# Covid-19, Corporate Survival and Public Policy: The Role of Accounting Information and Regulation in the Wake of a Systemic Crisis

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**ABSTRACT**

The economic crisis triggered by the Covid-19 pandemic prompted governments to issue several relief mechanisms to hold up companies and workers. This study analyzes how accounting information and regulation can support policymakers in the wake of a systemic crisis. Based on an accounting-based framework and readily available data from financial statements, it forecasts the impact of the crisis in terms of losses, equity depletion, and corporate defaults, absent government intervention. Next, it quantifies the costs and effects of five relief mechanisms in alleviating the risk of generalized corporate bankruptcies. The effects of the health pandemic and relief mechanisms on profitability and equity shortfalls are estimated for a sample of 586,076 privately held Italian firms. The findings indicate that the number of companies facing bankruptcy risk would increase from 65,463 (11% of the population) in 2019 to 153,681 (26%) in 2020, absent any government intervention. Altogether, these firms employ 1.4 million employees and have a total exposure to the financial industry equal to € 68 billion in loans. Next, we assess the effects of relief mechanisms introduced by the Italian government to support corporations, whose aggregate costs reach € 49.33 billion in 2020, and find that the interventions 'rescue' about 43,000 firms otherwise in default. Finally, the study adds to the debate on the role of accounting regulation in the wake of a systemic crisis by (a) discussing the effects of temporary changes to accounting rules on the informativeness and transparency of financial statements, and (b) suggesting alternative ways to modify accounting rules to safeguard corporate survival without compromising the informativeness of financial statements once the crisis reaches a halt.


**Keywords:** COVID-19; Accounting Regulation; Equity shortfalls; Systemic Crisis; Corporate Bankruptcy; Public policy

*'One of the issues […] is that relief measures, while necessary, have had negative implications for transparency.'*

Andrea Enria, Chair of the ECB Supervisory Board

Public hearing at the European Parliament on March 23, 2021

## 1. Introduction

Systemic crises triggered by health pandemics and natural disasters such as earthquakes and floods seriously threaten economic activities and societal well-being (Calhoun and Tedeschi, 2006; Zhang et al., 2009). Despite a wide-spread perception that such events are 'random and sporadic', recent evidence suggests otherwise (De Mel et al., 2012; Sargiacomo, 2015). Authoritative bodies highlight an increasing risk of events that adversely affect socioeconomic activities (e.g., Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services – IPBES 2020): their large-scale consequences call for policy interventions to mitigate the effects of shocks. A case in point is the recent spread of SARS-CoV-2 (Covid-19) defined by the World Health Organization as a 'global pandemic warning', whereby most governments implemented generalized lockdowns to restrict people's mobility, and devised relief mechanisms to protect firms and workers (Oxford COVID-19 Government Response Tracker, 2020).[2]

We argue that in addition to usual suspects, such as banking regulation (Herring and Schuermann, 2020), macroprudential policies and changes in governance rules (Zingales, 2009), accounting information and regulation offer valuable support to policymakers in understanding how crises shape firm financial conditions as well as in designing relief mechanisms to support corporations (Minnis and Schroff, 2017). The outbreak of the Covid-19 pandemic offers an opportunity to examine the role of accounting information and regulation in supporting public policy in the aftermath of a systemic crisis. For example, at the onset of the health pandemic, illiquidity surged as a major threat to corporations (De Vito and Gomez, 2020) with public interventions aimed at reigniting the liquidity channel (Banerjee et al., 2020). Empirical evidence documents that government concerns were echoed by stock market investors who abruptly sold shares in solvent but illiquid companies (Ramelli and Wagner, 2020). Policies aiming at safeguarding corporate liquidity, either via public guarantee schemes (Gonzalez-Uribe and Su, 2021), or temporary moratoria on debt, may prove effective

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[2] The IMF offers detailed guidance on the different governmental measures and relief mechanisms in responses to the Covid-19 pandemic. Available at, https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19, last accessed, September 2021.

in the short run (Core and De Marco, 2021); nonetheless, they may not suffice in mitigating the long-run effects of the crisis; in fact, a key risk is a stark increase in the number of *de facto bankrupt* companies (Giacomelli et al., 2021) despite their sound fundamentals in the precrisis period (De Haas and Van Horen, 2013). A simple accounting logic helps us here: replacing cash from revenues with cash from loans raises two issues (a) missing revenue in the face of less flexible costs exerts negative effects on profitability and depletes equity; and (b) an increase of liability enhances the risk of future defaults (Dorr, Licht, and Murmann, 2021). This risk increases for companies with thin equity at the beginning of the crisis (Stacchini and Degasperi, 2015). Furthermore, increased debt with shrinking equity worsens leverage ratios, creates a debt overhang problem (Myers, 1977), and slows down the pace of investments required to overcome the crisis (Kalemli-Ozcan et al., 2016). The latter issue is magnified in the case of privately held firms with no traded instruments on financial markets and relying primarily on bank financing and trade credit. Therefore, failing to anticipate the effects of crises on profitability and equity depletion, along with a liquidity crunch, can trigger a downward spiral: the rise of de facto defaulted firms (Gourinchas et al., 2020) will force financial institutions to write down loans; next, taxpayer funds will be used to servicing loans backed by public guarantees issued at the inception of the pandemic.

This study investigates how corporate financial information and accounting regulation aid policymakers in the wake of a systemic crisis (Bhimani, 2008), in the following ways: first, following an accounting-based framework, it estimates the effects of the health pandemic and government interventions on profitability, equity depletion, and corporate bankruptcies; second, it compares the costs and benefits of relief mechanisms designed to safeguard corporations; third, it analyzes the benefits and risks of temporary changes to accounting rules perused by governments.

We performed our analyses on a sample of 586.076 Italian corporations with available financial data in 2019. Our sample is representative of the universe of Italian limited liabilities and joint-stock companies (except in the financial services and real estate industries) active at the end of 2019. The focus on the Italian context is justified on two grounds: Italy has been the first country outside of China to be severely affected by the pandemic (Davis et al., 2020), and the one in most distress since then (Ding et al., 2021). Furthermore, the Italian government has been the first to devise a series of relief mechanisms ranging from one-off contributions to extraordinary furlough, including (temporary) changes to accounting regulations to support corporations. We estimate the impact of the crisis on firms' income and equity at the end of 2020 in the following way: *first*, we forecast corporate revenues in 2020 based on reported

sales in 2019 (pre-Covid-19) and the change in sales - by industry - filed monthly by companies with the Italian Taxation Office (Y-2020), relative to the corresponding period in the previous year (Y-2019) (see Appendix A).[3] *Second*, we estimate the change in (operating) costs employing a firm-specific measure of cost-elasticity, based on observable correlations between revenues and operating costs for each firm in the years before the crisis. Last, we derive (expected) income and equity based on the assumption that non-operating gains and expenses in 2020 would mimic those in 2019.

Our baseline estimation suggests that by the end of 2020, absent direct government intervention, the average net income falls from an average of € 114,000 per firm in 2019 to a negative € 78,000 in 2020. Relatedly, the number of firms in distress goes from 11% of the sample in 2019 to 26% in 2020.[4] Altogether, the firms potentially in distress employ 1,383,000 employees and have a total debt net of short-term assets equal to € 68 billion.

Moving from the baseline estimate, we assess the effects of five relief mechanisms devised by the Italian government to support corporations on their income and equity at the end of 2020. Mechanisms consist of 'real' contributions (e.g., cash-based) and 'accounting-based' interventions that help protect firms from excessive losses or depletion of assets. Specifically, the mechanisms are: (1) an extraordinary furlough granted to alleviate the cost of labor (LAB); (2) a one-off contribution for the partial restoration of the missed revenues in April 2020 compared to April 2019 (REV); (3) a one-off contribution towards rental expenses in the period between March and May 2020 (RENT). The two 'accounting-based' mechanisms are: (4) an option to suspend amortization charges for fixed assets (AMT) in 2020, and (5) an option to revalue fixed assets (REVAL). Our estimations assume that eligible firms will exploit

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[3] We exploit the monthly data on corporate sales available through the Italian Taxation Office, albeit aggregated by industry, to estimate the effects of the health pandemic on corporate revenues absent the government interventions. Monthly data allow capturing promptly the ensuing dynamic of revenues at the inception of the crisis, hence before the relief mechanisms were approved or even discussed. Nevertheless, we would like to highlight an important caveat: reliance on the reported data on corporate revenues in 2020 does not represent the most suitable approach to estimate revenues absent any government interventions. In fact, corporate revenues reported in 2020 already incorporate a series of stimuli at the economy-wide level. In section 4.6 of the manuscript, we tackle this issue more fully and offer alternative estimations to alleviate this concern; also, we discuss it in the limitation section (6). We thank one of the reviewers for the insightful comment and for bringing this issue to our attention.

[4] The general category of 'firms in distress' include both companies with negative equity (representing 6% of firms in 2019 and 20% in 2020, absent government interventions) and companies whose equity is positive, yet below legal requirements. The latter group represents 5% of firms in 2019 and an additional 6% of the sample in potential troubles in 2020. In Europe limited liability companies are subjects to minimum capital requirements to stay fully operational. In Italy the minimum capital for a "Società per azioni - Spa" is €50,000, for a "Società a responsabilità limitata - Srl" is €10,000 and for a "Società a responsabilità limitata semplificata - Srls" is €1. In Germany for a "Gesellschaft mit beschränkter Haftung - GmbH" the minimum capital is €25,000. In France for a "Société anonyme - SA" the minimum capital is €37,000 whilst for the "Société à responsabilité limitée - Sarl" and for the "Société par actions simplifiée - Sas" is €1. In Spain for the "Sociedad Limitada – Sl" the minimum capital is €3,000 whilst for the "Sociedad Anónima - A" is €60,000.

all available mechanisms put forward by the Italian government;[5] hence, we offer an upper bound in terms of their ability to reduce the risks of corporate bankruptcy.

We find that the first four mechanisms lead to a marked improvement in terms of profitability (e.g., the average income turns positive to € 43,000), as well as in terms of the number of firms with negative equity dropping to from 20% - absent government intervention - to 14%. Next, we project the potential effects of the fifth mechanism by estimating the required revaluation of fixed assets (relative to their carrying amount) needed to replenish equity above the legal threshold in 2020. The findings indicate that, on average, firms in distress after Covid-19 should revalue their fixed assets by a multiplier of 24 times, which is hard to justify based on accounting and economic grounds.

This study offers the following contributions: first, it adds to the recent debate on the economic impact of a systemic crisis triggered by a health pandemic (De Vito and Gomez, 2020; Gourinchas et al., 2020) by leveraging on a microlevel, accounting-based perspective in assessing the effects of the Covid-19 crisis on profitability, equity shortfalls, and insolvencies. Specifically, the paper offers an accounting-based framework that incorporates the effects of vanishing revenues in forecasting the effects of a systemic crisis, as well as relief mechanisms on profitability, equity, and corporate insolvency. The second contribution lies in quantifying the effects of the crisis on corporations and the extent to which government-backed relief mechanisms mitigate the risk of corporate bankruptcy. Third, it enriches the literature on changes in accounting regulation as a policy tool in the wake of a systemic crisis (Sunder, 2016); it highlights the risks of temporary changes in accounting policies and discusses how a relatively easy to implement change in accounting regulation - such as capitalizing incompressible 'Covid-19' related costs - can help both alleviate corporate distress in the short term, as well as protect transparency and comparability of financial statements in the long run.

## 2. Theoretical framework and institutional setting

Accounting information supports policymakers in designing public policy in the wake of a systemic crisis, in terms of: (a) identifying the key financial issues corporations face, in the short and in the long run; (b) estimating the effects of policy interventions on corporate survival and public finance; and (c) evaluating the effectiveness of alternative policy interventions. We first discuss how systemic crises affect corporate profitability and equity in relation to solvency

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[5] Without granular data on specific firm level decisions, it is hard to ascertain which companies will exploit the available mechanisms to increase income or equity. Given that accessing the mechanisms had no costs for corporations, we assume that all corporations would willingly resort to them.

and survival (Mafrolla and D'Amico, 2017). Next, we offer an overview of the main relief mechanisms implemented by the Italian government to support corporations before discussing how they taper the effects of the health pandemic on their survival.

**2.1 The Effects of the Crisis on Profitability, Equity, and Corporate Bankruptcies**

Lockdowns and restrictions on people's mobility imposed by national authorities severely affected corporate revenues, especially in industries such as tourism, leisure, travel, and manufacturing (OECD, 2020). Temporary halts to business activities deemed 'not essential' decreased firm productivity and sales; similarly, lockdowns affected people' behavior due to uncertainty about the spread of the virus, curtailing consumption and investment (Ozili and Arun 2020). Thus, companies that lost sales revenues experienced a sudden liquidity crisis. To remedy this, nearly all governments and the European Central Bank sought to address this issue through generous liquidity injections (Anderson et al., 2020).[6] Although timely and valuable in ensuring liquidity through increased access to loans and debt, moratoria does not mitigate two major threats to corporations in the long run: an increased risk of default and a slowing down in the pace of investment and growth to recover from the crisis (Kalemli-Ozcan et al., 2016).

