

Government Assistance and Firm Investment: Evidence from a Natural Disaster

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Foto de Hélio Madeiras, CTI (2018)

How do firms fare after a natural disaster?

- 15-16 October 2017 Wildfires & official aid (= 85% of damage)
- Differences-in-differences approach
- Huge increase in the book value of fixed assets (198% in three years)
- Increase in output (accumulated change in three years equal to 42%) and employment remained stable.
- Sales and EBITDA increase. Most EBITDA appropriated by banks following the increase in long-term bank credit.
- Productivity does not increase.
- Firms increase scale and liquidity. Management of corporate liquidity uses asset and liability sides of firm balance sheet.

Literature review

- Many studies study the effects of natural disasters on households. Often, these studies account for official assistance (e.g. hurricane Katrina in New Orleans). Deryugina, Kawano and Levitt (2018), Gallagher and Hartley (2017).
- Some studies relate natural disasters to bank behavior and mortgage lending to households. Cortés (2014), Chavaz (2016), Berrospide, Black, and Keeton (2016), Cortés and Strahan (2017).
- A number of studies relate natural disasters with bank behavior and financial fragility. Klomp (2014), Koetter, Noth, and Rehbein (2020).
- A number of studies relate natural disasters with bank behavior and firm behavior, but do not account for official assistance. Barrot and Sauvagnat (2016), Koetter, Noth, and Rehbein (2020).
- **We account explicitly for official assistance, and have detailed datasets on firm financial accounting and bank lending.**
- **Regarding the liquidity literature, we have *observable* investment opportunities,**

The wildfires

- 483 firms (1.22% of total number of firms in *Região Centro*)
- 4238 jobs (2.02% of total number of jobs in *Região Centro*)
- Estimated loss = 269 million euros in property damage (0.76% of GDP of *Região Centro*)
- Private insurance = 150 million euros + 30 million euros (for Portugal)
- The *Law* of available subsidies: 104 million euros available
 - Official assistance computed after discounting private insurance payments.
 - 85% of losses in damaged assets and stopped operations.
 - Had to be spent in the purchase of fixed assets.
 - Firm could not reduce employment below 85%.
 - Implicitly/explicitly requires bank lending (and therefore bank screening).

The wildfires

Firm size	Eligible expenses	Available funding (share of eligible expenses)
Small and medium enterprises (SME)		85%
Large firms	Part of eligible expenses \leq 235000 euros	85%
	Part of eligible expenses $>$ 235000 euros	25%

Table 1: Available funding according to the law.

	Mean	Median
Eligible expenses (€000)	351.754	88.277
Available funding (€000)	278.630	74.043
Subsidy payments (€000)	216.144	57.251

Table 2: **Statistics regarding subsidies** This table reports statistics for the 372 firms that applied successfully to the subsidy scheme. The source of information is CCDRC in 15 December 2020.

Data

Banco de Portugal

- CRC
- Central de Balanços

CCDRC

- Subsidies

	Mean	Std. Dev.	P25	Median	P75
Total Assets (€000)	616.55	1,712.60	63.36	165.58	445.18
Fixed assets (€000)	172.88	623.34	5.10	21.85	98.30
Output (€000)	115.71	339.02	11.11	34.44	92.03
Number of employees	5.68	11.72	1.20	2.80	5.67
Full-time equivalent	4.78	10.10	0.95	2.20	4.74
Total sales (€000)	502.78	1,546.02	46.35	121.31	341.89
Profits (EBITDA, €000)	41.21	343.52	-1.26	6.46	24.19
Total wages (€000)	75.73	374.46	8.01	22.00	55.31
Cash holdings (€000)	46.80	119.58	4.18	12.54	37.85
Total debt (€000)	178.47	617.20	1.95	22.26	99.32
Total bank credit (€000)	170.45	1,904.71	0.11	10.00	58.89
Bank credit lines (€000)	40.02	345.54	0.00	0.00	10.00
Long-term bank credit (€000)	98.74	1,219.17	0.00	2.77	28.76
Total credit guarantees (€000)	13.68	77.80	0.00	0.00	0.98
Non-activated credit guarantees (€000)	12.92	74.21	0.00	0.00	0.75
Overdue credit (€000)	11.60	259.14	0.00	0.00	0.00
Firm age (years)	14.26	11.35	5.00	13.00	20.00
Capital expenditure (€000)	22.36	83.65	0.05	2.38	12.63
Fixed assets growth	-0.06	0.59	-0.22	-0.04	0.10
Sales growth	0.04	0.56	-0.09	0.00	0.14

Table 3: **Summary statistics** This table reports summary statistics for the variables used in the analysis for the entire sample of 29 167 firms. P25 and P75 are the 25th and the 75th percentiles, respectively. The reference period is the year, the sample period is 2012 to 2016, and the sources are *Banco de Portugal* and CCDRC. The growth of variable X is given by $\frac{X_t - X_{t-1}}{\frac{X_t + X_{t-1}}{2}}$.

Methodology

- Differences-in-Differences approach
- Representativeness

	Control	Treated	t-statistic	P-Value
Total Assets (€000)	610.933	1282.510	-3.949	0.000
Fixed assets (€000)	170.764	423.969	-3.792	0.000
Output (€000)	114.244	289.801	-4.961	0.000
Number of employees	5.624	12.783	-5.897	0.000
Full-time equivalent	4.727	11.055	-5.777	0.000
Total sales (€000)	496.219	1281.061	-4.618	0.000
Profits (EBITDA, €000)	40.634	109.497	-4.183	0.000
Total wages (€000)	75.057	155.703	-4.168	0.000
Cash holdings (€000)	46.597	70.886	-2.595	0.010
Total debt (€000)	177.107	339.932	-2.998	0.003
Total bank credit (€000)	169.357	300.115	-2.539	0.012
Bank credit lines (€000)	39.667	82.369	-2.632	0.009
Long-term bank credit (€000)	98.039	181.623	-2.621	0.009
Total credit guarantees (€000)	13.384	48.724	-3.635	0.000
Non-activated credit guarantees (€000)	12.627	48.000	-3.653	0.000
Overdue credit (€000)	11.684	1.690	5.666	0.000
Firm age (years)	14.260	14.779	-0.735	0.463
Capital expenditure (€000)	21.942	71.774	-4.475	0.000
Fixed assets growth	-0.060	0.032	-4.466	0.000
Sales growth	0.044	0.094	-2.465	0.014

Table 5: **Summary statistics for the treated and control groups for the entire sample** This table reports means for some variables used in the analysis. The treated group contains 244 firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains 28 923 firms that did not obtain subsidies. The sample period is 2012 to 2016 and the sources are *Banco de Portugal* and CCDRC. Differences in means are assessed with the t-test.

