The impact of firm-level Covid rescue policies on productivity growth and reallocation

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Context

Covid-19 triggered the largest drop in GDP since WWII

- GDP fell 5-10% in 2020 in most Western countries.
- Belgium: -6.1%, i.e. 3x as much as financial crisis.

Various safety measures to curb the spread of the virus

- Lockdowns and industry closures.
- Huge disruption in production and consumption patterns.

Flanking support measures for businesses and households

- EU: largest stimulus package ever (2 trillion euro).
- Flanders: firm subsidies, moratoria on bankruptcies, furlough schemes.

This paper

Exploit detailed information on firms (Flanders, 2019-2021)

- Rescue support measures and firm outcomes.
- In-depth interviews.

Ex post policy evaluation of government interventions

- Initiated as an independent expert evaluation.

What is the impact of firm support measures on

- Micro: firms' productivity growth, exit probabilities.
- Macro: aggregate productivity growth, exit and creative destruction.

Preview of findings

Firm-level outcomes

- Productivity: temporary 4-5% increase.
- Exit probability: 45% decrease (counterfactual 9% in the aggregate).

Aggregate outcomes

- Both treated and untreated firms contribute to positive productivity growth.
- Suboptimal creative destruction on exit and reallocation margins.
- But reallocation margin was already suboptimal before the crisis.

Policy implications

- Measures helped firms to survive and temporarily increase productivity.
- Interviews suggest funds used as intended: cover fixed costs, keep personnel, avoid liquidity/solvency issues, overcome highly uncertain period.
- No differential effect on ongoing process of creative destruction.

Literature

Impact of Covid on micro/macro outcomes

- Productivity effects: Bloom et al. (2022).
- Production: Chetty et al. (2020), Bounie et al. (2020), Sherif (2020).
- Consumption: Andersen et al. (2020), Carvalho et al. (2021).
- Turnover: Dhyne and Duprez (2021).
- Firm exit: Cros et al. (2021), Piette and Tielens (2022).
- Capital constraints: Bellucci et al. (2020), Chundakkadan et al. (2022).

Covid policies and firm outcomes

- Liquidity base EU firms: Harasztosi et al. (2022).
- Uptake loans and SME's UK: Hurley et al. (2021).
- Productivity/zombies: EU: Bighelli et al. (2021), Freeman et al. (2021).

Methods

- Productivity growth: Olley and Pakes (1996); Melitz and Polanec (2015).

