

“The value of preserving a match: firm-level evidence on the role of government crisis aid,”

A Appendix

A.1 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.²⁷ 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. We briefly outline the steps we took to verify our data.

First, over 90 percent of our the respondents were owner-managers or CEOs, and thus know (or make) the financial and labor choices in the firm.²⁸ 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. We find that nearly 90% of the reported statuses (having/not having furloughed workers) were accurate (Table A.1).

Table A.1: Number of firms reporting furloughs/no furloughs in the administrative register and the COVID survey

		Survey		Total
		No furloughs	Furloughs	
Register	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.

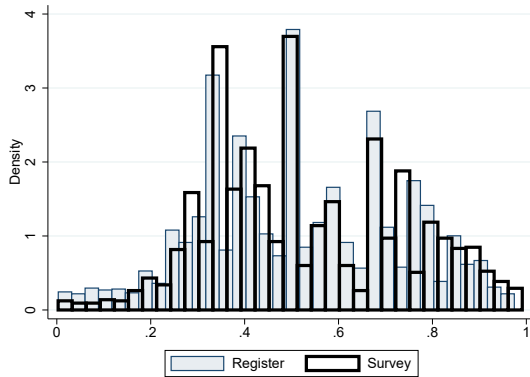
²⁷For example, when there are thresholds for reporting requirements (Garicano, Lelarge and Van Reenen 2016).

²⁸The remainder of the respondents were non-managing owners or other administrative staff.

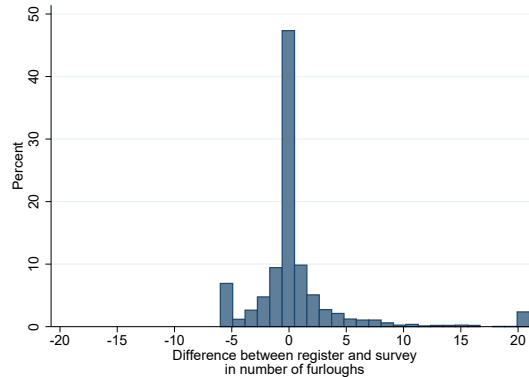
Figure A.1 plots the distribution of the number of furlough reports in the register and survey, as well as the firm-specific difference in reported numbers between the survey and the register records. It shows remarkable accuracy.

Figure A.1: Comparison of survey and register data for actual furlough counts

(a) Distribution of the share of actual furloughed workers



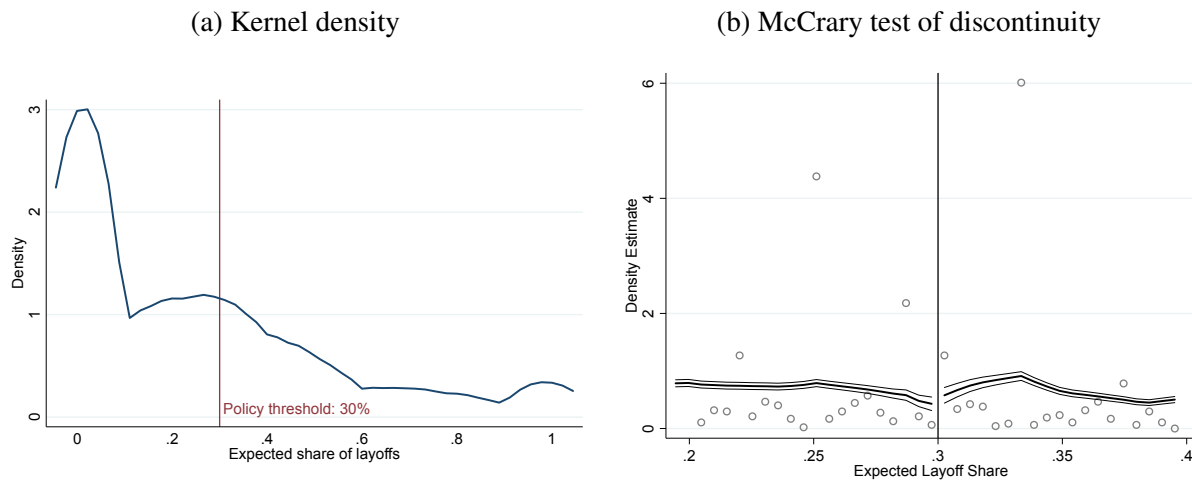
(b) Distribution of the difference in reported furloughs versus registered furloughs



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.