Methodology

Coarsened exact matching with k-to-k match

- 244 treated and 29371 controls
- Region, industry, fixed assets, number of employees,
- EBITDA, overdue credit
- Not sales growth, not cash.

	Control	Treated	t-statistic	P-Value
Total Assets (€000)	1170.288	1198.941	-0.127	0.899
Fixed assets (€000)	348.701	370.145	-0.281	0.779
Output (€000)	279.126	261.615	0.350	0.727
Number of employees	10.533	11.900	-0.886	0.376
Full-time equivalent	8.976	10.242	-0.934	0.351
Total sales (€000)	1187.955	1225.083	-0.153	0.879
Profits (EBITDA, €000)	106.938	96.679	0.417	0.677
Total wages (€000)	160.158	143.648	0.572	0.568
Cash holdings (€000)	82.828	71.236	0.714	0.475
Total debt (€000)	312.706	323.297	-0.139	0.889
Total bank credit (€000)	287.048	284.001	0.040	0.968
Bank credit lines (€000)	66.642	78.439	-0.562	0.575
Long-term bank credit (€000)	183.994	169.893	0.267	0.790
Total credit guarantees (€000)	41.717	44.174	-0.168	0.867
Non-activated credit guarantees (€000)	41.674	43.444	-0.121	0.903
Overdue credit (€000)	2.526	1.704	0.427	0.669
Firm age (years)	15.522	14.682	0.810	0.418
Capital expenditure (€000)	55.964	64.454	-0.653	0.514
Fixed assets growth	0.037	0.032	0.153	0.878
Sales growth	0.029	0.094	-1.759	0.079

Table 6: **Summary statistics for the treated and control groups after matching** This table reports means for some variables used in the analysis. The initial sample contains the treated group with 244 firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group with 29 923 firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016. We apply automated coarsening and restrict the matching solution to a k-to-k match, thereby obtaining 242 firms in each of the groups of firms. The sample period is 2012 to 2016 and the sources are *Banco de Portugal* and CCDRC. Differences in means are assessed with the t-test

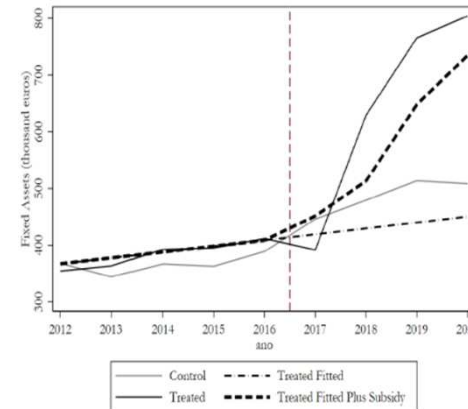
Empirical specification

$$y_{i,t} = \sum_{k=2014, k \neq 2016}^{2020} \iota_k \times year_{k,t} + \sum_{k=2014, k \neq 2016}^{2020} \delta_k \times year_{k,t} \times Treated_i + \eta_i + \varepsilon_{i,t} \quad (1)$$

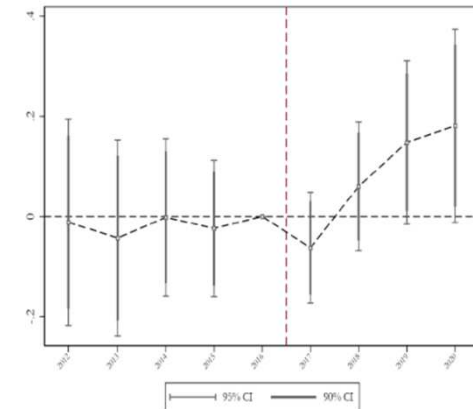
- Standard errors are heteroscedasticity-consistent and clustered at the firm level (Bertrand, Duflo, and Mullainathan, 2004).
- The coefficients of interest are the δ 's.

Empirical results

- Treated firms increase fixed assets more than control firms by 198% on average from 2016 until 2020.
- Accumulated difference in output 2018-2020 equal to 42%.
- Regional GDP had approximately constant growth rate from 31 Dec 2014 until 31 Dec 2019.



(a) Fixed assets (€000)



(b) $\ln(\text{Output}+1)$

Figure 2: **Wildfires, fixed tangible assets, and output** Panel (a) plots average values of fixed assets for the treated and control groups, and Panel (b) plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for output. The horizontal axis displays time in years, with variables measured in December and with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in thousand euros for fixed assets, and are measured in natural logarithms for output. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are *Banco de Portugal* and CCDRC.

