the McCrary test of discontinuity at the labor policy threshold of 30%. The discontinuity is not significant, suggesting that there is no break at that point.

A.4   Labor aid takers and furloughed workers

Figure A.7b shows the relationship between the revenue impact of firms that experienced a negative shock and the share of actual share of furloughed or laid off workers. The solid squares represent firms that took at least one type of aid, while hollow squares represent firms that did not take aid. Circles show the relationships for the outcome of actual furloughs. Solid circles represent firms that took at least one type of aid, while hollow circles represent firms that did not take aid. The difference between aid-taking and non-aid taking firms is stark: those that did take aid laid off significantly fewer workers at the higher end of the impact values, and furloughed substantially more workers. Those that did not take aid laid off more workers than they furloughed.

A.5   Direction of revenue change

We document that, in general, the direction of the revenue change is relatively similar across firm size bands, and the majority of the variation is driven by industry. Figure A.8a shows the expected change in revenue across the firm size bands, and Figure A.8b shows the same data across industries.

A.6   Other outcomes: costs, liquidity and survival expectations

### Cost and liquidity

Approximately 40 percent of the respondents chose to report their monthly costs in January and April, as well as the share of their costs accounted for by labor and fixed costs, and their available liquidity (including cash-on-hand and available loans). Table A.5 reports the average value of these responses by three different types of firms: firms experiencing different levels of revenue change, by their aid recipient status, and by firm size.

All firms reported lower costs in April relative to January, though the share of costs taken up by labor or fixed expenses remained relatively similar. Likewise, liquidity remained stable across the two months.

Figure A.5: Comparison of survey and register data for actual furlough counts

(a) Distribution of the share of actual furloughed workers


Register   Survey
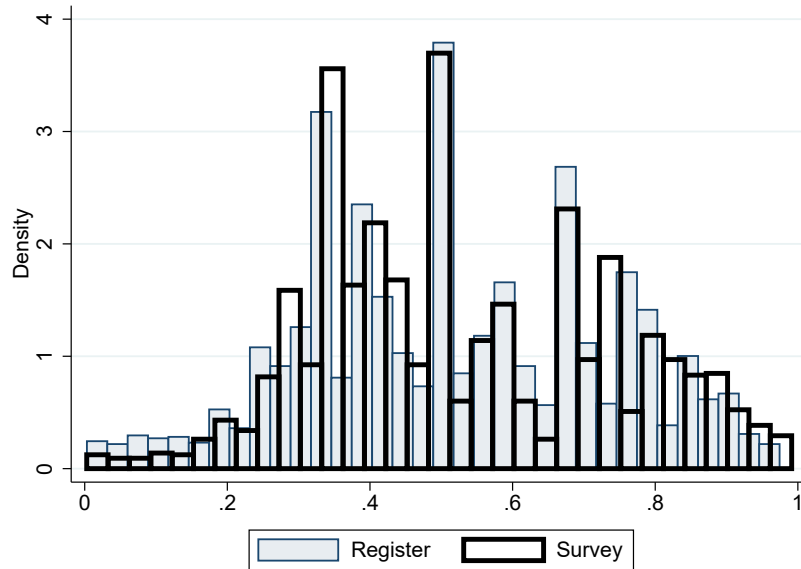
(b) Distribution of the difference in reported furloughs versus registered furloughs
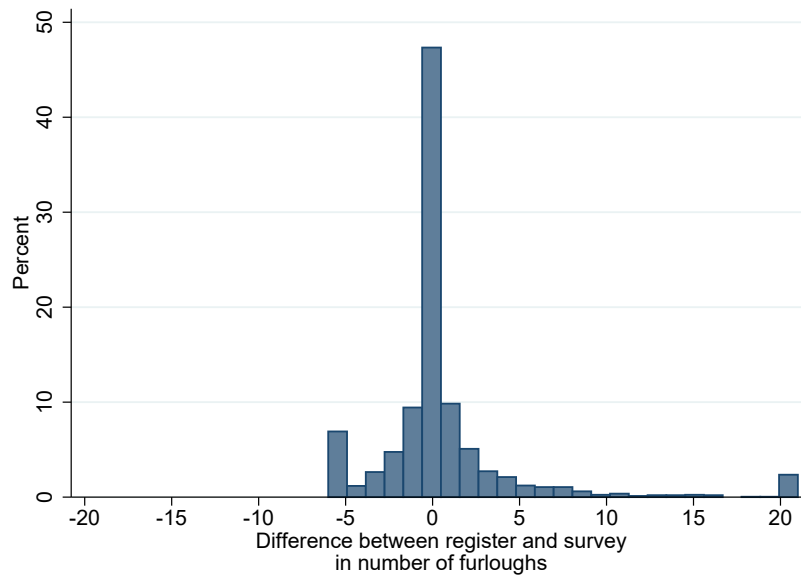
Notes: This graph uses two types of data: (1) data from the Danish government registry of disbursement of wage support for furloughed workers from March 9 to June 9 2020. The data includes 242,126 workers across 29,471 firms. (2) data from the authors' Danish COVID-19 survey from 23 April 2020 to 1 June 2020. The total data includes 10,642 responses, covering approximately one quarter of the Danish economy and forming a representative sample of firms in the country. This graph includes the 3002 firms that have recorded furloughs in the government register and also responded to the COVID-19 survey. Panel (a) plots the distribution of furlough shares at the firm level in both datasets, showing they are strikingly similar. Panel (b) plots the authors calculation of the difference between the number of reported workers furloughed and the number of workers furloughed in the government register for each firm. This suggests that almost half of the firms reported exactly the correct number, and the vast majority report numbers within 5 employees of the actual register number.