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 value they thought was the minimum acceptable. However, we do not see evidence of this in the reports. Figure A.4 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.

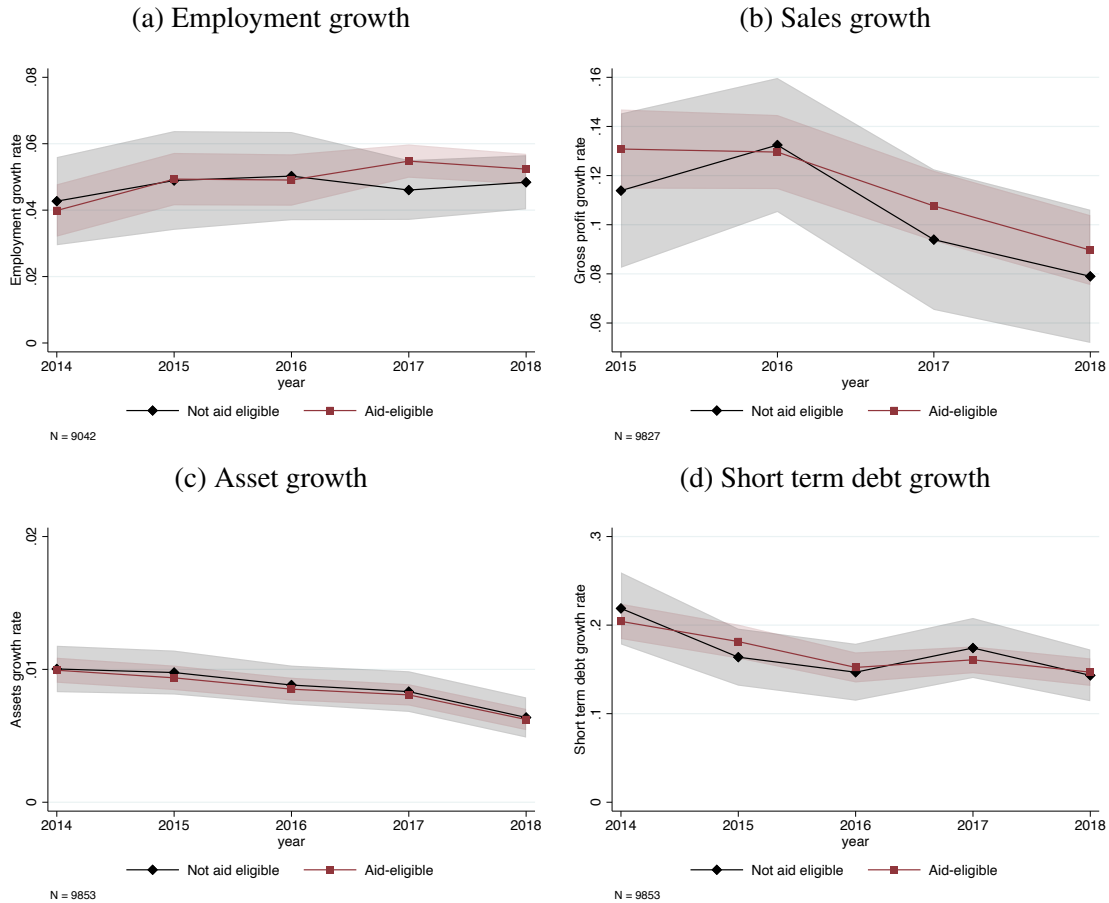
Figure A.2: Distribution of reported expected layoffs



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.

More generally, one might be concerned that the differences we observe between firms that took aid and those that did not reflect the continuation of trends firms in those different groups were on prior to the pandemic. It is unsurprising given the unexpected nature of the public health shock, that firms that took aid and firms that did not were performing similarly in terms of employment growth, sales, profits, and debt in the years leading up to the pandemic (Figure A.3).

