

Sailing through Troubled Waters: Evidence from the APOIAR Program

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Public support to firms and workers in times of crisis

- ▶ While the US insured workers against the cost of job losses by increasing unemployment benefits, Europe focused on **preserving the match** between workers and firms with **subsidies for temporary layoffs** (Giupponi et al., 2022).
- ▶ Entrepreneurs in micro and small firms may not be sufficiently covered by these schemes and some complementary measures were implemented to minimize the destruction of productive capacity and employment - **but were they really effective?**
- ▶ What was the **impact of APOIAR Program on firms' performance?**
 - ▶ a non-repayable cash-flow support to firms in sectors particularly affected by confinement measures - paid incentive over €1.2 billion (layoff: €1.18 billion)

Institutional context

- ▶ **Portuguese firms were particularly vulnerable** to disruptions in international trade and global value chains - Real GDP growth rate in:
 - ▶ 2020: -8.3% PT vs -5.6% UE27
 - ▶ 2021: 5.7% PT vs 6% UE27
 - ▶ 2022: 6.8% PT vs 3.4% UE27
- ▶ **Severe economic contraction in 2020:** Tourism in Portugal was particularly hit - non-resident tourists decreased 73.7% (after growing 7.9% in 2019)
- ▶ **2020 support:** moratorium on debt and rental payments, credit lines, deferred tax payments, non-refundable wage subsidies - a paid furlough scheme under which workers were temporarily laid off, but 1/3 were still paid by firms
- ▶ Kozeniauskas et al. (2022) show that higher-productivity firms were more successful at maintaining employment, less likely to take up government support, and no rise in exit for lower productivity firms in 2020

Contribution

- ▶ Bloom et al. (2023): Productivity fell during 2020-21, with heterogeneity over sectors - greatest impacts in those with extensive in-person activity
- ▶ Humphries et al. (2020); Autor et al. (2022b,a); Granja et al. (2022); Agarwal et al. (2024) on the effects of the paycheck protection program in the US
 - ▶ forgivable on the condition that recipient firms maintained employment and wages at close to pre-crisis levels in the two to six months following loan receipt

Our paper provides **causal evidence** on the **impact of public support on firm performance in times of crisis**

- ▶ Kopp and Siegenthaler (2021); Giupponi et al. (2022); Giupponi and Landais (2023); Cahuc (2024) on the effects of short-time work schemes in previous crisis

Our paper examines a complementary policy that was implemented to keep businesses afloat by **providing compensations for other fixed costs**

The APOIAR program

- ▶ **Main sectors:** wholesalers, retailers, tourism (hotels, restaurants,...)
- ▶ **Nov 2020** Aimed at micro and small enterprises with turnover losses $>25\%$ between Jan and Sep 2020 (yoy), with a right to non-repayable compensation of 20% of this loss, with limits depending on firm size.
- ▶ **Jan 2021** Expanded to larger firms and individual entrepreneurs that had a turnover losses $>25\%$ in 2020 compared to the previous year, with more generous limits depending on firm size
- ▶ **Requirements:** firms should not hold debts to the fiscal authority and to social security, cannot fire workers or distribute dividends in the short-run
- ▶ **Simple on-line application** process
- ▶ We are **excluding** startups (born in 2019), self-entrepreneurs, and medium/ large firms as different rules apply

Data

Panel data from 2019 to 2022 with information on a wide range of variables on characteristics of firms (location, sector, etc.) and subsidies received

- ▶ **E-Fatura emitentes**, invoice data covering all (legal) transactions aggregated per seller at the monthly level, as reported by firms to the Tax Authority
- ▶ **SCIE**, yearly balance-sheet information on all non-financial private firms
- ▶ **Beneficiary firms from the APOIAR** Program, including when it was approved and the amount
- ▶ **Excluded from the sample**: non-SME, firms in non-eligible sectors (according to Portaria-271-A-2020 of 24th November and Portaria 69-A 2021 of 24th March), firms with non-positive assets, turnover, equity or employment, firms based in Madeira or Azores and startups (born in 2019)

Table of descriptive statistics

Table: Summary Statistics - baseline 2019

	Mean	Std. Dev.	p25	p50	p75	p99	Obs.
Turnover	487100.5	775091.9	75866.5	187475.5	499716	3747072	103940
Number of employees	4.771426	5.278187	1	3	6	24	103940
Wage expenditure	62138.74	82370.93	12087	29619.5	72623	376204	77978
Total assets	429985.2	689561.7	64395.5	163344	437876	3307012	103940
Net Income	19981.26	43466.32	584	5901	22049.5	198959	103940
Invest. (basic equip.,transport)	8571.798	19383.49	0	0	5500	91109	103940

Median firm has **3 employees**, has a turnover of 187,476€ and assets of 163,344€.

