Relief Policy and the Sustainability of COVID-19 Pandemic: Empirical Evidence from the Italian Manufacturing Industry

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Abstract: This work investigates the impact of COVID-19 on the Italian manufacturing industry, testing whether the recovery measures introduced by the government were effective in alleviating the economic consequences of the virus in 2020. In particular, this work aims to address the impact of COVID-19 on the Italian manufacturing industry, and evaluation of the adopted recovery measures. Considering the current situation, with the war in Ukraine and the related gas crisis across the European Union, such investigation on policy relief is even more relevant, contributing to the current debate. Adopting RE models, and considering the latest economic and financial information available, we analyzed active private limited firms in the Italian manufacturing industry between 2019 and 2020, investigating the impact of layoff on their productivity (i.e., Total Factor Productivity) and profitability (i.e., Return On Assets), as well as their expected probability of default. According to the results of these regression models, and assuming 8 weeks of layoff, we observed an increase in productivity (between 1.20% and 1.59%), a decrease in profitability (1.47%) and an increase in bankruptcy risk (2.27%). Hence, the relief policy was not able to alleviate the economic consequences of COVID-19 for these firms, even though the layoffs were able to support their productivity. Practical implications concern the necessary improvements for the above relief policy, i.e., interventions to support the demand of manufactured products, interventions to support the digitalization of services, interventions to support the remote working, and interventions to support the introduction of innovative products on the market.

Keywords: COVID-19; layoff; relief policy; manufacturing industry; Total Factor Productivity (TFP); Return On Assets (ROA); labor cost; probability of default

1. Introduction

Italy was the first European country affected by the COVID-19 pandemic, with the first cases identified in the north of Italy in February 2020. The Italian government reacted with localized lockdowns in those areas, creating the so-called "*red zones*", which were extended to the whole country in March to contain the spread of this first wave (see Figure A1 in Appendix A). During this national lockdown, only some strategic businesses (e.g., food supply chain) were allowed to continue operating, with a significant negative impact on the manufacturing industry. Indeed, both consumers and employees were not allowed to leave their homes, greatly reducing the demand for products by the former and the supply of labor by the latter. The Italian government's interventions to support economic activities were mainly oriented toward protecting labor and permanent employees. On the one hand, firms were forbidden from dismissing their workers but, on the other hand, they could apply for layoffs, reducing the cost of unproductive human resources. Accordingly, layoff applications increased exponentially, with a peak of almost 400 million hours in May 2020 (see Figure A2 in Appendix A). These economic measures were maintained for the rest of the year, supporting businesses during the second COVID-19 wave of October 2020, although

the national lockdown was restricted to the nighttime hours (10 p.m.–5 a.m.). Besides these measures, which significantly reduced employee costs, there were no interventions to support the demand for final goods and spending by consumers, as well as no efforts to support access to external financial resources and/or internal liquidity (e.g., tax reductions). The situation was even more serious if we consider the impossibility for firms to quickly adapt their internal structures to the new demand of goods (i.e., by dismissing employees).

This work aimed to investigate the impact of this relief policy on the Italian manufacturing industry, testing whether the measures introduced by the government were able to alleviate the economic consequences of the virus. In particular, considering the latest economic and financial information available on this population of firms, this work aimed to address the following key issues: (1) impact of COVID-19 on the Italian manufacturing industry, and (2) evaluation of the adopted recovery measures. We test the proposed hypothesis by analyzing active private limited firms in the Italian manufacturing industry between 2019 and 2020 and by combining information extracted from their balance sheet and economic statements, so that we could investigate the relation between firms' access to layoffs and their productivity, profitability and default probability. To the best of our knowledge, no investigations have been carried out into the impact of COVID-19 on the Italian manufacturing industry, and our work represents an opportunity to provide new and practical insights to managers and policy makers. Moreover, this work can contribute to current investigations around the economic and financial impact of COVID-19 in Western countries [1] and in Asia [2–5], as well as the main interventions adopted by national governments [6,7].

The article is organized as following. Section 2 presents an overview of current literature and proposes the hypothesis. Section 3 introduces data and methodology. Section 4 shows the collected results. Finally, Section 5 proposes some conclusions, focusing on the main practical implications.