Figure A.3: Pre-pandemic trends in key firm outcomes



Notes: Data from Experian including limited liability firms are required to file at the Danish Ministry of Economic and Business Affairs, matched to the firms in the authors' COVID survey. Black diamonds represent firms that reported not being eligible to take any government aid. Red squares represent firms that report being eligible to take government aid. Each panel shows the average growth rate for the following variables for each type of firm: Panel (a) employment, Panel (b) sales, Panel (c) assets and Panel (d) short term debt. Each sub-figure notes the number of firms included in the unbalanced panel. Coverage for financial variables such as assets and debt is greater than for employment and sales, as the former are part of mandatory reporting.

A.2 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 n.d.). On 18 April 2020 the government aid packages were extended to 8 July 2020 and also substantially expanded (Regeringen n.d.).

Table A.2: Summary of firm aid government programs.

Country	Furlough support	Loan and grant	Cost subsidy	Others
Denmark	100% of employee salaries are covered: 75% by the government, up to DKK30,000 per employee per month, 25% by firm. Eligibility: firm would layoff at least 30% of its workers.	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%-80% of fixed costs for firms with 35-100% decreases in turnover, but still open. 100% of fixed cost compensation if forced to close.	Sick leave covered 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.
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
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 maximum 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

A.3 Sample characteristics and response rates

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.4 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.

Table A.4: Distribution of Survey Responses

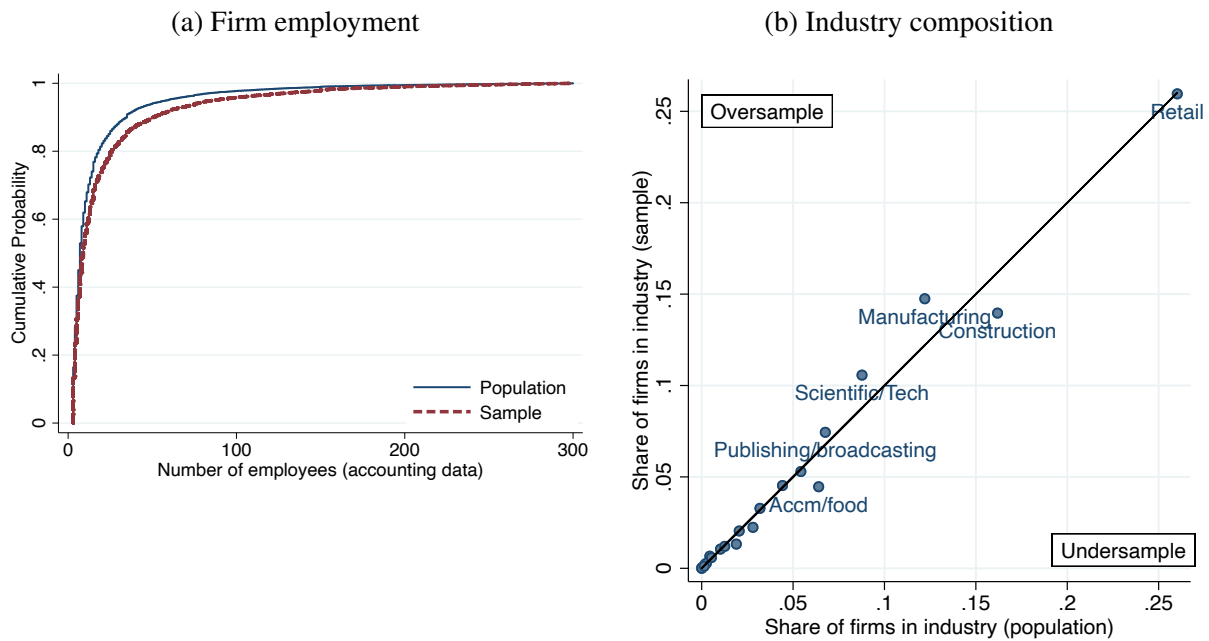
	Resp N	Popn N	Response rate	Share in sample	Share in popn
Firm size					
3-5 emp	3202	15768	0.20	0.30	0.36
6-9 emp	2283	10488	0.22	0.22	0.24
10-25 emp	2817	10860	0.26	0.27	0.24
26-50 emp	1063	3801	0.28	0.10	0.09
51+ emp	1200	3457	0.35	0.11	0.08
Industry					
Accommodation/Food	472	2840	0.17	0.04	0.06
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.