% Companies - breakdown by sector

Table: Distribution of Firms by Main Sector

Main Sector	Frequency	Percent (%)
Accommodation and Food Services	18,280	17.59
Arts, Entertainment, and Sports	3,415	3.29
Administrative and Support Services	3,146	3.03
Retail and Wholesale Trade	57,426	55.25
Consulting and Technical Services	3,222	3.10
Education	2,154	2.07
Manufacturing Industry	1,769	1.70
Information and Communication	1,780	1.71
Other Services	3,456	3.32
Health and Social Support	9,292	8.94
Total	103,940	100.00

Identification strategy

- ▶ **Regression Discontinuity Design** à la Cattaneo et al. (2023): Sharp/ Fuzzy approaches
- ▶ Baseline results: Polynomial or order 2, triangular kernel function, and the bandwidth is the optimal CCT
- ▶ Eligibility criteria threshold: decrease of 25% in turnover

$$\text{Turnover_Drop} = \min(\text{Drop_9months}, \text{Drop_12months}) \quad (1)$$

- ▶ No other changes at this threshold and in this period.
- ▶ Outcomes: Sales, Profits, Expenses (including taxes, Supplies and External Services,...), Wages ,Employment, Labor productivity, Probability to survive
 - ▶ euro amounts winsorized at 2,5%

Identification strategy

Sharp RDD: the treatment assignment (D) is fully deterministic and exclusively defined by whether the running variable X crosses a predefined threshold c :

$$D = \begin{cases} 1 & \text{if } X \geq c, \\ 0 & \text{if } X < c. \end{cases}$$

The treatment effect at the cutoff, τ_{SRD} , is identified as the discontinuity in the conditional expectation of the outcome variable Y at $X = c$:

$$\tau_{SRD} = \lim_{X \rightarrow c^+} E[Y|X] - \lim_{X \rightarrow c^-} E[Y|X]. \quad (2)$$

In practice, this is estimated using local polynomial regression, with bandwidth selection optimizing the balance between bias and variance.

Fuzzy RDD: treatment is no longer deterministic - the probability of receiving treatment may change discontinuously at the threshold c :

$$P(D = 1 | X) = \begin{cases} p_1 & \text{if } X \geq c, \\ p_0 & \text{if } X < c, \end{cases}$$

Since not all individuals near the threshold comply with the treatment assignment we estimate the effect only for those who receive the treatment. The estimand takes the form of a ratio of two Sharp RD estimands:

- The **reduced-form equation**:

$$\lim_{X \rightarrow c^+} E[Y | X] - \lim_{X \rightarrow c^-} E[Y | X].$$

- The **first-stage equation**:

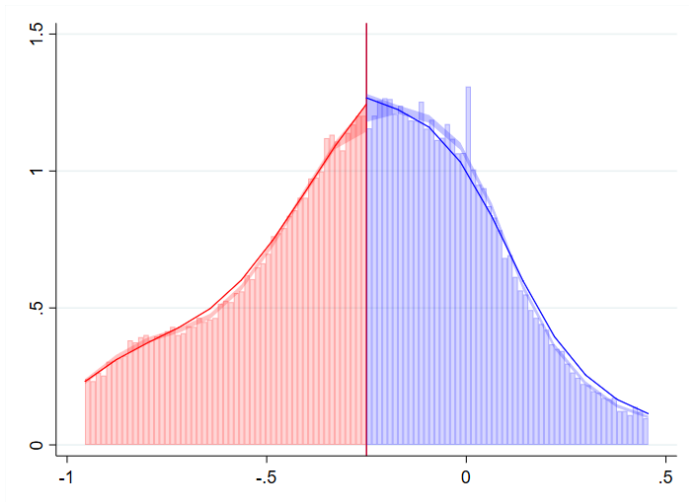
$$\lim_{X \rightarrow c^+} P(T = 1 | X) - \lim_{X \rightarrow c^-} P(T = 1 | X).$$