App. 9

Figure A.6: Distribution of reported expected layoffs
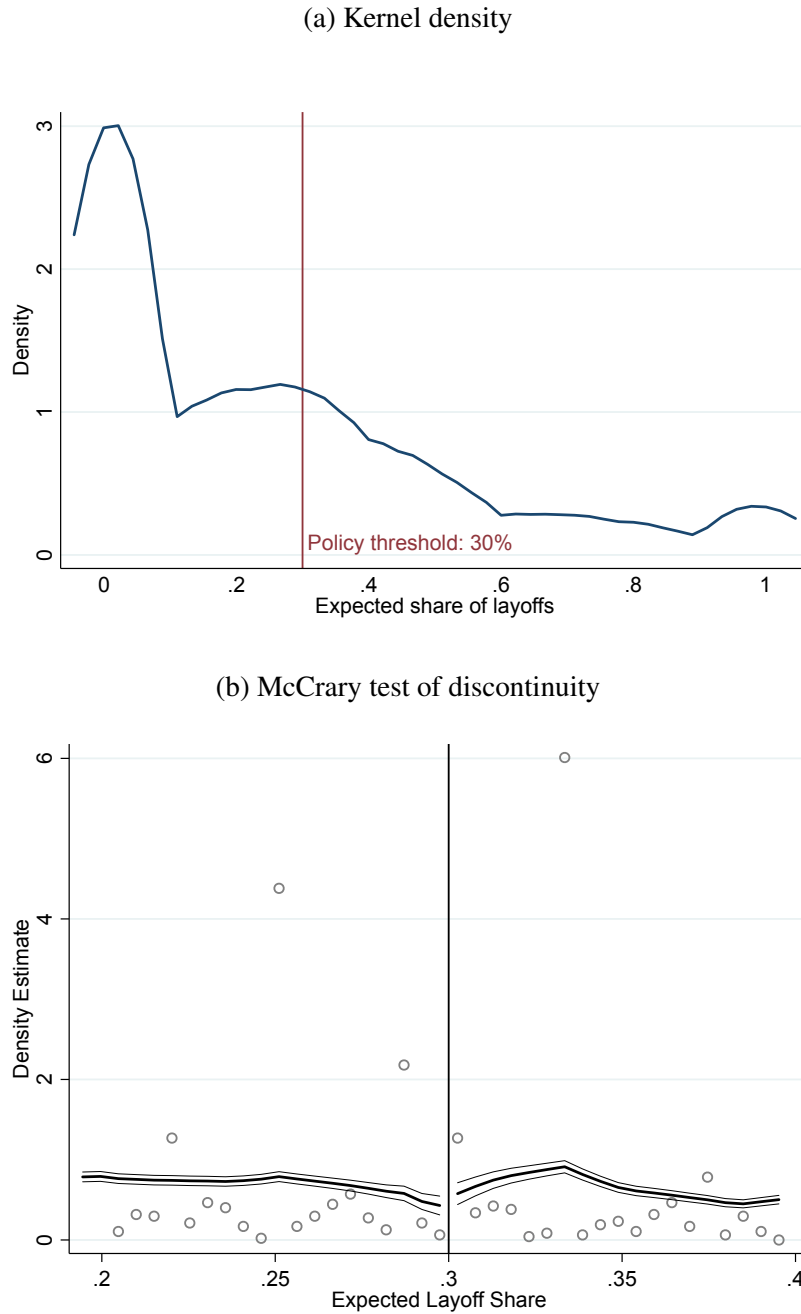
(a) Kernel density

