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THE IMPACT OF COVID-19 ON ITALIAN FIRMS' PROFITABILITY: A PANEL EVENT STUDY

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***Abstract.** Using data from the AIDA dataset carried out by Bureau van Dijk, we empirically analyze the effect of Covid-19 pandemic on the financial performance of enterprises, specifically focusing on their operational efficiency and capacity to generate profits. The panel structure of the dataset enables us to execute a Panel Event Study, thereby furnishing empirical insights into the significant repercussions of the Covid-19 outbreak on the profitability of Italian companies. The findings demonstrate a noteworthy and enduring influence of the pandemic on businesses, albeit with varying degrees of severity contingent upon the industrial sector and geographic location of the firms. The heterogeneous results are indicative of the diverse lockdown measures on economic activities and the substantial regional economic disparities prevalent within our country.*

***Keywords:** Profitability, ROI, ROE, Covid-19 pandemic, Panel Event Study*

1. INTRODUCTION

In 2020, Italy was the first European country to be affected by Covid-19, with very high rates of contagion and death, and the Italian government was the first of Western governments to implement measures progressively stricter in terms of duration and severity, such as lockdowns, curfews, and limitations on face-to-face interactions, to reduce infection and hospitalization rates. Therefore, beyond

the impact on public health, the Covid-19 pandemic have had profound economic impacts on people's livelihoods, but also on enterprises, which faced several economic hardships because of diminished demand, disruptions in supply chains, and production slowdowns associated with unsafe work environments. The health regulations, forcing the social distancing between people and the complete or partial closure of many activities in presence and direct contact with customers, have hampered company sales, generating dramatic problems of liquidity and profitability.

Several studies have attempted to investigate the immediate impact of the Covid-19 outbreak on financial outcomes and/or stock markets (Liu et al., 2020; Nicola et al., 2020; Zhang et al., 2020). However, the main limitation of this existing literature is the restricted dataset and the fact that the Covid-19 pandemic was still ongoing at the time of the research, thus not considering subsequent effects. Therefore, given the impossibility of assessing and drawing definitive conclusions about the impact of the health crisis on corporate financial performance, the results of these studies can be considered preliminary.

The main goal of this paper is therefore twofold: first, to assess the intensity of effects of the pandemic outbreak on business profitability. In this paper, we contribute to the existing literature by offering a more comprehensive assessment of the effect of Covid-19 on the economic activities in Italy, providing an analysis that is based on panel data spanning from 2013 to 2022 encompassing about 300,000 Italian's firms. Second, we show that these effects tend to be uneven across sectors and regions. Since that the outbreak tends to be more impactful in sectors where companies classified as non-essential, which had to be shut down when remote work was not possible, for which stronger effects are plausibly expected. In addition, the evident territorial differences that the virus presented in its expansion and spread and the notable duality of the Italian economic landscape, explains the heterogeneous results across regions.

Moreover, our study adds to the literature that use the event study methodology to evaluate the impact of a non-corporate event such as the outbreak of the disease on financial metrics and/or stock markets (Chen et al., (2007), (2018); Heyden and Heyden, (2021); Liu et al., (2020); Pendell and Cho, (2013). Indeed, we empirically test the different and scarring effect of the outbreak of the pandemic on the profitability of the Italians' firms, implementing a quasi-

experimental method, i.e. the panel event study. This design is an effective empirical tool to identify the impact of pandemic on financial outcomes, while taking into account pre-event trends and confounding factors that may affect this relationship. We identify pre- and post- Covid-19 periods, and we use two different profitability outcomes the Return on Investment (henceforth ROI) and the Return on Equity (henceforth ROE), adopting the specifications of dynamic fixed effects models. Estimates are carried out separately for sectors and geographical location of the operational headquarters, due to differences in the stringency of the anti-contagion policies adopted by the government depending on the severity of the virus spread.

The rest of the paper is organized as follows. Section 2 contains a review of the existing literature on the impact of the Covid-19 pandemic on the profitability of firms; Section 3 describes data we use, the empirical strategy, with a brief illustration of Panel Event Study methodology are described in Section 4; while Section 5 summarizes the results, and Section 6 concludes.

2. LITERATURE REVIEW

The pandemic's rapid spread had a profound impact on economies and financial markets on a global scale, affecting practically every business sector and industry.

Several studies have explored the influence of Covid-19 at the macro level, particularly on national stock markets' performance and found an adverse, strong relationship. Baker et al. (2020), suggest that no previous infectious disease outbreak, including the Spanish Flu, has affected the U.S. stock market as forcefully as the Covid-19 pandemic. However, the global pandemic of Covid-19 has generated negative shocks on the equity markets across the globe. Harjoto et al. (2021), using an event study method, reveal that the adverse impact of Covid-19 on the equity markets is greater for emerging countries than developed countries.

Meanwhile, a growing number of studies take a closer, micro-level examination of the variations in the profitability of firms under the Covid-19 crisis context, revealing that the severity of the shock due to the pandemic

suffered by firms is closely correlated by their size and the sector in which they operate. According to Yan (2020), Baldwin and Weder di Mauro (2020), small firms were experienced greater negative shocks from Covid-19 relative to large firms, due to their lower competitive power, worse access to capital, experience and operational efficiency. On the other hand, firms operating in different sectors showed different responses to the Covid-19 shock, as documented by Shen et al. (2020), Golubeva (2021), Bartik et al. (2020), and Fahlenbrach et al. (2021). Particularly, companies facing financial constraints within the manufacturing, retail industries and services domains have experienced more severe repercussions from the outbreak and face an elevated risk of operational closure. Nayak et al. (2022) present a detailed explanation of the impact of Covid-19 on six different industries, and they conclude that not only the major areas such as global supply chains, trade, agriculture industry, transportation and tourism industry, and so on have been severely disrupted because of the outbreak of Covid-19, but also the economy of various other sectors such as aviation industry, entertainment industry, sports industry, have been severely hampered all over the world due to lockdown.

However, these papers offer initial findings as they have carried out an examination during the initial stages of the pandemic, not considering the more intricate effects the Covid-19 outbreak had on companies in later periods. Therefore, we contribute to this literature providing a more detailed investigation on the impact of the outbreak on the profitability of firms, using an effective empirical tool that considers any pre-event trends and confounding factors that might influence this relationship, namely the Panel Event Study method.

3. DATA

In order to conduct our study, we use data from the AIDA dataset carried out by Bureau van Dijk, which contain balance sheet/income statement information on Italian firms. The dataset spans the period 2013-2022, providing objective and standardized information on firms, given that, balance sheet and income statement are compulsory and they are compiled according to transparent and standardized criteria by all firms (except banking, insurance sector and the public sector entities). Tables 1 and 2 in the Appendix provide some descriptive statistics.

4. METHODOLOGY: PANEL EVENT STUDY

In this study, the empirical work is based on the Panel Event Study methodology, as we seek to reveal how Italian firms, particularly their profitability, behave during and after the outbreak of the coronavirus. The design estimates the impact of some event that occurs by considering the variation in outcomes around the adoption of the event compared with a baseline reference period, one can estimate both event leads and lags, which allows us to have a clear visual representation of the event's causal impact (Clarke et al., 2021).

The key assumption underlying consistent estimation in Panel Event Study model is that the occurrence of the event is not systematically related to the changes in levels that would have occurred in the future in the absence of the event. In particular, the Panel Event Study methodology has been borne out of older difference-in-differences (DD) designs, or two-way fixed-effects models, to overcome their limits, such as the Parallel trend assumption. Therefore, it can be used, also in cases where events occur at the same time in each unit.