The treatment effect for compliers at the threshold, τ_{FRD} , is then:

$$\tau_{FRD} = \frac{\lim_{X \rightarrow c^+} E[Y | X] - \lim_{X \rightarrow c^-} E[Y | X]}{\lim_{X \rightarrow c^+} P(T = 1 | X) - \lim_{X \rightarrow c^-} P(T = 1 | X)}. \quad (3)$$

RDD Assumption I: No Manipulation

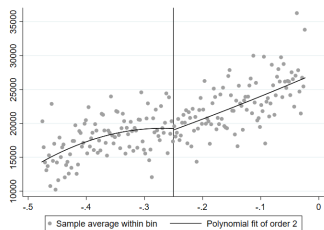
Firms reported sales to the Tax Authority before the announcements so no strategic adjustments



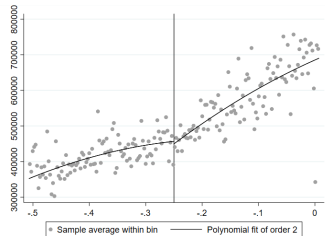
Cattaneo et al. (2023) manipulation test for eligible firms, baseline.

RDD Assumption II: Pre-shock Continuity

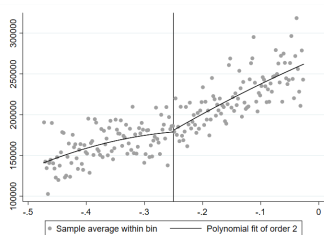
In 2019, firms were **not** different at the threshold



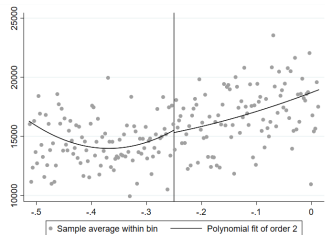
Net income



Turnover



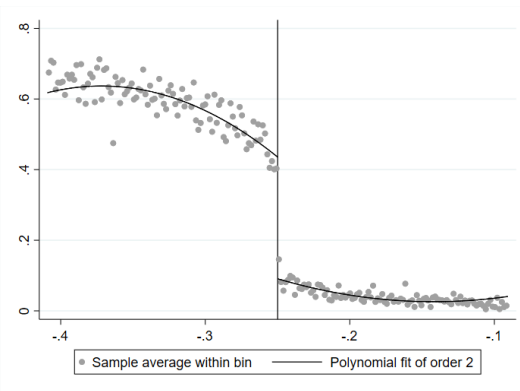
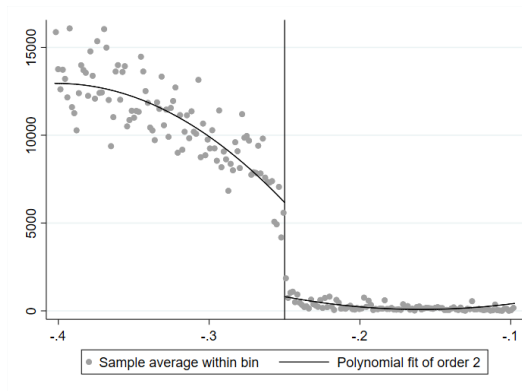
Equity



Assets

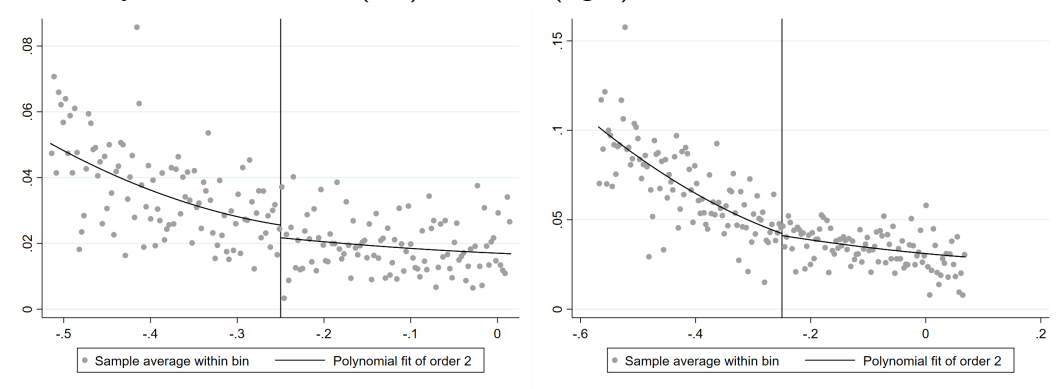
First stage

- ▶ Total APOIAR incentives received in Euros (left) and percentage of firms that received APOIAR support (right)
- ▶ **Average incentive** for firms below the cutoff: 5,270€; Conditional on receiving support: 15,460€