Today

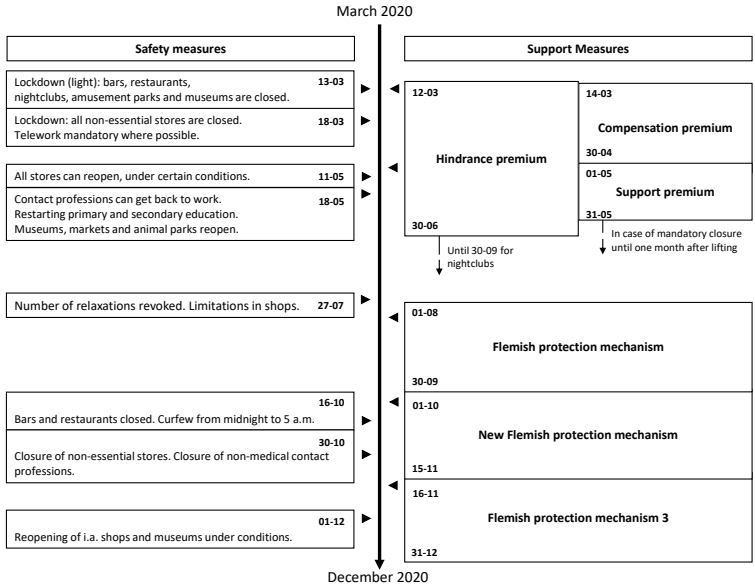
Covid support measures in Flanders

Impact of subsidies on firm outcomes

Aggregate productivity growth

Potential mechanisms

Flanders safety measures flanked by support measures



Five waves of firm-level support measures

	Support measure	Description	Coverage period	First payout
1	Hindrance premium	Requirement: mandatory closure of physical site. Subsidy: € 160/day.	Mar 12 - Jun 30	Apr 2, 2020
2	Compensation premium	Requirement: drop in turnover $\geq$60% relative to reference period in 2019. Subsidy: €3,000. Half for self-employed in secondary occupation. Not cumulative with hindrance premium.	Mar 14 - Apr 30	May 7, 2020
3	Support premium	Requirement: drop in turnover $\geq$60% relative to reference period in 2019. Subsidy: €2,000. Half for self-employed in secondary occupation.	May 01 - May 31	Jul 16, 2020
4	Flemish protection mechanism	Requirement: drop in turnover $\geq$60% relative to reference period in 2019. Subsidy: 7.5% of turnover; with max €15,000. Half for self-employed in secondary occupation.	Aug 01 - Sep 30	Sep 30, 2020
5	New Flemish protection mech.	Requirement: drop in turnover $\geq$60% relative to reference period in 2019. Subsidy: 10% of turnover; with min €1,000; max: €60,000 (FTE marks). Half for self-employed in secondary occupation.	Oct 1 - Nov 15	Nov 17, 2020

Data sources

VLAIO firm-level subsidies (2020)

- Type of subsidy.
- Date submitted, approved/rejected, amount, date of payment.
- Total of 1.7 billion euro.
- Median payout 2 days after submission.

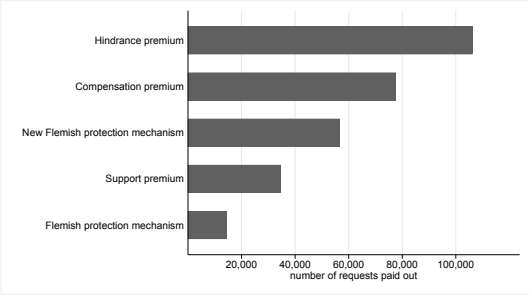
Additional datasets

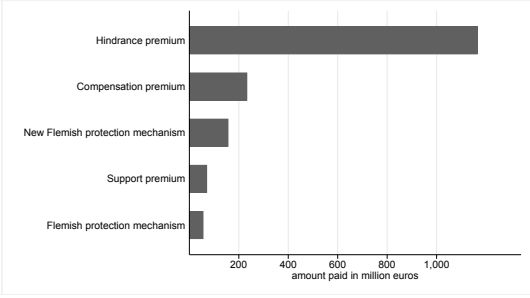
- VAT declarations (quarterly): sales, inputs (2019-2021).
- Social security (quarterly): FTEs, wages (2005-2021).
- Annual accounts (yearly): sales, inputs, fixed assets, value added (2005-2021).

In-depth interviews

- Sector organizations and business representatives.

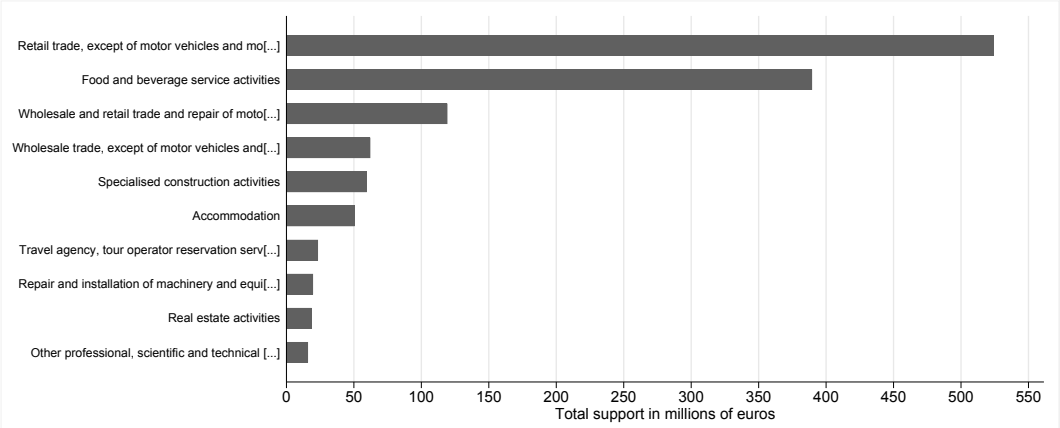
Support amount by type of mechanism





Largest support from first subsidy: forced closures, flat fee mechanism.

Who is supported?



Mostly downstream sectors with prolonged closures (not manufacturing).
Mostly micro firms ($\leq$10 FTE).