We identify pre- and post- Covid-19 periods, which coincide with the year 2020. Subsequently, we estimate a dynamic model of the form:

$$y_{it} = \alpha + \sum_{j=2}^J \beta_j Lag_{it}^j + \sum_{k=1}^K \gamma_k Lead_{it}^k + \lambda_i + \mu_t + \theta X_{it} + \varepsilon_{it} \quad (1)$$

Where the y_{it} is the profitability outcome of firm i at the time t , we use two different profitability outcomes: i) the Return on Invested (ROI), which is a metric that may be used to assess a company's profitability as well as reveal the origins of its competitive advantages; ii) the Return on Equity Return on Equity (ROE) is a financial metric that reveals the ability of a company to convert its equity financing into profits. When contrasted to ROI, it represents the total return on all capital invested in an asset, whereas ROE solely evaluates the equity component (Damodaran, 2007).

Lag_{it}^j and $Lead_{it}^k$ are the j -lag and k -lead set of dummies denoting the time distance away from the event – the outbreak of Covid-19 - λ_i the firms fixed effect, μ_t the time fixed effect, X_{it} an additional control, namely the number of dependents as a proxy of firm size, which tends to drive the intensity of the impact during the Covid-19 outbreak (Ding et al., 2021). Indeed, large firms are

able to mitigate the negative shock of the pandemic outbreak due to their greater competitive power than small firms due to larger market share, better access to capital, experience, and operational efficiency (Ichev and Marinc, 2018). Finally, ε_{it} is the unobserved error term.

The terms β_j and γ_k are parameters to be estimated denoting how financial measures vary in periods before and after the Covid-19 outbreak (compared to the year prior to the event, in this case the year of 2019).

In general, when policies are assigned by a group, such as a state, and outcomes are followed over time within these groups, a standard inference problem arises, related to the potential serial correlation of the outcome variable over time. However, the standard solution is to allow for within-cluster autocorrelation by using a cluster-robust variance-covariance estimator (CRVE) to estimate standard errors and CIs on regression parameters (Wooldridge, 2010). Therefore, to overcome this problem, we adopted a dynamic fixed effects model specifications with standard errors clustered at the firm level.

In addition, we carried out separately estimates for industrial sectors and geographical areas (north, center and south), considering that, not all industries, indeed, have been equally affected by the pandemic, due to lockdown resolutions, the different level of spread of the Covid-19 virus among regions and their different economic starting conditions.

5. RESULTS

We investigate the impact of the Covid-19 pandemic on the Italians firms' profitability, by estimating a dynamic fixed-effects model with standard errors clustered at the firm level for both ROI and ROE of all firms active in 2022.

Our results reveal that during the Covid-19 outbreak, Italians companies performed badly, as indicated by the first column of Table 3 and Table 4. In the specification in which all possible lags and leads are included, we note from Table 3, a clear decline in ROI in 2020 relative to the base year (i.e., 2019), and a further slight deterioration in the following year, apart from northern and southern firms, for which there would appear to be no statistically significant difference with the year 2019. Similar results are shown in Table 4 for ROE, which decrease at the timing of the Covid-19 outbreak but rise in the upcoming year.

Table 1: The impact of Covid-19 on the ROI of Italian firms

Time relative to Covid-19 event	ROI		ROI North		ROI Centre		ROI South	
t-7	-0.620 (0.030)	***	-0.487 (0.039)	***	-0.563 (0.063)	***	-1.012 (0.063)	***
t-6	-0.419 (0.029)	***	-0.239 (0.038)	***	-0.492 (0.062)	***	-0.790 (0.062)	***
t-5	-0.091 (0.028)	***	0.080 (0.037)	**	-0.274 (0.060)	***	-0.324 (0.060)	***
t-4	0.231 (0.028)	***	0.447 (0.037)	***	0.091 (0.059)		-0.154 (0.058)	***
t-3	0.270 (0.027)	***	0.546 (0.035)	***	0.113 (0.056)	**	-0.229 (0.056)	***
t-2	0.297 (0.025)	***	0.444 (0.032)	***	0.233 (0.052)	***	-0.005 (0.051)	
Event	-1.951 (0.027)	***	-1.958 (0.036)	***	-2.311 (0.058)	***	-1.589 (0.055)	***
t+1	-0.077 (0.027)	***	-0.050 (0.036)		-0.312 (0.057)	***	0.064 (0.054)	
t+2	-0.131 (0.028)	***	-0.046 (0.037)		-0.311 (0.059)	***	-0.155 (0.056)	***
Intercept	5.892 (0.018)	***	5.654 (0.025)	***	5.930 (0.039)	***	6.391 (0.037)	***
Obs	1,857,203		1,006,105		436,087		449,736	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 4: The impact of Covid-19 on the ROE of Italian firms

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South	
t-7	-1.234 (0.069)	***	-1.487 (0.093)	***	-1.129 (0.140)	***	-0.630 (0.146)	***
t-6	-0.424 (0.067)	***	-0.686 (0.090)	***	-0.598 (0.136)	***	0.359 (0.141)	**
t-5	1.114 (0.065)	***	0.964 (0.087)	***	0.882 (0.133)	***	1.699 (0.137)	***
t-4	1.025	***	1.158	***	0.958	***	0.768	***

	(0.063)		(0.084)		(0.128)		(0.134)
t-3	1.424 ***		1.920 ***		1.065 ***		0.663 ***
	(0.060)		(0.081)		(0.123)		(0.127)
t-2	1.051 ***		1.321 ***		0.973 ***		0.534 ***
	(0.055)		(0.074)		(0.113)		(0.118)
Event	-2.675 ***		-2.492 ***		-3.514 ***		-2.201 ***
	(0.058)		(0.077)		(0.120)		(0.121)
t+1	1.464 ***		1.653 ***		1.019 ***		1.509 ***
	(0.058)		(0.078)		(0.120)		(0.121)
t+2	-0.992 ***		-0.507 ***		-1.296 ***		-1.715 ***
	(0.059)		(0.079)		(0.121)		(0.121)
Intercept	8.863 ***		8.163 ***		8.936 ***		10.310 ***
	(0.039)		(0.052)		(0.079)		(0.081)
Obs	3,719,853		1,969,847		923,481		896,110

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** $p < .01$, ** $p < .05$, * $p < .10$

Overall, our results reflect that all companies have been severely affected by this epidemic, reflected mainly in declining stock prices, revenues, and profits. At the same time, however, government interventions to support the economic and financial balance of enterprises and the maintenance of employment levels, and the relaxation of lockdown measures mitigated the negative effects of the pandemic outbreak. The public subsidies and tax relief measures somewhat mitigated firm losses and had significant effect, but relatively mild compared to the size of the economic shock. Therefore, results also highlight the importance of public support measures in helping firms coping with the pandemic. In the absence of such programs, pronounced sales losses would have threatened the liquidity and the survivability of firms and hence also the job security of employees (Janzen and Radulescu, 2022).

However, Italian companies return to negative performance in 2022, but results could be affected by the negative fallout from the war in Ukraine. The ongoing conflict between Russia and Ukraine has highlighted the various problems related to the existence of global production chains, causing an uncontrolled rise in the prices of raw materials, and generating problems in the supply of energy sources. These dynamics have affected the balance sheets of companies, especially manufacturing ones, jeopardizing the tentative recovery after the outbreak of the Covid-19 pandemic. Therefore, to be sure that results

suggest the impact of the virus on profitability, we decide to continue our study excluding the year 2022.

From the industry perspective, all sectors were affected by the pandemic, in particular the Covid-19 outbreak has created a sudden and sharp drop in profitability in the hospitality industry. These companies were closed for several months due to government decisions (e.g., the DPCM of March 22, 2020) that resulted in large losses of revenue and profits. Therefore, it is necessary to distinguish these branches of the economy from other sectors, which were able to continue operating during the pandemic, although not as usual, but with rather limited restrictions related to mitigating the spread of the virus.