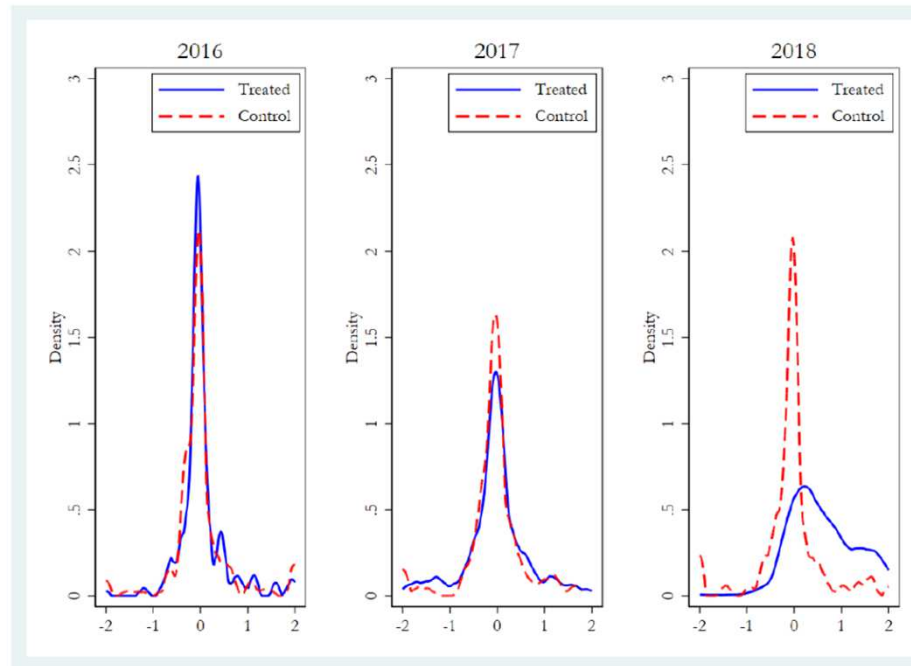


Figure 3: **Wildfires and the distribution of the variation of fixed assets**
This figure plots the densities of the symmetric growth rate in fixed tangible assets, shown separately for the treated and control firms. The symmetric growth rate of fixed assets in 2016 equals the difference between the value of fixed assets in 31 December 2016 and in 31 December 2015 divided by average of these two values. This growth rate definition is bounded in the range $[-2,2]$ and can accommodate entry and exit, and limit the influence of outliers. We plot the densities separately for 2016, 2017, and 2018. The units in the horizontal axis are rates of growth (0.5 corresponds to a rate of growth of 50%), and the units in the vertical axis are densities. The treated group contains firms that obtained subsidies in the aftermath of the October wildfires in 2017, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are *Banco de Portugal* and CCDRC.

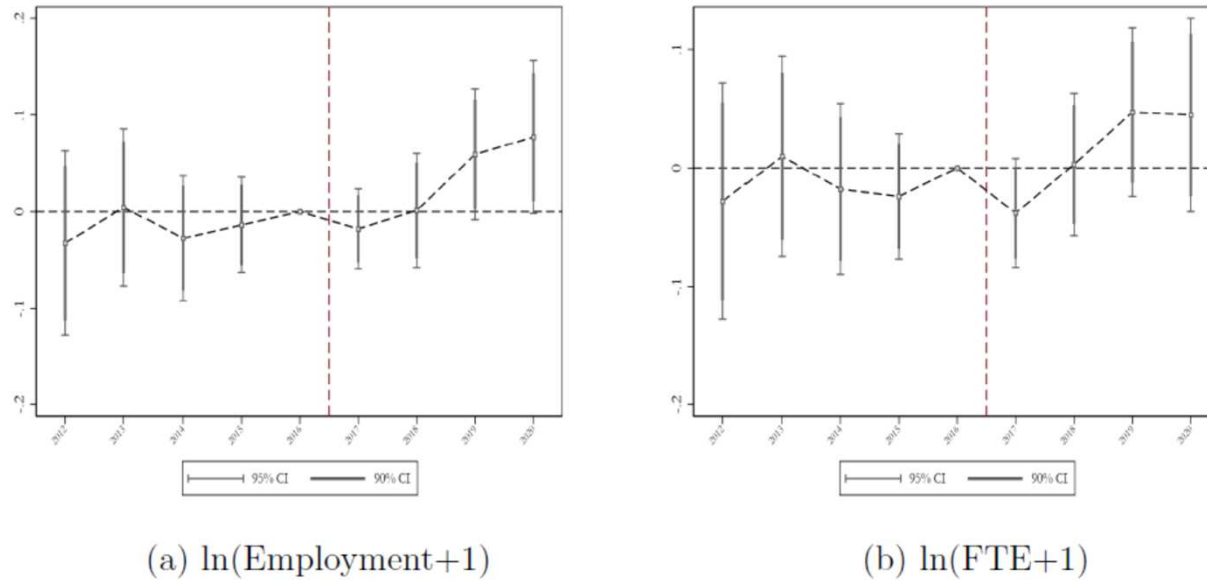


Figure 4: **Wildfires and employment** This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, number of employees and full time equivalent. The horizontal axis displays time in years, with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

	(1)	(2)	(3)
	ln(Fixed Assets+1)	ln(Output+1)	ln(Employment+1)
Treated ×			
2012	0.061 (0.118)	-0.012 (0.105)	-0.032 (0.048)
2013	-0.034 (0.102)	-0.043 (0.100)	0.004 (0.041)
2014	-0.085 (0.078)	-0.002 (0.080)	-0.027 (0.033)
2015	-0.041 (0.063)	-0.024 (0.069)	-0.014 (0.025)
2017	-0.059 (0.064)	-0.063 (0.056)	-0.018 (0.021)
2018	0.735*** (0.090)	0.060 (0.065)	0.001 (0.030)
2019	0.998*** (0.105)	0.148* (0.083)	0.059* (0.034)
2020	1.092*** (0.113)	0.181* (0.098)	0.077* (0.040)
Firm Chars × Year	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	4142	3944	4141
Adjusted R^2	0.865	0.858	0.927

Table 8: **Baseline results** This table reports estimates of coefficients δ_k in Specification (1) for a range of outcome variables. The regressors are indicator variables equal to 1 when the firm received a subsidy, interacted with a year dummy (2016 is the reference year and is omitted). The estimates result from panel regressions, and the standard errors are heteroscedasticity-consistent and clustered at the firm level. Standard errors are in parentheses and *, **, *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