(b) McCrary test of discontinuity

Notes: Survey data refers to data from the authors' Danish COVID-19 survey from 23 April 2020 to 1 June 2020. The full dataset includes 10,642, covering approximately one quarter of the Danish economy and forming a representative sample of firms in the country. Graphs include only aid-taking firms, N=5,868. The variable "expected layoff share" is built using the answer to the survey question: "If you had not taken up aid, how many employees would have laid off?", divided by the total number of employees in the firm. Panel (a) shows the distribution of the variable, highlighting the threshold for being eligible for government aid with the red line — the policy stated that firms expecting to lay off more than 30 percent of their workforce were eligible for aid. Panel (b) shows the McCrary (2007) test of discontinuity at the threshold of 30 percent, showing that there is no discontinuity at the policy point. This suggests firms were not defaulting to a particular answer when reporting their values.

App. 10

Figure A.7: Labor response to revenue change

(a) By aid taker status, actual response
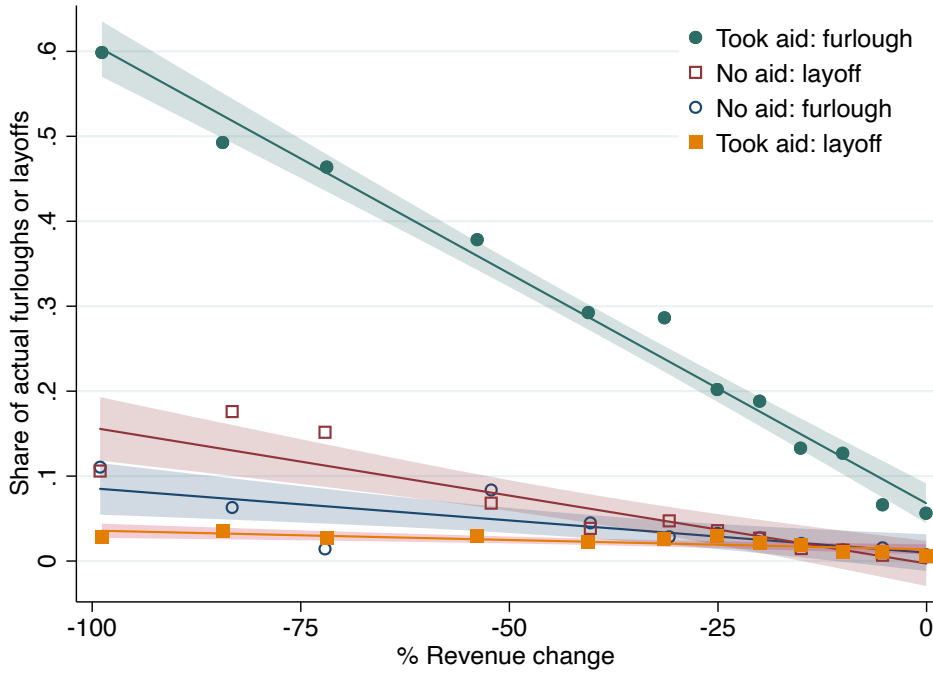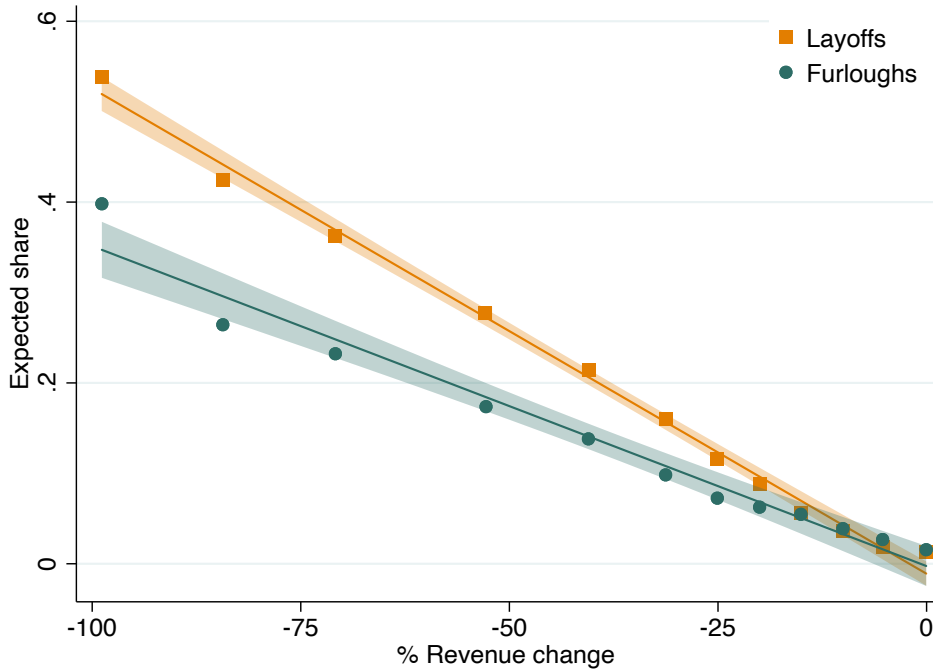
(b) Only aid takers, counterfactual response