In Tables 5a and 5b and Tables 6a and 6b, we report estimates on the impact of the pandemic on activities of accommodation and catering services sector and the rental, travel agencies, business support services, respectively, that are nested in the hospitality industry. Our findings suggest that, in the context of the hospitality industry, activities of accommodation and catering services sector were the most affected by the outbreak of pandemic. In fact, the ROI of Italian firms operating in this sector (column 1 of Table 5a), compared to the baseline year, declines by about 5.9 pp at the timing of the pandemic outbreak, and deteriorates further in the following year by about 1.5 pp. Table 5b, column 1, shows the impact of Covid-19 on profitability measured by the ROE; the results suggest a decrease of about 10 pp in 2020, but an increase in the following year, which could be due to an increase in the level of debt due to emergency loans, resulting in higher borrowing costs and consequently higher ROE.

Table 5a: The impact of Covid-19 on the ROI of the firms operating in the activities of accommodation and catering services sector

Time relative to Covid-19 event	ROI	ROI North	ROI Centre	ROI South
t-7	-2.391 *** (0.148)	-2.410 *** (0.230)	-2.045 *** (0.285)	-2.672 *** (0.253)
t-6	-1.696 *** (0.145)	-1.415 *** (0.226)	-1.503 *** (0.278)	-2.251 *** (0.246)
t-5	-0.869 *** (0.141)	-0.422 * (0.220)	-0.983 *** (0.268)	-1.354 *** (0.243)

t-4	-0.460 *** (0.138)	-0.003 (0.218)	-0.648 ** (0.262)	-0.831 *** (0.232)
t-3	-0.223 * (0.131)	0.004 (0.208)	-0.078 (0.245)	-0.690 *** (0.225)
t-2	0.006 (0.120)	0.107 (0.190)	0.041 (0.222)	-0.214 (0.209)
Event	-5.948 *** (0.142)	-6.688 *** (0.223)	-6.162 *** (0.271)	-4.751 *** (0.243)
t+1	-1.486 *** (0.135)	-1.712 *** (0.215)	-1.935 *** (0.258)	-0.838 *** (0.226)
Intercept	5.487 *** (0.094)	5.282 *** (0.153)	5.413 *** (0.166)	5.776 *** (0.158)
Obs	92,685	37,723	27,654	29,370

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 5b: The impact of Covid-19 on the ROE of the firms operating in the activities of accommodation and catering services sector

Time relative to Covid-19 event	ROE	ROE North	ROE Centre	ROE South
t-7	-2.901 *** (0.371)	-3.003 *** (0.600)	-2.419 *** (0.665)	-3.182 *** (0.639)
t-6	-0.490 (0.354)	0.022 (0.571)	-0.625 (0.640)	-1.354 ** (0.610)
t-5	1.787 *** (0.344)	3.195 *** (0.554)	1.211 ** (0.616)	0.433 (0.598)
t-4	1.916 *** (0.333)	3.030 *** (0.537)	1.405 ** (0.594)	1.034 * (0.579)
t-3	1.390 *** (0.314)	2.852 *** (0.498)	0.289 (0.565)	0.613 (0.556)
t-2	1.216 *** (0.285)	1.576 *** (0.450)	0.799 (0.511)	1.063 ** (0.511)
Event	-9.902 *** (0.332)	-10.054 *** (0.524)	-10.546 *** (0.625)	-8.969 *** (0.572)
t+1	1.566 *** (0.317)	2.155 *** (0.503)	0.636 (0.591)	1.682 *** (0.540)
Intercept	7.532 *** (0.197)	5.978 *** (0.320)	7.936 *** (0.357)	9.116 *** (0.348)
Obs	185,046	73,922	57,367	57,888

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Similarly, in Tables 6a and 6b we note that the effect of the spread of the virus has the same impact in terms of sign, but not magnitude on the profitability indicators for firms operating in the rental, travel agency and business support services sectors in Italy.

Table 6a: The impact of Covid-19 on the ROI of the firms operating in the rental, travel agencies, business support services sector

Time relative to Covid-19 event	ROI		ROI North		ROI Centre		ROI South	
t-7	-1.143 (0.188)	***	-1.267 (0.251)	***	-0.273 (0.367)		-1.853 (0.418)	***
t-6	-0.753 (0.185)	***	-0.624 (0.251)	**	-0.559 (0.365)		-1.239 (0.393)	***
t-5	-0.172 (0.178)		-0.122 (0.239)		0.093 (0.347)		-0.670 (0.382)	*
t-4	-0.095 (0.172)		-0.120 (0.235)		0.026 (0.332)		-0.250 (0.366)	
t-3	-0.080 (0.166)		-0.061 (0.224)		0.031 (0.322)		-0.313 (0.352)	
t-2	0.308 (0.152)	**	0.269 (0.208)		0.365 (0.293)		0.243 (0.322)	
Event	-2.763 (0.170)	***	-2.942 (0.234)	***	-2.996 (0.331)	***	-2.059 (0.351)	***
t+1	-0.611 (0.166)	***	-0.789 (0.227)	***	-0.475 (0.325)		-0.357 (0.352)	
Intercept	7.454 (0.114)	***	7.636 (0.156)	***	7.126 (0.225)	***	7.444 (0.238)	***
Obs	62,376		31,556		17,237		14,853	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 6b: The impact of Covid-19 on the ROE of the firms operating in the rental, travel agencies, business support services sector

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South	
t-7	-1.002 (0.378)	***	-1.200 (0.517)	**	-0.902 (0.717)		-0.481 (0.829)	
t-6	0.328 (0.365)		0.268 (0.500)		-0.173 (0.693)		1.153 (0.794)	
t-5	2.033 (0.351)	***	2.264 (0.480)	***	1.781 (0.667)	***	1.906 (0.757)	**
t-4	1.403 (0.338)	***	1.910 (0.462)	***	1.122 (0.630)	*	0.764 (0.749)	
t-3	1.201 (0.325)	***	1.739 (0.436)	***	1.369 (0.629)	**	-0.213 (0.713)	
t-2	1.226 (0.297)	***	1.725 (0.402)	***	1.052 (0.561)	*	0.276 (0.659)	
Event	-3.465 (0.317)	***	-3.658 (0.442)	***	-3.607 (0.596)	***	-2.807 (0.670)	***
t+1	1.278 (0.319)	***	1.435 (0.434)	***	0.880 (0.605)		1.583 (0.691)	**
Intercept	10.885 (0.206)	***	10.678 (0.284)	***	10.480 (0.390)	***	11.634 (0.450)	***
Obs	140,926		69,397		40,220		34,072	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

The pandemic has also severely affected the arts, cultural and intellectual activities sector, which were subjected to a harsh and lengthy lockout: in fact, as of March 2020, all cultural facilities were closed, and on-site activities were suspended. Although demand for cultural and creative content intensified during the lockdown period, and digital access became more critical than ever before (Radermecker, 2020), this sector has been one of the hardest hits and probably one of the slowest to recover.

The estimates shown in Tables 7a and 7b, suggest a significant negative impact of Covid-19, which has indiscriminately affected businesses operating in these sectors throughout the peninsula. The indicator of the ROI declining by about 5 pp during the first year of the pandemic and a further decline of just under

2 pp in 2021. As regard for ROE, this declined by about 7 pp in 2020, with no statistically significant recovery in the second year of pandemic.