Agenda

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Identification strategy

Difference-in-difference estimation

- Treated vs untreated.
- Within firm over time pre/post intervention.

Treated vs never treated groups

- Data on all firms that applied for Covid support in 2020.
- Either obtained (treated) or rejected (never treated).
- Rejection: e.g. insufficient documentation, not in Flanders, non-closed sector, $\leq$60% sales drop.
- Compare pre (2019) and post (2020-2021) outcomes.

Specifications

- Pre vs post intervention: total effect of the subsidies.
- Quarterly diff-in-diff: pre-trends and persistence.
- By premium: heterogeneity.
- Exit probabilities.

Pre vs post intervention: Total effects

$$Y_{it} = \beta D_{it} + \alpha_i + \lambda_{jt} + \varepsilon_{it}$$

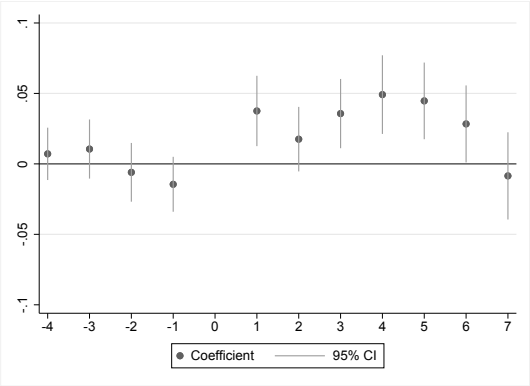
	ln(sales/FTE)	ln(value added/FTE)
Treatment D_{it}	0.040**	0.047**
	(0.014)	(0.015)
Industry-year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes
Adj. R^2	0.81	0.59
N	78,972	78,972

Notes: Heteroscedastic robust standard errors are clustered at the firm level. Significance: * < 5%, ** < 1%, *** <0.1%.

Treated firms see a 4-5% increase in productivity on average vs. untreated.

Quarterly diff-in-diff: Persistence of effects

$$Y_{it} = \sum_{k=-4}^{7} \beta_k D_{ik} + \alpha_i + \lambda_{jt} + \varepsilon_{it}$$



Parallel trends: no anticipation effects, SUTVA.
Temporary effect: dies out by the end of 2021.

Heterogeneous effects: By premium

	ln(sales/FTE)	ln(value added/FTE)
Premium 1	0.043***	0.071***
	(0.015)	(0.017)
Premium 2 or 3	0.028	0.017
	(0.015)	(0.017)
Premium 4 or 5	0.013	0.004
	(0.025)	(0.030)
Industry-year fixed effects	Yes	Yes
Firm fixed effects	Yes	Yes
Adj. R^2	0.87	0.73
N	78,972	78,972

Notes: Heteroscedastic robust standard errors are clustered at the firm level. Significance: * < 5%, ** < 1%, *** <0.1%.

First premium largest effect: largest amount, forced closures, flat fee.
Others: not significantly different from evolution of control group.

Probability of exit in the next quarter

	Pr(exit)	Pr(exit)	Pr(exit)
Treatment D_{it}	-0.57***	-0.57***	-0.57***
	(0.12)	(0.12)	(0.12)
ln(value added/FTE)	-0.25***	-0.25***	-0.25***
	(0.04)	(0.03)	(0.03)
ln(FTE)	-0.96***	-0.96***	-0.96***
	(0.05)	(0.05)	(0.05)
debt/asset ratio 2019		0.06**	0.05**
		(0.03)	(0.03)
ln(age)			-0.02
			(0.03)
Unconditional exit probability	1.1%.		
Quarter fixed effects	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes
Pseudo R^2	0.15	0.15	0.15
N	217,508	217,508	217,508

Marginal effect: 0.5 p.p. decline in exit probability; or 45% lower.