Figure A.4a 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. 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.4 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.4b, 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.5 shows the firm size distribution across each industry in the population and our survey sample.

Figure A.4: Representativeness of survey sample

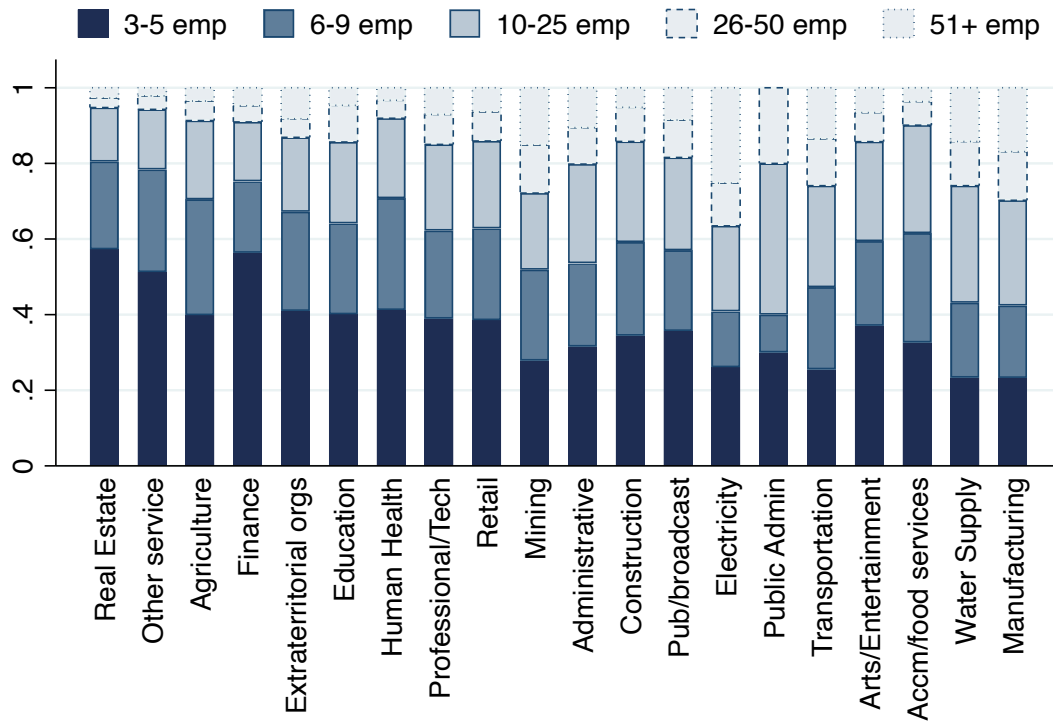


Notes: Panel (a) shows the cumulative distribution of firm employment in the population and in the survey sample. The red dashed line represents the cumulative distribution function of firm employment in our survey sample. The blue line represents the cumulative distribution function of the remainder of the population of firms in Denmark with more than 3 employees. Employment truncated at 99th percentile (300 employees) for exposition. Panel (b) shows the share of firms within each industry in the population and in the survey sample. 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.