Literature Review and Hypotheses

Storm (2021) highlighted that Italian interventions had been negatively affected by the fiscal capacity of government to raise spending to cushion the economic impact of the health emergency for vulnerable businesses [8]. Indeed, according to the author, even if the COVID-19 mortality was relatively high, the per-capita spending was relatively low because the high public debt and governments' limited access to external financial resources. As a consequence, the pandemic had a significant economic negative impact on the national economy. According to Cetrulo (2021), the Italian GDP contracted by about 6.6% between 2019 and 2020, while the reduction in working hours was about 7.5% [9]. Moreover, the author notes that, compared to 2019, employment declined by 414,000 units (−1.8%), a drop that was mainly concentrated among fixed-term employees (−383,000) and self-employed workers (−129,000). Indeed, the Italian government's interventions to support economic activities were mainly oriented toward protecting permanent employees, preventing the dismissal of their workers and reducing the cost of unproductive human resources through the introduction of layoffs [10]. Besides these measures, which significantly reduced the potential uneven impact of the pandemic, preserving job stability for millions of workers [11], there were no interventions to support the demand for final goods and spending by consumers, as well as no significant efforts to support the adoption of new digital services by firms and/or the introduction of innovative products on the market. Moreover, there were limited interventions to support workers' resilience, facilitating opportunities for smart-working [12]. On the one hand, we expected the adoption of layoffs supported the productivity of these firms, decreasing the labor costs, while, on the other hand, we expected that their profitability decreased, and defaults probability increased. Hence, following this reasoning, we sought empirical confirmation of a positive relation between access to layoffs and productivity and, at the same time, we expected to observe a negative impact on profitability and default probability. More precisely, we expected:

H₁ higher productivity;
H₂ lower profitability;
H₃ higher default probability.

These are the hypotheses we tested in our empirical investigation, expecting to confirm the limits of Italian policy relief during the pandemic. To the best of our knowledge, no investigations have been carried out into the impact of COVID-19 on the Italian manufacturing industry, and our work represents an opportunity to provide new and practical insights for managers and policy makers.

2. Materials and Method

We tested the proposed hypothesis by analyzing active private limited firms in the Italian manufacturing industry between 2019 and 2020 and by combining information extracted from AIDA (Bureau van Dijk's database). Bureau van Dijk (BvD) is a Moody's Analytics Company, and it is a publisher of business information specialized in private companies and their financial analysis. In particular, a RE regression model with a panel sample and robust option was used to estimate the relationship between the dependent variables and the key explanatory variable, assuming that random-effects specification is appropriate for individual-level effects in our model. Note that the decision to adopt FEs is supported by the Hausman specification test. The full model has the following form:

$$Y_{i,t} = \beta_0 + \beta_1 \, Labor_{i,t} + \beta_k \sum_{k=1}^{m} X_{k_{i,t-1}} + \beta_j \sum_{j=1}^{n} Z_{j_i} + \varepsilon_i + \mu_{i,t}$$

where *i* is the observations at time *t*. *Y* represents the economic dynamics under investigation, *Labor* is the key explanatory variable, *X* represents control variables and *Z* are *j* time-invariant fixed effects. The dependent variables are Total Factor Productivity (TFP), Return On Assets (ROA), and the expected probability of default, while the explanatory variable is the labor cost per employee, which is a good proxy of the firms' requested layoffs.

According to the literature, TFP can be considered an evaluable indicator for measuring recession after crises, and many recent studies focus on the analysis of COVID-19, comparing the situation pre-pandemic and post-pandemic [13,14]. In particular, considering data availability and coherently with literature [15,16], we proposed two TFP indexes: revenue-based TFP and added value-based TFP, calculated as suggested by Petrin et al. (2004) [17]. Obviously, these indicators represent a different meaning of productivity: the former analyzes the sales growth over time, while the latter considers the ability to generate profits from the operating activities of firms. Afterwards, according to the literature [18,19], we proposed a representative index for firms' profitability, which is expressed in terms of Return on Assets (i.e., ROA) and represents their ability in reacting to the pandemic and/or other negative shocks (e.g., recession, war), considering the volatility of profits on total assets. Finally, according to literature [20,21], the probability of default represents the financial health of firms, and is good proxy to estimate the impact of COVID-19, evaluating whether these businesses are unable to react rapidly to the unexpected conditions created by the pandemic. Focusing on the explanatory variable, coherently with current literature [22–24], we considered labor cost as a proxy of layoffs, studying whether this measure contributed to reduce the negative impact of pandemic on the firms' performance.

In accordance with the current literature [25–27], the control variables refer to the firms' corporate finance and their access to external financial resources (i.e., credit rating score, financial debt ratio, trade credit ratio), their maturity (i.e., size, seniority), the institutional environment in which they are located (i.e., institutional quality index), and the incidence of COVID-19. The variable COVID-19 (% incidence) had a positive value only for the year 2020, while it assumes a value equal to zero for the year 2019. Lastly, we introduced fixed effects in our model: NACE code—2 digit (FE), which is a dummy variable equal to 1 according to 2 digits (24 classes), or zero otherwise; and geographical Macro area, which is a dummy variable equal to 1 according to NUTS1 (5 classes), or zero otherwise. NACE

codes are essential to control the strategic businesses (e.g., food supply chain) that were allowed to continue operating during the national lockdown.

Table 1 presents a detailed description of these variables and their construction, while Table A1 in Appendix A shows the correlation matrix. Afterwards, Table 2 shows some preliminary highlights, considering industrial sectors (i.e., NACE codes 2 digits), the variation of our dependent variables, and the proposed key explanatory variable.

Table 1. Dependent and independent variables.