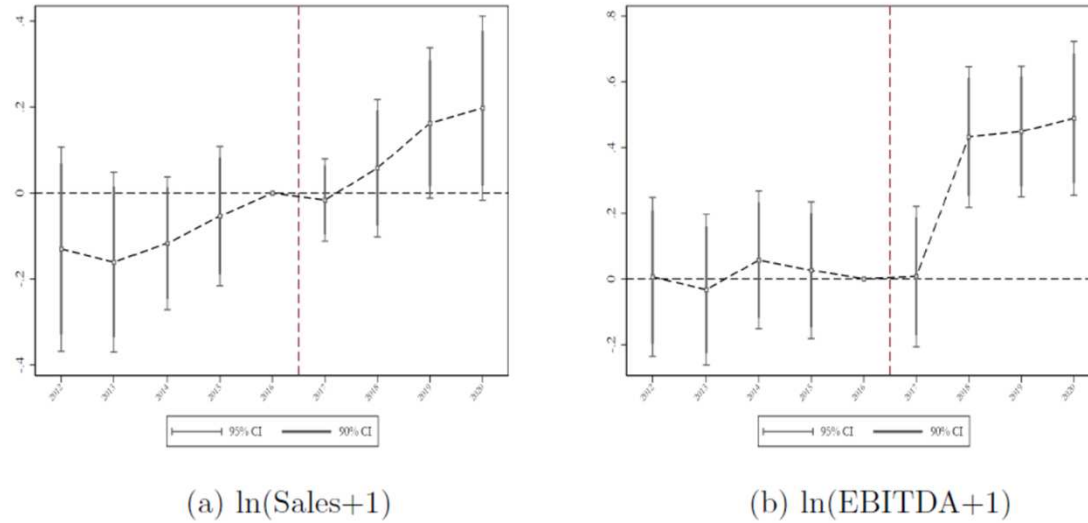
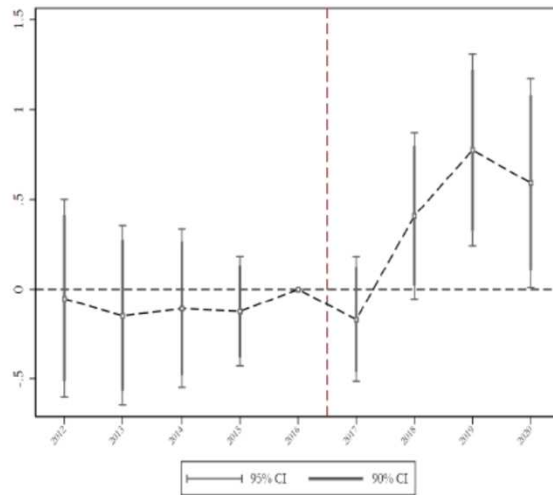
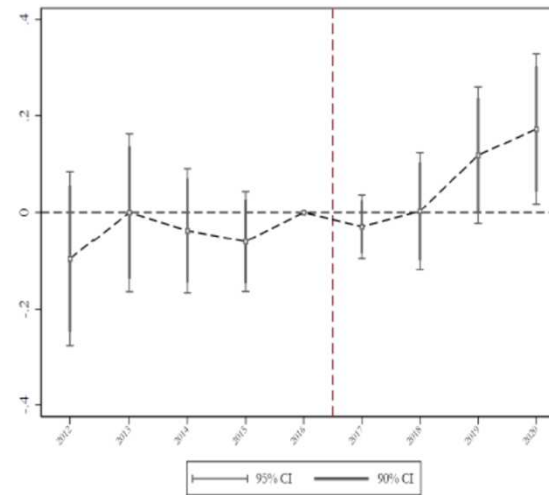


Figure 5: **Wildfires, sales and profitability** This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, total sales and profitability (measured by EBITDA). The horizontal axis displays time in years, with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.



(a) $\ln(\text{Interest payment}+1)$



(b) $\ln(\text{Wages}+1)$

Figure 6: **Wildfires, interest payments and wages** This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, total interest payments and total wages. The horizontal axis displays time in years, with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

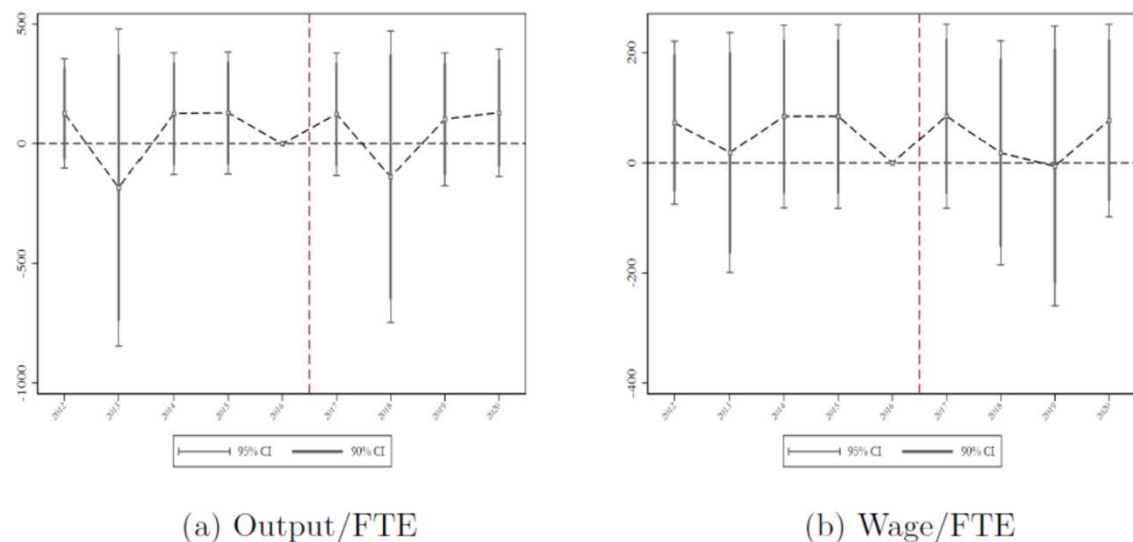


Figure 7: **Wildfires and productivity** This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, the ratio of output to full time equivalent and the ratio of total wages to full time equivalent. The horizontal axis displays time in years, with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