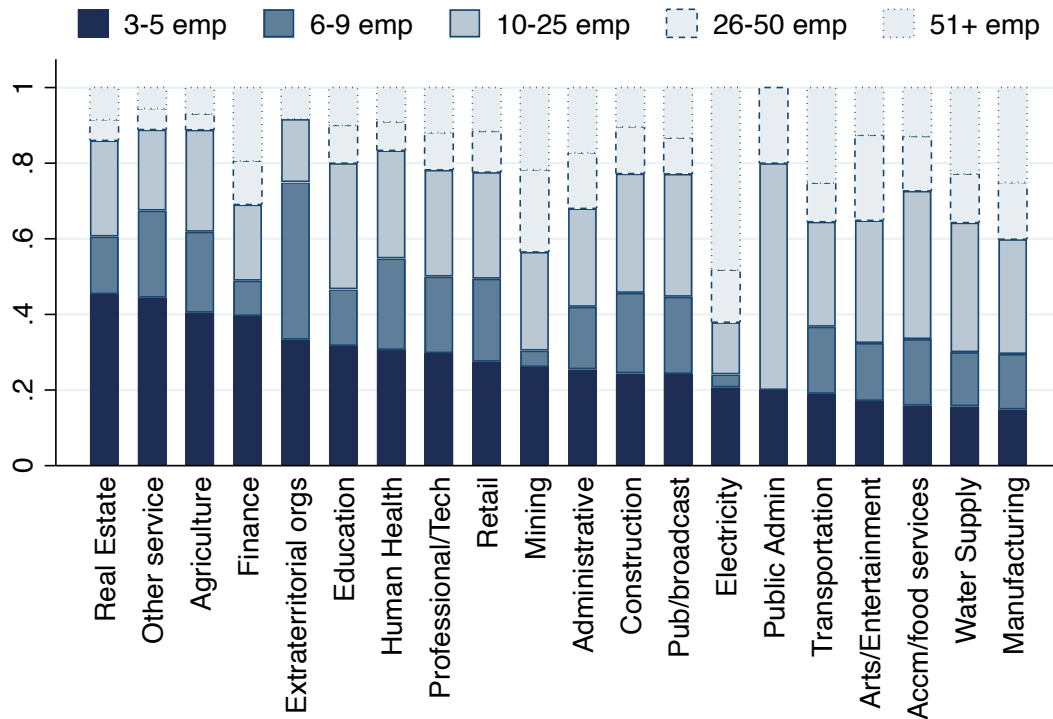
The overall response rate we received was high for this type of non-incentivized, voluntary survey. As all questions were voluntary, not all survey questions had the same response rate. Effectively all respondents provided answers to the main questions regarding establishment employment size, share of furloughed workers and share of laid-off workers. 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.

Figure A.5: Firm size distribution within industry, population

(a) Population



(b) COVID-19 Survey Sample



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.4 Labor aid takers and furloughed workers

Figure A.6 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.

Figure A.7a shows the distribution of the implicit cost of furloughing workers separately for full time and part time workers. Figure A.7b shows the industry-level relationship between average furlough days and workers' monthly earnings separately for full time and part time workers.

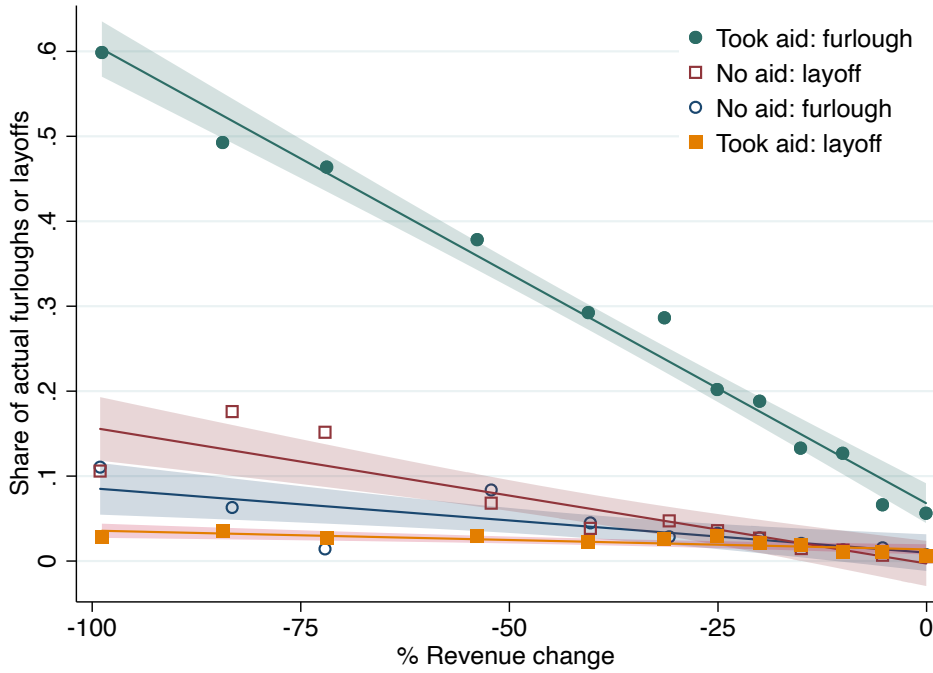
Table A.5: Summary statistics of furloughed workers, first round