The marked drop in revenues experienced by many firms is not paralleled by a similar reduction in operating costs, both financial and non-financial. This is due to the limited ability to renegotiating contracts, thus forcing firms to bear fixed or semi-fixed costs despite a productivity slowdown (Banker et al., 2013). The consequences are plummeting profitability and equity depletion due to unforeseen losses (Carletti et al., 2020). In such a scenario, the risk of insolvency rises if equity drops below legal thresholds and firms may face distress or worsening of their credit standing, unless financial resources are available to replenish capital.[7] Therefore, in addition to the focus on liquidity (Schivardi and Romano, 2020), policy makers must account for the effects of the crisis on corporate profitability, equity, and long-term solvency. These are distinct yet interrelated issues: in fact, whilst liquidity constraints may occur at any point in time throughout the year, an appreciation of languishing profitability is temporarily shifted to the end of fiscal year. The temporal mismatch between the two may advocate for relief mechanisms addressing the liquidity crunch in the short term, while overlooking the longer-term consequences of the crisis.

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[6] The 'Targeted-Longer-Term Refinancing Operations' is a noticeable example of a direct intervention of the ECB.
[7] Interestingly, undercapitalization is a good predictor of insolvency and of the dissolution of the company (Orlando and Rodano, 2020) or anticipates the firm going out of business.

This study emphasizes the role of accounting information in detecting the systemic risk of generalized equity shortfalls, above and beyond the emphasis on liquidity for two reasons: first, liquidity shortage does not automatically entail corporate default because resources may become available via renegotiating loans or trade financing (Gourinchas et al., 2020). In fact, firms may be able to re-negotiate trade credit (debt) conditions as well as relying on debt moratoria. Second, guaranteeing firm survival through liquidity injections despite negative equity can amplify the risk of 'zombie firms' (Schivardi et al., 2020), with negative consequences in terms of access to credit and competitiveness for viable firms (Urionabarrenetxea et al., 2018), and country-level growth (Caballero et al., 2008).

## 2.2 The Institutional Setting and Relief Mechanisms in Italy

Italy has been the first country outside of the Asian continent to be hit by the Covid-19 pandemic (Ding et al., 2020). On February 23, 2020, two weeks before the official declaration of a general pandemic by the WHO, two largely populated and economically important regions (Lombardia and Veneto) were locked down due to the spread of the virus. A nationwide lockdown was enacted on March 11, 2020. More importantly, on March 20, the Italian government imposed a temporary shutdown (up to May 4, 2020) on all business activities operating in 'non-essential' sectors; Essential industries were identified based on their ATECO industry code (e.g., a national classification comparable to NACE or NAICS).[8] Following a short period of partial laxing of restrictions, a spark in the number of Covid-19 infections prompted the Italian authorities (on October 2020) to introduce a national curfew and implement a system of lockdowns and restrictions on mobility at regional level until the end of 2020.

Beginning in March 2020, the Italian government devised a wide range of relief mechanisms to support the economy. Interestingly, some of these mechanisms offered direct cash-based support to corporations (either in terms of cash reimbursement or fiscal benefits), while other mechanisms entailed temporary changes to accounting principles. Overall, the amount of public resources mobilized by the Italian government through various mechanisms is sizeable: €5.1 billion to directly support the credit supply; a total of (nominal) €400 billion in terms of state-guaranteed loans (equaling to 25% of yearly GDP) to prompt liquidity. Given our focus on the effects of the crisis on firm profitability and equity depletion, we included five

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[8] Specifically, the DPCM OG n. 76, March 22, 2020, defined which sectors were not subject to the lockdown ("essential sectors"). All the other sectors were considered "non-essential" and so subject to the lockdown. Available at https://www.gazzettaufficiale.it/eli/id/2020/03/22/20A01807/sg last accessed on March , 2021.

major interventions that affect profitability and equity, while we exclude mechanisms that aim to support corporate liquidity (Core and De Marco, 2021), or a temporary moratorium on the repayment of bank loans or debts to public entities.

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### 2.2.1 Furlough and wage subsidies (LAB)

The first relief mechanism granted all companies access to a dedicated 'furlough' due to Covid-19 throughout 2020 (LAB).[9] , combining a restriction to dismissal or firing of employees for the same period, allowing companies to temporarily reduce and suspend the workforce considering the reduction in business activities. Furloughed employees are entitled to a state-paid allowance corresponding to 80% of their monthly salary; firms are levied from paying salaries while paying a fee depending on the size of the drop in sales in the first six months of 2020, vis-à-vis the corresponding period in 2019. There were no restrictions in terms of firms or industries entitled to furlough: unsurprisingly, as shown in Appendix B, the two most affected sectors in terms of the number of firms relying on the furlough were construction (e.g., 58,60% of firms resorted to the furlough) and the accommodation and food sectors (56,90%).[10] Section 3.3.1 details how we estimated the effects of this intervention.

### 2.2.2 One-off mechanisms: revenue allowance (REV) and rental charges (RENT).

Two additional support mechanisms were launched on May 19, 2020, the first (DL 34/2020, Art. 25) entailed a one-time cash-based allowance to firms whose revenues dropped by at least 1/3 in April 2020 compared to April 2019 (REV).[11] The mechanism was accessible to a large portion of firms whose yearly turnover was below € 5M in 2019 (i.e., 534,599 eligible firms), and offered a cash contribution equaling up to 20% of the missed revenues in April. A second one-off mechanism (DL 34/2020, Art. 28) entails a cash contribution covering 60% of the rental expenses and fees (e.g., rental of properties for nonresidential use, leasing, and

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[9] Law decree March 18, 2020 no. 18 ("Cura Italia decree").

[10] The Appendix B reports the data aggregated at the industry level offered by the Bank of Italy and the INPS (National Institute for Social Security) (Bank of Italy and INPS 2020) regarding the percentage of firms resorting to the furlough in each industry (%FUR_FIRMSj), and the average percentage of employees on temporary layoffs in each industry (%FUR_EMPj).

[11] Law Decree May 19, 2020 no. 34 ("Decreto Rilancio").

concessions) incurred by firms in March, April, and May 2020 (RENT). Eligible companies were those that experienced a revenue drop in the relevant period of at least 50% compared to the same period in 2019. Section 3.3.2 details how we estimate the effects of these interventions.

*2.2.3 Accounting-based mechanisms: suspension of amortization charges (AMT) and revaluation of fixed assets (REVAL)*

Although the previous mechanisms involved a cash contribution that affected both the financial position and profits of the companies, the fourth and fifth mechanisms introduced in October (Law 126/2020) are merely 'accounting-based'. In fact, to minimize the risks of excessive losses forcing firms into bankruptcy, the government allowed companies to exploit the accrual-based nature of some accounting elements to shift current costs to the future (e.g., through the suspension of amortization charges), or revalue potentially underestimated fixed assets, thus strengthening equity capital through 'revaluation reserves.'

The first accounting-based mechanism allowed companies to suspend amortization and depreciation charges related to tangible and intangible fixed assets for fiscal year 2020 (AMT). This will entail a one-year extension of the initial amortization and depreciation plan for the affected assets. Depreciation and amortization are non-cash expenses that affect a company's income statement; therefore, their deferral will have a positive impact on net income and equity in 2020 but will not have an effect on liquidity.[12] Such a mechanism is designed as an 'option' both in terms of choosing to exploit it or not, and in terms of individual or classes of assets subject to delayed amortization. Therefore, it is hard to anticipate which firms will exploit it and its aggregate effects in terms of profitability gains. Section 3.3.4 details how we estimate the effects of such intervention.

A second accounting-based mechanism allows companies to revalue fixed, tangible, intangible, and financial assets (REVAL). Although these revaluations are consistent with IAS 16 and IAS 38 for IFRS compliant firms, according to the Italian GAAP (OIC 16) these must be authorized by a special legislative intervention. Revaluation allows companies to restore a 'current' value of each underlying asset based on its recoverable amount, being either the 'value

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[12] It is worth noting that despite the delay of amortization charges in financial statements following Civil Code Law, from a tax perspective these are still deductible in FY 2020. Hence firms would benefit twice from higher income in 2020 and lower tax burden. As per normal, reversals will occur in the future. From a public finance perspective, the shift to the future of amortization charges, entails a drop in revenues from corporate taxes (as their taxable income will be lower).

in use' or an exit value obtained in the sale hypothesis.[13] Sections 3.3.4 and 3.3.5 detail how we estimated the effects of these two interventions. Table 1 describes each intervention.

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## 3. Empirical strategy

### 3.1 Sample and descriptive statistics

Our analyses are based on a highly representative sample of 586.076 Italian companies, with data available through the BVD-AIDA database (Beuselinck et al., 2021). All companies included in our sample meet the following criteria (Table 2): (a) are active at the end of 2019; we excluded dissolved companies or those subject to insolvency procedures; (b) are all incorporated and have limited liabilities (e.g., SRL or SPA according to the Italian Civil Code); (c) adopt full national GAAPs, with no option for simplified financial statements; (d) are privately held with no financial instruments traded on markets. This is to ensure comparability in terms of accounting regulation (e.g., none adopts IFRS) as well as in terms of incentives and monitoring mechanisms; (e) we excluded companies operating in the following industries (NACE in parentheses): financial and insurance (64-66); real estate (68); public administration and defense, compulsory social security (84); activities of membership organizations and other services (94-95); extraterritorial organizations and bodies (99); (f) we excluded companies with missing data on revenues, total operating costs, and equity; (g) last, all firms filed financial statements for the 2019 fiscal year, the latest period available at the time of the writing. The latter criterion is relevant for the sake of forecasting the effects of the crisis on corporate bankruptcy, as well as in predicting the effects of relief mechanisms; relying on the most recent information enhances accuracy in ascertaining which companies near the legal threshold trigger potential insolvency procedures. Interestingly, this feature also represents an improvement over current research on this topic using older data (Gourinchas et al., 2020; Carletti et al., 2020; De Vito and Gomez 2020; Schivardi et al. 2020).

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[13] The revaluation offered in 2020 has two features making it especially advantageous for corporations: first, a flat tax rate of 3% (previously it ranged between 12-14%) would shield firms from taxes on potential future gains on sales. Second, unlike previous revaluation mechanisms. Companies can elect to revaluating individual assets rather than 'classes of similar assets', thus enabling a higher degree of discretion in choosing only valuable assets.[13]

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**3.2 Estimation of revenues, operating costs, income, and equity**

Our aim is estimating the impact of the Covid-19 crisis on corporate profit and equity in 2020, to derive the number of companies potentially forced into distress;[14] we expect firms whose losses in 2020 may clear, or reduce, their equity to bear either of the following consequences: reporting negative equity at the end of 2020 (Equity_neg), or positive equity yet below the minimum legislative requirements (Equity_below_legal) according to the Italian civil code (Art. 2327, 2463 and 2463-bis). We begin by estimating revenues in 2020 and then operating costs before adding non-operating items and taxes. The following sections detail the process.

*3.2.1 Estimation of corporate revenues*

We begin by forecasting the impact of the Covid-19 pandemic on corporate revenues in 2020. The basic assumption is that, absent the crisis, firms would report revenues in line with 2019. This choice seems tenable due to the stationary Italian economy (ISTAT, 2019). Our estimations are based on the revenues reported by each firm in their 2019 income statement and the change in revenues – aggregated at the industry level – reported by Italian companies to the Italian Taxation Office through the revenue electronic invoicing system.[15] Next, we project revenue 2020 (*REV20*) for firm *i* in industry *s* as revenues 2019 (*REV19*) multiplied by the change in revenues for industry *j* at the end of 2020.

According to the Italian GAAPs, private firms file their financial statements on an annual basis (e.g., financial statements for 2020 will be available by mid/late 2021); whereas data from the electronic invoicing system are available monthly and then aggregated by the end of 2020. The latter is an important source of information, as it allows moving away from simulations based on GDP and other macroeconomic variables: in fact, we derive revenues in 2020 in the following way:[16]

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[14] We identify distressed firms as those whose equity is below the legal thresholds given their legal status. In different analyses we partition those with negative equity (Equity_neg) from those with positive yet insufficient capital to meet the legal requirements (Equity_below_legal).

[15] In the Appendix A we illustrate and discuss the data employed to derive the industry-average drop in revenues in 2020.

[16] To the best of our knowledge, our work is the first using data on revenues trends by sector to estimate equity shortfall. In fact, previous research on this topic has mainly used either forecasts (Schivardi et al. 2020) or simulated distress scenarios (Carletti et al. 2020; De Vito and Gomez 2020; Gourinchas et al. 2020; OECD 2020) to identify the impact of COVID on firm revenues.

$$REV20_{ij} = REV19_{ij} * (1 + REV20\_IND\_CHG_j) \tag{1}$$

Where, for each firm (i) operating in sector (j), revenue 2020 (*REV20*) is equal to the prior year revenues *(REV19)* times the average change in revenues for the relevant industry *(REV20_IND_CHG)* as reported in the MEF data.