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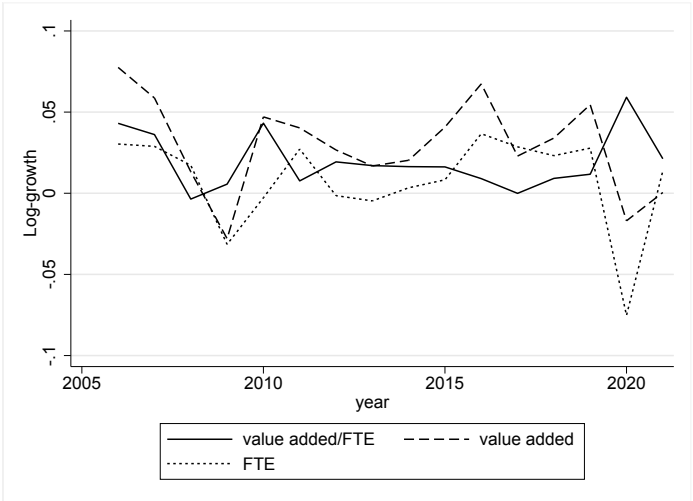
Aggregate labor productivity growth and its components



Productivity growth 5.9% in 2020 and 2.1% in 2021 (robust to several measures).
Both VA and FTE fell, but FTE much faster → positive growth.

Decomposing aggregate productivity growth

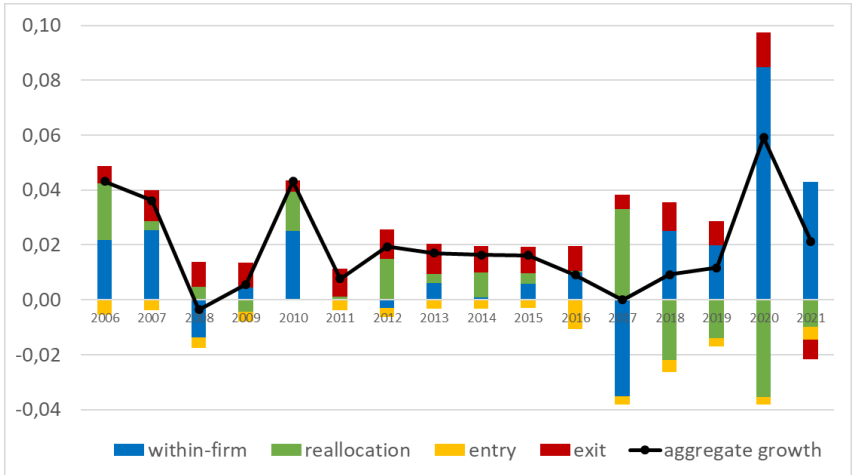
Aggregate log productivity Φ_t (Olley & Pakes, 1996)

$$\begin{aligned}\Phi_t &= \sum_{i \in N_t} s_{it}\varphi_{it} \\ &= \bar{\varphi}_t + \sum_{i \in N_t} (s_{it} - \bar{s}_t)(\varphi_{it} - \bar{\varphi}_t) \\ &= \underbrace{\bar{\varphi}_t}_{\text{average}} + \underbrace{Cov(s_{it}, \varphi_{it})}_{\text{allocative efficiency}}\end{aligned}$$

Decomposing aggregate productivity growth (Melitz & Polanec, 2015)

$$\begin{aligned}\triangle\Phi_t &= \triangle\bar{\varphi}_t + \triangle Cov(s_{it}, \varphi_{it}) \\ &= \underbrace{\triangle\bar{\varphi}_t^S}_{\text{within firm}} + \underbrace{\left(Cov(s_2^S, \varphi_2^S) - Cov(s_1^S, \varphi_1^S)\right)}_{\text{reallocation of market shares}} + \underbrace{s_2^E\left(\Phi_2^E - \Phi_2^S\right)}_{\text{entrants}} + \underbrace{s_1^X\left(\Phi_1^S - \Phi_1^X\right)}_{\text{exiters}}\end{aligned}$$

Growth decomposition (VA/FTE)



Aggregate productivity growth mostly driven by within-firm growth.
Negative reallocation effect, but already present in last years.

Reallocation of market shares across treated vs untreated

- Further decomposition into subgroups: treated vs untreated.
- All components for each subgroup + new reallocation term.
- Focus on surviving firms.

	(all in p.p.)	*Treated*		*Untreated*		
Year	Agg. gr. survivors	Within firm	Covariance	Within firm	Covariance	Between Group Reallocation
2020	5.0	4.1	-3.1	4.4	-1.6	1.1
2021	5.3	2.6	-1.11	1.7	0.6	-0.4

- **Within-firm evolutions** are similar across both groups (catch-up effect).
- **Share of treated firms much smaller** $\rightarrow$ larger contribution per firm.
- **Reallocation of market shares** to less productive firms in both groups.
- **Across groups**: reallocation of market shares from treated to untreated.