	Mean	SD	25th ptile	Median	75th ptile	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

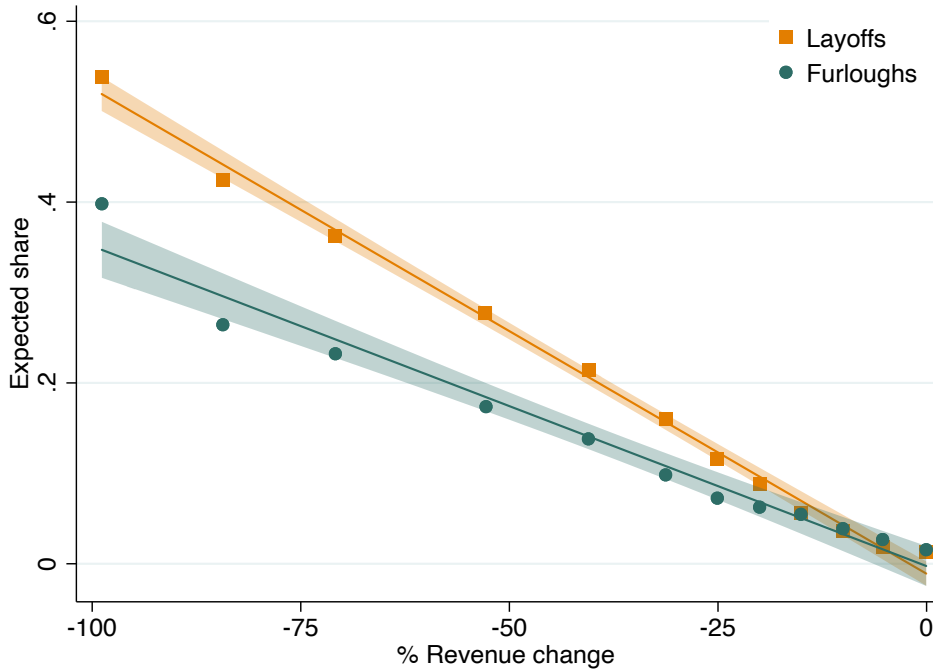
Notes: Data from the Danish government registry of disbursement of wage support for furloughed workers from March 9 to June 9 2020. The data includes 242,126 workers across 29,471 firms. This table reports summary descriptive statistics for workers and firms. Full time refers to workers who were reported 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.6: Labor response to revenue change

(a) By aid taker status, actual response



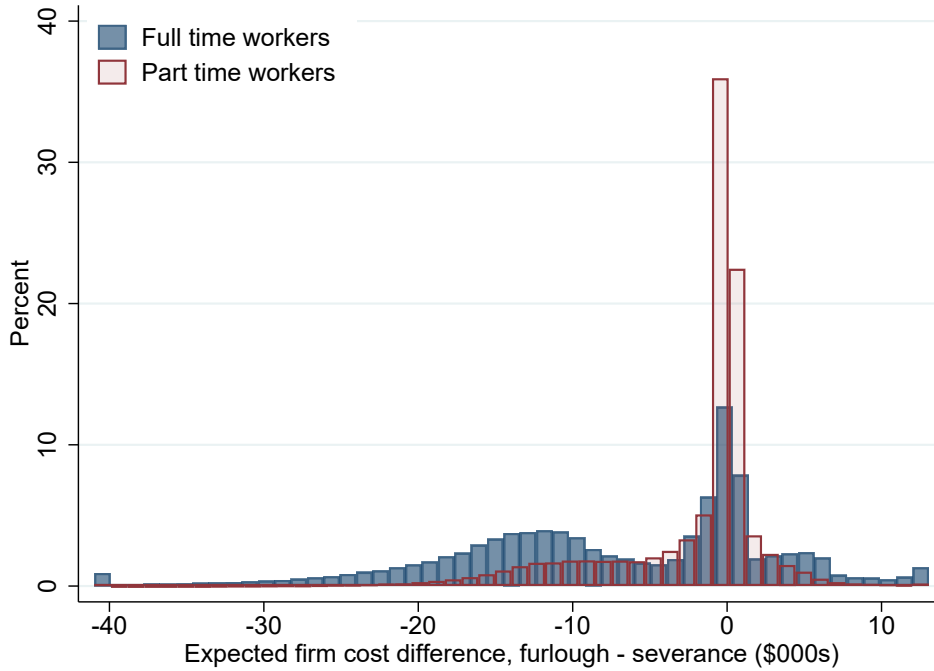
(b) Only aid takers, counterfactual response