Notes: Survey data refers to data from the authors' Danish COVID-19 survey from 23 April 2020 to 1 June 2020. The full dataset includes 10,642, covering approximately one quarter of the Danish economy and forming a representative sample of firms in the country. The number of aid-takers is 5868. These graphs show the binned scatterplot of the simple relationship between the percentage revenue change in firms and the share of employees that they report actually furloughing or laying off. Squares show the relationships for the outcome of actual layoffs. Solid squares represent firms that took at least one type of aid, while hollow squares represent firms that did not take aid. Circles show the relationships for the outcome of actual furloughs. Solid circles represent firms that took at least one type of aid, while hollow circles represent firms that did not take aid.

Table A.4: Summary statistics of furloughed workers

	Mean	SD	25th pctile	Median	75th pctile	N
Worker-level summary statistics						
Share male	0.50	0.50	0.00	0.00	1.00	242126
Weekly hours worked (pre-COVID)	28.15	12.61	18.00	37.00	37.00	242126
Monthly earnings (000s DKK)	24.90	19.28	9.06	24.82	35.06	242126
Total firm compensation (000s DKr)	37.71	25.55	13.72	37.32	59.40	242126
Share full time	0.58	0.49	0.00	1.00	1.00	242126
# days furloughed	68.27	21.90	62.00	77.00	83.00	242126
# days furloughed (FT workers)	64.67	22.77	52.00	72.00	81.00	140331
# days furloughed (non-FT workers)	73.22	19.59	70.00	79.00	86.00	101795
Firm-level summary statistics						
Share male	0.48	0.40	0.00	0.50	1.00	29471
Weekly hours worked (pre-COVID)	30.56	8.51	26.00	34.75	37.00	29471
Monthly earnings (000s DKK)	24.38	13.33	15.29	24.08	31.86	29471
Total firm compensation (000s DKr)	43.96	20.23	28.41	44.53	58.50	29471
Share full time	0.63	0.40	0.25	0.77	1.00	29471
# days furloughed	73.54	19.14	66.43	80.00	88.00	29471
# employees furloughed	8.22	44.86	1.00	3.00	6.00	29471
# days furloughed (FT workers)	72.54	19.51	64.54	79.00	87.00	23987
# days furloughed (non-FT workers)	73.91	19.22	68.00	81.00	88.00	16907

Notes: Data from the Danish government registry of disbursement of wage support for furloughed workers from March 9 to June 9 2020. The data includes 242,126 workers across 29,471 firms. This table reports summary descriptive statistics for workers and firms. Full time refers to workers who were reported to work a 37-hour week pre-pandemic, while part time refers to anyone who works fewer than 37 hours. The lighter shades depict part-time worker data and the darker shade depicts full-time worker data.