Table 7a: The impact of Covid-19 on the ROI of the firms operating in the artistic, sports, and entertainment activities sector

Time relative to Covid-19 event	ROI		ROI North		ROI Centre		ROI South	
t-7	-1.365 (0.328)	***	-0.925 (0.478)	*	-1.696 (0.577)	***	-1.586 (0.664)	**
t-6	-1.212 (0.325)	***	-1.103 (0.484)	**	-1.230 (0.553)	**	-1.083 (0.642)	*
t-5	-0.788 (0.316)	**	-0.569 (0.481)		-1.216 (0.543)	**	-0.523 (0.597)	
t-4	-0.394 (0.311)		-0.002 (0.472)		-0.881 (0.544)		-0.499 (0.585)	
t-3	0.353 (0.292)		0.404 (0.439)		0.450 (0.532)		0.166 (0.545)	
t-2	0.365 (0.279)		0.458 (0.409)		0.361 (0.505)		0.415 (0.549)	
Event	-4.490 (0.326)	***	-5.208 (0.479)	***	-4.956 (0.623)	***	-2.648 (0.598)	***
t+1	-1.979 (0.321)	***	-2.694 (0.482)	***	-1.910 (0.614)	***	-0.767 (0.571)	
Intercept	4.706 (0.215)	***	4.633 (0.326)	***	4.767 (0.382)	***	4.152 (0.432)	***
Obs	21,413		10,119		5,953		5,815	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 7b: The impact of Covid-19 on the ROE of the firms operating in the artistic, sports, entertainment, and entertainment activities sector

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South	
t-7	-2.341 (0.747)	***	-2.045 (1.100)	*	-3.657 (1.341)	***	-1.784 (1.474)	

t-6	0.736 (0.705)		0.196 (1.040)		-1.431 (1.315)		4.014 (1.337)	***
t-5	2.509 *** (0.659)		2.892 *** (0.934)		0.188 (1.229)		4.000 (1.342)	***
t-4	1.860 *** (0.634)		2.003 ** (0.947)		1.174 (1.132)		2.111 (1.232)	*
t-3	3.105 *** (0.594)		3.441 *** (0.876)		1.778 * (1.069)		3.129 (1.174)	***
t-2	1.732 *** (0.555)		1.454 * (0.820)		0.644 (1.001)		2.648 (1.084)	**
Event	-6.894 *** (0.639)		-8.388 *** (0.977)		-7.326 *** (1.138)		-4.435 (1.186)	***
t+1	0.211 (0.619)		0.208 (0.931)		-0.571 (1.095)		0.717 (1.174)	
Intercept	5.848 *** (0.410)		5.055 *** (0.610)		6.176 *** (0.708)		5.766 (0.923)	***
Obs	49,261		23,025		14,004		13,433	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** $p < .01$, ** $p < .05$, * $p < .10$

Similar but smaller results are obtained, if we look at the impact of the pandemic on ROI of the firms operating in the professional, scientific, and technical activities sector, which are reported in Table 8a. On the other hand, the ROE, which is the indicator of firms' profitability and their efficiency in generating profits, of these activities recovered slightly as early as 2021.

Table 8a: The impact of Covid-19 on the ROI of the firms operating in the professional, scientific, and technical activities sector

Time relative to Covid-19 event	ROI		ROI North		ROI Centre		ROI South	
t-7	-0.173 (0.124)		-0.086 (0.150)		-0.137 (0.285)		-0.576 (0.321)	*
t-6	-0.068 (0.123)		-0.005 (0.148)		-0.066 (0.284)		-0.296 (0.316)	
t-5	0.209 * (0.118)		0.346 ** (0.144)		-0.096 (0.268)		0.021 (0.308)	
t-4	0.338 *** (0.118)		0.569 *** (0.145)		0.117 (0.267)		-0.245 (0.292)	
t-3	0.393 ***		0.615 ***		-0.023		0.050	

	(0.112)		(0.137)		(0.254)		(0.273)
t-2	0.369 ***		0.389 ***		0.581 **		0.084
	(0.104)		(0.127)		(0.232)		(0.263)
Event	-1.464 ***		-1.525 ***		-1.615 ***		-0.934 ***
	(0.108)		(0.133)		(0.246)		(0.264)
t+1	-0.306 ***		-0.320 **		-0.534 **		0.050
	(0.109)		(0.134)		(0.251)		(0.267)
Intercept	5.939 ***		5.660 ***		6.493 ***		6.194 ***
	(0.079)		(0.096)		(0.181)		(0.194)
Obs	117,937		73,906		25,501		20,232

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 8b: The impact of Covid-19 on the ROE of the firms operating in the professional, scientific, and technical activities sector

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South
t-7	0.307		0.023		0.872 *		0.891
	(0.250)		(0.316)		(0.528)		(0.615)
t-6	0.952 ***		0.609 **		1.293 ***		1.961 ***
	(0.240)		(0.305)		(0.492)		(0.606)
t-5	2.270 ***		2.166 ***		1.994 ***		3.009 ***
	(0.232)		(0.293)		(0.488)		(0.580)
t-4	1.564 ***		1.922 ***		1.360 ***		0.607
	(0.224)		(0.283)		(0.469)		(0.568)
t-3	2.105 ***		2.499 ***		1.892 ***		0.889 *
	(0.215)		(0.273)		(0.458)		(0.522)
t-2	1.708 ***		2.029 ***		1.757 ***		0.563
	(0.198)		(0.249)		(0.412)		(0.500)
Event	-2.354 ***		-2.524 ***		-2.967 ***		-0.798 *
	(0.197)		(0.250)		(0.413)		(0.480)
t+1	0.969 ***		0.804 ***		0.759 *		2.080 ***
	(0.202)		(0.256)		(0.428)		(0.491)
Intercept	11.543 ***		11.607 ***		12.081 ***		10.437 ***
	(0.138)		(0.174)		(0.295)		(0.341)
Obs	277,734		171,229		63,784		46,754

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

In addition, the decision to limit international, regional, and local travel with the objective of carrying out health controls, have also jeopardized the transportation industry, which heavily depends on the mobility of people (Yang et al., 2020). Overall, both passenger transport and freight have suffered severe setbacks from the pandemic. Our findings reported in Tables 9a and 9b suggest that the immediate impact of the Covid-19 outbreak was negative on the profitability indicators, but after the lifting of the lockdown the transport and warehousing sector shows a sharp increase in its capability to generate profits.

Table 9a: The impact of Covid-19 on the ROI of the firms operating in the transport and warehousing sector

Time relative to Covid-19 event	ROI		ROI North		ROI Centre		ROI South	
t-7	-0.685 (0.208)	***	-0.264 (0.278)		-1.299 (0.458)	***	-0.924 (0.402)	**
t-6	-0.040 (0.202)		0.507 (0.276)	*	-0.664 (0.452)		-0.481 (0.377)	
t-5	0.876 (0.191)	***	1.288 (0.260)	***	-0.069 (0.434)		0.907 (0.354)	**
t-4	1.221 (0.181)	***	1.669 (0.253)	***	0.525 (0.397)		1.036 (0.328)	***
t-3	0.905 (0.173)	***	1.287 (0.240)	***	0.441 (0.391)		0.684 (0.309)	**
t-2	0.190 (0.160)		0.294 (0.224)		-0.081 (0.358)		0.198 (0.285)	
Event	-1.920 (0.176)	***	-1.876 (0.248)	***	-2.674 (0.378)	***	-1.385 (0.314)	***
t+1	-0.209 (0.173)		0.155 (0.245)		-0.785 (0.374)	**	-0.372 (0.308)	
Intercept	6.954 (0.118)	***	6.642 (0.166)	***	7.239 (0.261)	***	7.270 (0.214)	***
Obs	50,249		23,781		11,152		16,231	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 9b: The impact of Covid-19 on the ROE of the firms operating in the transport and warehousing sector