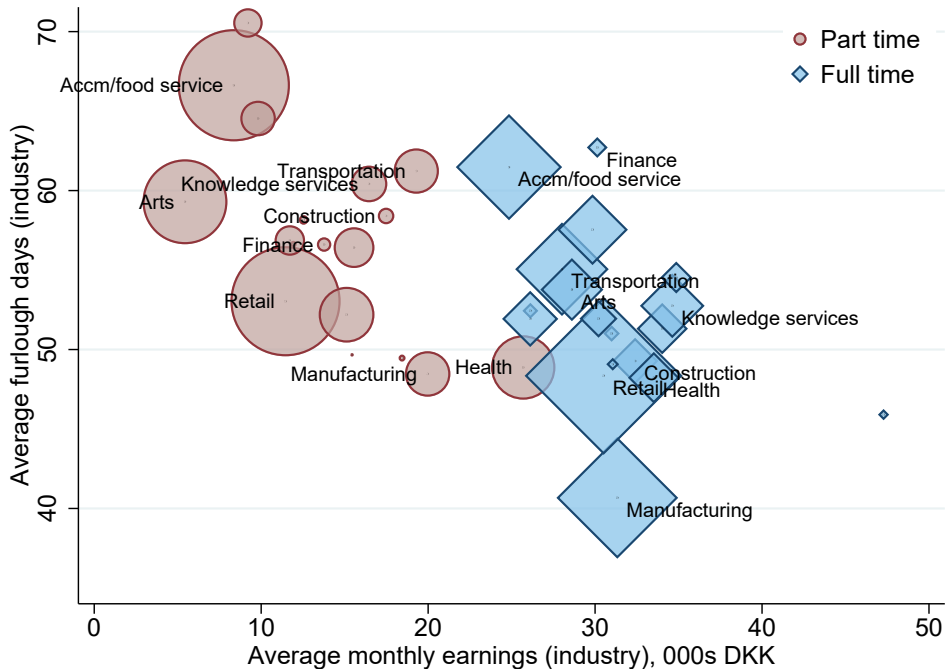
Notes: Survey data refers to data from the authors' Danish COVID-19 survey from 23 April 2020 to 1 June 2020. The full dataset includes 10,642, covering approximately one quarter of the Danish economy and forming a representative sample of firms in the country. The number of aid-takers is 5868. These 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.

Figure A.7: Furloughed workers, detailed patterns by full time status

(a) Implicit cost of furloughing workers



(b) Furlough days and wages



Notes: Panel (a) plots the distribution of the implicit net firm cost of furloughing workers for all furloughed workers. We estimate the implicit net cost of furloughing a worker as the total actual amount the firm paid (25% of their wage bill for furloughed days) minus the expected amount of severance pay the firm would have owed the worker if they were fired (winsorized at 0.05%). Panel (b) plots the industry-level average number of furlough days relative to the industry-level average monthly earnings of workers. Each circle or diamond 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-worker type. Data is from the Danish government registry of disbursement of wage support for furloughed workers from March to December 2020.