*3.2.2 Estimation of operating costs*

The next step involves estimating operating costs in 2020. We focus on operating costs and assume that nonoperating costs (e.g., interest expenses, extraordinary items) do not change compared to 2019. Furthermore, we partition operating costs into variable (raw materials, services costs) and fixed costs (salaries, depreciation, amortization, and rentals), and incorporate the idea that variable costs are more likely to be reduced in the short term after a drop in productivity and revenues (Banker et al., 2013). Operating variable costs for 2020 are estimated at the firm level by computing the elasticity of costs to changes in revenues for each individual firm in the ten years prior to 2019. Following a customary regression framework (De Vito and Gomez 2020), we estimate the elasticity in the following way:

$$OP\_VAR\_COSTS_{it} = \alpha + \beta_i * REV_{it} + \varepsilon \tag{2}$$

Here, OP_VAR_COSTSi, t is the natural logarithm of total variable costs (e.g., raw materials, consumables, and merchandise services) for firm *i* at time *t; REV*$_{it}$ is the natural logarithm of revenue for firm *i* at time *t*. We perform the estimation on a rolling window and require that each firm has at least three consecutive years of available data.[17] The resulting $\beta_i$ coefficient is interpretable as the % change in operating variable costs due to a % change in revenue. Then, we derive the total operating variable cost of a firm *(OP_VAR_COSTS20$_{ij}$)* in the following way:

$$OP\_VAR\_COSTS20_{ij} = OP\_VAR\_COSTS19_{ij}*(1+ (REV20\_IND\_CHG_j * \beta_i)) \tag{3}$$

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[17] In estimating firm-level elasticity over the 2010-2019 period, we impose as a minimum criterion that a firm would have data at least for three consecutive years. Furthermore, any firm in the sample is 'active' (hence not involved in bankruptcy or insolvency procedures) as of Dec 31, 2019. However, there are two types of firms for whom the three-consecutive years criterion would not be satisfied: (a) companies set up from 2017 onwards, or (b) companies with missing data in the database. In both cases, we replaced the individual firm cost-elasticity with the average elasticity observed at the four-digit industry level (ATECO).

Here, $OP\_VAR\_COSTS20_{ij}$ are the variable operating costs in 2020; $OP\_VAR\_COSTS19_{ij}$ are the variable operating costs in 2019; $REV20\_IND\_CHG_j$ is the estimated change in revenues in the relevant industry $j$, and $\beta_i$ is the elasticity coefficient previously estimated as per Eq. (2).

### 3.2.3 Estimation of net income and equity

The final steps of our estimate involve computing net income 2020 ($NI20_{ij}$) and the ensuing equity ($EQ20_{ij}$). We start from the projected revenues in 2020 ($REV20_{ij}$) and subtract the total variable costs ($OP\_VAR\_COSTS20_{ij}$), fixed costs 2019 ($FC19ij$), and algebraically sum the nonoperating items ($NON\_OP\_ITEMS19_{ij}$) (i.e., interest charges and adjustments to carrying amount of financial assets), which we assumed constant in 2020. Finally, we subtract expected taxes on income ($TAX20_{ij}$):

$$NI20_{ij} = REV20_{ij} - (OP\_VAR\_COSTS20_{ij} + FC19_{ij}) + (NON\_OP\_ITEMS19_{ij}) - TAX20_{ij}$$

$$(4)$$

Finally, we estimate equity 2020 ($EQ20_{ij}$) as the algebraic sum of equity reported at the end of the previous fiscal year ($EQ19_{ij}$) and the just computed net income 2020 ($NI20_{ij}$). Therefore:

$$EQ20_{ij} = EQ19_{ij} + NI20_{ij} \tag{5}$$

## 3.3. Relief Mechanisms

In the following paragraphs, we discuss how the various relief mechanisms have been operationalized before assessing their impact on profitability and equity.

### 3.3.1 Furlough and wage subsidies (LAB)

We estimate the amount of savings accrued to each firm through the grant of an extraordinary furlough related to the health pandemic. Due to the unavailability of firm-specific information on their access to the furlough, we rely on the data offered by the Bank of Italy and the National Institute of Social Security (Bank of Italy and INPS 2020) aggregated at the industry level. The data offer two types of information (see Appendix B): the percentage of firms resorting to the furlough in each industry ($\%FUR\_FIRMS_j$), and the average percentage of employees on temporary layoffs in each industry ($\%FUR\_EMP_j$). Given the impossibility for discerning firms to access the furlough, we adopt a conservative approach and hypothesize that all eligible firms

would exploit this opportunity. Also, we allow for variation across industries in terms of the percentage of employees laid off, hence cost savings. Our firm-level estimate of cost savings due to the furlough in 2020 ($LAB\_SAV20_{ij}$) is based on the percentage of employees furloughed during 2020 in the relevant industry ($\%FUR\_EMP_j$) times the costs of wages and salaries as reported in the company's income statement in 2019 ($W\&S19_{ij}$). Given that firms could access the furlough for all eligible employees from June onward, we estimated the savings based on a 6-month period, thus applying a discount factor equal to 0.5. Also, we account for the differences (imposed by the Law) in terms of costs and fees ($FUR\_FEES20_{ij}$) incurred by firms in accessing the furlough,[18] and we estimate the (cash) and income-based benefits for companies in terms of salaries not being paid to the workers ($LAB\_SAV20_{ij}$) as follows:

$$LAB\_SAV20_{ij} = ((W\&S19_{ij} *0.5) * (\%FUR\_EMP_j)) - FUR\_FEES20_{ij} \qquad (6)$$

Where, $W\&S19_{ij}$ is the total costs of wage and salaries from the 2019 income statement; $\%FUR\_EMP$ is the average percentage of employees on temporary layoffs in each industry, 0.5 is the discount factor due to the halving of the period of access, and $FUR\_FEES20_i$ captures the individual firm fees incurred by the firms to access the furlough. To estimate the effects on net income in 2020, we consider the cost savings resulting from the furlough in 2020 ($NI20\_FUR_{ij}$). Specifically, we estimate net income 2020 as the algebraic sum of net income 2020, absent any intervention ($NI20_{ij}$) and cost savings ($LAB\_SAV20_{ij}$) as follows:

$$NI20\_FUR_{ij} = NI20_{ij} + LAB\_SAV20_{ij} \qquad (7)$$

Next, equity 2020 is based on the cost savings due to wage relief ($EQ20\_FUR_{ij}$), as the algebraic sum of equity reported at the end of the previous fiscal year ($EQ19_{ij}$) and the computed net income 2020 with the cost savings due to the furlough ($NI20\_FUR_{ij}$). Hence:

$$EQ20\_FUR_{ij} = EQ19_{ij} + NI20\_FUR_{ij} \qquad (8)$$

*3.3.2 One-time allowance: contribution to lost revenues (REV)*

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[18] Firms experiencing a drop in sales in 2020 (vis-à-vis 2019) above 20% drop would not incur in any fee for resorting to the furlough. Instead, firms experiencing a drop of sales of less than 20% shall contribute to the 9% of total costs saved through the furlough – therefore experiencing lower costs savings. Finally, firms who did not experience a drop in sales could still access the furlough but contribute a 18% of the costs to support the workers.

The second relief mechanism is a one-off contribution in the form of a nonrefundable, cash-based grant, offered to companies that experienced a drop in revenues of at least one third in April 2020 compared to 2019, and with a yearly turnover of less than €5M. The amount of the allowance ($REV\_ALLOW20_{ij}$) varied with the percentage of drop in revenues and decreased with the size of revenues according to Law Decree no. 34 (art. 25) issued on May 19, 2020;[19] thus, we estimate the benefits for companies in terms of one-off contribution ($REV\_ALLOW20_{ij}$) as follows:

$$REV\_ALLOW20_{ij} = (REV19_{ij}/12) * Allowance \qquad (9)$$

where $REV19_{ij}$ are the revenues reported in 2019. Annual revenues are divided by 12 to obtain an estimate of monthly revenues for April. *Allowance* is the percentage of contribution paid to each company if the company experienced a decrease in revenues in April 2020 versus April 2019 of at least 1/3 and the total revenues 2019 ($REV19_{ij}$) are in a specific range.[20]

*3.3.3 One-time contribution to rental expenses (RENT).*

A similar approach was followed in relation to another mechanism aimed at alleviating costs incurred by firms during halt periods: the government offered a one-off cash-based contribution equal to 60% of the monthly rental fees paid from March to May 2020; eligible companies were those experiencing a drop of at least 50% of their revenues compared to the same period in 2019. We calculate the savings in rental expenses ($RENT\_SAV20_{ij}$) as follows:

$$RENT\_SAV20_{ij} = (TPE19_{ij}/4)* 0.60 \qquad (10)$$

Where $TPE19_{ij}$ measures the costs of third-party lease and rental charges as reported in 2019. The yearly amount is divided by four to obtain quarterly fees paid by each company. The value is then multiplied by 0.60, that represents the amount offered by the Italian government as a partial restoration of the incurred costs.

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[19] All firms included in our sample adopt Italian GAAPs: according to the Civil Code (Art. 2425) and Italian Institute of Chartered Accountants, both types of allowances are booked into the income statement - Item A.5: "5) altri ricavi e proventi, con separata indicazione dei contributi in conto esercizio" that is purposefully dedicated to 'non-recurrent component' and one-off allowances contributing to the 'Total Value of Production'.

[20] Specifically, a contribution of 20% of the missed revenues was granted if $REV19_{ij}$ were below €400.000; a contribution of 15% of the missed revenues was granted if $REV19_{ij}$ were between €400.000 and €1M; a contribution of 10% of the missed revenues was granted if $REV19_{ij}$ were between €1M and €5M. We exploited the monthly data provided by the Italian Ministry of Economics and Finance offering industry-level aggregated data on the drops in revenues in April 2020 vis-à-vis April 2019.

*3.3.4 Suspension of amortization and depreciation charges (AMT).*

The fourth relief mechanism under consideration refers to the option offered to all firms to suspend and postpone depreciation and amortization charges in 2020 for fixed tangible and intangible assets. Unlike the previous three mechanisms, this only has effects on the income statement, via a reduction in costs, but not on cash. Interestingly, it will also generate a temporary tax benefit for firms, as amortization and depreciation charges will be tax deductible despite their absence in financial statements. Given the ex-ante uncertainty in predicting which firms will exploit this opportunity, we assume that only companies operating with an expected negative income 2020 (*NI20*) will exercise such an option. Our choice is motivated by the fact that firms will weigh the benefits and costs of having higher (lower) income in 2020 (2021) unless this is necessary. Therefore, the amount of cost savings due to the postponement of amortization charges is equal to the sum of depreciation (*DEPR19$_{ij}$*) and amortization (*AMT19$_{ij}$*) charges as reported in the 2019 income statements. Therefore:

$$AMT\_SAV20_{ij} = DEPR19_{ij} + AMT19_{ij} \qquad\qquad (11)$$

The expected net income in 2020 when considering the cost savings due to the delay of amortization charges is the algebraic sum of the net income 2020 (*NI20$_{ij}$*) and the cost savings due to (*AMT_SAV20$_{ij}$*) as follows:

$$NI20\_AMT_{ij} = NI20_{ij} + AMT\_SAV20_{ij} \qquad\qquad (12)$$

Finally, we estimate the ensuing equity 2020 following the delay of amortization charges (*EQ20_AMT$_{ij}$*), via the algebraic sum of equity reported at the end of the previous fiscal year (*EQ19$_{ij}$*) and the net income 2020 with depreciation and amortization savings (*NI20_AMT$_{ij}$*):

$$EQ20\_AMT_{ij} = EQ19_{ij} + NI20\_AMT_{ij} \qquad\qquad (13)$$

*3.3.5 Revaluation of fixed assets (REVAL)*

A second accounting-based mechanism - illustrated in Section 2.2.3 - refers to the option granted to companies to revalue their fixed assets in 2020. Differently from the previous four mechanisms, we were not able to directly estimate the potential revaluations accruing to the firms choosing to adopt such mechanism for two reasons: first, firms can exert a significant

discretion in terms of which assets to revalue and by how much; second, it would be hard to assess the fair value for the chosen assets to revalue and the ensuing benefit in the balance sheet arising of the difference between the carrying amount and the recoverable amount. Hence, we pursued a different approach and estimated the expected revaluation – in percentage of the existing fixed assets in 2019 - needed to replenish equity to at least meet the legal capital requirements for all companies estimated to either have negative equity (*Eq_neg_20*) or equity below legal requirements in 2020 (Eq_below_legal_20).[21] Our starting point is the carrying amount of fixed assets that could be subject to revaluation, as reported in the 2019 financial statements. $FIX\_ASS\_REV_{ij}$ equals the sum of net tangible assets ($TAN19_{ij}$), net intangible assets ($INT19ij$), and financial instruments such as shares in subsidiaries and joint ventures ($FIN\_INST19_{ij}$) as reported in the 2019 balance sheet. Therefore:

$$FIX\_ASS\_REV_{ij} = TAN19_{ij} + INT19_{ij} + FIN\_INST19_{ij} \qquad (14)$$

Next, for all companies with forecasted equity below legal requirements in 2020, absent any other government interventions, we estimated the amount needed to restore equity to be at least equal to the minimum legal threshold to avoid juridical procedures and ensure viability: therefore, $EQ\_MISS20_{ij}$ is the difference between equity 2020 ($EQ20_{ij}$) and the minimum capital requirements according to the corporate legal form *(|MIN_EQUITY|)*. Hence:

$$EQ\_MISS20_{ij} = EQ20_{ij} - |\,MIN\_EQUITY| \qquad (15)$$

Finally, we estimate the revaluation of fixed assets ($FIX\_ASS\_REV\_REQ_{ij}$) required to replenish equity capital above the legal threshold; this is the ratio of the amount needed to replenish capital above capital requirements ($EQ\_MISS20_{ij}$) and the carrying amount of fixed assets ($FIX\_ASS\_REV_{ij}$). Therefore:

$$FIX\_ASS\_REV\_REQ_{ij} = (EQ\_MISS20_{ij}\, /\, FIX\_ASS\_REV_{ij}) \qquad (16)$$

### 3.4 Equity shortfalls and distress with government interventions
We then estimate the expected equity in 2020 ($EQ20\_ALL_{ij}$), once we consider the four

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[21] It is important emphasizing that this approach is extremely conservative in terms of the number of firms exploiting the mechanism and the revaluation of assets perused by firms. In fact, there was no restriction in terms of firm performance, financial position and characteristics required to pursue the revaluation.

interventions (e.g., furlough, on-off revenues and contributions towards rental charges, and suspension of amortization). Specifically, in re-estimating net income we include: the amount saved from each company due to the government wage subsidies ($LAB\_SAV20_{ij}$), the amount saved due to the amortization suspension ($AMT\_SAV20_{ij}$), the nonrefundable grant due to the drop in revenues in April 2020 ($REV\_ALLOW20_{ij}$) and the one-off contribution for March, April, and May rental expenses ($RENT\_SAV20_{ij}$):

$$NI20\_ALL_{ij} = NI20_{ij} + LAB\_SAV20_{ij} + AMT\_SAV20_{ij} + REV\_ALLOW20_{ij} + RENT\_SAV2$$

(17)

Finally, we include the effects of all government intervention ($EQ20\_ALL_{ij}$), that is, the sum of equity reported at the end of 2019 ($EQ19_{ij}$) and net income 2020 after the inclusion of all interventions ($NI20\_ALL_{ij}$):

$$EQ20\_ALL_{ij} = EQ19_{ij} + NI20\_ALL_{ij}$$

(18)

## 4. Analysis and results

Table 3, panel A reports the descriptive statistics for our sample firm in 2019. The average Italian firm reported a net income of € 114,000, revenues of € 3,25 million, and total operating costs of € 3,231 million. They employ (on average) 12 workers, and the equity is slightly above € 1.34 million. Overall, these data are in line with official data on the universe of Italian firms with limited liabilities (ISTAT, 2019). Panel B shifts the focus to companies whose equity in 2019 - before the inception of the crisis – was negative or below legal requirements. We observe that the number of firms in distress is 65,463 (11% of the sample) of which: 34,926 with negative equity (6% of the total) and 30,537 firms with positive equity but below legal requirements (5% of the total). Altogether, these firms employed 229,149 workers (3% of the total) and have total bank debts of € 22.85 billion (6% of the total).