Robustness

Diff-in-diff

- **Placebo test:** fake treatment support 1 quarter earlier.
- **Furlough schemes:** no differential effects across treated/untreated.
- **Alternative control groups:** 1:1 matching without replacement.
- **Alternative estimator:** weighted heterogeneous treatment (Sun-Abraham, 2021).

Aggregate productivity growth

- **Total factor productivity:** structural TFP gives similar results.
- **Job reallocation:** Massive reallocation that does not result in productivity growth.

Today

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Potential mechanisms

Intervention logic and identification revisited

Intervention logic

- Keep the economy afloat.
- Allow firms to make essential payments, retain productive capacity.
- Avoid failures, job destruction and liquidity/solvency issues.

Our previous results point in this direction

- But several underlying mechanisms might generate these outcomes.
- Triangulate our quantitative results with in-depth interviews and economic theory.

In-depth interviews

Setup

- Interviews with business associations, sector umbrella organizations and businesses.
- In-depth, semi-open interviews.
- Subset of questions on the perceived effects of the support mechanisms: Turnover, fixed costs, employment, financing structure, liquidity/solvability, probability of exit and future expectations.

In-depth interviews: Results

Turnover

- Most firms saw large reduction in turnover, but large variation across sectors/firms.

Main use of the subsidies

- Cover fixed costs (rents, energy, long term contracts, leases and personnel).
- For large firms, the first mechanism (flat fee) was insufficient.

Employment

- Federal furlough schemes provided largest safety net.
- Keeping highly wanted employees 100% on board (vs 70% furloughs).

Re-evaluation

- Alternate delivery (take-away, web shop, online events).
- Often with fewer required personnel.

Equity

- Buffer to increase equity or improve probability of loan if needed.
- Most buffers were depleted by end of 2020, fear of next lockdown.

Potential mechanisms

Support measures alleviate constraints that trigger firm exit

- Fixed costs keep running, even if temporarily closed.

Support measures as a source of productivity increases

- Productivity growth from larger drop in labor than value added.
- Large recovery in labor in 2021.

Labor as a variable cost

- First scale down with output, and use support for e.g. capital.
- As demand recovers, attract more labor.

Labor as a fixed cost

- Shut down if revenues $<$ variable costs.
- Use support for fixed costs (including capital).

Labor sorting

- Keep most productive workers and let go of others.

Are these productivity increases sustainable?

In favor of "No"

- Highly insecure work environment.
- Temporary contracts, women, mothers.
- High work pressure and burnouts.
- We see temporary effects in the analysis, mostly driven by recovery in FTE.

In favor of "Yes"

- Re-organization being efficiency improving.
- Worker sorting, restructuring, work from home.
- Investments and new ways to sell goods/services.

Conclusion

Impact of Covid subsidies on firm outcomes

- Within firms: 4-5% productivity growth.
- 45% lower exit probability.
- But temporary (reversion to the mean).

Aggregate productivity growth

- Driven by within-firm growth in both treated/untreated.
- Treated firms contribute to boost, not only catchup effect of treated.

Insufficient creative destruction

- Both treated and untreated face negative reallocation.
- But reallocation of market shares to untreated.
- Negative reallocation effect already present before the crisis.

Thank you!

Evolution sales, by sector

NACE Sector	Evolution of sales
A. Agriculture, forestry and fishing	34%
F. Construction	28%
Q. Human health and social work activities	24%
G. Wholesale and retail trade; repair of motor vehicles and motorcycles	22%
L. Real estate activities	20%
C. Manufacturing	19%
E. Water supply; sewerage; waste managment and remediation activities	12%
D. Electricity, gas, steam and air conditioning supply	10%
S. Other services activities	-7%
K. Financial and insurance activities	-9%
J. Information and communication	-22%
P. Education	-22%
M. Professional, scientific and technical activities	-25%
I. Accommodation and food service activities	-40%
H. Transporting and storage	-50%
N. Administrative and support service activities	-56%
T. Activities of households as employers	-62%
R. Arts, entertainment and recreation	-83%

Event study dataset

Sample balancing (2019)

- Treated firms are smaller on average.
- Use within-firm evolution of variables.
- Pre-trends: productivity evolutions are the same.