Survival

Probability to survive - 2021 (left) and 2022 (right)



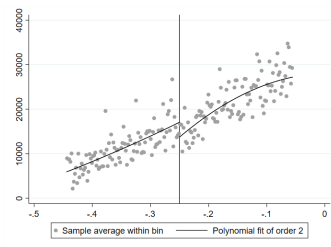
Survival

No evidence of impact on Survival

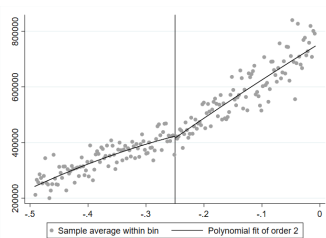
Table: Survival - 2021 and 2022

	Survival			
	2021		2022	
	Sharp	Fuzzy	Sharp	Fuzzy
Coef.	0.004	0.000	0.001	0.000
Std. Dv.	0.004	0.000	0.005	0.000
Obs.	103,940	103,940	103,940	103,940
Obs.left	26,625	24,857	30,016	24,833
Obs.right	32,647	29,612	37,811	29,586
Bandwidth	0.265	0.240	0.319	0.240

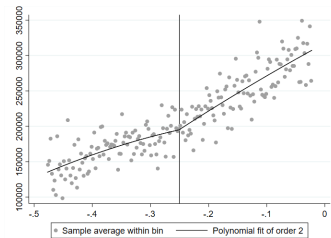
Performance 2021 - Graphs



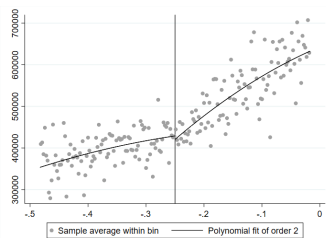
Net income



Turnover

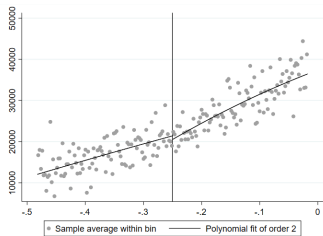


Equity

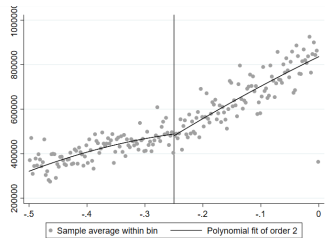


Assets

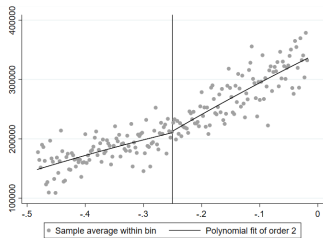
Performance 2022 - Graphs



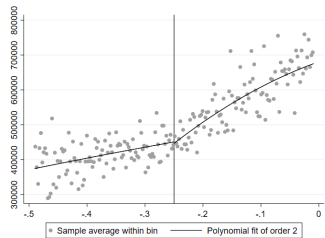
Net income



Turnover



Equity



Assets

Performance - Baseline Tables

Net Income: positive and significant (sharp and fuzzy) - no differences in growth of turnover nor reduction of expenses: combination of both factors

Table: Firm Performance - 2021

Firm Performance - 2021										
	Net Income		Turnover		Total Assets		Equity		Total Expenses	
	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy
Coef.	3,522**	0.658**	4,924	2.033	6,795	1.895	-1,168.2	0.207	3,522	1.979
Std. Dv.	1,591	0.281	21,679	4.111	21,356	3.870	11,034	1.986	20,040	3.865
Obs.	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940
Obs.left	21,160	19,542	24,968	20,663	24,272	21,218	23,842	21,278	25,358	20,516
Obs.right	24,259	22,123	29,805	23,603	28,739	24,323	28,160	24,434	30,380	23,424
Bandwidth	0.195	0.176	0.242	0.189	0.233	0.195	0.228	0.196	0.248	0.187