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INSERT TABLE 3 HERE

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**4.1 Baseline scenario: the effects of Covid-19 without government intervention**

Table 4 (Panel A) reports our baseline scenario, in which we estimated the effects of the crisis absent government intervention, noting that average NI declines from € 114,000 to - € 78,000.[22] The total number of companies with negative equity quadruples from 34,926 in 2019 to 118,807 in 2020 (i.e., 20% of the total); furthermore, 34,874 firms have positive equity but below legal requirements, that is, 6% of the total. If we add these two values, 153,681 firms would be undercapitalized in 2020 (26% of the entire sample). Altogether, these firms employ 1,383,020 employees (20% of the total) and have a total bank debt equal to more than € 68.41 BN (17% of the total).

**4.2 The effects of cash-based relief mechanisms on corporate income, equity, and distress**

In Table 5 (panels A and A1) we report the effects of the adoption of furlough (*LABOR*). The governmental support offered through a direct subsidy to wages (on average € 54,000 per firm in 2020) significantly improves net income, going from - € 78,000 (e.g., in the baseline scenario) to - € 36,000. This improvement reduces the number of distressed firms: the number of firms with negative equity (positive equity but below legal requirements) decreases from 118,807 (34,847) in the baseline scenario to 104,404 (33,552). Overall, the results suggest that the furlough intervention helped rescue 10% of the firms that would otherwise have been in distress, compared to the baseline scenario; this finding resonates with the recent work of Demmou et al. (2021a) suggesting that support to salaries has been the most effective mechanism in curbing potential insolvencies.

Panels B and B1 in Table 5 report results of the one-off contribution to offset missed revenues; being much smaller in scope, as it covered only one month, the alleviation in terms of revenue in minimal (from -€ 78,000 in the baseline scenario to -€ 76,000 with the contribution to revenues). Consequently, the number of rescued firms is approximately 2000 out of the 153,681 projected to be in distress in the baseline scenario. Similarly, panels C and C1 in Table 5 detail the effects of the one-off contribution towards rental charges for the quarter

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[22] We caution that our estimations of the baseline scenario should not be considered as being totally unaffected by government interventions. In fact, our forecasts of the firm-level corporate revenues in 2020 – as discussed in Sec. 3.2.1 – are derived from the (industry-average) revenues disclosed by corporations to the Italian Taxation Office throughout 2020, hence likely to be affected by the large stimulus package introduced by the Italian government, especially in terms of support to labor force. Given that a true counterfactual (e.g., observing corporate revenues in 2020 absent any government intervention) is not attainable, we perform a similar estimation by considering the change in corporate revenues 2020 only by considering the first five months of 2020. As a matter of fact, government interventions and relief mechanisms were approved between March 23rd and May 20th, 2020, but only entered into force from June 2020 onwards. Un-tabultated analyses show a substantial overlap in terms of the effects of the crisis on corporations, absent government interventions: when relying on estimates for the whole 2020, the percentage of firms in distress equals to 26% of the sample, versus an expected increase when relying on data from the first five months (28%).

between April and June 2020: the overall benefit for the average firm nears € 5,000 per year in terms of higher net income. The overall effects in terms of distressed firms are a marginal improvement, comparable in size to the contribution to revenues, with slightly more than 2,000 rescued firms out of the total of 153,681.

## 4.3 The effects of the deferral of amortization and depreciation charges

Table 5 (Panels D and D1) shows the effects of deferral of depreciation and amortization charges in 2020. The average savings of the firms reached € 69,000, with net income improving markedly (e.g., -€ 9,000), in relation to the baseline scenario and in relation to the furlough intervention. Delaying amortization charges exerts a more positive effect than introducing wage subsidies: the expected number of firms with negative equity is 101,451, whilst those with equity positive but below legal requirements are 32,689. Globally, the number of companies in distress decreases from 153,681 in 2020 to 134.140. Overall, this implies a reduction of 13% compared to the baseline scenario.

## 4.4 The joint effect of all relief mechanisms

In Table 5 (Panels E and E1) we report the joint effects of the four relief mechanisms previously analysed for the average firm in terms of revenue, income, equity, and the ensuing aggregated consequences in terms of distress. The net benefit of the four mechanisms accrues, amongst cost savings and extra revenue, to € 134,000. Therefore, the average net income becomes positive (€ 43,000) yet still far from the average income in the last year before Covid-19 (e.g., € 114,000). The total number of firms in potential distress is equal to 110,737, of which 80,922 with negative equity and 29,815 with equity below requirements: this means that jointly the mechanisms lead to 'rescuing' 42,954 firms, thus a reduction of 28% of the de facto in distress companies compared to the baseline scenario without interventions. The beneficial effects of the interventions spill over to the number of employees at risk, declining by more than 500.000 workers, and in terms of risky loans, declining by 1/3. Despite the marked improvement, the number of firms with negative equity remains high, more than double the value registered in 2019 (80,922 vs 34,926).[23]

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[23] Consistent with the point raised in Section 4.1, we re-estimated the effects of each relief mechanisms (both individually and combined) in terms of income, equity depletions and bankruptcies relying on an expected change in corporate revenues 2020 based on the first 5 months of 2020, when government interventions had not kicked in yet in full. Un-tabulated results show once again strikingly similar results across the different estimations, with the overall number of firms in distress ranging from 110.737 to 115.345 under the two different estimation hypotheses. In particular, the positive effect of combined governmental interventions entails rescuing of about 25% of the firms otherwise in distress, and this is comparable to the 28% of firms recued. Taken together, the different approaches yield nearly identical results.

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INSERT TABLES 4 AND 5 HERE.

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Table 6 offers a comparison of the effects of Covid-19 in terms of corporate bankruptcy, employees, and loans at risk in the hypotheses of no government intervention (e.g., the baseline scenario in columns 4 and 5) and with the four mechanisms in place (columns 6 and 7) with respect to the pre-Covid-19 conditions, in 2019. Interestingly, the number of firms in distress more than doubles in the baseline scenario, taking it to more than a quarter of the population, with a marked drop attributable to the four relief mechanisms launched by the Italian government. The effects of bankruptcy on employment (e.g., job losses) and the stability of the financial sector (e.g., loans at risk) are also marked with a quadrupling (doubling) of the number of employees at risk (loans at risk) even in the hypothesis of government intervention.


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INSERT TABLE 6 HERE.

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**4.5 An assessment of the effects of asset revaluations on equity**

Our final set of analyses refers to the potential effects of an accounting-based mechanism that allows firms to revalue their fixed assets in 2020 (see Section 3.3.5). Unlike our previous approach, in which we estimated the effects of the four interventions in terms of income, equity depletion, and firm distress, we sought to address the following question: by how much should firms revalue their fixed assets in 2020, to offset the negative impact of ensuing losses on their equity? Our approach is motivated by the lack of a reference point in terms of the 'potential revaluation' firms can peruse the absence of data on the recoverable amount or market value of fixed assets (IAS 16), we sought to follow a different approach. We restricted our analysis to firms whose expected equity, in the baseline scenario, would fall below the legal requirements. These firms, allegedly nearing bankruptcy, would have an incentive to opt for such a mechanism and would also be the most problematic from the government perspective in terms of their contribution to systemic risk. Moreover, we constrain our analyses to firms with nonzero fixed assets: in fact, for 58,729 firms with no fixed assets, any revaluation would yield hard-to-interpret results on the denominator being zero.

Table 7 reports the results in relation to the size of the revaluations required by undercapitalized firms to replenish their equity capital up to the minimum legal threshold and ensure viability. Panels A and B offer a separate analysis for firms whose equity is negative (Eq_Neg_20) and those with positive equity yet under legal requirements (Eq_Below_20) (see Section 4.1). Specifically, panels A and B refer to the subsample of firms with equity below the threshold in the aftermath of the crisis and absent any intervention (e.g., the baseline scenario), and with nonzero fixed assets: unsurprisingly, firms with negative equity (equity below legal requirements) should – on average – revalue assets by 46 times (10) to reestablish equity above minimum legal requirements, which would imply that a firm with fixed assets whose carrying amount is € 1,000 will need to revalue them by € 46,000.[24] The median values offer more economically meaningful estimates, as they are not affected by extreme values: the required amount of revaluation is 1.12, hence the average firm in distress should more than double the carrying amount of their fixed assets to pursue juridical viability.

In Table 7 Panel C, we restricted our analyses to firms whose equity was already below the legal threshold in 2019, before the crisis hit. Not surprisingly, the results suggest that for those firms, the required revaluation should be more pronounced: first, a revaluation of 61 times is required for corporations with equity under threshold capital; second, the median value of 2.76 indicates that for those firms, the value of fixed assets should almost triple to offset equity depletion. Finally, in Table 7, panel D, we focus on firms whose equity fell below the threshold in the aftermath of the crisis. Again, consistent with expectations, for those firms – which allegedly would not have displayed negative equity, absent the crisis - the results indicate a much milder revaluation of fixed assets to replenish equity. The mean value (median) for companies with equity below the legal threshold is 24 (0.65).

Overall, our estimates offer interesting insights in terms of how much would be needed – in terms of fixed asset revaluations – to offset the ensuing depleted equity in the aftermath of the crisis. Two points are worth noticing: (a) firms that were already in distress in 2019 are likely to have a low value of fixed assets, therefore revaluations would not be a feasible option; (b) companies facing equity below the legal threshold in the post-crisis period may well peruse

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[24] We would like to emphasize that our choice of the legal capital requirements as the minimum threshold to consider a firm to be 'viable' is motivated by the juridical consequences stemming from the failure in meeting such requirement. In fact, board members and the board of statutory auditors must enact 'as soon as possible' a series of actions to call for shareholders' replenishment of equity capital, or, in direr circumstances, to formally file for bankruptcy through Courts. The mere fact that firms are not in a condition to be liquidated, dissolved, or not filing for bankruptcy does not ensure it will be viable, solvent, and profitable in the future.

this relief mechanism because, at least the median firm, would need a revaluation of 65% of the carrying amount of their fixed assets in 2019 to reestablish viable equity.

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INSERT TABLE 7 HERE

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**4.6 Robustness Tests and Alternative Specifications**

Two key research design choices underpin our estimations: the forecasts of the changes in revenues in 2020 and the ensuing dynamics of operating costs based on their elasticity (see Section 3.2). As a robustness test, to probe the stability of our findings, we now offer two alternative specifications and review our results when changing the estimate of revenue 2020 and the cost elasticity. First, we rely on changes in revenues as reported by Italian listed firms in their annual financial statements 2020, as compared to the revenues booked in the previous year (see Appendix C). Then, we averaged the changes in revenues by industry. For a detailed overview of the chosen approach, see Appendix D. In Table 8, panel A, we report the effects of the Covid-19 pandemic, absent any government interventions, thus mimicking the baseline scenario as reported in Table 4. Panels B and B1 of Table 8 suggest that the total number of distressed companies would be 145,086, (i.e., 113,123 with negative equity and 31,963 with equity below legal requirements); these findings are comparable to the results in Table 4 (baseline scenario) indicating 153,681 firms in distress. Once we consider the effects of all four relief mechanisms, the net income becomes positive (average € 51,000), as illustrated in Table 8 (panel C). Next, in Table 8 (panel D) the expected number of distressed companies drops to 114,336 firms with a reduction of 25% compared to the baseline scenario without any interventions (as a comparison, see Table 6).

Second, we use the elasticity of total operating costs instead of the elasticity of total variable costs. This is to allow for the possibility that firms may be able to act more profoundly on their cost structure in the short term. Unsurprisingly, Table 9 suggests a marked increase in net income (panel C) and a significant reduction in the total number of companies in distress, now totaling 134,615: compared with the basic scenario means a decrease of 19,999 distressed companies. Once we consider all interventions (Table 9, panel C) the number of companies with expected negative equity is € 67,611, which means twice the value registered in 2019. Net income is now positive at € 60,000. In general, the results appear robust to alternative approaches to measuring the expected change in revenue and cost elasticity.