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South	
t-7	0.429 (0.445)		-0.083 (0.648)		-0.036 (0.894)		1.756 (0.811)	**
t-6	2.558 *** (0.427)		2.288 *** (0.604)		1.156 (0.906)		4.345 *** (0.774)	***
t-5	4.941 *** (0.413)		4.888 *** (0.595)		4.562 *** (0.847)		5.327 *** (0.746)	***
t-4	4.045 *** (0.394)		4.137 *** (0.570)		3.649 *** (0.795)		4.302 *** (0.715)	***
t-3	2.793 *** (0.378)		3.405 *** (0.548)		2.778 *** (0.764)		1.967 *** (0.683)	***
t-2	0.961 *** (0.350)		1.410 *** (0.509)		1.439 ** (0.697)		0.113 (0.631)	
Event	-3.110 *** (0.374)		-2.909 *** (0.546)		-4.620 *** (0.803)		-2.044 *** (0.640)	***
t+1	1.223 *** (0.372)		2.374 *** (0.541)		0.404 (0.800)		0.151 (0.643)	
Intercept	9.621 *** (0.246)		8.825 *** (0.363)		9.424 *** (0.497)		10.670 *** (0.443)	***
Obs	94,235		42,373		21,874		31,744	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

The outbreak of pandemic affected the manufacturing sector, as expected. The extent of disruption was largely twofold: an endogenous disruption of production processes and systems and extreme shifts in supply and demand caused by an exogenous supply chain disruption. Due to supply chain disruption and the unavailability of raw material, some industries, such as electronics, have put new product development on hold and have also reduced production quantities (Ivanov and Dolgui, 2020). Therefore, the pandemic has paralyzed the manufacturing sectors, negatively impacting firms' profitability. Tables 10a show that ROI decreased not only during the first year of the health crisis, but also during the following year, while the results reported in Table 10b suggest, that profitability as measured by the ROE indicator would appear to have declined by

about 4.5 pp; while a more pronounced reduction is estimated for firms operating in central Italy, with a 5.5 pp decrease from the year 2019.

Table 10a: The impact of Covid-19 on the ROI of the firms operating in the manufacturing sector

Time relative to Covid-19 event	ROI	ROI North	ROI Centre	ROI South
t-7	-0.547 *** (0.076)	-0.388 *** (0.095)	-0.438 ** (0.179)	-1.197 *** (0.171)
t-6	0.062 (0.074)	0.293 *** (0.091)	0.073 (0.171)	-0.790 *** (0.169)
t-5	0.492 *** (0.071)	0.706 *** (0.088)	0.406 ** (0.166)	-0.138 (0.161)
t-4	0.896 *** (0.068)	1.266 *** (0.085)	0.696 *** (0.158)	-0.245 (0.154)
t-3	1.011 *** (0.064)	1.410 *** (0.080)	0.764 *** (0.150)	-0.182 (0.144)
t-2	0.791 *** (0.059)	1.083 *** (0.073)	0.618 *** (0.136)	-0.082 (0.134)
Event	-2.663 *** (0.064)	-2.638 *** (0.079)	-3.047 *** (0.152)	-2.272 *** (0.148)
t+1	-0.199 *** (0.064)	-0.097 (0.080)	-0.475 *** (0.150)	-0.254 * (0.147)
Intercept	7.409 *** (0.044)	7.444 *** (0.063)	7.423 *** (0.102)	7.223 *** (0.106)
Obs	257,297	164,431	50,108	47,875

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 10b: The impact of Covid-19 on the ROE of the firms operating in the manufacturing sector

Time relative to Covid-19 event	ROE	ROE North	ROE Centre	ROE South
t-7	-1.304 *** (0.174)	-1.639 *** (0.219)	-0.600 (0.393)	-0.611 (0.397)
t-6	0.423 ** (0.168)	0.197 (0.211)	1.076 *** (0.381)	0.627 (0.391)

t-5	2.459 *** (0.162)	2.404 *** (0.202)	2.396 *** (0.371)	2.753 *** (0.376)
t-4	2.481 *** (0.155)	2.798 *** (0.193)	2.477 *** (0.342)	1.450 *** (0.367)
t-3	3.292 *** (0.148)	3.936 *** (0.186)	2.985 *** (0.328)	1.532 *** (0.353)
t-2	2.105 *** (0.136)	2.697 *** (0.170)	1.966 *** (0.296)	0.415 (0.326)
Event	-4.666 *** (0.147)	-4.605 *** (0.183)	-5.508 *** (0.333)	-3.755 *** (0.338)
t+1	0.358 ** (0.145)	0.690 *** (0.181)	-0.106 (0.324)	-0.117 (0.342)
Intercept	9.821 *** (0.097)	9.476 *** (0.132)	9.997 *** (0.214)	10.555 *** (0.234)
Obs	434,798	265,035	93,752	84,846

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

The pandemic and subsequent lockdown resulted in social distancing and isolation that had a detrimental effect on the wholesale and retail sector, despite sales of small and medium-sized supermarket chains increased in a short period of time, as severe pandemic measures led to the closure of high population densities malls and supermarkets. In addition, the unprecedented systematic uncertainty resulting from the combination of uncertainty about the duration of the crisis, the future prospects for income and employment caused people to reduce current consumption and increase savings, making the situation worse. Results reported in Tables 11a and 11b, suggest that the pandemic outbreak has had a large impact on the Italian firms of the wholesale and retail sector, with ROI falling by 2.2 pp in 2020, and a reduction of ROE of about 2.7 pp. In addition to all the problems caused by the pandemic, it has accelerated the online presence of retail enterprises. However, many traditional retail enterprises were unable to develop online platforms, and carry on the business, which resulted in cash flow constraints that have brought many businesses to the brink of bankruptcy. As a result, the government has taken a series of measures for economic support especially for the wholesale and retail sector, which has been particularly hard hit by the Covid-19 shock, and this could explain the estimated improvement in both profitability indicators, in 2021.

Table 11a: The impact of Covid-19 on the ROI of the firms operating in the wholesale and retail, repair of motor vehicles and motorcycles sector

Time relative to Covid-19 event	ROI		ROI North		ROI Centre		ROI South	
t-7	-0.906 (0.076)	***	-0.952 (0.107)	***	-0.702 (0.160)	***	-0.996 (0.141)	***
t-6	-0.436 (0.073)	***	-0.357 (0.104)	***	-0.344 (0.153)	**	-0.643 (0.135)	***
t-5	0.165 (0.070)	**	0.280 (0.099)	***	0.058 (0.150)		0.047 (0.130)	
t-4	0.570 (0.066)	***	0.868 (0.095)	***	0.343 (0.141)	**	0.251 (0.121)	**
t-3	0.349 (0.063)	***	0.765 (0.090)	***	0.140 (0.132)		-0.180 (0.115)	
t-2	0.374 (0.056)	***	0.563 (0.081)	***	0.248 (0.119)	**	0.123 (0.102)	
Event	-2.195 (0.064)	***	-2.129 (0.091)	***	-2.730 (0.138)	***	-1.874 (0.113)	***
t+1	0.175 (0.063)	***	0.505 (0.091)	***	-0.062 (0.132)		-0.152 (0.110)	
Intercept	7.533 (0.044)	***	7.334 (0.064)	***	7.349 (0.092)	***	7.986 (0.077)	***
Obs	293,925		139,924		70,101		89,134	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 11b: The impact of Covid-19 on the ROE of the firms operating in the wholesale and retail, repair of motor vehicles and motorcycles sector

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South	
t-7	-0.721 (0.167)	***	-1.222 (0.241)	***	-0.546 (0.342)		0.125 (0.306)	
t-6	0.779 (0.159)	***	0.233 (0.233)		0.849 (0.321)	***	1.671 (0.290)	***
t-5	2.490 (0.154)	***	2.309 (0.223)	***	2.322 (0.316)	***	3.048 (0.276)	***
t-4	2.225	***	2.510	***	2.168	***	1.810	***