Type	Variable	Explanation
Dynamics under investigation	TFP (added value) $^{\psi}_t$	Composite indicator of firms' ability to create added value
	TFP (revenues) $^{\psi}_t$	Composite indicator of firms' ability to create revenues
	ROA $^{\psi}_t$	Profit $_t$ /Total assets $_t$
	Probability of default $^{\psi}_t$	Incidence index (‰) of expected insolvency $_t$
Explanatory variable	Labor cost (per employee) $_t$	Total labor cost / number of employee $_t$
Control Variables	Credit rating score $_{t-1}$	Count variable that ranges between 1 (worst score) and 7 (excellent score) $_{t-1}$
	Financial debt ratio $^{\psi}_{t-1}$	Total short-term financial debts $_{t-1}$ /Total assets $_{t-1}$
	Trade credit ratio $^{\psi}_{t-1}$	Total short-term operating debts $_{t-1}$ /Total assets $_{t-1}$
	Size $^{\psi}_{t-1}$	Total assets $_{t-1}$
	Seniority $^{\psi}_{t-1}$	Year $_{t-1}$ –Year $_{founding}$
	COVID-19 (% infected) $_t$	Incidence index (%) of individuals positive to COVID-19 $_t$
	Institutional quality index $_{t-1}$	Composite indicator that ranges between 0 and 1 $_{t-1}$
Fixed Effects	NACE code—2 digit (FE)	Dummy variable according to 2 digits (24 classes)
	Macro area (FE)	Dummy variable according to NUTS1 (5 classes)
	Macro area (FE)	Dummy variable according to NUTS1 (5 classes)

Notes: Probability of default is estimated by Bureau van Dijk (source: AIDA). The institutional quality index is estimated according to Nifo and Vecchione (2014) [28], while the TFP according to Levinsohn and Petrin (2003) and Petrin et al. (2004) [17,29]. More precisely, we estimated TFP adopting added value and revenues (as dependent variable, respectively in the first and in the second model), total labor costs and total services costs (as freely variable inputs), raw materials costs (as intermediate input), total fixed net assets (as capital variable). All the economic control variables are lagged by 1 year, so that we could reduce the simultaneity of the firms' performance and managerial decisions. ψ logarithmic transformation. t refers to the year.

Table 2. Variation of labor cost (per employee), productivity, profitability and probability of default between 2019 and 2020. Italian manufacturing industry, active private limited companies.

NACE (2 Digits)	Description	Labor Cost (Per Employee)	TFP (Revenues)	TFP (Added Value)	ROA	Probability of Default
10	Manufacture of food products	0.09%	0.68%	−0.79%	−134.10%	103.49%
11	Manufacture of beverages	−1.11%	1.71%	−1.48%	−43.80%	62.23%
12	Manufacture of tobacco products	−0.32%	37.68%	77.41%	−49.81%	−5.28%
13	Manufacture of textiles	−2.13%	2.06%	−4.12%	−170.75%	123.47%
14	Manufacture of wearing apparel	−2.39%	1.67%	−6.91%	−87.20%	147.54%
15	Manufacture of leather and related products	−2.28%	2.88%	−10.43%	−134.57%	231.55%
16	Manufacture of wood and of products of wood and cork	−1.24%	2.20%	−2.93%	100.80%	63.77%
17	Manufacture of paper and paper products	−1.51%	2.05%	2.12%	−38.57%	27.25%
18	Printing and reproduction of recorded media	−2.46%	1.03%	−4.55%	−114.09%	102.03%
19	Manufacture of coke and refined petroleum products	0.05%	3.07%	1.89%	−55.18%	32.92%
20	Manufacture of chemicals and chemical products	−0.63%	2.35%	8.15%	9.46%	89.30%
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	−0.60%	5.00%	24.99%	−3.75%	18.55%

Table 2. *Cont.*

NACE (2 Digits)	Description	Labor Cost (Per Employee)	TFP (Revenues)	TFP (Added Value)	ROA	Probability of Default
22	Manufacture of rubber and plastic products	5.59%	2.86%	2.15%	−37.92%	41.21%
23	Manufacture of other non−metallic mineral products	−1.22%	3.10%	3.30%	−4.60%	67.92%
24	Manufacture of basic metals	−1.04%	2.83%	−1.42%	−13.58%	41.75%
25	Manufacture of fabricated metal products, except machinery and equipment	−0.81%	1.83%	−1.71%	−47.42%	106.91%
26	Manufacture of computer, electronic and optical products	0.63%	6.32%	4.88%	−48.09%	89.85%
27	Manufacture of electrical equipment	−0.78%	3.47%	2.24%	−4.01%	71.81%
28	Manufacture of machinery and equipment	−0.55%	5.11%	5.04%	−30.95%	115.82%
29	Manufacture of motor vehicles, trailers and semi−trailers	0.85%	7.11%	−0.34%	−198.94%	72.27%
30	Manufacture of other transport equipment	−1.16%	58.93%	6.51%	−152.70%	69.29%
31	Manufacture of furniture	−1.08%	1.89%	−3.63%	−65.21%	133.23%
32	Other manufacturing	−1.90%	2.94%	−0.67%	−5.72%	117.93%
33	Repair and installation of machinery and equipment	−0.36%	2.61%	−0.43%	−2.44%	121.69%
	Manufacturing industry	−0.57%	3.20%	−0.23%	−51.21%	103.68%