	(1)	(2)	(3)	(4)
	ln(Total Sales+1)	ln(EBITDA+1)	Output/FTE	Wage/FTE
Treated ×				
2012	-0.130 (0.121)	0.006 (0.123)	126.789 (115.753)	72.621 (75.376)
2013	-0.160 (0.106)	-0.033 (0.117)	-183.961 (337.138)	18.437 (110.743)
2014	-0.117 (0.079)	0.057 (0.107)	125.768 (129.605)	83.951 (84.570)
2015	-0.053 (0.083)	0.026 (0.106)	128.420 (130.115)	83.976 (84.958)
2017	-0.016 (0.049)	0.008 (0.109)	123.384 (130.601)	84.528 (85.144)
2018	0.059 (0.081)	0.432*** (0.109)	-138.581 (309.872)	17.918 (103.560)
2019	0.163* (0.089)	0.449*** (0.101)	102.143 (141.259)	-5.889 (129.082)
2020	0.198* (0.109)	0.489*** (0.119)	129.011 (135.606)	76.953 (88.913)
Firm Chars × Year	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	4142	3487	3929	3929
Adjusted R^2	0.865	0.809	0.110	0.046

Table 9: **Sales, profitability and productivity** This table reports estimates of coefficients δ_k in Specification (1) for a range of outcome variables. The regressors are indicator variables equal to 1 when the firm received a subsidy, interacted with a year dummy (2016 is the reference year and is omitted). The estimates result from panel regressions, and the standard errors are heteroscedasticity-consistent and clustered at the firm level. Standard errors are in parentheses and *, **, *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

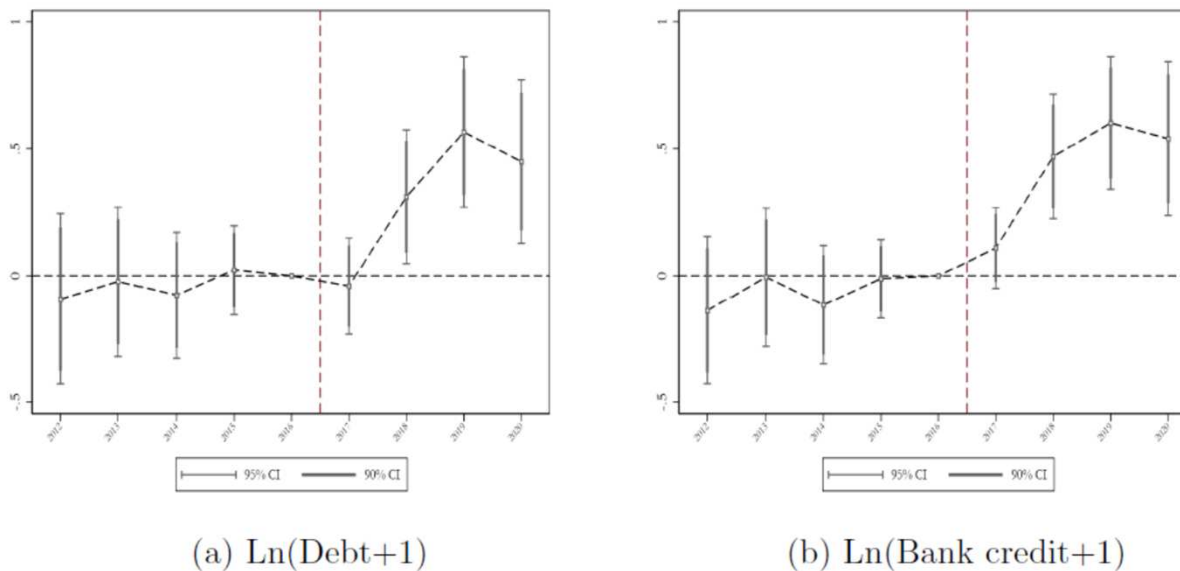


Figure 8: **Wildfires, debt and bank credit** This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, total debt and total bank credit. The horizontal axis displays time in years, with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

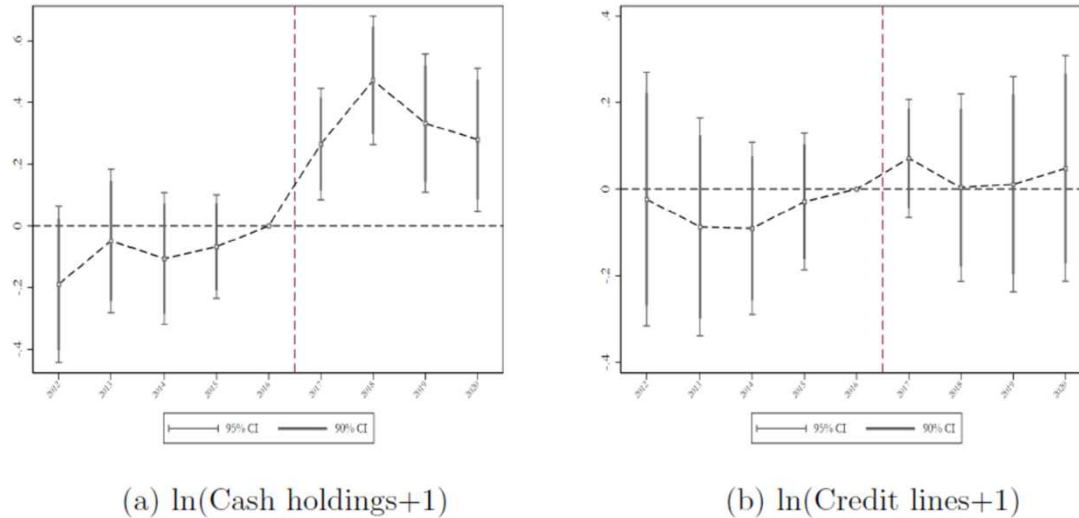


Figure 9: **Wildfires, cash holdings and credit lines** This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, cash holdings and credit line drawdowns. The horizontal axis displays time in years, with variables measured in December and with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