	(0.148)		(0.216)		(0.301)		(0.269)
t-3	2.049 ***		2.907 ***		1.815 ***		0.978 ***
	(0.141)		(0.206)		(0.290)		(0.254)
t-2	1.331 ***		1.740 ***		1.174 ***		0.828 ***
	(0.129)		(0.187)		(0.266)		(0.231)
Event	-2.679 ***		-1.873 ***		-3.721 ***		-3.066 ***
	(0.138)		(0.201)		(0.286)		(0.245)
t+1	1.192 ***		2.428 ***		0.413		-0.067
	(0.135)		(0.198)		(0.280)		(0.238)
Intercept	10.615 ***		9.397 ***		10.331 ***		12.684 ***
	(0.090)		(0.134)		(0.188)		(0.157)
Obs	568,557		260,840		144,039		174,214

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

In addition, Covid-19 has completely disrupted any previous daily practice also in the construction industry, for example architects left the office and began completing the design stage remotely. Therefore, the pandemic has had a severe impact on the ability of contractors to work on-site and to meet deadlines. Some sites were suspended, there have been delays in payments and in the delivery of materials, all this has led to a lack of cash, manpower, and resources in general, creating a chain of delays, loss of productivity and profitability, as shown in Tables 12a and 12b.

However, since July 2020, with the desire to restart the construction sector strongly penalized by the Covid-19 pandemic, it has been implemented a public grant policy, so called “*Superbonus 110%*”, (Italian Law. L. 17 July, 2020) that by cutting costs for property owners strongly encouraged energy efficiency works. Indeed, as we can see from the Tables 12a and 12b, in 2021 than 2019, the profitability of the construction industries increases.

Table 12a: The impact of Covid-19 on the ROI of the firms operating in the construction sector

Time relative to Covid-19 event	ROI	ROI North	ROI Centre	ROI South
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t-7	-0.341 ***	(0.076)	-0.355 ***	(0.113)	-0.009	(0.148)	-0.613 ***	(0.135)
t-6	-0.459 ***	(0.075)	-0.496 ***	(0.112)	-0.369 **	(0.151)	-0.496 ***	(0.131)
t-5	-0.102	(0.073)	-0.110	(0.108)	-0.204	(0.146)	-0.044	(0.128)
t-4	0.123 *	(0.073)	0.089	(0.110)	0.249 *	(0.146)	0.020	(0.124)
t-3	0.029	(0.071)	0.277 ***	(0.107)	0.078	(0.142)	-0.351 ***	(0.122)
t-2	0.151 **	(0.065)	0.246 **	(0.098)	0.187	(0.133)	-0.052	(0.110)
Event	-1.186 ***	(0.070)	-1.320 ***	(0.106)	-1.366 ***	(0.141)	-0.907 ***	(0.117)
t+1	0.750 ***	(0.073)	0.617 ***	(0.110)	0.636 ***	(0.146)	0.957 ***	(0.122)
Intercept	5.566 ***	(0.050)	5.546 ***	(0.075)	5.430 ***	(0.102)	5.639 ***	(0.091)
Obs	219,653		99,100		54,878		72,006	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 12b: The impact of Covid-19 on the ROE of the firms operating in the construction sector

Time relative to Covid-19 event	ROE	ROE North	ROE Centre	ROE South
t-7	-1.026 *** (0.185)	-1.576 *** (0.283)	-0.987 *** (0.358)	-0.254 (0.318)
t-6	-0.835 *** (0.179)	-1.332 *** (0.272)	-1.470 *** (0.351)	0.405 (0.308)
t-5	1.496 *** (0.175)	0.845 *** (0.263)	0.834 ** (0.346)	2.924 *** (0.306)
t-4	0.964 *** (0.169)	1.225 *** (0.255)	0.479 (0.328)	0.900 *** (0.296)
t-3	1.074 *** (0.162)	1.488 *** (0.245)	0.833 *** (0.316)	0.724 ** (0.282)
t-2	0.642 *** (0.150)	0.854 *** (0.226)	0.856 *** (0.293)	0.230 (0.259)
Event	-1.912 ***	-2.014 ***	-2.900 ***	-0.907 ***

	(0.149)		(0.223)		(0.296)		(0.261)
t+1	3.761 ***		3.317 ***		3.803 ***		4.337 ***
	(0.155)		(0.234)		(0.306)		(0.269)
Intercept	8.556 ***		8.206 ***		8.932 ***		8.484 ***
	(0.104)		(0.157)		(0.206)		(0.199)
Obs	440,860		199,295		113,394		140,214

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

The analysis proceeds, distinguishing these branches of the economy from other sectors such as agriculture and mining, which were able to continue operating during the Covid-19 pandemic, albeit not as usual, but with rather limited restrictions. Despite government restrictions on agricultural labor mobility, the establishment of safety protocols to prevent virus transmission, the trade and provision of essential items has been ensured and normalized. Indeed, results reported in Tables 13a and 13b, suggest that the pandemic slightly reduced the profitability of the firms operating in the agriculture, forestry and fishing sector, but with no statistically significant impact for enterprises operating in northern and southern Italy. In contrast, for firms operating in central Italy, for which the pandemic caused a reduction in profitability, this effect may have been driven by the complete closure of only those firms operating in the forestry and logging subsector, which are more prevalent in central Italy.

Table 13a: The impact of Covid-19 on the ROI of the firms operating in the agriculture, forestry, and fishing sector

Time relative to Covid-19 event	ROI	ROI North	ROI Centre	ROI South
t-7	-0.126 (0.170)	0.048 (0.259)	-0.976 (0.301) ***	0.255 (0.311)
t-6	-0.454 *** (0.171)	-0.046 (0.257)	-1.055 *** (0.302)	-0.531 * (0.311)
t-5	-0.303 * (0.166)	0.042 (0.250)	-0.885 *** (0.291)	-0.319 (0.303)
t-4	0.323 ** (0.160)	0.418 * (0.246)	-0.082 (0.284)	0.491 * (0.281)
t-3	0.110	0.243	-0.458 * (0.284)	0.277

	(0.158)		(0.239)		(0.271)		(0.283)
t-2	0.061		0.349		-0.221		-0.067
	(0.146)		(0.218)		(0.243)		(0.267)
Event	-0.371	**	-0.057		-0.741	***	-0.442
	(0.152)		(0.217)		(0.276)		(0.273)
t+1	0.311	**	0.457	*	0.181		0.174
	(0.157)		(0.238)		(0.274)		(0.282)
Intercept	2.067	***	1.863	***	1.261	***	2.962
	(0.110)		(0.187)		(0.198)		(0.196)
Obs	38,405		13,743		10,466		14,997

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 13b: The impact of Covid-19 on the ROE of the firms operating in the agriculture, forestry, and fishing sector

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South
t-7	1.381	***	0.759		-0.135		2.614
	(0.478)		(0.735)		(0.947)		(0.806)
t-6	-0.358		-0.621		-1.416		0.296
	(0.479)		(0.767)		(0.932)		(0.787)
t-5	0.550		0.321		-0.016		1.083
	(0.456)		(0.711)		(0.882)		(0.762)
t-4	1.040	**	0.971		-0.017		1.711
	(0.444)		(0.672)		(0.845)		(0.762)
t-3	0.653		0.961		-0.894		1.097
	(0.424)		(0.668)		(0.805)		(0.711)
t-2	0.264		0.261		0.409		0.049
	(0.395)		(0.598)		(0.772)		(0.668)
Event	-0.413		0.102		-1.318	*	-0.249
	(0.405)		(0.629)		(0.791)		(0.674)
t+1	1.458	***	1.782	***	0.897		1.501
	(0.413)		(0.656)		(0.796)		(0.682)
Intercept	1.852	***	1.218	***	-1.679	***	4.991
	(0.276)		(0.440)		(0.554)		(0.458)
Obs	66,082		23,341		17,568		26,484

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

In the following Tables 14a and 14b, we can see estimates for the mining industry, which are negatively affected by the Covid-19 crisis, although many mines have remained operational and productive during the pandemic, despite having less people on site. However, business continuity has come at a cost due to the added expenses of new processes, procedures, health protocols, and so on, (Galaś, et al., 2021; Jowitt, 2021).