				percentiles		
Sample	Variable	Mean	Std. Dev.	10*th*	50*th*	90*th*
Treated	Employees (FTE)	5.8	30.2	0.6	2.3	11.5
(N = 23,049)	Employees (headcount)	6.9	38.8	1.3	3	13.5
	Value added	465,793	2,456,059	45,578	183,334	891,127
	Turnover	2,292,974	13,418,564	204,861	680,592	3,803,435
	Value added/FTE	126,067	594,293	42,609	74,621	177,064
	Turnover/FTE	706,401	3,254,355	178,006	292,323	1,098,652
Never treated	Employees (FTE)	7.2	25.1	0.7	2.6	14.2
(N = 3,275)	Employees (headcount)	8.3	28.1	1	3	13.5
	Value added	768,410	3,891,372	63,191	239,685	1,317,445
	Turnover	2,624,011	10,034,862	194,352	704,650	4,593,542
	Value added/FTE	147,804	446,478	50,097	87,019	222,249
	Turnover/FTE	614,204	3,669,736	114,005	263,016	960,200

Notes: This table reports the distributions of yearly variables of treated and untreated companies in 2019. Employment is expressed as the number of full-time equivalents (FTE) at the company, averaged over quarters in 2019; value added and turnover are the totals in euros over quarters in 2019. p10, p50 and p90 indicate the 10th, 50th and 90th percentiles.

Aggregate productivity growth dataset (pooled, 2005-2021)

			percentiles		
Variable	Mean	Std. Dev.	10*th*	50*th*	90*th*
Employees (FTE)	12.1	83	0.6	2.8	20.0
Value added	1,306,534	15,967,020	48,061	227,119	1,725,210
Value added/FTE	152,170	1,799,713	41,583	78,233	211,182
Tangible fixed assets	1,204,518	20,698,849	9,649	132,862	1,202,357

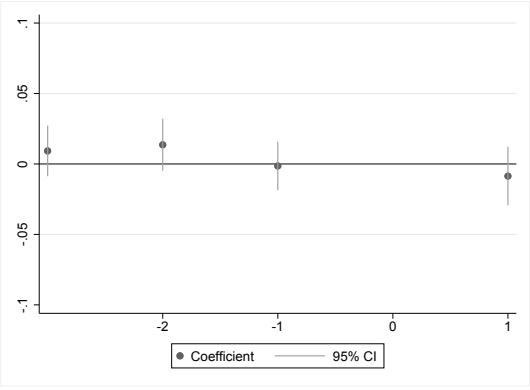
Notes: Employment is expressed as the number of full-time equivalents (FTE); value added and tangible fixed assets are in euros. All variables are yearly values, pooled over 2005-2020. p10, p50 and p90 indicate the 10th, 50th (median) and 90th percentiles.

Decomposition of exit probabilities

Scenario	Pr(exit)
Unconditional exit probability	1.1%
Average exit probability: Treated	1.0%
Average exit probability: Untreated	1.1%
Counterfactuals	
1. If no firms had received support	1.2%
2. If firms that did get support had not received support	1.7%
3. If all firms had received support	0.7%
4. If firms that did not get support had received support	0.6%

Notes: The decomposition shows the average exit probabilities implied by the logit coefficients from the exit regression.

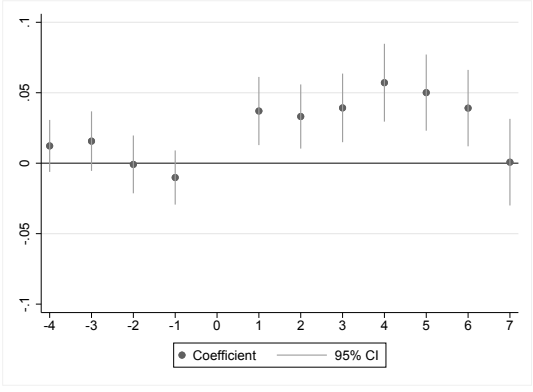
Placebo test fake treatment



Notes: Event study coefficients for the impact of support on labour productivity when treatment is brought forward two periods as a placebo test. Both firm fixed effects and industry-quarter fixed effects are included. Heteroscedastic robust standard errors are clustered at the firm level.