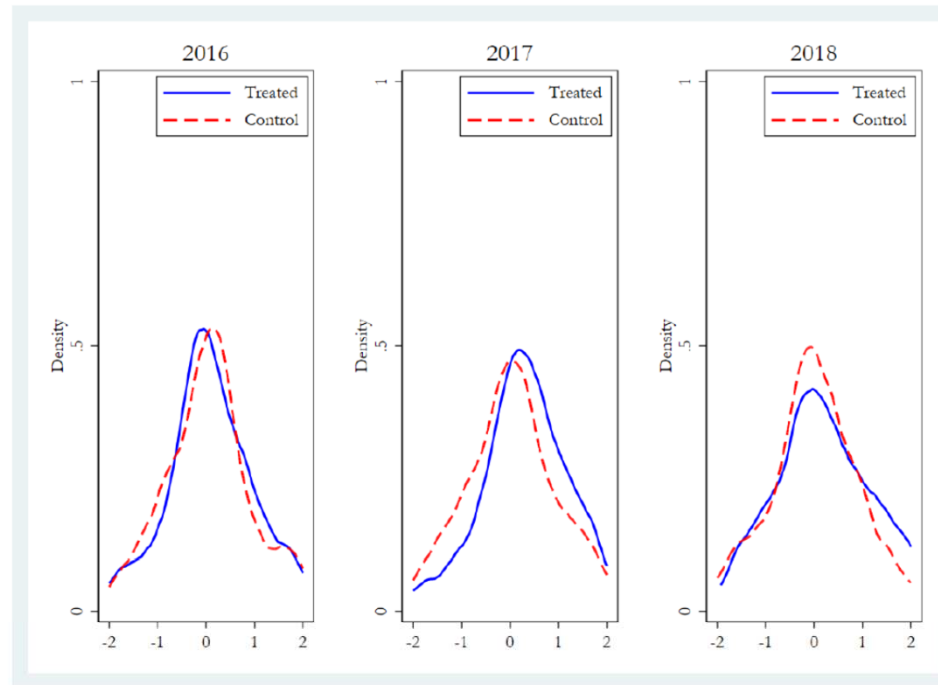
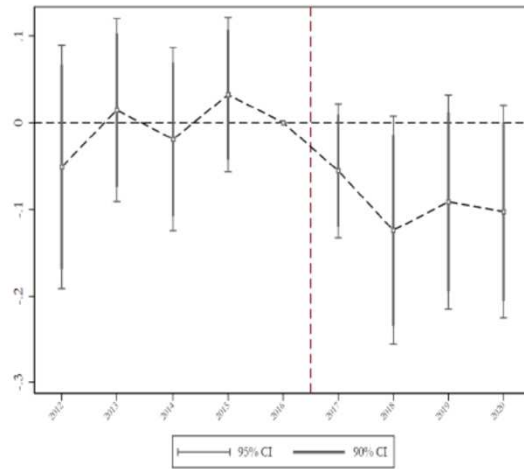
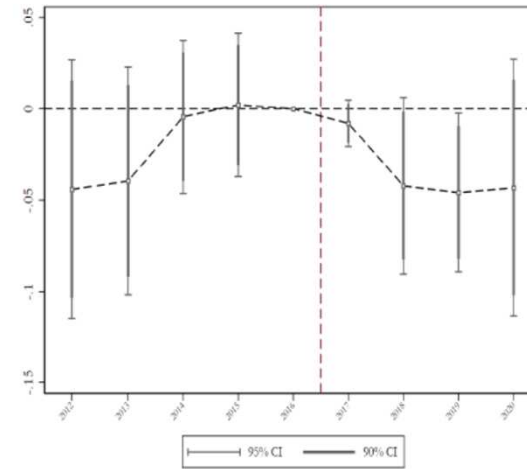


Figure 10: **Wildfires and the distribution of the variation of cash holdings**

This figure plots the densities of the symmetric growth rate in cash holdings, shown separately for the treated and control firms. The symmetric growth rate of cash holdings in 2016 equals the difference between the value of cash holdings in 31 December 2016 and in 31 December 2015 divided by average of these two values. This growth rate definition is bounded in the range $[-2,2]$ and can accommodate entry and exit, and limit the influence of outliers. We plot the densities separately for 2016, 2017, and 2018. The units in the horizontal axis are rates of growth (0.5 corresponds to a rate of growth of 50%), and the units in the vertical axis are densities. The treated group contains firms that obtained subsidies in the aftermath of the October wildfires in 2017, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are *Banco de Portugal* and CCDRC.



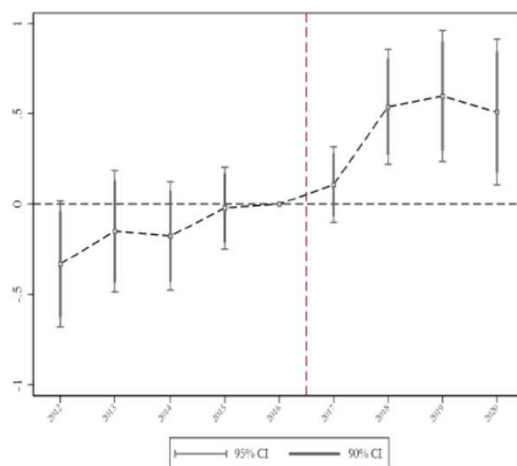
(a) $\ln(\text{Overdue credit}+1)$



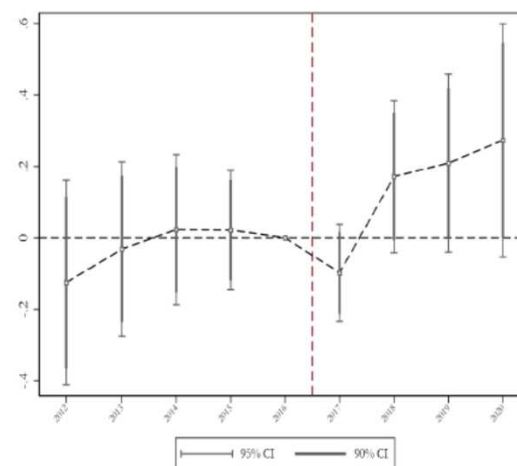
(b) $\ln(\text{Activated credit guarantees}+1)$

Figure 11: Wildfires, overdue credit and activation of credit guarantees

This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, overdue credit and activated credit guarantees. The horizontal axis displays time in years, with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.