Industrial sector of the Italian manufacturing industry and highlights the variation between 2019 and 2020 of TFP, ROA and probability of default, as well as the variation of the labor cost. Hence, according to the evidence proposed in Table 2, on average, the labor cost decreased between 2019 and 2020, confirming the access to layoffs by manufacturing firms, even if we can detect a certain heterogeneity among industrial sectors. For instance, the NACE code 22 (i.e., manufacture of rubber and plastic products) highlights a significant increasing of this cost, which is explained by an increasing of human resources to support a massive production of medical devices to contain the virus. Considering the profitability and probability of default, we can observe a significant and generalized negative impact in both cases, while focusing on the productivity indexes, we can observe an increasing of TFP (revenues) for all sectors, while a significant heterogeneity in case of TFP (added value). This evidence suggests that firms shaped their production strategy according to the restrictions imposed by the government, the adopted policy relief based on layoffs, and the new demand of products. On the one hand, considering the TPF (revenues), we expected that firms were able to adapt their inputs to maximize their revenues, exploiting successfully the available layoff. On the other hand, we might have expected that the restrictions affected negatively the ability to maximize their added value, conditioning negatively the production costs. The proposed empirical analysis investigated these dynamics, confirming whether or not expectations were correct.

Note that, even if there are no available data about the number of layoffs requested by each firm, we can stratify the intensity of this measure by observing the labor cost per employee. Indeed, firms with authorized layoffs were able to decrease this key cost in 2020 and, investigating the variation in the labor cost between 2019 and 2020, we can estimate the impact of such a relief policy. Indeed, firms were not allowed to fire their employee in 2020, which means that a reduction in this cost can be explained by the access to layoffs of the firms. Accordingly, the observations in 2019 are counterfactual concerning the impact of this relief policy is assessed.

To corroborate the collected evidence, we used Multiple Analysis of Variance (MANOVA) as an extension analysis. MANOVA determines the effects of an independent dummy variable (i.e., equal to 1 if the observation was collected during the COVID-19 pandemic, or zero otherwise) on multiple continuous dependent variables (i.e., Total Factor Productivity, Return On Assets, and the expected probability of default). Hence, we had

the opportunity to compare our population of private limited firms, before and after the pandemic, with respect to the multiple continuous variables that represent the managerial dynamics under investigation.

3. Results

Table 3 shows the main results of our empirical analysis. The *Wald chi2* test suggests that the model is statistically significant (*p*-value < 0.0000), while the overall R-squared ranges between 0.27 (Model with "TFP—Revenues") and 0.70 (Model with "Probability of default"). Note that, authors adopted "unemployment rate" as an instrument of our explanatory variable, verifying the robustness of our evidence in case of endogeneity.

Table 3. RE regression model with robust standard errors. Italian manufacturing industry, active private limited companies (2019–2020).

Variable	TFP (Revenues) $^{\psi}{}_{t}$	TFP (Added Value) $^{\psi}{}_{t}$	ROA $^{\psi}{}_{t}$	Probability of Default $^{\psi}{}_{t}$
Labor cost (per employee) $^{\psi}{}_{t}$	−0.0785 ***	−0.0593 ***	0.0738 ***	−0.112 ***
	(0.00796)	(0.00877)	(0.0114)	(0.0134)
Credit rating score $_{t-1}$	0.00397 **	0.0929 ***	0.280 ***	−1.018 ***
	(0.00165)	(0.00185)	(0.00398)	(0.00492)
Financial debt ratio $^{\psi}{}_{t-1}$	−0.0105 ***	0.00108	0.0124 ***	0.120 ***
	(0.00106)	(0.00124)	(0.00309)	(0.00358)
Trade credit ratio $^{\psi}{}_{t-1}$	−0.0965 ***	0.0304 ***	0.189 ***	0.0708 ***
	(0.00363)	(0.00380)	(0.00810)	(0.00863)
Size $^{\psi}{}_{t-1}$	−0.108 ***	0.153 ***	−0.0342 ***	−0.00634
	(0.00193)	(0.00195)	(0.00424)	(0.00452)
Seniority $^{\psi}{}_{t-1}$	−0.00927 ***	−0.0538 ***	−0.162 ***	−0.0845 ***
	(0.00218)	(0.00225)	(0.00543)	(0.00585)
COVID−19 (% infected) $_{t}$	−0.00122	−0.0918 ***	−0.153 ***	0.122 ***
	(0.00126)	(0.00236)	(0.00601)	(0.00767)
Institutional quality index $_{t-1}$	−0.0696 ***	−0.0335 *	0.149 ***	−0.297 ***
	(0.0167)	(0.0191)	(0.0467)	(0.0481)
Constant	1.748 ***	0.0372	0.717 ***	6.445 ***
	(0.0224)	(0.0253)	(0.0455)	(0.0507)
Macro area (FE)	Yes	Yes	Yes	Yes
NACE code—2 digits (FE)	Yes	Yes	Yes	Yes
Wald chi2 (32)	10,092.85	14,078.39	8659.22	83,042.39
Prob > Chi2	0.0000	0.0000	0.0000	0.0000
R−squared (overall)	0.267	0.282	0.181	0.702
Observations	68,741	67,898	61,775	66,184
Number of firms	41,155	40,905	39,715	38,415