Table 14a: The impact of Covid-19 on the ROI of the firms operating in the mining of minerals from quarries and mines sector

Time relative to Covid-19 event	ROI	ROI North	ROI Centre	ROI South
t-7	-0.509 (0.560)	-0.980 (0.803)	-0.804 (1.002)	0.381 (1.102)
t-6	-0.156 (0.566)	-0.532 (0.803)	-0.670 (1.117)	0.867 (1.112)
t-5	-0.953 * (0.542)	-1.855 ** (0.761)	-0.883 (1.172)	0.581 (1.001)
t-4	-0.108 (0.552)	-1.393 * (0.811)	-0.258 (1.077)	1.350 (1.043)
t-3	-0.669 (0.492)	-1.211 * (0.687)	-0.478 (0.881)	-0.285 (1.039)
t-2	0.052 (0.448)	-0.224 (0.583)	0.234 (0.927)	0.357 (0.898)
Event	-0.970 ** (0.453)	-1.507 ** (0.629)	-1.863 * (0.946)	0.325 (0.826)
t+1	0.306 (0.501)	0.223 (0.674)	-1.117 (1.035)	1.189 (0.943)
Intercept	2.846 *** (0.379)	3.164 *** (0.523)	3.638 *** (0.813)	2.400 *** (0.731)
Obs	3,689	1,785	933	1,087

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 14b: The impact of Covid-19 on the ROE of the firms operating in the mining of minerals from quarries and mines sector

Time relative to Covid-19 event	ROE	ROI North	ROE Centre	ROE South
t-7	-2.361 * (1.402)	-3.378 * (1.887)	-3.296 (2.726)	0.864 (2.734)
t-6	-0.712 (1.395)	-2.087 (2.015)	-1.392 (2.732)	3.189 (2.603)
t-5	0.788 (1.293)	-2.720 (1.875)	2.330 (2.807)	6.197 *** (2.233)
t-4	-1.766 (1.374)	-4.000 ** (1.813)	-0.884 (2.485)	2.187 (2.998)
t-3	-0.198 (1.275)	0.110 (1.534)	0.253 (2.712)	-1.197 (2.745)
t-2	0.573 (1.038)	0.290 (1.353)	1.674 (1.935)	0.931 (2.267)
Event	-0.970 (1.105)	-2.080 (1.560)	0.858 (2.038)	-0.113 (2.204)
t+1	2.450 ** (1.248)	3.299 * (1.786)	-0.213 (2.231)	3.919 (2.483)
Intercept	0.710 (0.935)	-0.302 (1.217)	1.752 (1.764)	1.106 (1.640)
Obs	5,952	2,764	1,589	1,782

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

As for the power sector, the pandemic had a relatively small impact on these economic activities; while the lockdown measures depressed commercial and industrial sector electricity consumption, it increased electricity demand in the residential sector.

Similarly, for the sector of water supply, the pandemic led to an increase in domestic demand while it decreased for business, (Renukappa et al., 2021). The estimates from Tables 15a and 15b and Tables 16a and 16b show that the pandemic impairs the profitability of firms but only in 2020, except for those operating in central Italy; in fact, in the following year the indicators improved.

Table 15a: The impact of Covid-19 on the ROI of the firms operating in the supply of electricity, gas, steam and air conditioning sector

Time relative to Covid-19 event	ROI	ROI North	ROI Centre	ROI South
t-7	0.121 (0.203)	0.077 (0.256)	0.188 (0.460)	0.180 (0.448)
t-6	-0.579 *** (0.193)	-0.710 *** (0.243)	-0.688 (0.447)	-0.112 (0.420)
t-5	-0.882 *** (0.181)	-1.139 *** (0.226)	-0.934 ** (0.429)	-0.132 (0.402)
t-4	-0.924 *** (0.181)	-1.165 *** (0.227)	-0.977 ** (0.417)	-0.297 (0.401)
t-3	-0.017 (0.172)	-0.374 * (0.222)	0.481 (0.380)	0.629 * (0.360)
t-2	0.041 (0.150)	-0.088 (0.194)	-0.021 (0.352)	0.547 * (0.313)
Event	-0.539 *** (0.146)	-0.590 *** (0.178)	-0.526 (0.371)	-0.482 (0.321)
t+1	0.815 *** (0.179)	0.765 *** (0.232)	0.475 (0.429)	0.976 *** (0.362)
Intercept	5.277 *** (0.121)	5.569 *** (0.152)	5.505 *** (0.270)	4.452 *** (0.276)
Obs	24,930	15,537	4,448	5,503

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 15b: The impact of Covid-19 on the ROE of the firms operating in the supply of electricity, gas, steam and air conditioning sector

Time relative to Covid-19 event	ROE	ROE North	ROE Centre	ROE South
t-7	7.979 *** (0.703)	7.927 *** (0.930)	9.050 *** (1.514)	7.126 *** (1.416)
t-6	-1.133 * (0.643)	-1.341 (0.836)	-0.116 (1.441)	-1.218 (1.305)
t-5	-4.004 *** (0.626)	-4.720 *** (0.809)	-3.143 ** (1.426)	-2.665 ** (1.289)
t-4	-2.892 *** (0.582)	-3.052 *** (0.749)	-2.750 ** (1.344)	-2.975 ** (1.206)

t-3	0.343 (0.564)		0.082 (0.715)		0.969 (1.379)		0.682 (1.173)
t-2	-0.019 (0.506)		-0.267 (0.647)		0.739 (1.232)		0.390 (1.005)
Event	-1.548 *** (0.492)		-1.521 ** (0.623)		-0.578 (1.236)		-2.168 ** (0.998)
t+1	2.926 *** (0.525)		2.896 *** (0.689)		4.184 *** (1.210)		1.733 * (1.019)
Intercept	8.723 *** (0.359)		8.686 *** (0.466)		9.650 *** (0.843)		8.664 *** (0.725)
Obs	41,028		25,450		7,333		9,231

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 16a: The impact of Covid-19 on the ROI of the firms operating in the water supply; sewage networks, waste treatment and remediation activities sector

	Time relative to Covid-19 event		ROI		ROI North		ROI Centre		ROI South	
t-7	-1.374 (0.361)	***	-1.214 (0.515)	**	-1.505 (0.713)	**	-1.534 (0.648)	**		
t-6	-0.776 (0.351)	**	-0.556 (0.502)		-0.103 (0.733)		-1.555 (0.606)	**		
t-5	-0.887 (0.343)	***	-0.811 (0.462)	*	-0.857 (0.731)		-1.081 (0.639)	*		
t-4	-0.474 (0.339)		-0.296 (0.471)		-0.036 (0.708)		-1.246 (0.612)	**		
t-3	0.450 (0.324)		0.424 (0.441)		1.255 (0.733)	*	-0.013 (0.579)			
t-2	0.308 (0.297)		0.204 (0.422)		1.352 (0.570)	**	-0.143 (0.543)			
Event	-0.557 (0.284)	**	-0.722 (0.403)	*	-0.981 (0.607)		-0.100 (0.486)			
t+1	1.190 (0.306)	***	1.166 (0.432)	***	1.689 (0.642)	***	0.868 (0.528)			
Intercept	7.174 (0.234)	***	7.549 (0.328)	***	6.628 (0.538)	***	6.715 (0.519)	***		
Obs	11,469		5,546		2,477		3,894			