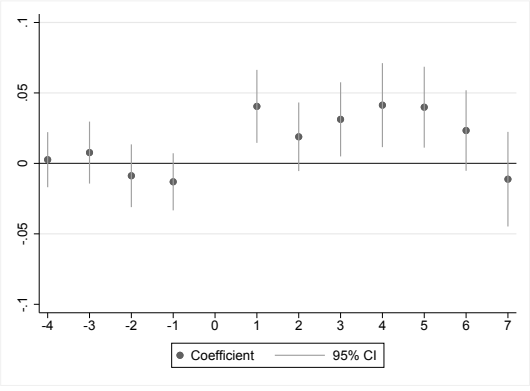
Furlough schemes

All firms could make use of temporary unemployment schemes at the federal level.
We include a control variable $\frac{full-time\ equivalents_t}{number\ of\ workers_t} - \frac{full-time\ equivalents_{t-1}}{number\ of\ workers_{t-1}}$.



Notes: This figure shows the event study coefficients for the impact of support on labour productivity when controlling for the furlough scheme. Both firm fixed effects and industry-quarter fixed effects are included. Heteroscedastic robust standard errors are clustered at the firm level.

Alternative control groups: 1:1 NNM without replacement

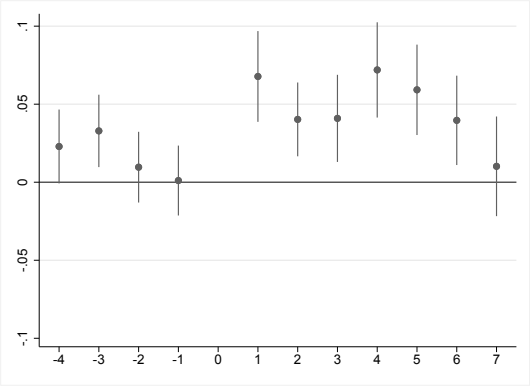


Notes: Both firm fixed effects and industry-quarter fixed effects are included. Heteroscedastic robust standard errors are clustered at the firm level.

Alternative estimator: Abraham and Sun (2021)

Baseline: (i) all subsidies, (ii) by subsidy.

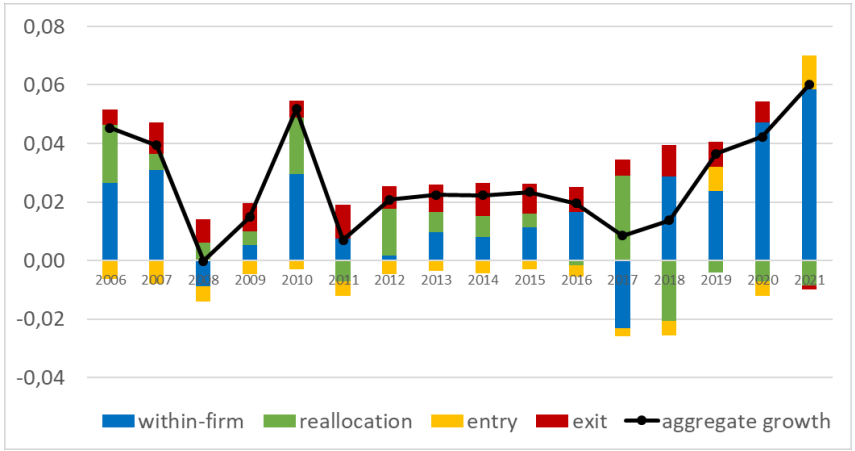
Robustness: heterogeneous effects by cohort.



Notes: Both firm fixed effects and industry-quarter fixed effects are included. Heteroscedastic robust standard errors are clustered at the firm level.

Aggregate productivity growth with structural TFP

For firms with annual accounts, estimate structural TFP (Ackerberg, Caves and Frazer, 2015)



Aggregate productivity growth (TFP)

year	Gr. Agg. TFP Surv.	Treated: Av.	Treated: Cov.	Untreated: Av.	Untreated: Cov.	Between Groups Cov.
2020	0.040	0.009	-0.012	0.038	-0.010	0.015
2021	0.050	0.036	-0.005	0.022	0.006	-0.010

Notes

- positive aggregate productivity growth
- driven by within-firm evolution
- negative covariance term
- positive net entry term
- same results for treated/untreated

Alternative reallocation measures

Job reallocation (Davis and Haltiwanger, 1992).
Gross reallocation is the sum of creation and destruction.