Notes—ψ logarithmic transformation. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. t refers to the year.

Table 4 highlights the results of our extension analysis, showing the MANOVA output. In particular, the table includes four multivariate test statistics (i.e., Wilks' lambda, Pillai's trace, Lawley-Hotelling trace and Roy's largest root). Table A2 in Appendix A shows additional evidence on data of our extension analysis, with the output of a multivariate regression model in which we estimated the impact of COVID-19 pandemic (dummy variable used in the MANOVA) on the selected multiple continuous dependent variables (i.e., Total Factor Productivity, Return On Assets, and the expected probability of default).

Table 4. MANOVA. Italian manufacturing industry, active private limited companies (2019–2020).

Test	Statistic	Prob > F
Wilks' lambda	0.9839	0.0000
Pillai's trace	0.0161	0.0000
Lawley-Hotelling trace	0.0163	0.0000
Roy's largest root	0.0163	0.0000

Notes: 127,372 observations.

3.1. Discussion: COVID-19, Relief Policy and Firms Dynamics

According to the collected results, COVID-19 (% infected) had a negative impact on the firms' dynamics, decreasing productivity (added value) and profitability (ROA), and increasing default probability. Nevertheless, the layoffs were able to alleviate the impact on productivity. Indeed, focusing on the key explanatory variable, if firms had access to layoffs in 2020 (i.e., the labor cost went down), we would expect a higher level of productivity (H1) but, at the same time, we would expect a negative impact on profitability (H2) and default probability (H3). According to our models and assuming 320 h of layoffs (i.e., labor cost reduction equal to 18.18%), we detected an 1.59% increase in TFP (revenues) and an 1.20% increase in TFP (added value), as well as an 1.47% decrease in profitability and a 2.27% increase in default probability. Hence, even if the relief policy was able to maintain high level of productivity, reducing the labor cost through layoffs, the adopted measures were not able to alleviate the negative impact of the pandemic, and therefore we cannot reject the proposed three hypotheses. The extension analysis confirmed this evidence. On the one hand, all tests rejected the null hypothesis, indicating some kind of difference, in terms of variance, between the selected variables (Table 4); while, on the other hand, the multivariate regression model emphasized the negative impact of COVID-19 (impact) on the dynamics under investigation (Table A2 in Appendix). Lastly, comparing the preliminary insights showed in Table 2 with the coefficients in Table 3, we can observe how the restrictions imposed by the government to the different industrial sectors during the lockdown and the new demand of products are determinant in explaining firms' productivity. Indeed, ceteris paribus, layoffs had a positive impact both on TFP (revenues) and TFP (added value), while significant heterogeneity occurred within the industrial sector (see Table A3 in the Appendix).

These results are also consistent with preliminary evidence proposed in the literature and based on the available information collected during the pandemic [30]. Even if the recent COVID-19 crisis has generated a concern that productivity (which was already at historically low levels) may further decline [14], the Italian policy reform was able to maintain a high level of productivity, decreasing labor costs. Nevertheless, the relief policy was not able to support the businesses, with a significant decrease of their profitability and an increase of their default probability. Indeed, according to literature [31], there were demand-side changes due to peoples' immediate responses to the pandemic (e.g., reduced demand for goods or services). Moreover, sectors relating to manufacturing were more likely to be constrained by supply shocks with reductions due to the closure of non-essential industries and workers not being able to perform their activities at home. Our evidence supports these claims, as highlighted by the collected results. Taking these considerations into account, the successive sub-section proposes some practical implications.

3.2. Practical Implications

Practical implications concern necessary improvements to the above relief policy. In particular, according to our results, the introduction of layoffs could be integrated with interventions to support the demand of manufactured products. This measure could support the manufacturing industry at this difficult time, raising their profitability and, in this way, decreasing their default probability. This is an essential measure, as highlighted by stakeholders (See *Commissione Nazionale per le Società e la Borsa* (CONSOB), link: https://www.consob.it/web/investor-education/crisi-sanitaria-economica, accessed on

1 September 2022). Additional interventions could concern the digitalization of services to support the resilience of firms on the market, as well as interventions to support the introduction of innovative products that might respond to new necessities. In both cases, there could be opportunities to make these businesses more competitive in the market, especially in this critical context. Finally, even if the layoffs adopted by the Italian government reduced the potential uneven impact of the pandemic, preserving job stability for millions of (fixed) workers, interventions to support remote working could be advisable, fostering workers' resilience (e.g., smart-work). Indeed, the possibility of working remotely affects only a minority, and it is not equally distributed among the workforce [9]. Obviously, the workers excluded by this opportunity could face higher risks of negative outcomes (i.e., lower income or unemployment, as well as worse health conditions); the pandemic significantly worsened their conditions. Accordingly, policy makers should adopt interventions to remove all technical, organizational and social features that might prevent this opportunity.