Performance - Baseline Tables

No evidence of impact on Net Income, Turnover, Assets and Equity

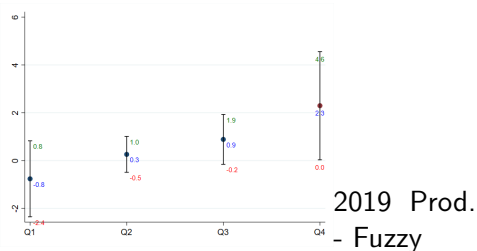
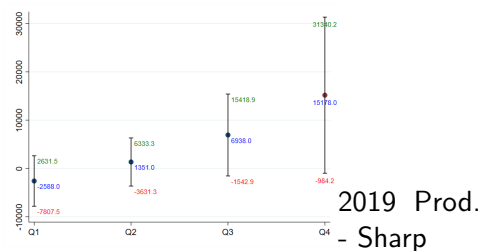
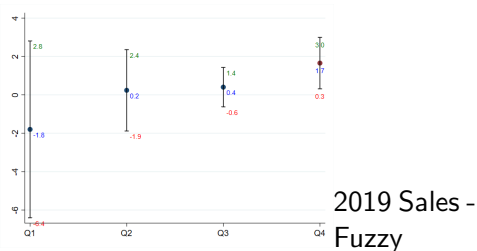
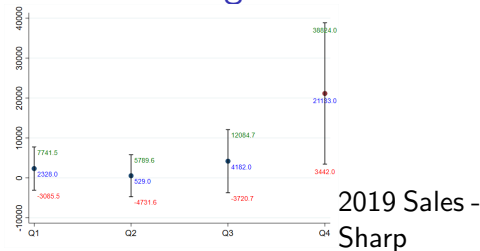
Table: Firm Performance - 2022

Firm Performance - 2022										
	Net Income		Turnover		Total Assets		Equity		Total Expenses	
	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy
Coef.	846.3	0.183	4,317	2.779	3,489	1.188	-3,180.4	-0.340	2,488	2.426
Std. Dv.	1,772	0.321	24,364	4.767	22,633	4.037	12,032	2.143	22,484	4.400
Obs.	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940
Obs.left	24,216	21,211	25,534	20,221	24,861	22,128	24,267	21,958	25,604	20,289
Obs.right	28,672	24,317	30,946	23,046	29,615	25,720	28,733	25,472	31,055	23,134
Bandwidth	0.232	0.195	0.250	0.184	0.241	0.206	0.233	0.204	0.251	0.185

Performance - Key variables

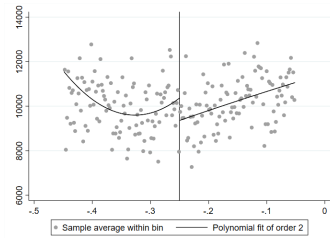
- ▶ **Profitability of treated companies increased** compared to counterfactual: Net income increased by an average of 3,522€ in 2021 (7,913€ conditional on receiving support)
- ▶ These **results are short lived**, as they do not persist in 2022
- ▶ There are no significant differences in the increase in revenue or decrease in expenses
- ▶ Precautionary motives (uncertainty)?
- ▶ No evidence of effects on turnover **so what did firms do with the rest of the APOIAR support?**

Performance: Heterogeneous Results - Net Income 2021

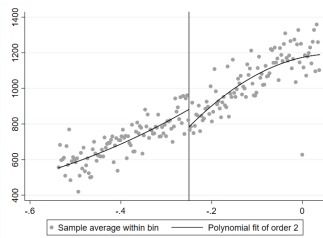


Firms with higher sales/productivity benefited the most (and made the least use of it)

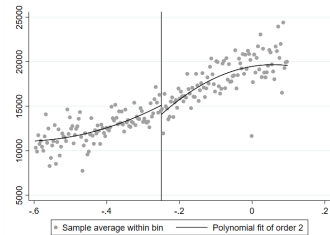
How was APOIAR spent - Expenditures and Liabilities 2021



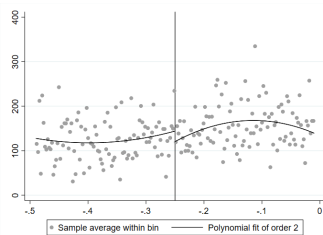
Rents



Office Supplies

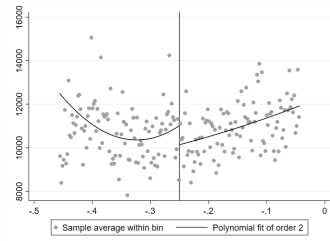


Liabilities-State

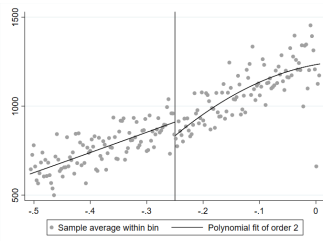


Liabilities-Shareholders

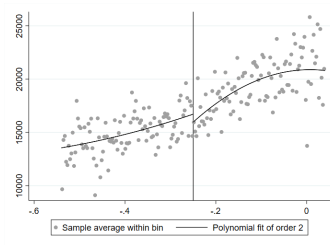
How was APOIAR spent - Expenditures and Liabilities 2022