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INSERT TABLES 8 & 9 HERE

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## 5. Discussion and contributions

This study joins a growing body of literature on the impact of the Covid-19 pandemic on corporations and how governments can reduce the crisis and revive economies (Hansen, 2020). Recent literature highlights the systemic importance of corporate liquidity (De Vito and Gomez, 2020), equity, shortfalls, and bankruptcy (Carletti et al., 2020). Other studies question the effectiveness of relief mechanisms like public guarantees on loans (Core and De Marco, 2021), support on wages and salaries (Gourinchas et al., 2020) or debt moratoria (OECD, 2020). We complement this literature by focusing on how accounting information and regulation in the wake of a health pandemic may help policymakers in: (a) quantifying the effects of a systemic crisis on corporations; (b) assessing the impact of relief mechanisms and comparing ex ante alternatives; and (c) evaluating the impact of resorting to temporary changes to accounting principles.

### 5.1 Accounting information in support of public policies

The first contribution of this study relates to employing an accounting-based framework – based on microdata from financial statements – to complement existing macro-based models and assists policymakers in forecasting the effects of the crisis on corporations and benchmarking the effects of alternative relief mechanisms. We put to the fore that, in addition to the liquidity freezes in the short run, a major consequence of systemic crises is the plummeting profitability and the ensuing equity depletions in the long run, thus triggering many insolvencies (Orlando and Rodano, 2020). A key advantage of this approach lies in formally incorporating firm-level financial and economic positions at the inception of the crisis to forecast wide and systemic effects of the crisis.

Based on this framework, we estimate the effects of the crisis on a highly representative sample of privately held Italian companies and compare the relative efficacy of four major policy interventions devised by the Italian government in 2020 to safeguard corporate survival. Our findings suggest that, absent any government intervention, the number of firms with negative equity would increase from 6% (in 2019) to more than 20%, while the number of firms with positive equity but below legal requirements would increase slightly from 5% to

6%. Firms in potential distress employ 1.38 million workers whose jobs could be at risk, and have a total exposure of € 68 billion that may become unlikely to pay (UTP) or nonperforming loans (NPLs). When considering four major relief mechanisms devised by the Italian government, we document a sizeable attenuation in terms of the number of firms in distress (from 26% to 19%) with significant improvement (versus the baseline scenario) in terms of job losses (40% of jobs would be rescued) and overall debt exposure (dropping to € 47 billion).

Our work adds to the debate on the systemic consequences of the health pandemic. Carletti et al. (2020) perform a similar estimation of the equity shortfalls for a smaller sample of about 90,000 Italian firms with available data in 2018, yet they do not account for the changes in operating costs due to cost elasticity, nor they account for the effects of relief mechanisms in alleviating the severity of corporate bankruptcies. Similarly, Gourinchas et al. (2020) offer a cross-country analysis of the effects of Covid-19 on the profitability and equity of SMEs, as well as estimating the effects of public interventions, yet they do not exploit the granularity and specificies of each country's intervention at the firm level. Last, we differ from the recent work of De Vito and Gomez (2020) in three ways: Their focus is on the risk of liquidity crunch, whereas we emphasize the systemic importance of profitability and equity to avoid a spike in insolvencies with systemic consequences (Danovi et al., 2021). Second, their analyses are based on an international sample of listed companies, whose ability to access financial markets offers them more tools to recover; whereas our focus on smaller and privately held firms makes government interventions relatively more important to their survival. Third, we exploit changes in revenues from observable data as disclosed by private firms to the Italian Taxation Office throughout 2020, whilst De Vito and Gomez (2020) rely on 2018 financial statements data and scenario simulations to mimic effects of the crisis.

## 5.2 The effects and costs of relief mechanisms and alternative policies

Our study offers an interesting opportunity to corroborate simulations and forecasting based on macro data or time series. For example, reliance on micro data from financial statements enabled an estimation of the effects (in terms of firms rescued from potential distress) and costs (both direct or delayed in times) borne out by the Italian government and taxpayers. Table 10 (panel A) offers a direct comparison in terms of expected benefits and costs across the four mechanisms: interestingly, the single mechanism bearing the strongest effect in terms of mitigating losses and equity shortfalls is the accounting-based option to suspend amortization and depreciation charges. More than 19,541 firms employing 226,860 workers would avoid bankruptcy if they delayed amortization charges experienced in 2019. We caution that delaying

amortization charges is a temporary shift to the following years, and hence absent a substantial recovery in terms of income-generating ability, new issues may arise. The furlough also provides substantial support in terms of 'rescued' firms (15,725) and workers (280,924), but it is very costly from a public finance perspective, with total costs close to € 32 billion in total. In relative terms, the furlough had a high cost per rescued firm (e.g., € 280,000 per firm) with a relatively low cost per rescued job. Due to the nature of this mechanism, the available 'erga omnes', we conjecture that larger firms with a relatively higher number of employees exploited it. We next turn our attention towards two cash-based mechanisms offering a one-off allowance to replenish missing revenues in April 2020 (REV) or offsetting rental costs for the period April to June (RENT). The two mechanisms share some similar features: first, they were selective, meaning that only firms meeting certain eligibility criteria (e.g., a drop in revenues of 30% or 50% in each period) were entitled to the allowance, and second, they are much smaller in scale. For example, each generated a cost for the state nearing € 3 billion. Likewise, in terms of their effectiveness, the one-off allowance towards missed revenues (rental charges) rescued about 2,000 (2,393) firms. Notwithstanding these similarities, the one-off allowance towards revenues had a negligible effect in terms of rescued jobs (about 11,608) vis-à-vis the contribution towards rental charges (slightly more than 26,844). This is interesting as it speaks to the type of firms benefiting from these two similar mechanisms: while allowance to revenues benefited a large portion of smaller firms with lower number of employees, a contribution towards rental charges supported larger, perhaps operational, and active firms, employing a larger number of workers.

Next, we compare the effects and costs of the relief mechanisms with those of plausible alternative mechanisms. Table 10 (panel B) displays the results. The four mechanisms jointly generated an overall cost of € 49.22 billions, enabling 44,944 firms to be rescued, hence approximately 28% of the 153,681 facing distress, absent any government intervention. A first alternative policy could have sought to replenish the equity of all 153,681 firms, ensuring that they reached the minimum legal capital threshold to avoid the dire juridical consequences of insolvency procedures and courts. The total cost for such selective yet full rescue of all distressed firms would be € 39.7 billion (compared to the 49.22 billion to save 28% of firms). While restoring minimum capital requirements does not necessarily ensure economic viability (yet juridical) of the firm, we resort to a second, extreme, alternative policy intervention and estimate the total cost incurred by the State to replenish all losses incurred by all Italian firms and reinstate the equity capital as it featured in 2019. The total cost would jump to € 93.01 billion, an order of magnitude that doubles the current cost, but it is less than the amount of

resources devoted by the European Commission to the Italian Plan of Recovery and Resilience or 5.8% of the Italian GDP in 2019.

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INSERT TABLE 10 HERE
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**5.3 Accounting regulation as a public policy tool: the risks of temporary changes to corporate disclosure**

Another distinct contribution of this study relates to the literature on accounting regulation as a public policy tool. Previous research emphasizes the role of incentives (Ramanna, 2008) and political ideology (Bischof et al., 2020) in shaping accounting standards or enforcement actions (Correia, 2014). Instead, the effects of changes in accounting policies as a policy tool have been investigated to a much lesser extent (Sunder, 2016). We argue that temporary changes in accounting rules as a tool to relaunch the economy should be carefully crafted and weigh the short-term benefits versus longer-term consequences in terms of transparency and comparability of financial statements (Posner, 1974).

Our work resonates with a stream of research based on the regulatory capture view (Kothari et al., 2010; Stigler, 1971) suggesting that politicians tend to cater with their constituents and provide benefits accruing to the parties currently involved but failing to anticipate future negative consequences. We echo Zeff's (2010) concerns that politicians knew very little or nothing about financial accounting issues, therefore pursuing potentially wrong decisions. This is especially dangerous in the wake of a systemic crisis in which key decisions must be made in a timely manner and have long-lasting consequences. More pointedly, in relation to the Covid-19 crisis, we argue that two accounting-based relief mechanisms devised by the Italian government call for a careful assessment of their potential effectiveness in the short run and their long-term costs in terms of transparency and ability to convey information on the underlying financial and economic conditions of the firms. We turn to assessing the two mechanisms separately.

The first 'accounting-based' mechanism allowed firms to opt for a discretionary suspension of amortization and depreciation charges. This option has several potentially negative consequences and casts doubts in terms of its effectiveness from a public policy standpoint. First, letting individual firms choose whether to delay amortisation charges (or not) makes it hard to estimate ex ante the aggregate effects of such provision in terms of alleviating

losses and replenishing equity. A plausible expectation is that poorly performing firms will delay amortization, irrespective of whether their negative performance is the consequence of the pandemic situation. Furthermore, allowing firms to keep these costs as tax-deductible will also temporarily reduce the tax basis for the State to sustain poor performing firms in a year of economic downturn. Instead, an immediate consequence is a generalized worsening in terms of the comparability of accounting information between firms. Importantly, the ex-ante uncertainty in terms of who is going to exploit the provision may trigger significant opacity in future financial statements: delaying amortization charges entails postponing current nonfinancial costs to the future. A key issue to ascertain is whether future (higher) revenues will be able to offset these higher charges.

A second accounting-based mechanism refers to the option to revalue fixed assets with a direct positive effect on equity reserves. From an accounting point of view, a revaluation of fixed assets entails the possibility to account for unrealized profits, thus 'anticipating' future profits arising from the gain on sale, if the market value exceeds the carrying amount, or through a higher 'value in use' of the underlying asset (IAS 16). This mechanism raises the following concerns in terms of its effectiveness as a policy tool. First, it is hard to anticipate the actual amounts of 'revaluations': this stems from the difference between the 'fair value' – unobservable - and the carrying amount of all fixed assets subject to revaluation. This information is firm- or even asset-specific, difficult to verify ex-ante; thus, it sheds doubts on the government's ability to assess its effectiveness ex ante. Second, differently from the IFRS the revaluation of fixed assets is either selective or non-periodically, thus consistently with the arguments raised in relation to postponing amortization and depreciation charges, the discretionary nature of the option will inevitably trigger inconsistencies and lack of comparability in corporate financial statements. Lastly, the mechanism may prove to be ineffective, especially for firms facing higher constraints and with higher incentives to exploit it. In fact, firms with negative equity in the aftermath of the pandemic should on average revalue their fixed assets by a multiplicator of 24 (see Table 6).

Although in principle we do not reject resorting to changes to accounting rules and principles as a tool to protect firms from unwarranted bankruptcies during times of generalized turmoil, we suggest that an alternative and relatively easier to implement tool would be a direct identification and capitalization of 'crisis related' costs. At the beginning of the health crisis, firms suffered heavy losses due to a less than proportional reduction in costs compared to declining revenues. Therefore, non-compressible costs incurred during the pandemic could be treated as 'capitalized costs' insofar as they were incurred in 2020 to guarantee the future

operational and financial viability of the business. This approach may have several advantages: first, it shields the income statement from significant losses and equity depletions threatening corporate survival in the fiscal year in which the costs were incurred; second, the amount of capitalized costs could be estimated using as a boundary the elasticity of operating costs to revenues as retrieved from previous years and – to minimize potential self-serving behaviours – be subject to third-party auditing; third, the ensuing accounting item would be quickly capitalized, thus offering a clear estimation of its future impact on income statements. We argue that this approach (e.g., capitalization of costs and systematic amortization) along with full disclosure in the notes to financial statements may help safeguard both the corporate viability and the transparency and comparability of financial statements.

## 6. Limitations

Our findings should be interpreted with care and subject to the following caveats. A first caveat refers to the generalizability of our conjectures in relation to the country-level legal system and insolvency laws: the emphasis on equity depletion and default risks is especially relevant in jurisdictions based on a civil law tradition in which equity falling below 'legal requirements' imposes court interventions or costly juridical restructuring. In contexts whereby firms may operate with negative equity, like in the UK, this issue may be much attenuated, and the design of policies be different.

A second important methodological limitation relates to our estimation of corporate revenues in 2020 absent any government interventions (e.g., baseline scenario). We rely on observed data disclosed monthly by the Italian Taxation Office; thus, corporate revenues are inevitably affected by the broad set of relief mechanisms supporting corporations (e.g., through loans, tax shields, debt moratoria), workers, and households (e.g., through moratoria). Therefore, revenues already capture some of the indirect beneficial effects of the broad array of mechanisms launched by the government. We sought to alleviate this concern through two alternative estimation techniques and relying on revenues reported (at the industry level) by publicly listed firms in 2020 (see Section 4.6) or using corporate revenues reported in the first five months of 2020, hence less likely to be affected by government interventions. The results indicate a substantial overlap between the three estimations: the number of firms in potential distress – absent any government interventions – ranges from 145,086 (25%) to 163,681 (28%). Similarly, the effects of the four relief mechanisms result in a substantial 'rescue' of 25% to 28% of firms otherwise in distress.