4. Discussion: Firms Characteristics and the Institutional Environment

Considering the control variables and focusing on the main dynamics (i.e., profitability and default probability), all the coefficients are interesting. On the one hand, the regressors on firms' maturity and financial governance are consistent with the current literature [32,33], emphasizing the role of external financial resources and business strategies (e.g., signaling hypothesis for young and small firms). On the other hand, consistent with the current literature [34,35], the institutional environment can have a positive impact on the society and the market. Our results confirm this, showing a positive relation between the institutional quality index and the profitability of these businesses, as well as a negative relation with respect default probability.

Note that the proposed analysis focuses on the impact of the COVID-19 pandemic on firms, considering dynamics in the short-term. More in-depth investigations are necessary to shed light on the productivity and financial strategies of firms, possibly confirming the collected results.

5. Conclusions

COVID-19 had a significant negative impact on the Italian economy, due mainly to national lockdowns and the population's inability to buy products. Uncertainties about the future and the end of the pandemic amplified these difficulties, further reducing the demand for goods. Interventions by the Italian government were aimed at protecting employees both through layoffs and by forbidding firms from dismissing their workers, supporting productivity. Although these interventions were able to control social unrest in the country, the price paid by firms could have been too high. Our results confirm these expectations and quantify the aforementioned impact in terms of profitability and bankruptcy risk. Without appropriate interventions by policy makers, many manufacturing firms were destined to decrease their competitiveness on the global market. In particular, we would have expected major interventions to support the demand for goods or to minimize financial shocks due to lower revenues.

According to our evidence, practical implications concern necessary improvements to the above relief policy including interventions to support the demand of manufactured products, interventions to support the digitalization of services, interventions to support the remote working, and interventions to support the introduction of innovative products on the market. These interventions could support the Italian manufacturing industry in facing potential new waves and/or challenges, creating the necessary conditions for a sustainable economic environment.

Although the results presented here are interesting, our work has clear limits since we focused on a very peculiar case study, i.e., the Italian manufacturing industry, and we had no access to micro data that could corroborate our expectations (e.g., the ability of different occupations to work from home, and access to layoff). If new and more recent

data are available, our future studies will investigate further these dynamics to corroborate the findings gathered thus far. In addition, if data on other manufacturing industries become available, there will be opportunities to investigate alternative policy reliefs, and to compare different approaches to mitigate next waves.