Table A.6: Relationship between aid type and labor decisions

Panel A: Aid takers only	(1)	(2)	(3)	(4)	(5)	(6)
Difference in share of workers...	Furloughs			Layoffs		
Labor aid taken=1	0.270*** (0.012)	0.269*** (0.012)	0.269*** (0.012)	-0.193*** (0.009)	-0.185*** (0.009)	-0.190*** (0.009)
Non-labor aid taken=1	0.043*** (0.013)	0.051*** (0.014)	0.042*** (0.013)	-0.054*** (0.009)	-0.054*** (0.009)	-0.054*** (0.009)
Avg Employment Growth		0.071* (0.037)			-0.056** (0.025)	
Avg Wage Growth			0.025 (0.016)			-0.014 (0.012)
<i>Controls</i>						
Industry FE	✓	✓	✓	✓	✓	✓
Revenue shock	✓	✓	✓	✓	✓	✓
Observations	5261	4562	4940	5190	4501	4872
# Firms	5261	4562	4940	5190	4501	4872
Panel B: Aid takers only	(1)	(2)	(3)	(4)	(5)	(6)
Total share of workers...	Furloughs			Layoffs		
<i>Reported actuals</i>						
Labor aid taken=1	0.275*** (0.009)	0.269*** (0.009)	0.274*** (0.009)	-0.083*** (0.006)	-0.083*** (0.007)	-0.083*** (0.007)
Non-labor aid taken=1	-0.008 (0.009)	-0.006 (0.009)	-0.006 (0.009)	-0.027*** (0.005)	-0.026*** (0.005)	-0.026*** (0.005)
<i>Reported counterfactuals</i>						
If labor not taken=1	0.037*** (0.009)	0.035*** (0.009)	0.036*** (0.009)	0.161*** (0.008)	0.151*** (0.008)	0.157*** (0.008)
Non-labor aid not taken=1	0.013 (0.009)	0.009 (0.009)	0.013 (0.009)	0.059*** (0.006)	0.056*** (0.007)	0.058*** (0.006)
Avg Employment Growth		0.013 (0.023)			0.028* (0.017)	
Avg Wage Growth			-0.011 (0.009)			0.015** (0.008)
<i>Controls</i>						
Industry FE	✓	✓	✓	✓	✓	✓
Revenue shock	✓	✓	✓	✓	✓	✓
Observations	10522	9124	9880	10380	9002	9744
# Firms	5261	4562	4940	5190	4501	4872
Panel C: All firms	(1)	(2)	(3)	(4)	(5)	(6)
Total share of workers...	Furloughs			Layoffs		
<i>Ref category: non-eligible non-aid takers</i>						
Labor aid taken=1	0.290*** (0.007)	0.284*** (0.007)	0.288*** (0.007)	-0.048*** (0.004)	-0.047*** (0.004)	-0.048*** (0.004)
Non-labor aid taken=1	0.005 (0.006)	0.008 (0.006)	0.007 (0.006)	0.008*** (0.002)	0.009*** (0.003)	0.008*** (0.002)
Aid eligible=1	-0.022*** (0.004)	-0.025*** (0.005)	-0.024*** (0.004)	0.015*** (0.003)	0.014*** (0.003)	0.014*** (0.003)
Avg Employment Growth		0.032* (0.018)			0.005 (0.009)	
Avg Wage Growth			-0.002 (0.007)			0.007** (0.004)
Industry FE	✓	✓	✓	✓	✓	✓
Revenue shock	✓	✓	✓	✓	✓	✓
Observations	9251	7998	8678	9251	7998	8678
# Firms	9251	7998	8678	9251	7998	8678

Notes: ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels. Standard errors in parentheses. The outcome variables for Columns (1) - (3) refer to share of workers who are furloughed, and Columns (4) - (6) refer to share of fired workers. The sample in Panels (A) and (B) include only firms that took at least one type of aid, and we duplicate each firm observation to include their actual outcome response as well as their reported counterfactual response. The coefficient estimates for labor, cost, and fiscal aid in these panels correspond to firms' reported actual outcomes. Panel (C) includes all firms in our survey sample. All columns are estimated with OLS and include controls for revenue loss, log of January employment, and industry (2-digit NACE level).

B 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 packages?

- 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>