Third, our study does not capture the whole set of policy interventions in the economy

(e.g., direct public investments to support specific industries or digitalization processes); therefore, we caution not to view our study as an attempt to test the effectiveness of policy interventions. Nor compare alternative relief mechanisms aiming at restoring liquidity (e.g., like debt moratoria, delaying, and offsetting of tax debts) as other concurrent studies do (Core and De Marco, 2021). In fact, the effects of these measures are likely confounded and affected by the dynamic nature of relief mechanisms that change with the unfolding of the crisis. Finally, our study does not consider the long-term fiscal costs or the opportunity costs of each policy action.

## 7. Conclusions

The outbreak of the recent Covid-19 health pandemic triggered a systemic crisis that poses serious threats to corporate survival and employment levels. This study argues that accounting information and regulation play a significant role in the aftermath of a systemic crisis in supporting policymakers in designing effective relief mechanisms. We emphasize that, along with short-term concerns surrounding corporate liquidity, a systemic crisis has effects on profitability and equity depletions, with a longer-term consequence on default risk and viability of surviving firms. We sought to estimate the severity of the issue by focusing on a highly representative sample of Italian companies and found – in our baseline scenario – that absent any government interventions, about 26% of Italian firms would face risks of insolvency (versus a standard rate of 11%). Next, we evaluate the effectiveness of four different relief mechanisms (an extraordinary furlough, one-off contribution towards revenues, a one-off contribution towards rental expenses, and the option to suspend amortization and depreciation charges) and find that altogether these mechanisms substantially reduce the number of firms in distress (19%). Finally, we discussed the potential downsides of (temporary) changes to accounting principles (e.g., delay amortization charges and revaluation of fixed assets) in the aftermath of the crisis and highlighted the risk of impairing informativeness and comparability of financial statements. We argue that any change in the accounting standard should not deteriorate accounting quality and comparability in the long run. We conclude by presenting an alternative accounting treatment – namely capitalizing hard to compress costs due to the crisis followed by systematic amortization – that would allow firms from the burdensome effects of the crisis in the affected year as well as ensuring transparency and comparability over time.

**Figures and Tables**

**Figure 1: Timeline: Spread of pandemic, shutdowns, and relief mechanisms in Italy**



2. First Country-wide lockdown — 08/03

4. Relief Mechanism #1 — 17/03

6. Relief Mechanisms #2 and #3 — 19/05

8. Second Country-wide Lockdown — 26/10

2020

1. Localized outbreaks in Veneto and Lombardy — 23/02

3. WHO issues pandemic warning — 11/03

5. Temporary shutdown of economic activities — 20/03

7. Relief Mechanisms #4 and #5 — 13/10
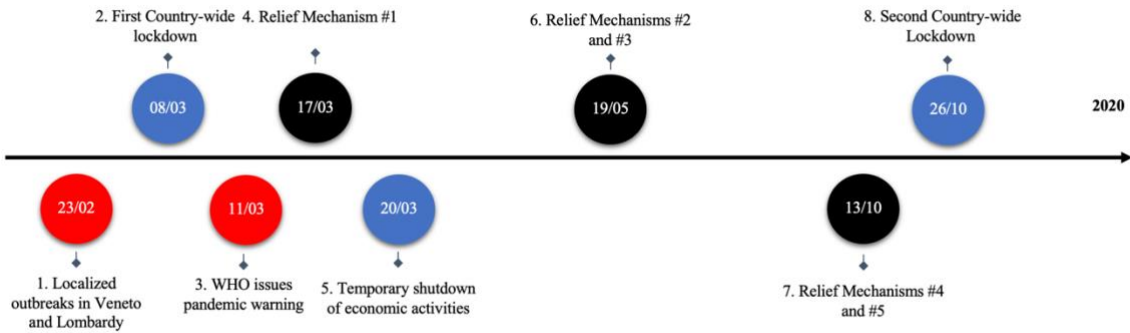
Health and Pandemic related events are in red
Restrictions and lockdowns imposed by the Italian Government are in blue
Relief mechanisms implemented by the Italian Government are in black

**Table 1: Relief Mechanisms Implemented by the Italian Government throughout 2020**

| Acronym | Legislative Reference | Policy Intervention | Type |
|---------|----------------------|---------------------|------|
| LAB | Law Decree No. 18 - March 17, 2020 ("Decreto Cura Italia") | Dedicated 'furlough' due to Covid-19 | Real (Financial and Income) |
| REV | Law Decree No. 34 - May 19, 2020 ("Decreto Rilancio") Article 25 | One-off allowance to firms whose revenues fell by at least 1/3 in April 2020 compared to April 2019 | Real (Financial and Income) |
| RENT | Law Decree No. 34 - May 19, 2020 (Decreto Rilancio ") Article 28 | One-off cash contribution covering 60% of the rental expenses and fees of March, April and May 2020 if revenues dropped by 60% | Real (Financial and Income) |
| AMT | Law no. 126 - October 13, 2020 (conversion Law of 'Decreto Agosto' n.104 article 60) | Option of not charging to the P&L Account for the fiscal year 2020 the annual amortization charge related to tangible and intangible fixed assets | Accounting-based |
| REVAL | Law no. 126 - October 13, 2020 (conversion law of 'Decreto Agosto' n. 104 article 110) | Revaluation of tangible, intangible, and financial fixed assets | Accounting-based |

**Table 2: Sample Selection**

| | | |
|---|---|---:|
| Active Italian companies with financial statements available in 2019 | | 804,882 |
| 1. | (-) companies with unlimited liabilities; | (-) 61,801 |
| 2. | (-) listed companies; | (-) 332 |
| 3. | (-) adopters of international accounting standards | (-) 1,859 |
| 4. | (-) firms whose financial statements were released before 30.06.2019 | (-) 5,870 |
| 5. | (-) missing items in financial statements: revenues, total operating costs, and equity | (-) 49,512 |
| 6. | (-) firms whose primary NACE code was: | (-) 99,432 |
| | a. 64-66 financial and insurance activities | |
| | b. 68 real estate activities | |
| | c. 84 compulsory social security of public administration and defence | |
| | d. 94 activities of membership organisations | |
| | e. 95 Other service activities (repair of computers) | |
| | f. - 99 activities of extraterritorial organisations and bodies | |
| Final Sample | | 586.076 |

**Table 3: Summary statistics**

| Panel A: Summary statistics 2019 | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV19 | 586.076 | 3.250 | 58.964 | 89 | 395 | 1.315 |
| TOC19 | 586.076 | 3.231 | 60.120 | 94 | 395 | 1.306 |
| W&S19 | 586.076 | 338 | 3.722 | 0 | 44 | 184 |
| AMTZ19 | 586.076 | 99 | 2.751 | 1 | 7 | 31 |
| TPE19 | 586.076 | 94 | 1.107 | 0 | 13 | 48 |
| NI19 | 586.076 | 114 | 4.616 | 0 | 7 | 38 |
| Tot_Assets19 | 586.076 | 3.462 | 46.856 | 133 | 449 | 1.472 |
| Tot_Loans19 | 566.306 | 695 | 7.287 | 5 | 77 | 351 |
| EQ19 | 586.076 | 1.342 | 24.488 | 20 | 83 | 359 |
| Employees19 | 567.535 | 12 | 95 | 0 | 3 | 9 |
| Panel B: 2019 distressed firms | | | | | | |
| | N. | % | | | | |
| Distressed_Firms | 65.463 | 11% | | | | |
| Equity_neg | 34.926 | 6% | | | | |
| Equity_below_legal | 30.537 | 5% | | | | |
| Employees_risk* | 229.149 | 3% | | | | |
| Loans_risk* | 22.854.162 | 6% | | | | |

*Estimated on the total number of distressed firms in 2019 (i.e., 65,463).*
*Table 3 reports the following information: Panel A offers descriptive statistics for the characteristics of companies in 2019. Panel B reports summary statistics on firms in distress in 2019. Appendix E provides the definition of variables.*


**Table 4: Effects of Covid-19 on Corporate Income, Equity, and Bankruptcy**

| Panel A: Baseline scenario - Effects of Covid-19 without government interventions | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.830 | 49.778 | 77 | 339 | 1.154 |
| TOC20 | 586.076 | 2.939 | 53.137 | 88 | 368 | 1.214 |
| NI20 | 586.076 | -78 | 5.198 | -48 | -5 | 9 |
| EQ20 | 586.076 | 1.265 | 24.417 | 6 | 64 | 328 |
| Panel B: 2020 distressed firms | | | | | | |
| | N. | % | | | | |
| Distressed_firms | 153.681 | 26% | | | | |
| Equity_neg | 118.807 | 20% | | | | |
| Equity_below_legal | 34.874 | 6% | | | | |
| Employees_risk* | 1.383.020 | 20% | | | | |
| Loans_risk* | 68.414.757 | 17% | | | | |

*Estimated on the total number of distressed firms in 2020 (i.e., 153,681).*
*Table 4 reports on panel A the baseline scenario in 2020 in terms of revenues, operating costs, net income, and equity absent any government interventions on panel B reports summary statistics on firms in distress in 2020. Appendix E provides the definition of variables.*

**Table 5: Effects of Relief Mechanisms on Corporate Income, Equity, and Bankruptcy**

| Panel A: Effects of Furlough Intervention (LAB) | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.830 | 49.778 | 77 | 339 | 1.154 |
| TOC20 | 586.076 | 2.939 | 53.137 | 88 | 368 | 1.214 |
| NI20_FUR | 586.076 | -36 | 5.100 | -31 | -1 | 18 |
| EQ20_FUR | 586.076 | 1.306 | 24.623 | 9 | 73 | 354 |
| LAB_SAV20 | 586.076 | 54 | 520 | 0 | 6 | 30 |

| Panel A1: 2020 distressed firms considering furlough intervention (LAB) | | |
|---|---|---|
| | N. | % |
| Distressed_firms | 137.956 | 24% |
| Equity_neg | 104.404 | 18% |
| Equity_below_legal | 33.552 | 6% |
| Employees_risk* | 1.102.096 | 16% |
| Loans_risk* | 62.216.557 | 16% |

| Panel B: Effects of the One-Time Contribution to Missed Revenues (REV) | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.830 | 49.778 | 77 | 339 | 1.154 |
| TOC20 | 586.076 | 2.939 | 53.137 | 88 | 368 | 1.214 |
| NI20_ALLOW | 586.076 | -76 | 5.198 | -46 | -5 | 10 |
| EQ20_ALLOW | 586.076 | 1.266 | 24.417 | 6 | 65 | 330 |
| REV_ALLOW20 | 586.076 | 5 | 8 | 0 | 2 | 8 |

| Panel B1: 2020 distressed firms considering the one-off contribution to missed revenues (REV). | | |
|---|---|---|
| | N. | % |
| Distressed_firms | 151.639 | 26% |
| Equity_neg | 117.077 | 20% |
| Equity_below_legal | 34.562 | 6% |
| Employees_risk* | 1.371.412 | 20% |
| Loans_risk* | 67.965.050 | 17% |

| Panel C: Effects of the One-Time Contribution to Rental Expenses (RENT) | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.830 | 49.778 | 77 | 339 | 1.154 |
| TOC20 | 586.076 | 2.939 | 53.137 | 88 | 368 | 1.214 |
| NI20_RENT | 586.076 | -73 | 5.180 | -45 | -5 | 9 |
| EQ20_RENT | 586.076 | 1.269 | 24.452 | 6 | 65 | 331 |
| RENT_SAV20 | 586.076 | 5 | 87 | 0 | 0 | 0 |

| Panel C1: 2020 distressed firms considering the one-time contribution towards rental expenses (RENT) | | |
|---|---|---|
| | N. | % |
| Distressed_firms | 151.288. | 26% |
| Equity_neg | 116.367 | 20% |
| Equity_below_legal | 34.921 | 6% |
| Employees_risk* | 1.356.176 | 20% |
| Loans_risk* | 67.577.318 | 17% |

| Panel D: Effects of the Suspension of Amortization and Depreciation Charges (AMT) | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.830 | 49.778 | 77 | 339 | 1.154 |
| TOC20 | 586.076 | 2.939 | 53.137 | 88 | 368 | 1.214 |
| NI20_AMT | 586.076 | -9 | 4.953 | -24 | 0 | 18 |
| EQ20_AMT | 586.076 | 1.334 | 25.501 | 10 | 74 | 356 |
| AMT_SAV20 | 586.076 | 69 | 2.595 | 0 | 0 | 15 |
| Panel D1: 2020 distressed firms considering the suspension of amortization and depreciation charges (AMT). | | | | | | |
| | N. | % | | | | |
| Distressed_firms | 134.140 | 23% | | | | |
| Equity_neg | 101.451 | 17% | | | | |
| Equity_below_legal | 32.689 | 6% | | | | |
| Employees_risk* | 1.156.160 | 17% | | | | |
| Loans_risk* | 54.270.134 | 14% | | | | |
| Panel E: Effects of all Interventions | | | | | | |
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.830 | 49.778 | 77 | 339 | 1.154 |
| TOC20 | 586.076 | 2.939 | 53.137 | 88 | 368 | 1.214 |
| NI20_ALL | 586.076 | 43 | 4.920 | -8 | 6 | 42 |
| EQ20_ALL | 586.076 | 1.385 | 25.749 | 15 | 89 | 393 |
| ALL_INT_SAV | 586.076 | 134 | 2.854 | 3 | 18 | 65 |
| Panel E1: 2020 distressed firms considering all interventions | | | | | | |
| | N. | % | | | | |
| Distressed_firms | 110.737 | 19% | | | | |
| Equity_neg | 80.922 | 14% | | | | |
| Equity_below_legal | 29.815 | 5% | | | | |
| Employees_risk* | 827.778 | 12% | | | | |
| Loans_risk* | 47.234.364 | 12% | | | | |

*Estimated on the number of distressed firms in their respective simulation.