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Appendix A
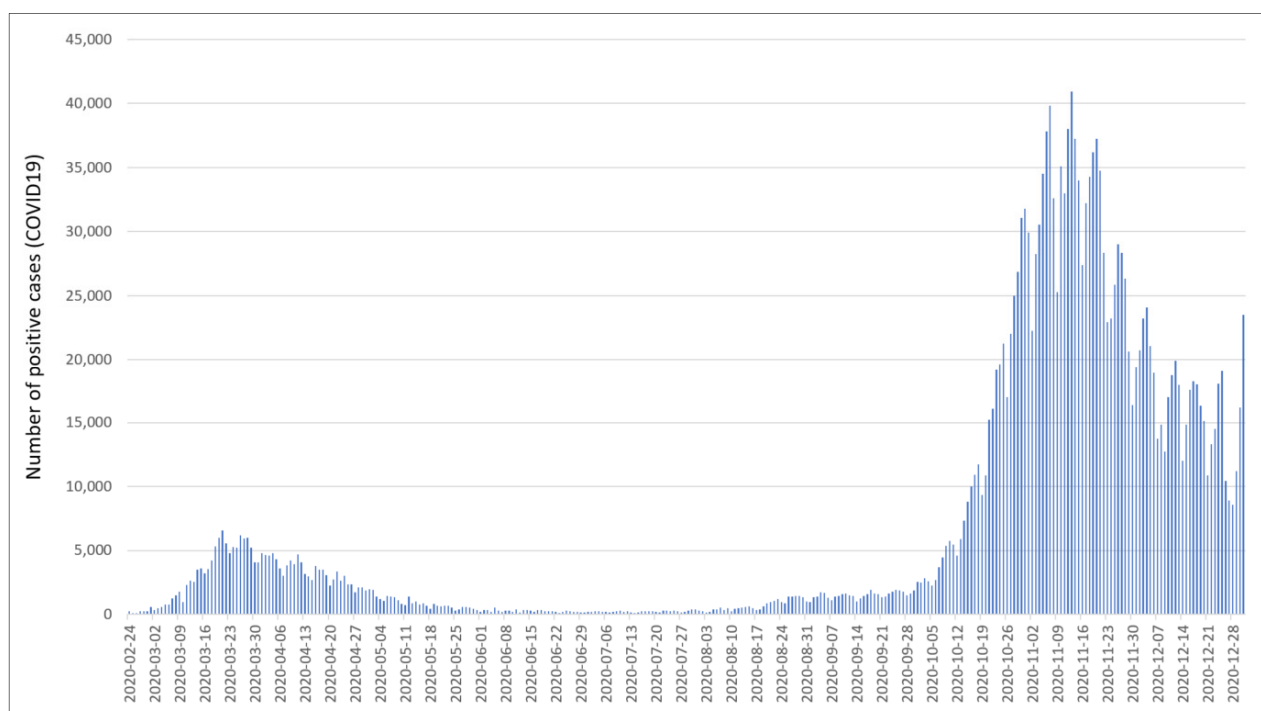
Figure A1. Number of positive cases (CVOID-19)—Italy (2020).
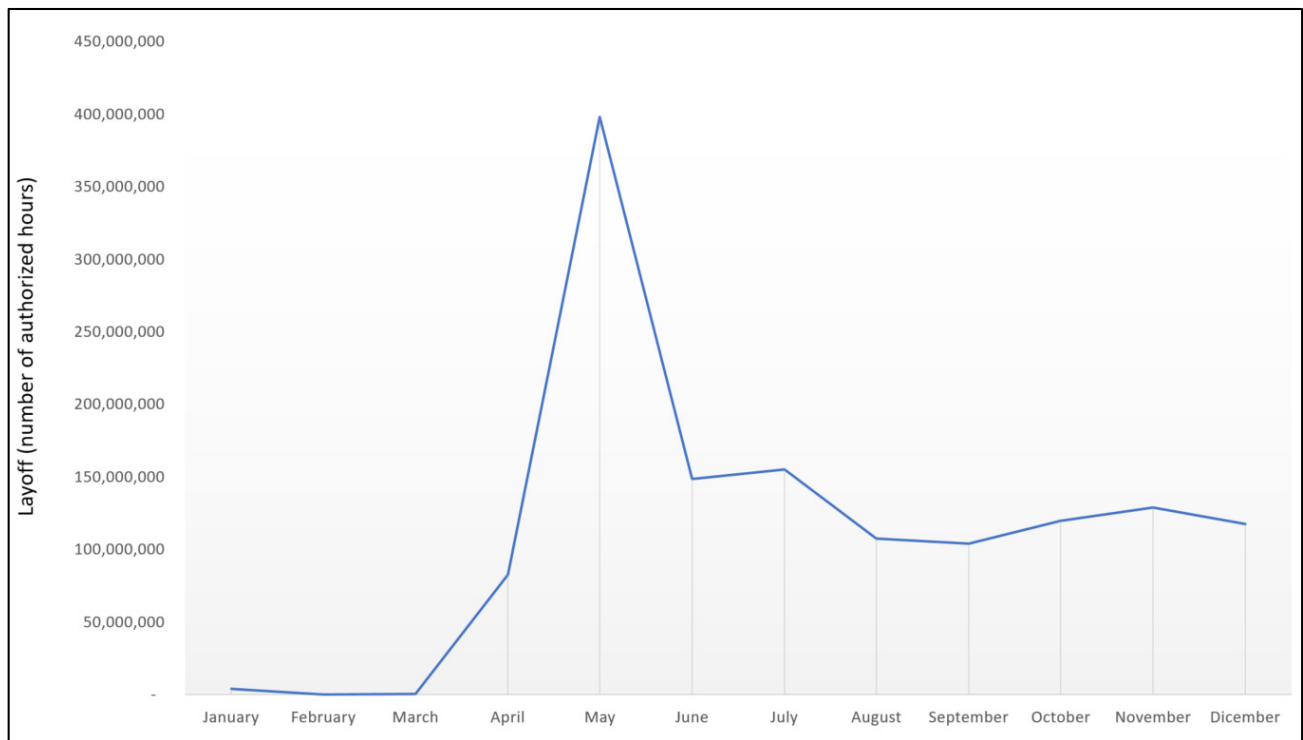
Figure A2. Layoff (number of authorized hours)—Italy (2020).

Table A1. Correlation matrix.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Labor cost (per employee)	1							
Credit rating score	0.105	1						
	(0.000)							
Financial debt ratio	−0.050	−0.429	1					
	(0.000)	(0.000)						
Trade credit ratio	−0.071	−0.277	0.033	1				
	(0.000)	(0.000)	(0.000)					
Size	0.549	0.099	−0.080	−0.129	1			
	(0.000)	(0.000)	(0.000)	(0.000)				
Seniority	0.274	0.280	−0.011	−0.227	0.443	1		
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)			
COVID−19 (% infected)	0.027	0.084	−0.011	−0.042	0.089	0.060	1	
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)		
Institutional quality index	0.268	0.111	0.055	−0.055	0.181	0.163	0.198	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Notes—Pairwise correlation coefficients with significance level in parentheses.