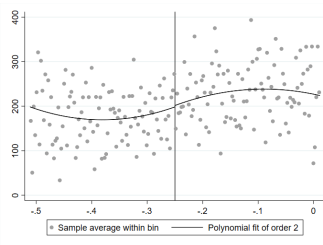
Rents



Office Supplies



Liabilities-State



Liabilities-Shareholders

How was APOIAR spent 2021 - Baseline Tables

Rents and Office Supplies (remote work, on-line sales, health and safety measures?) and State liabilities: positive difference

Table: Firm Liabilities and Expenditure - 2021

Firm Liabilities and Expenditure - 2021										
	Investment in Equipment		Rents		Office Supplies		Liabilities - State		Liabilities - Shareholders	
	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy
Coef.	-101.600	-0.029	1,086**	0.196	96.190***	0.019**	1,070*	0.274**	-10.840	-0.002
Std. Dv.	506.500	0.096	553.600	0.097	35.530	0.007	603.100	0.140	10.010	0.002
Obs.	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940
Obs.left	24,981	21,625	21,488	20,102	28,127	21,774	31,604	19,721	23,734	22,633
Obs.right	29,821	24,954	24,744	22,923	34,985	25,218	40,067	22,388	28,014	26,428
Bandwidth	0.242	0.200	0.198	0.183	0.289	0.202	0.347	0.178	0.226	0.213

How was APOIAR spent 2022 - Baseline Tables

Office Supplies: positive difference; **Shareholder liabilities:** negative difference;
Investment in equipment: Positive effect (conditional on receiving support)

Table: Firm Liabilities and Expenditure - 2022

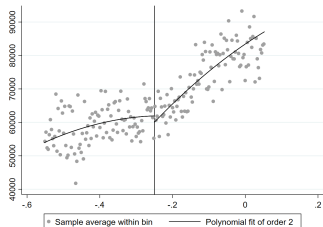
Firm Liabilities and Expenditure - 2022										
	Investment in Equipment		Rents		Office Supplies		Liabilities - State		Liabilities - Shareholders	
	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy
Coef.	933.200	0.183*	944.400	0.179	78.770*	0.016**	786.900	0.230	-16.620***	-0.003***
Std. Dv.	594.600	0.107	607.500	0.108	40.940	0.008	759.400	0.163	6.408	0.001
Obs.	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940	103,940
Obs.left	25,816	22,608	22,138	20,286	26,045	20,761	28,219	19,456	22,462	23,943
Obs.right	31,342	26,390	25,730	23,132	31,766	23,740	35,123	22,061	26,187	28,307
Bandwidth	0.254	0.212	0.206	0.185	0.257	0.190	0.290	0.175	0.210	0.229

How was APOIAR spent - Expenditures and Liabilities

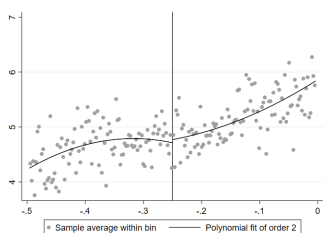
- ▶ Evidence that much of the support was used in Supplies and External Services (SES) - **Office Supplies** (small digital equipment? remote work, on-line sales, health and safety measures?) and **Rents**
- ▶ Office Supplies increased by an average of 96.19€ in 2021 (265.7€ conditional on receiving support) and 78.77€ (230.6€ conditional on receiving support) in 2022
- ▶ Rents increased by an average of 1,086€ in 2021 (2,707€ conditional on receiving support)
- ▶ **Liabilities to Shareholders** decreased by an average of 16.62€ in 2022 (46.25€ conditional on receiving support)
- ▶ Positive effect on investment in equipment (conditional on receiving support).