(a) $\ln(\text{Long-Term Credit}+1)$

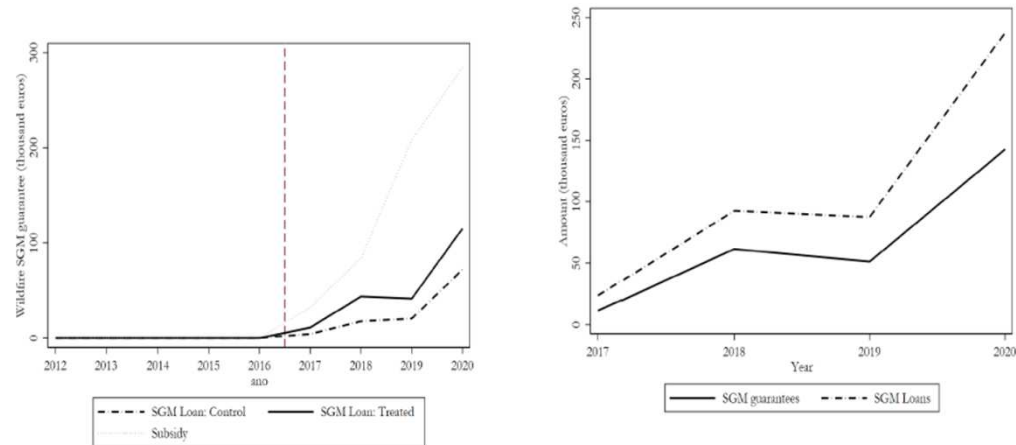


(b) $\ln(\text{Credit guarantees}+1)$

Figure 12: **Wildfires, long term credit and credit guarantees** This figure plots the point estimates and the 90% and 95% confidence intervals for the coefficients δ_k associated with the variable $Treated_i$ in Specification (1) for two outcome variables, long term credit and credit guarantees. The horizontal axis displays time in years, with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in natural logarithms. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.

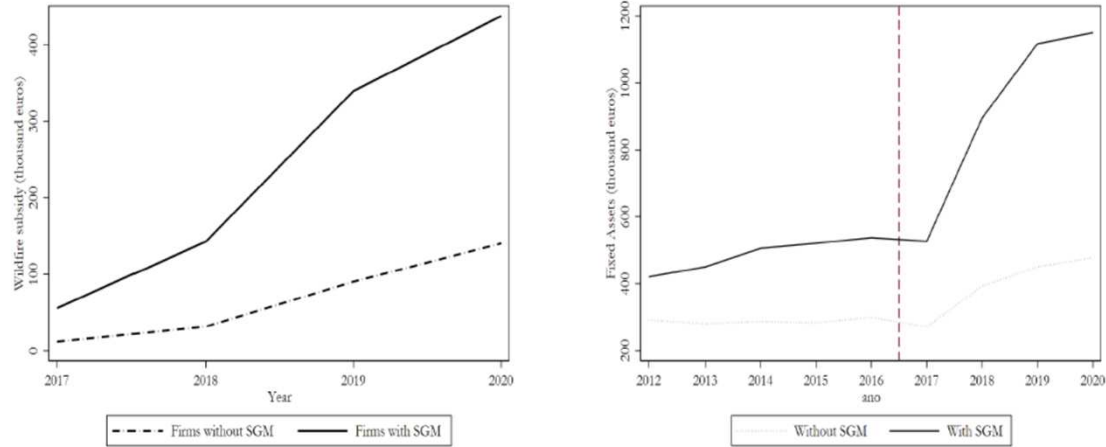
	(1)	(2)	(3)
	ln(Cash Holding+1)	ln(LT Credit+1)	ln(SGM+1)
Treated ×			
2012	-0.189 (0.129)	-0.331* (0.177)	-0.125 (0.146)
2013	-0.049 (0.118)	-0.150 (0.171)	-0.031 (0.124)
2014	-0.106 (0.109)	-0.177 (0.153)	0.023 (0.107)
2015	-0.068 (0.086)	-0.021 (0.115)	0.022 (0.085)
2017	0.265*** (0.092)	0.108 (0.106)	-0.098 (0.069)
2018	0.472*** (0.106)	0.539*** (0.162)	0.171 (0.108)
2019	0.333*** (0.114)	0.598*** (0.184)	0.209* (0.127)
2020	0.279** (0.118)	0.510** (0.205)	0.273 (0.166)
Firm Chars × Year	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	4142	4142	4142
Adjusted R^2	0.743	0.755	0.755

Table 10: **Liquidity** This table reports estimates of coefficients δ_k in Specification (1) for a range of outcome variables. The regressors are indicator variables equal to 1 when the firm received a subsidy, interacted with a year dummy (2016 is the reference year and is omitted). The estimates result from panel regressions, and the standard errors are heteroscedasticity-consistent and clustered at the firm level. Standard errors are in parentheses and *, **, *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are Banco de Portugal and CCDRC.