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROI. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

Table 16b: The impact of Covid-19 on the ROE of the firms operating in the water supply; sewage networks, waste treatment and remediation activities sector

Time relative to Covid-19 event	ROE		ROE North		ROE Centre		ROE South	
t-7	-2.246 (0.789)	***	-2.642 (1.125)	**	-1.247 (1.706)		-2.066 (1.351)	
t-6	-1.063 (0.795)		-1.198 (1.181)		-0.868 (1.726)		-1.246 (1.280)	
t-5	-0.954 (0.787)		-1.859 (1.099)	*	0.973 (1.757)		-1.231 (1.350)	
t-4	-1.748 (0.763)	**	-1.389 (1.060)		-0.888 (1.652)		-2.882 (1.354)	**
t-3	0.689 (0.727)		1.182 (1.043)		0.225 (1.533)		-0.064 (1.279)	
t-2	1.388 (0.659)	**	1.025 (0.937)		1.236 (1.295)		1.885 (1.175)	
Event	0.293 (0.695)		0.328 (0.919)		-1.278 (1.521)		0.450 (1.297)	
t+1	4.881 (0.698)	***	5.771 (1.006)	***	4.046 (1.410)	***	3.964 (1.227)	***
Intercept	8.775 (0.472)	***	8.724 (0.683)	***	7.772 (1.054)	***	9.057 (0.854)	***
Obs	19,004		8,633		4,211		6,849	

Note. Table reports the Panel Event Study estimates using a dynamic fixed-effect model specification for ROE. In parentheses, standard errors clustered at the firm level. The baseline year is 2019. Significance: *** p<.01, ** p<.05, *p<.10

6. CONCLUSIONS

The Covid-19 pandemic had a considerable influence on the business activities in almost all economic activities on the national level. However, the disruptions of the pandemic did not affect all enterprises equally. Therefore, it is necessary to explore how severely the industry sectors have been affected by the health crisis. To this end, we focus on investigating and analyzing the impacts of the pandemic at the sectoral and territorial levels on the quality of profitability, as measured by key financial metrics, such as ROI and ROE, of Italian firms. We use a robust empirical methodology in our analysis, the panel event study, which

allows us to discern the influence of Covid-19 disruptions on the financial performance of Italian companies, by considering previous trends and potential variables that could distort this correlation.

We estimate that in 2020, the profitability indicators of all the sectors considered declined, but those that suffered most from the pandemic were the accommodation and food services, transportation, manufacturing, and cultural sectors, with a reduction in profitability ranging from 4 to 10 pp. In addition, the results highlight that the Covid-19 crisis was undoubtedly a regional crisis, with spatially uneven impacts, and with heavy negative effects especially for firms in the above sectors operating in the North and particularly in Central Italy. When moving to 2021, we see a moderate recovery for Italian industries; the economic blow has been cushioned by the various government interventions to support the economy, with particular attention to the hardest hit sectors by the pandemic.

Overall, the results can be largely explained by the strictness of the anti-contagious policies, which caused disruptions in supply chains, prevented some purchases, and highlighted the inability of many industries in several sectors to transition to remote work, and online sales. In fact, these measures had a significant impact on several sectors, such as accommodation and food services, rental, travel agencies, business support services, and the arts and culture sector, which were forced to close, and on those businesses that could not benefit from remote work.

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APPENDIX

Table 1: Descriptive statistics for ROI

ROI	Mean									
	t-7	t-6	t-5	t-4	t-3	t-2	t-1	Event	t+1	t+2
	4.43	4.58	4.94	5.81	6	6.20	6.15	4.59	6.31	6.40
Sectors:										
Agriculture, forestry, and fishing	1.32	.94	1.15	2.37	2.10	2.24	2.29	2.15	2.78	2.53
Mining of minerals from quarries and mines	1.70	2.09	1.65	2.53	2.53	3.29	3.18	2.55	4.13	3.94
Manufacturing	6.34	6.85	7.25	7.99	8.18	8.19	7.67	5.51	7.83	8.07
Supply of electricity, gas, steam and air conditioning	5.17	4.35	3.95	4.44	5.43	5.49	5.45	5.10	5.99	5.00
Water supply; sewage networks, waste treatment and remediation activities	5.33	5.79	5.66	6.59	7.21	7.31	7.19	6.84	8.53	8.14
Construction	4.05	4.00	4.47	5.44	5.68	5.94	6.13	5.49	7.29	7.47
Wholesale and retail, repair of motor vehicles and motorcycles	5.99	6.39	6.94	7.79	7.77	8.01	7.89	6.08	8.43	8.41
Transport and Warehousing sector	5.54	6.12	7.06	7.92	7.73	7.24	7.29	5.65	7.36	7.91
Activities of accommodation and catering services	2.75	3.33	3.98	4.77	4.95	5.39	5.66	0.259	4.49	5.61
Professional, scientific, and technical activities	5.24	5.29	5.64	5.98	6.11	6.33	6.25	5.16	6.11	5.98
Rental, travel agencies, business support services	5.73	5.92	6.48	7.05	7.18	7.73	7.64	5.48	7.58	7.27
Artistic, sports, entertainment, and entertainment activities	2.83	3.09	3.41	4.08	4.96	4.97	5.07	0.963	3.41	5.72
Obs	155,172	149,593	158,441	122,753	124,953	129,022	134,892	139,684	142,056	148,646

Table 2: Descriptive statistics for ROE

ROE	Mean									
	t-7	t-6	t-5	t-4	t-3	t-2	t-1	Event	t+1	t+2
	5.36	7.013	9.57	10.08	11.03	11.21	10.59	7.82	13.22	11.01
Sectors:										
Agriculture, forestry, and fishing	0.99	-0.23	0.99	2.02	2.28	2.04	2.33	2.3	3.94	1.86
Mining of minerals from quarries and mines	-2.16	-0.32	1.51	-0.98	0.23	1.95	1.23	0.56	4.72	3.11
Manufacturing	5.96	8.18	10.80	11.42	12.74	12.29	10.75	6.74	11.93	10.88
Supply of electricity, gas, steam and air conditioning	16.84	7.47	4.38	5.51	8.39	8.14	8.33	6.58	11.27	6.83
Water supply; sewage networks, waste Treatment and remediation activities	5.09	6.55	7.08	6.53	8.91	10.05	9.11	9.54	14.03	10.40
Construction	3.09	4.19	7.57	8.07	9.30	9.69	9.71	8.45	14.9	12.20
Wholesale and retail, repair of motor vehicles and motorcycles	6.37	8.52	10.99	11.64	12.34	12.52	11.90	9.97	14.18	11.49
Transport and Warehousing sector	6.89	9.74	12.85	12.59	12.27	10.90	10.72	8.07	12.97	11.37
Activities of accommodation and catering services	0.77	4.03	7.03	7.96	8.11	9.01	8.92	-0.11	11.38	9.14
Professional, scientific, and technical activities	8.21	9.56	11.70	11.89	13.23	13.72	12.68	11	14.84	12.76
Rental, travel agencies, business support services	6.27	8.41	11.03	11.21	11.56	12.57	12.04	9.16	14.23	10.88
Artistic, sports, entertainment, and entertainment activities	-0.19	3.73	6.06	6.52	8.36	8.09	7.27	1.28	8.02	9.40
Obs	208,321	225,377	245,354	264,061	283,499	300,335	313,785	308,666	326,543	332,605