Labour market effects 2021 - Graphs

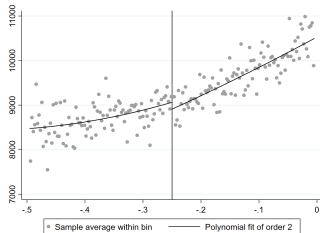
No evidence of effects on employment (layoff effect?)



Total wage bill

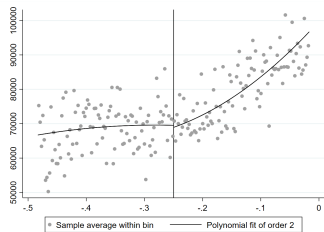


Employment

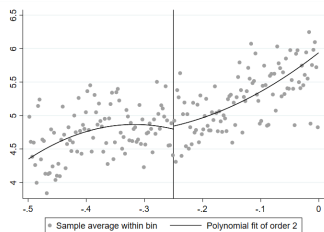


Average Wage

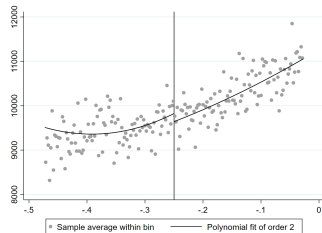
Labour market effects 2022 - Graphs



Total wage bill



Employment



Average Wage

Labour market effects 2021 - Baseline Tables

Table: Employment - 2021

Employment - 2021						
	Total Employment		Total wage bill		Average Wage	
	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy
Coef.	-0.098	-0.000	1,250.900	-0.035	121.590	0.027
Std. Dv.	0.149	0.000	2,461.200	0.485	158.680	0.025
Obs.	103,940	103,940	75,083	75,083	75,083	75,083
Obs.left	25,237	20,421	21,512	14,043	18,848	15,578
Obs.right	30,200	23,305	28,602	16,320	23,793	18,513
Bandwidth	0.246	0.186	0.303	0.165	0.245	0.188

Labour market effects 2022 - Baseline Tables

No effect on Employment or Wages

Table: Employment - 2022

Employment - 2022						
	Total Employment		Total wage bill		Average Wage	
	Sharp	Fuzzy	Sharp	Fuzzy	Sharp	Fuzzy
Coef.	-0.086	-0.000	-255.550	-0.121	176.720	0.038
Std. Dv.	0.157	0.000	3,198.800	0.538	183.450	0.028
Obs.	103,940	103,940	73,934	73,934	73,934	73,934
Obs.left	25,459	20,720	17,898	13,769	17,292	14,683
Obs.right	30,549	23,695	22,402	16,119	21,465	17,394
Bandwidth	0.249	0.190	0.233	0.165	0.222	0.179

Robustness Tests

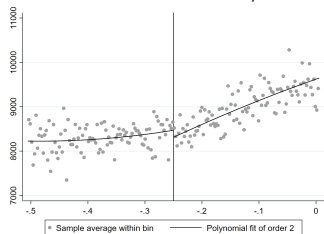
- ▶ Polynomial of degree 1;
- ▶ Including sector FE;
- ▶ Including region FE;
- ▶ Including sector and region FE;
- ▶ Change in CTT bandwidth (+/- 10%);
- ▶ Honest RDD (Armstrong and Kolesár 2018);
- ▶ Winsorizing outcome variable (1% and 5%);
- ▶ Reduced sample (excluding firms that "closed" in the period).

References

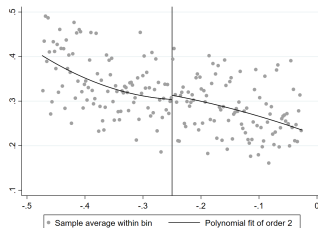
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AppendixA - RDD Assumption II: Pre-shock Continuity

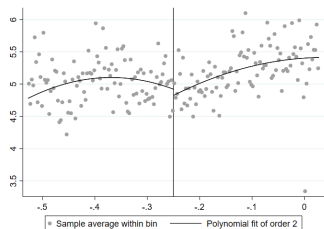
In 2019, firms were **not** different at the threshold



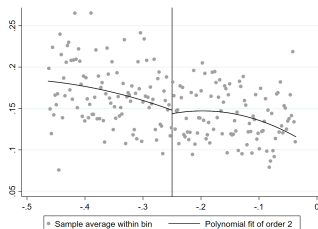
Average
Wage



$\Delta\%$
Turnover
(3years
average)



Employment



$\Delta\%$
Turnover