Panel A displays the effects of the adoption of a furlough. Panel A1 reports summary statistics about the distressed firms in 2020 considering the furlough intervention (LAB). Panel B presents the one-off contribution to the revenues. Panel B1 reports summary statistics about the distressed firms in 2020 considering the effects of the one-time contribution to missed revenues (REV). Panel C shows the one-off contribution to rents. Panel C1 reports summary statistics about the distressed firms in 2020 considering the effects of the one-off contribution towards rental expenses (RENT). Panel D shows the effects of the deferral of depreciation and amortization charges in 2020. Panel D1 reports summary statistics about the distressed firms in 2020 considering the effects of the suspension of amortization and depreciation charges (AMT).

Panel E reports on the joint effects of the four relief mechanisms on corporations. Panel E1 reports summary statistics on distressed firms in 2020 considering the effects of all interventions. Appendix E provides the definition of variables.

**Table 6: A Comparison of the Bankruptcy Risk Before Covid-19, with and without Government Intervention**

| | 2019 (Pre-Covid) | | 2020 (baseline scenario) | | 2020 ( Gvt Intervention) | |
|---|---|---|---|---|---|---|
| | N. | % | N. | % | N. | % |
| Firms_in_distress | 65.463 | 11% | 153.681 | 26% | 110.737 | 19% |
| Equity_neg | 34.926 | 6% | 118.807 | 20% | 80.922 | 14% |
| Equity_below_legal | 30.537 | 5% | 34.874 | 6% | 29.815 | 5% |
| Employees_risk | 229.149 | 3% | 1.383.020 | 20% | 827.778 | 12% |
| Loans_risk | 22.854.162 | 6% | 68.414.757 | 17% | 47.234.364 | 12% |

Table 6 offers a direct comparison of the conditions of Italian companies in the period before Covid-19 (2019) (Columns 2 and 3), in the hypothesis of no government intervention (Columns 4 and 5) and in the hypotheses of full-blown relief mechanisms (Columns 6 and 7)

**Table 7: The Effects of Fixed Asset Revaluations on Equity Replenishments**

Panel A: Eq_Neg_20 (No Interventions)

| FIX_ASS_REV> **0** | Eq_Neg_20 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | obs. | Mean | sd | P10 | p25 | P50 | P75 | P90 |
| FIX_ASS_REV | 105.911 | 533 | 10742 | 2 | 9 | 44 | 181 | 632 |
| EQ_MISS20 | 105.911 | 323 | 6052 | 11 | 20 | 48 | 127 | 353 |
| FIX_ASS_REV_REQ | 105.911 | 46 | 1502 | 0.12 | 0.34 | 1.12 | 4.98 | 22.71 |

Panel B: Eq_Below_legal_20 (No Interventions)

| FIX_ASS_REV> **0** | Eq_Below_20 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | obs. | Mean | sd | P10 | p25 | P50 | P75 | P90 |
| FIX_ASS_REV | 29.577 | 78 | 438 | 1 | 2 | 8 | 42 | 157 |
| EQ_MISS20 | 29.577 | 9 | 3 | 10 | 10 | 10 | 10 | 10 |
| FIX_ASS_REV_REQ | 29.577 | 10 | 221 | 0.06 | 0.20 | 1.08 | 5.21 | 10.08 |

Panel C: Firms already in distress in 2019 (no interventions)

| FIX_ASS_REV> **0** | Eq_Neg_20 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | obs. | Mean | sd | P10 | p25 | P50 | P75 | P90 |
| FIX_ASS_REV | 53.136 | 255 | 9039 | 1 | 2 | 12 | 59 | 230 |
| EQ_MISS20 | 53.136 | 263 | 3778 | 10 | 10 | 26 | 87 | 261 |
| FIX_ASS_REV_REQ | 53.136 | 61 | 1658 | 0.24 | 0.74 | 2.76 | 8.86 | 31.94 |

Panel D: Firms entering in distress in 2020 (no interventions)

| FIX_ASS_REV> **0** | Eq_Below_20 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | obs. | Mean | sd | P10 | p25 | P50 | P75 | P90 |
| FIX_ASS_REV | 82.352 | 548 | 9786 | 2 | 12 | 55 | 213 | 694 |
| EQ_MISS20 | 82.352 | 249 | 6158 | 10 | 10 | 32 | 97 | 279 |
| FIX_ASS_REV_REQ | 82.352 | 24 | 1071 | 0.07 | 0.21 | 0.65 | 2.56 | 10.70 |

*Panel A refers to firms with nonzero fixed assets and negative equity in 2020 absent any other government interventions. It shows that to replenish missing equity to restore the minimum capital requirement, firms should revalue their 2019 fixed asset by a multiplier of 46. Panel B refers to firms with non-zero fixed assets and positive equity but below the threshold in 2020 (absent government interventions); it shows that to replenish the missing equity (i.e., € 9.000 for the average firm) the average firm should increase its non-current asset by a multiplier of 10. Panel C refers to firms already in distress in 2019 (absent any government interventions and with non-zero fixed assets); it shows that these firms should revalue their fixed assets by a factor of 61 to bring their capital above the required threshold to avoid insolvency procedures. Panel D refers to firms entering in distress in 2020 - but not in distress in 2019 - (absent any government interventions and with non-zero fixed assets); it shows that firms should increase their fixed assets by a factor of 24 in order to replenish their equity. Appendix E provides the definition of variables.*

**Table 8: Robustness test: estimations of the effects of Covid-19 based on observed changes in revenues reported by Italian listed firms in 2020**

| Panel A: Scenario using listed percentage drop | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20_LISTED | 580.867 | 3.006 | 54.544 | 80 | 346 | 1.208 |
| TOC20_LISTED | 580.867 | 3.076 | 56.695 | 90 | 377 | 1.253 |
| NI20_LISTED | 580.867 | -48 | 4.753 | -40 | -2 | 17 |
| EQ20_LISTED | 580.867 | 1.295 | 24.594 | 7 | 69 | 346 |
| Panel A1: 2020 distressed firms | | | | | | |
| | N. | % | | | | |
| Distressed_firms | 145.086 | 25% | | | | |
| Equity_neg | 113.123 | 19% | | | | |
| Equity_below_legal | 31.963 | 5% | | | | |
| Employees_risk* | 1.265.285 | 19% | | | | |
| Loans_risk* | 62.976.313 | 16% | | | | |
| Panel B: Scenario using listed percentage drop with all interventions | | | | | | |
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20_LISTED | 580.867 | 3.006 | 54.544 | 79 | 346 | 1.208 |
| TOC20_LISTED | 580.867 | 3.076 | 56.695 | 90 | 377 | 1.253 |
| NI20_LISTED_ALL | 580.867 | 51 | 4.419 | -10 | 6 | 41 |
| EQ20_LISTED_ALL | 580.867 | 1.395 | 25.815 | 14 | 88 | 395 |
| All Interv. savings | 580.867 | 111 | 2.400 | 1 | 12 | 50 |
| Panel B1: 2020 distressed firms considering all interventions | | | | | | |
| | N. | % | | | | |
| Distressed_firms | 114.336 | 20% | | | | |
| Equity_neg | 85.040 | 15% | | | | |
| Equity_below_legal | 29.296 | 5% | | | | |
| Employees_risk* | 819.187 | 12% | | | | |
| Loans_risk* | 47.002.095 | 12% | | | | |

*Panel A reports the scenario 2020 without government interventions using changes in revenues – at the industry level – reported by the Italian listed companies in their FY2020 annual statements. Panel A1 reports summary statistics on companies in distress in 2020. Panel B reports the joint effects of the four relief mechanisms. Panel B1 reports summary statistics on distressed firms in 2020 considering the effects of all interventions. Appendix E provides the definition of variables.*

**Table 9: Robustness test: estimations of the effects of the Covid-19 based elasticity of total operating costs**

| Panel A: TOC scenario | | | | | | |
|---|---|---|---|---|---|---|
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.829 | 49.778 | 77 | 339 | 1.154 |
| TOC20_EL | 586.076 | 2.906 | 52.455 | 84 | 352 | 1.178 |
| NI20_EL | 586.076 | -52 | 4.903 | -29 | -1 | 15 |
| EQ20_EL | 586.076 | 1.290 | 24.460 | 9 | 71 | 345 |
| Panel A1: 2020 distressed firms | | | | | | |
| | N. | % | | | | |
| Distressed_firms | 134.615 | 23% | | | | |
| Equity_neg | 99.933 | 17% | | | | |
| Equity_below_legal | 34.682 | 6% | | | | |
| Employees_risk* | 1.017.724 | 15% | | | | |
| Loans_risk* | 62.186.227 | 16% | | | | |
| Panel B: TOC scenario all interv. | | | | | | |
| | obs. | Mean | Sd | P25 | Median | P75 |
| REV20 | 586.076 | 2.829 | 49.778 | 77 | 339 | 1.154 |
| TOC20_EL_ALL | 586.076 | 2.906 | 52.455 | 84 | 352 | 1.178 |
| NI20_EL_ALL | 586.076 | 60 | 4.754 | -3 | 11 | 53 |
| EQ20_EL_ALL | 586.076 | 1.403 | 25.804 | 20 | 97 | 407 |
| ALL_INT_SAV_EL | 586.076 | 125 | 2.798 | 3 | 17 | 62 |
| Panel B1: 2020 distressed firms considering all interventions | | | | | | |
| | N. | % | | | | |
| Distressed_firms | 95.172 | 16% | | | | |
| Equity_neg | 67.611 | 12% | | | | |
| Equity_below_legal | 27.561 | 5% | | | | |
| Employees_risk* | 544.990 | 8% | | | | |
| Loans_risk* | 44.526.455 | 11% | | | | |

*Panel A reports the baseline scenario 2020 without government interventions using TOC elasticity. Panel A1 reports summary statistics on companies in distress in 2020. Panel B reports the joint effects of the four relief mechanisms on corporations using TOC elasticity. Appendix E provides the definition of variables.*

**Table 10: A comparison of the costs and effects of relief mechanisms on public finances**

| Panel A: Relief Mechanisms: Rescued Firms, Employees, and Costs for the State | | | | | | |
|---|---|---|---|---|---|---|
| | Distressed firms | Employees at risk | Direct Costs & Indirect Costs | N (%) of rescued firms* | Avg cost per rescued firm** | N (%) of rescued employees*** | Avg cost per rescued employee **** |
| **Effect of Covid-19 with absent government interventions** | | | | | | |
| Baseline Scenario | 153.681 | 1.383.020 | | | | | |
| **Effects and costs of cash-based relief mechanisms** | | | | | | |
| LAB | 137.956 | 1.102.096 | 31.859 M | 15.725 (10%) | 2.026.017 | 280.924 (20%) | 113.408 |
| REV | 151.639 | 1.371.412 | 3.082 M | 2.042 (1%) | 1.509.338 | 11.608 (1%) | 265.512 |
| RENT | 151.288 | 1.356.176 | 2.998 M | 2.393 (2%) | 1.252.850 | 26.844 (2%) | 111.685 |
| **Effects and Costs of Suspension of Amortization** | | | | | | |
| AMT | 134.140 | 1.156.160 | 11.287 M | 19.541 (13%) | 577.595 | 226.860 (16%) | 49.752 |
| **Overall effects and costs of all relief mechanisms** | | | | | | |
| All_Mechanisms | 110.737 | 827.778 | 49.226 M | 42.944 (28%) | 1.146.284 | 555.242 (40%) | 88.657 |

| Panel B Comparison of the effects and costs of current relief mechanisms with possible alternative interventions | Total costs for the State | N (%) rescued firms |
|---|---|---|
| Current Relief Mechanisms | 49.226 M | 42.944 (28%) |
| Alternative Policy #1: Recapitalization of firms whose equity falls below legal requirements in 2020 due to the Covid-19 crisis. No other relief mechanisms were applied. | 39.700 M | 153,681 100% |
| Alternative Policy #2 - Releasing all losses ensuing in 2020 following the Covid-19 pandemic. No other relief mechanisms were applied. | 93.096 M | |

*Firms with equity above legal requirements after the relief mechanism. ** Cost of the State / Number of firms saved. *** Number of employees in firms with equity above legal requirements after the intervention. **** Cost for the state / Number of employees saved.*

**Appendix and Supplementary Material**

**Appendix A: Estimation of the decline in revenues for Italian companies in 2020**

To estimate the effects of the Covid-19 pandemic on corporate revenues in 2020, we relied on two sources of information: (i) from the AIDA-BVD database we retrieved firm-level information about revenues in 2019 (Rev19); (ii) to ascertain the changes in revenues (by industry) in 2020 (vis-à-vis 2019), we resorted to the data provided by the Italian Ministry of Economics and Finance (MEF) on the revenues disclosed by all active Italian firms to the Italian Taxation Office (Agenzia delle Entrate). Data for the full year 2020 became available in April 2021 through the MEF website and are freely available at the following link: https://www.finanze.gov.it/export/sites/finanze/.galleries/Documenti/entrate_tributarie_2020/ Fatt-Elettr-Dicembre-2020.pdf?v=201710.

The changes in revenues are reported as the average change at the two-digit industry level (ATECEO). The data are based on the revenues filed monthly to the Italian Taxation Office by the universe of active, limited-liability corporations, via an electronic invoicing system. Then, the MEF periodically discloses the aggregated data. Interestingly, the electronic invoicing system is mandatory for all Italian firms, hence the Italian taxation office can access revenue data (but no other items in income statement or balance sheet) in a much timelier way than through the filing of financial statements, which typically are available by the second quarter of the following fiscal year.