Table A2. Multivariate regression model. Italian manufacturing industry, active private limited companies (2019–2020).

VARIABLE	TFP (Revenues) $^{\psi}_t$	TFP (Added Value) $^{\psi}_t$	ROA $^{\psi}_t$	Probability of Default $^{\psi}_t$
COVID−19 $_t$ (Impact)	0.0110 ***	−0.0498 ***	−0.2345 ***	0.3864 ***
	(0.00233)	(0.00198)	(0.00597)	(0.01087)
Constant	0.7951 ***	1.3046 ***	1.6213 ***	−0.0517 ***
	(0.00162)	(0.00138)	(0.00415)	(0.00755)

Notes—ψ logarithmic transformation. Standard errors in parentheses. *** $p < 0.01$. t refers to the year.

Table A3. Fixed effects adopted in the RE regression model: NACE codes (2 digits).

VARIABLE	TFP (Revenues) $^{\psi}$ t	TFP (Added Value) $^{\psi}$ t	ROA $^{\psi}$ t	Probability of Default $^{\psi}$ t
Code 11	0.0420 ***	−0.0270	−0.137 ***	0.136 ***
	(0.0146)	(0.0274)	(0.0466)	(0.0385)
Code 12	0.0130	−0.117	0.319	0.111
	(0.0489)	(0.269)	(0.480)	(0.307)
Code 13	0.0711 ***	−0.0579 ***	−0.0487	0.0113
	(0.0107)	(0.0120)	(0.0310)	(0.0284)
Code 14	0.115 ***	−0.114 ***	0.0188	0.156 ***
	(0.0123)	(0.0129)	(0.0277)	(0.0270)
Code 15	0.0724 ***	−0.0706 ***	0.0721 **	0.0862 ***
	(0.0115)	(0.0123)	(0.0286)	(0.0281)
Code 16	−0.0484 ***	0.00147	−0.0136	0.0430
	(0.00763)	(0.0106)	(0.0267)	(0.0265)
Code 17	0.0215 **	0.0409 ***	0.112 ***	−0.167 ***
	(0.00845)	(0.0119)	(0.0331)	(0.0325)
Code 18	0.0416 ***	−0.0373 ***	0.0207	0.0745 **
	(0.00990)	(0.0120)	(0.0299)	(0.0292)
Code 19	0.156 ***	−0.0392	0.0934	−0.0705
	(0.0414)	(0.0728)	(0.0965)	(0.121)
Code 20	0.00514	0.0799 ***	0.255 ***	−0.152 ***
	(0.00895)	(0.0135)	(0.0297)	(0.0297)
Code 21	0.0488	0.161 ***	0.466 ***	−0.0649
	(0.0300)	(0.0375)	(0.0838)	(0.0802)
Code 22	−0.00404	0.0695 ***	0.177 ***	−0.171 ***
	(0.00680)	(0.00905)	(0.0230)	(0.0230)
Code 23	−0.00522	−0.00764	−0.0699 ***	0.00971
	(0.00749)	(0.0114)	(0.0257)	(0.0249)
Code 24	0.0610 ***	0.0371 ***	−0.0302	−0.01000
	(0.0120)	(0.0132)	(0.0370)	(0.0340)
Code 25	0.0493 ***	0.0475 ***	0.0844 ***	−0.0688 ***
	(0.00567)	(0.00737)	(0.0178)	(0.0178)
Code 26	0.000784	0.103 ***	0.249 ***	−0.0920 ***
	(0.0129)	(0.0121)	(0.0305)	(0.0312)
Code 27	−0.0182 *	0.0556 ***	0.142 ***	−0.0493 *
	(0.00977)	(0.0114)	(0.0278)	(0.0273)
Code 28	−0.0264 ***	0.0584 ***	0.159 ***	−0.0195
	(0.00641)	(0.00824)	(0.0201)	(0.0204)
Code 29	−0.0129	0.0380 **	0.0881 **	−0.0352
	(0.0156)	(0.0171)	(0.0429)	(0.0417)
Code 30	0.0425 *	0.0665 ***	0.165 ***	0.0948 **
	(0.0242)	(0.0200)	(0.0468)	(0.0440)
Code 31	−0.0675 ***	−0.0534 ***	−0.0420	0.140 ***
	(0.00732)	(0.0111)	(0.0267)	(0.0258)
Code 32	−0.00862	−0.0120	0.143 ***	−0.0673 **
	(0.00966)	(0.0126)	(0.0295)	(0.0303)
Code 33	0.110 ***	0.102 ***	0.268 ***	−0.0615 **
	(0.0104)	(0.0100)	(0.0238)	(0.0265)

Notes—ψ logarithmic transformation. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. t refers to the year.

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