Figure A.8: Expected direction change in revenue

(a) By firm size

Expected direction of revenue change, by firm size

(b) By industry
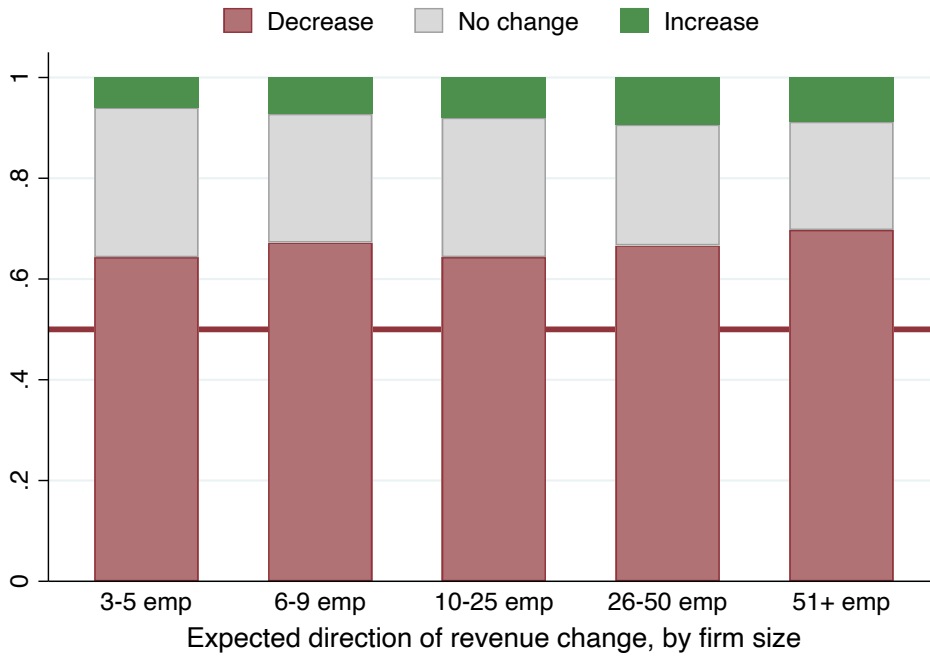
Expected direction of revenue change, by industry
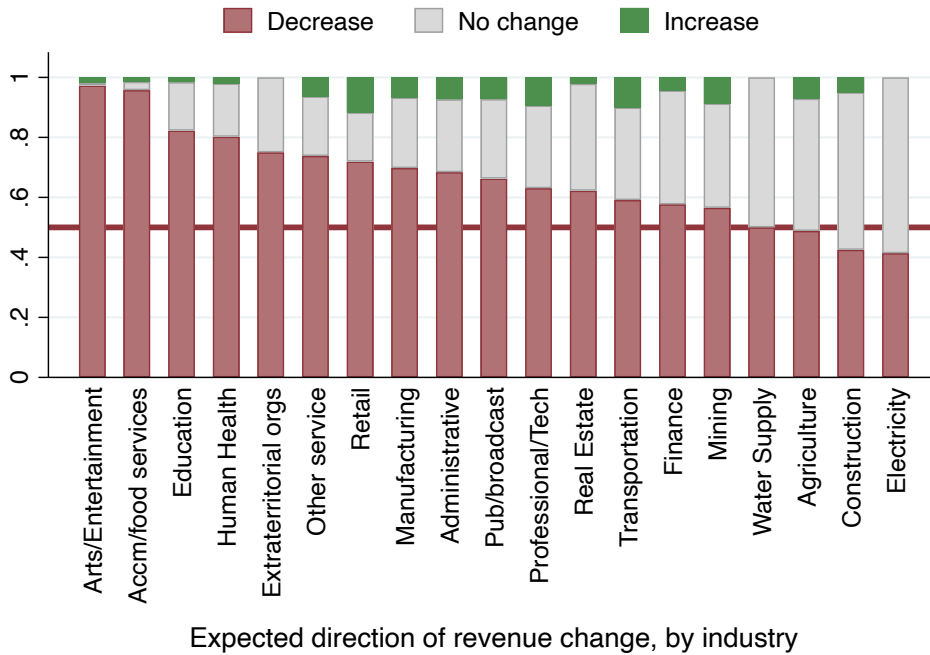
Notes: See Table A.1 for the sample size of each industry and size band in the sample. The figure shows the share of firms reporting an expected decrease, increase or no change in revenue as a result of the pandemic. Panel (A) shows the distribution across firm size bands, and Panel (B) shows the distribution across industries.