(a) Loans backed by SGM guarantees by treated firms that obtained guarantees (€000): Treated versus Control firms (€000) (b) Loans and SGM guarantees obtained

Figure 13: **SGM credit guarantees** Panel (a) plots average values of bank loans backed by credit guarantees issued after the wildfires for the treated and control groups, and Panel (b) plots average loans backed by credit guarantees and average credit guarantees measured in euros for the treated firms that obtained SGM guarantees. The horizontal axis displays time in years, with variables measured in December and with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in thousand euros. The treated group contains firms that obtained subsidies in the aftermath of the 15-16 October 2017 wildfires, and the control group contains firms that did not obtain subsidies. We perform matching on industry, fixed assets, growth of fixed assets, number of employees, profitability, and overdue credit. The matching is performed for the average of the period 2012-2016, restricting the matching solution to a k-to-k match. The sample period is 2012 to 2020 and the sources are *Banco de Portugal* and CCDRC.



(a) Subsidies obtained (€000): Treated firms with and without SGM guarantees (b) Fixed assets (€000): Treated firms with and without SGM guarantees

Figure 14: **Treated firms with and without SGM credit guarantees** Panel (a) plots average values of subsidies received by the 114 treated firms that obtained SGM guarantees and of subsidies received by the 128 treated firms that did not obtain SGM guarantees, and Panel (b) plots average values of fixed assets treated firms that obtained SGM guarantees and received by treated firms that did not obtain SGM guarantees. The horizontal axis displays time in years, with variables measured in December and with the wildfires happening in 15-16 October 2017. The units on the vertical axis are measured in thousand euros. Treated firms obtained subsidies in the aftermath of the 15-16 October 2017 wildfires. The sample period is 2012 to 2020 and the sources are *Banco de Portugal* and CCDRC.

Conclusion

Picture may be misleading:

- No private insurance.
- Funding had to pay for damaged assets too (not shown).

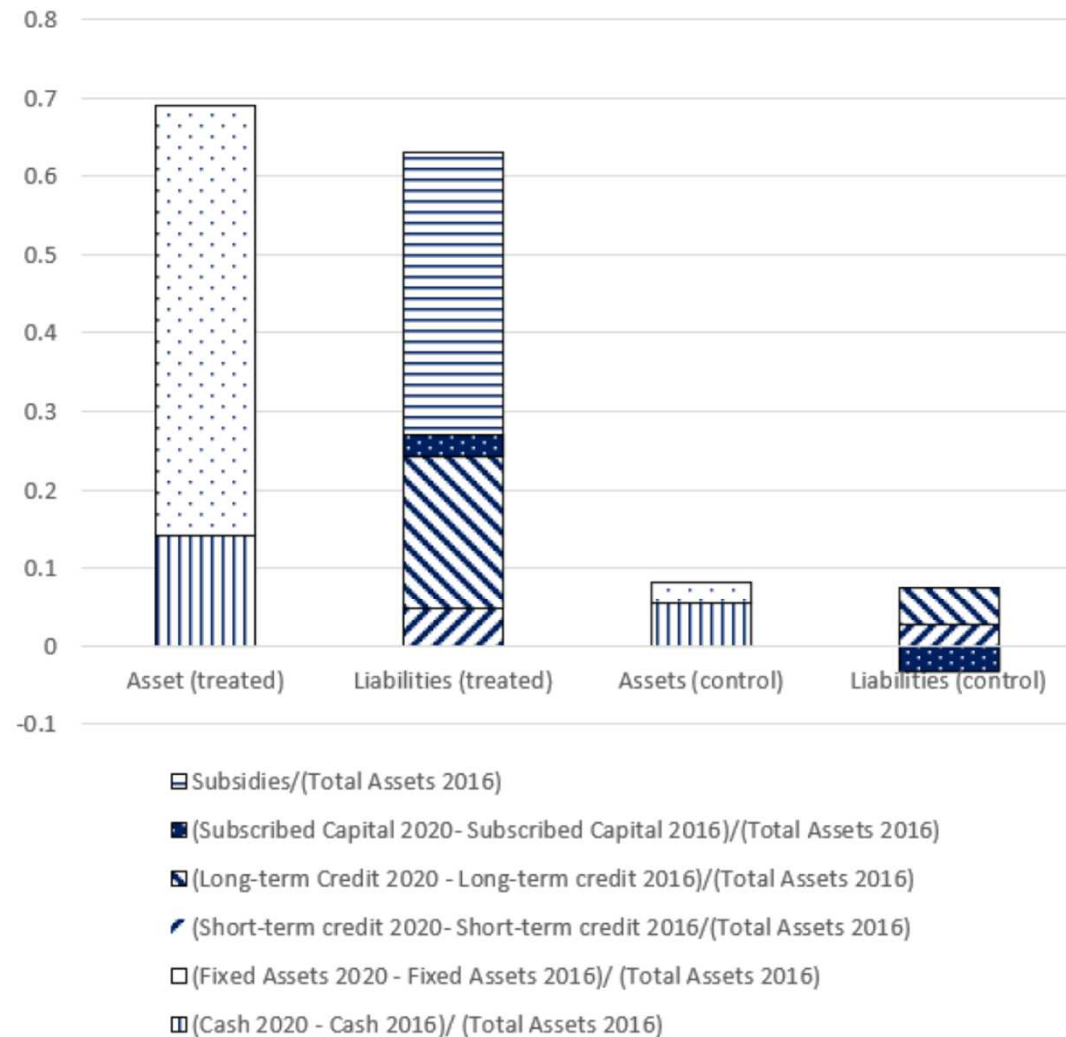


Figure 15: **Evolution of balance sheets between 2016 and 2020** The figure depicts changes in the components of the balance sheets of treated and control firms, standardized by the total assets in 2016.

Conclusion

- Internal validity: can we estimate treatment effect for our particular sample?
 - Credit guarantees are additional layer of official assistance; most of the impact is via long-term credit.
 - There was a program of credit guarantees for affected firms, but conditions were fairly similar to the standard scheme.
- External validity: can we extrapolate our estimates to other populations?
 - 85% subsidy (with take up equal of 77,57% of available funding).
 - Law induced investment in the purchase of fixed assets.
 - Portuguese authorities rely extensively on bank screening.
 - Firms could not reduce employment below 85%.
 - The official assistance satisfies the *de minimis* rule (Commission Regulation (EU) No 1407/2013) which sets a benchmark for state aid.