Table A.5: Costs and liquidity, averages

	Mo. costs (Jan)	Mo. costs (April)	Lab. share cost (Jan)	Lab. share cost (Apr)	Fix share cost (Jan)	Fix share cost (Apr)	Liq (Jan) 100k Kr.	Liq (Apr) 100k Kr.
Decrease	31.43	21.98	0.58	0.59	0.31	0.35	45.87	44.12
Increase	40.68	28.75	0.56	0.58	0.29	0.30	50.06	52.32
No change	31.96	24.20	0.57	0.59	0.29	0.31	50.05	51.20
By aid recipient								
Did not take aid	37.02	26.22	0.58	0.60	0.29	0.31	52.21	52.46
Took aid	29.49	21.06	0.58	0.58	0.31	0.35	43.95	42.49
By firm size								
3-5 emp	4.85	2.89	0.58	0.59	0.32	0.35	19.06	18.22
6-9 emp	8.09	5.58	0.59	0.60	0.30	0.33	22.10	21.70
10-25 emp	17.89	12.83	0.59	0.60	0.30	0.33	38.85	38.01
26-50 emp	39.78	27.10	0.57	0.58	0.29	0.33	67.66	66.73
51+ emp	140.22	106.08	0.54	0.55	0.30	0.33	139.10	138.00
Total N	4225	3971	4017	3897	3894	3782	4083	4039

Notes: The table reports financial indicators of surveyed firms in terms of monthly cost in January(column 1), monthly cost in April (column 2), labor cost shares in January (column 3), labor cost shares in April(column 4), fixed cost shares in January(column 5), fix cost shares in April (column 6), liquidity in January (column 7) and liquidity in April (column 8) across groups with different revenue change expectations, aid recipients and firm size. Last row of the table reports number of total observations for each indicator.

B Policy Appendix

On 14 March 2020, the Danish government, labour unions and employer organizations reached an agreement that included temporary salary compensation for employees at risk of losing their jobs, effective for the period from 9 March 2020 to 9 June 2020 (Ministeriet; 2020). On 18 April 2020 the government aid packages were extended to 8 July 2020 and also substantially expanded (Regeringen; 2020).

Table B.6: Summary of firm aid government programs.

Country	Furlough support	Loan and grant	Cost subsidy	Others
Denmark	- 75% of employee salaries are covered by the government, up to DKK30,000 per employee per month. Eligibility: firm would layoff at least 30% of its workers. Firm covers the remaining 25% of the salaries.	Loan guarantee on 70% of new corporate loans related to COVID-19. Eligibility: SMEs with losses of 50% or more. Large: revenue losses of 30% or more.	Between 25% and 80% of fixed costs for firms experiencing between 35 and 100% decreases in turnover, but remaining open. 100% of fixed costs are compensated for firms forced to close.	Employers are paid sickness reimbursement for salaries and benefits from to first day of absence instead of the 30th. 30 day VAT payments delay.
Germany	- Govt covers up to 80% (87 if family) of salaries and 100 % of the social-security contributions for reduced working hours. Working hours can be reduced with reduced wages. Eligibility: at least 10 % of workers affected	100% - loan guarantee up to 25% of the revenue of 2019. Max EUR 500k in loans for firms with 10-50 employees and 800k for > 50 employees.	Direct payment to self-employed and firms with 10 employees or less, up to EUR 15,000.	Reduced VAT rate to 7% for restaurants for 12 months
Sweden	- Employers can cut the working hours by 80%. Government covers most of the salary, workers receive 90%.	- Loan guarantee of 70% to companies, up to SEK 75 million in loans per company. No legal company size limit	Between 22.5% and 75% of fixed costs for firms with min SEK 250k in turnover and a decrease of at least 30% this year.	VAT by sole proprietors might be postponed.
Netherlands	Up to 90% of wages are compensated. If: At least 20% decreases in revenue in March to May compared to 2019 and the workers are not laid off.	- Loan guarantee of 50%, min EUR 1.5m and max EUR 150m per company.	Firms forced to close can apply for EUR 4000 lump-sum payment	VAT, income, corporate and turnover taxes might be deferred.
France	70% of wages, up to EUR 45.68 per hour not worked, are compensated, if a business is forced to close or reduce activities due to COVID-19.	- 70 % to 90% of loans might be guaranteed by the State. - Different percentages of guarantees apply to different sizes of firms	Lump-sum transfer of up to EUR 1500. For: Very small businesses, self-employed etc., if decreases of 70% in revenue or forced to closure	Early corporate tax repayment, postponed employers social security contribution
Italy	- 80% of salaries covered, with a maximum of EUR 1.200 for a maximum of 9 weeks.	Fee-free loan guarantee for SMEs, EUR 5m max guarantee	regional fund to assist firms with redundancy payments for 9 weeks of suspension for a max of 5 employees	6 months suspension of loan repayment for SMEs
UK	Up to 80% of salaries with a maximum of 2,500 GBP are paid for the next three months for retained workers. All employers are eligible to apply	- Guarantee of loan repayments up to GBP 5m for SMEs. Loan guarantee of 80% for loans up to GBP 25m for large firms, between GBP 45m - GBP 500m in turnover	Cash grant between GBP 10,000 and GBP 25,000, if firm uses properties for retail, hospitality or leisure and a property value of maximimum GBP 51,000.	VAT deferral for the second quarter of 2020
USA	Unemployment insurance payments plus USD 600 per month, under it the majority of workers get a replacement rate over 100	Low interest federal loans to affected small businesses	50% payroll tax reduction for affected firms that do not layoff workers	Tax payments deferred

Sources:
OECD Country Policy Tracker, 2020

C Survey Questionnaire

Question 1: Respondent role in the firm

Which of the following categories matches your role in the business?

- Owner-manager

- Non-owner director

- Non-director owner

- Other, state: <Open Textbox>

Question 2: Employees

At the end of January, how many employees were there in the company?

- Write the number of employees: <Open Textbox>

Question 3: Effect from COVID-19 economic shock

What was the pandemic effect on the demand for your company's products and services?

- Very negative

- Negative

- Not affected

- Positive

- Very positive

Question 4: Expected revenue change

How do you expect your company's sales revenue to change during the epidemic?

- Sales revenue will *decrease* by <Open Textbox> percent

- Sales revenue will *increase* by <Open Textbox> percent

- Sales revenue will remain *unchanged*

Question 5: Aid packages take-up

Has your company used or is planning to use any of the following aid pacakges?

- Aid Package 1: Compensation for canceled or postponed events

- Aid Package 1: Payment of Compensation up to 80 percent of fixed expenses given a decrease in sales revenue above 40 percent?

- Aid Package 3: State-guaranteed bank loan through the Growth Fund for the drop in sales revenue over 30 percent

- Aid Package 4: No employer-required period for daily sick pay

- Aid Package 5: Pay compensation of 75 to 90 percent of wage payments to employees sent home due to corona triggered financial downturn

- Aid Package 6: Temporary deferral of payment deadlines for tax contributions (VAT, etc.)

- We have not used and do not plan to use any of the above actions [Exclusive]

Question 5A: Reason for no aid take-up

[only asked if respondent selected "no aid taken" in question 5] Is the reason your company has not used or plans to use state aid packages that you do not meet the eligibility requirements?

- Yes

- No

Question 6: Employment Measures

What employment measures has the company introduced?

- Dismissals

- Sent home without wage subsidy (unpaid furlough)

- Sent home with wage subsidy (paid furlough)

- None of the above <Exclusive><Fixed>

Question 6A: Dismissals

How many employees have been laid off in the company?

- Write the number: <Open Textbox>

Question 6B: Furloughs

How many employees were sent home (furloughed) by the company, but are still employed?

- Write the number: <Open Textbox>

Question 6C: Expected dismissals in the absence of aid (counterfactuals)

[only asked if an aid package was selected in Q5] How many employees would have been laid off in your firm if you had not taken up government aid packages?

- Write the number: <Open Textbox>

Question 6D: Expected furloughs in the absence of aid (counterfactuals)

[only asked if an aid package was selected in Q5] How many employees would have been sent home (furloughed) in your firm if you had not taken up government aid packages?

- Write the number: <Open Textbox>