Table A1 reports the average monthly change in revenues for the firms in each industry with respect to the corresponding month in 2019. The last column, reporting the average annual drop in 2020, is the relevant data point for our estimation. In Figure A1, we can observe the average change in revenues by month. We can observe a very high drop in April revenues (-37.1%); this probably is due not only to the mandatory lockdown imposed in March but also to the two-relief mechanisms, i.e, REV and RENT in fact both were granted only if the drop in April revenues were respectively higher than 30% and 50%.

**Table A1 – Real changes in revenues in 2020 (vis-à-vis 2019) by industry reported by the Italian Ministry of Finance**

| Months | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Full period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A - Agriculture, Forestry and Fishing | 25,2% | 8,3% | -1,4% | -6,5% | -6,6% | 9,2% | -2,0% | 5,2% | 1,3% | 0,3% | 0,1% | -12,2% | 0,6% |
| B - Mining and Quarrying | 1,2% | 3,6% | -31,2% | -52,6% | -32,7% | -18,7% | -8,3% | -4,7% | -2,6% | -13,0% | -8,8% | -20,5% | -16,1% |
| C - Manufacturing | -9,8% | -4,6% | -27,9% | -51,5% | -28,8% | -8,5% | -10,9% | -2,3% | -5,7% | -11,5% | -9,3% | -18,8% | -16,2% |
| D - Electricity, Gas, Steam, Air Conditioning | -3,8% | -18,0% | -20,2% | -18,1% | -31,9% | -28,7% | -26,3% | -23,3% | -18,2% | -22,2% | -20,0% | -19,1% | -20,6% |
| E - Water Supply and Sewerage | 9,7% | 0,1% | -15,2% | -22,5% | -19,9% | -6,8% | -9,7% | -6,6% | -7,0% | -5,0% | -5,4% | -23,2% | -10,0% |
| F - Construction | 30,1% | 12,2% | -11,2% | -41,4% | -26,6% | -6,2% | -3,7% | 11,2% | 2,4% | 1,5% | 5,1% | 6,5% | -2,4% |
| G - Wholesale and Retail Trade | 11,1% | 0,0% | -24,8% | -41,6% | -21,9% | -6,6% | -3,3% | -0,2% | 1,1% | -4,1% | -10,4% | -16,9% | -10,3% |
| H - Transportation and Warehousing | 18,4% | 3,8% | -9,6% | -27,5% | -24,7% | -14,5% | -4,8% | -7,3% | -2,3% | -6,3% | 0,2% | 4,1% | -6,4% |
| I - Accommodation and Food Services | 21,8% | 4,6% | -56,1% | -70,7% | -70,8% | -51,4% | -51,8% | -23,1% | -33,7% | -37,7% | -38,0% | -49,0% | -40,6% |
| J - Information and Communication Services | 14,5% | -8,0% | -7,1% | 0,8% | -14,1% | -6,5% | -2,7% | -4,6% | 23,4% | -1,0% | 1,6% | 0,1% | -0,3% |
| K - Financial and Insurance Activities | 14,7% | -7,1% | -26,7% | -28,9% | -34,2% | -30,6% | -7,0% | -24,4% | -18,6% | -19,3% | -10,2% | -2,6% | -15,8% |
| L - Real Estate | 18,9% | -0,9% | -21,4% | -35,9% | -30,1% | -18,9% | -14,4% | -2,9% | 2,5% | -18,3% | 1,9% | -14,7% | -12,5% |
| M - Professional,  Scientific, and Technical Services | 26,8% | -1,5% | -7,6% | -22,4% | -22,6% | -4,7% | 10,3% | 2,7% | -10,2% | -0,5% | 1,2% | 3,4% | -2,2% |
| N - Rental Agencies, Travel Agencies and Business Support Services | 11,3% | -3,1% | -25,9% | -39,9% | -36,8% | -27,8% | -24,6% | -20,0% | -26,8% | -19,5% | -15,3% | -11,7% | -20,7% |
| O - Public Administration and Defence; Compulsory Social Security | 43,7% | 12,9% | 8,2% | -23,2% | -17,3% | -26,3% | -9,4% | -6,6% | 32,8% | -11,7% | -23,9% | -2,1% | -4,5% |
| P - Educational Services | 40,6% | 12,8% | -24,1% | -52,0% | -34,9% | -29,0% | -7,3% | -4,3% | -3,7% | -3,9% | -9,1% | -5,4% | -11,5% |
| Q - Health Care and Social Assistance | 8,3% | 3,3% | -3,8% | -15,7% | -23,2% | -8,2% | 0,0% | -0,7% | 3,5% | 0,1% | -5,0% | -10,7% | -4,7% |
| R - Arts, Entertainment, and Recreation | 12,9% | -0,1% | -37,1% | -49,1% | -67,7% | -44,4% | -26,5% | -31,3% | -13,2% | -12,1% | -21,9% | -16,7% | -25,7% |
| S - Other Service Activities | 19,3% | -1,6% | -18,0% | -28,1% | -28,0% | -18,1% | -17,5% | -7,0% | -8,7% | -8,9% | -6,8% | -2,0% | -11,0% |
| T - Family and cohabitation acivities as employers of household personnel | -24,0% | -10,5% | -47,5% | -47,8% | -32,6% | -34,6% | -7,9% | -45,9% | -38,7% | -49,8% | -60,1% | 164,4% | -29,5% |
| U - Extraterritorial organizations and agencies | -48,8% | -24,1% | 3,0% | -39,8% | -35,0% | 4,3% | -2,7% | -32,7% | -2,0% | -9,4% | -8,9% | -19,0% | -19,5% |
| Z - Non-Classifiable Activities | 187,1% | 121,5% | 76,7% | 32,2% | 32,8% | 68,2% | 55,5% | 71,9% | 63,0% | 50,2% | 76,9% | 58,4% | 71,2% |
| Total | 7,0% | -1,3% | -20,6% | -37,1% | -25,6% | -10,2% | -7,8% | -3,8% | -3,5% | -7,9% | -7,3% | -11,7% | -11,1% |

**Figure A1 – Monthly average real changes in industry revenues during 2020 (vis-à-vis 2019) reported by the Italian Ministry of Finance**
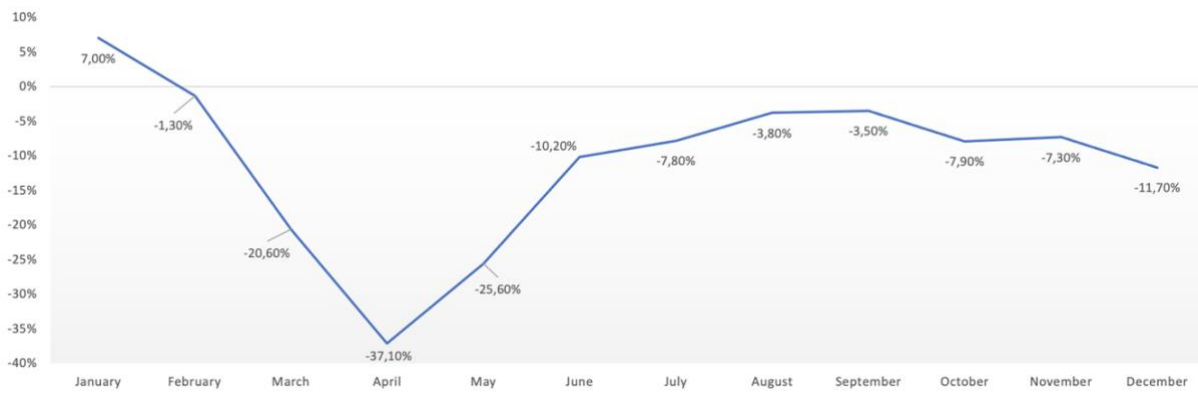
**Appendix B: Share of companies and employees who are being laid off by industry**

This table extracted from the Bank of Italy and the INPS report issued on March 2020 (Bank of Italy and INPS 2020) represents the percentage of firms resorting to the furlough in each industry (% FUR_FIRMSj) and the average percentage of employees on temporary layoffs in each industry (%FUR_EMP$_j$).

| Ateco | Description | %FUR_FIRMSj | %FUR_EMPj |
|-------|-------------|-------------|-----------|
| A | Agriculture, Forestry, Fishing, and Hunting | 22,80% | 17,70% |
| B | Mining | 80,70% | 27,40% |
| C | Manufacturing | 34,30% | 38,10% |
| D | Electricity, gas, steam, and air conditioning supply | 28,10% | 5,30% |
| E | Water supply and sewerage | 37,70% | 10,40% |
| F | Construction | 65,50% | 58,60% |
| G | Wholesale and retail trade; Repair of motor vehicles and motorcycles | 54,30% | 29,60% |
| H | Transportation and Warehouse | 37,70% | 22,80% |
| I | Accommodation and Food Services | 75,70% | 56,90% |
| J | Information and communication | 46,40% | 13,40% |
| M | Professional, Scientific, and Technical Services | 53,00% | 28,10% |
| N | Rentals, Travel Agency, and Administrative and Support Service Activities | 51,20% | 17,70% |
| P | Educational Services | 70,60% | 22,20% |
| Q | Health Care and Social Assistance | 55,60% | 25,20% |
| R | Arts, Entertainment, and Recreation | 65,40% | 38,60% |
| S | Other Services | 22,30% | 23,10% |

**Appendix C: Changes in revenues (2020 versus 2019) reported by Italian listed firms**

To estimate the robustness of our results, we relied on the annual financial statements issued by all Italian listed companies (excluded financial and real estate industries) in Semester 1 2020. Data for the 230 companies become available on May 20, 2021, via the Orbis BVD database. Given our interest in ascertaining the effects of the crisis on corporate sales, we took as a baseline what companies reported in the same period the year before: allegedly in 2019 there was no anticipation or signs of an imminent health pandemic. Therefore, we compared the revenues reported in 2020 with those reported in 2019. For example, if a company reported revenues in 2019 equal to € 800 and revenues in 2020 totaling € 600, the firm-level drop would be estimated to be 25%. Then, we derived an industry average change in revenues by using the NAICS 2 digit industry classification.

As we can observe in Table A, COVID-19 has affected the revenues of Italian listed companies revenues; in fact, we can observe an average decrease of -8.41%.

*Table A: Revenue change reported by Italian listed companies* in year 2020 versus year 2019

| NAICS | Industry Description | N | Revenue Change = 2020 / 2019 |
|-------|---------------------|---|------------------------------|
| 11 | Agriculture, Forestry, Fishing, and Hunting | 1 | 15.85% |
| 21 | Mining | 2 | -12.69% |
| 22 | Utilities | 8 | -2.30% |
| 23 | Construction | 6 | -2.11% |
| 31-33 | Manufacturing | 81 | -14.28% |
| 42 | Wholesale Trade | 10 | 2.62% |
| 44-45 | Retail Trade | 4 | 9.45% |
| 48-49 | Transportation and Warehouse | 6 | -9.46% |
| 51 | Information | 14 | 0.45% |
| 54 | Professional, Scientific, and Technical Services | 25 | -7.55% |
| 55 | Management of Companies and Enterprises | 38 | -5.37% |
| 56 | Administrative and Support and Waste Management and Remediation Services | 4 | -9.61% |
| 61 | Educational Services | 1 | -13.89% |
| 62 | Health Care and Social Assistance | 2 | 13.34% |
| 71 | Arts, Entertainment and Recreation | 2 | -36.01% |
| 72 | Accommodation and Food Services | 2 | -53.98% |
| 81 | Other Services (except Public Administration) | 1 | -0.28% |
| Total | 2020 | 207 | -8.41% |

## Appendix D: Robustness tests - Methodology

*First robustness test: changes in revenues as reported by listed companies full-year forecasts*

As an alternative measure for estimating the expected change in revenues in 2020, we rely on the listed companies annual change in revenues 2020 (vis-à-vis 2019) as described in Appendix C.

Therefore:

$$REV20\_LISTED_{ij} = REV19_{ij} * ((1 + (\%REV\_CHG\_IND\_20\_LISTED_j)).$$

Here, $\%REV\_CHG\_IND\_20\_LISTED_j$: annual listed changes in revenues by industry. In addition, in this case, we took the change in revenues in each industry (j) and multiplied it by the 2019 revenues for all firms in our sample.

Next, we calculate the NI in 2020 ($NI20\_LISTED_{ij}$) by employing the revenues' values applying the annual listed changes in revenues. Therefore:

$$NI20\_LISTED_{ij} = REV20\_LISTED_{ij} - (OP\_VAR\_COSTS20_{ij} + FC19_{ij}) +/- (NON\_OP\_COSTS19_{ij}) - TAX20_{ij}$$

Finally, we obtain the expected equity in 2020 ($EQ20\_LISTED_{ij}$):

$$EQ20\_LISTED_{ij} = EQ19_{ij} + NI20\_LISTED_{ij}$$

*Second robustness test: Elasticity of Total Operating Costs 2020*

As an alternative measure, we estimate the elasticity of total operating costs, thus including also fixed costs like amortization and depreciation, and apply a similar regression framework whereby we replace variable costs from prior estimation, with total operating costs. As in Sect. 3.2.1., the expected revenues in 2020 are calculated according to the real changes in revenues in 2020 (vis-à-vis 2019) by industry reported by the Italian Ministry of ($\%Rev\_Chg\_Ind\_20_j$). Hence:

$$OP\_COSTS_{i,t} = \alpha + \eta_i * REV_{i,t} + \varepsilon$$

Here, $OP\_COSTS_{i,t}$ is the natural logarithm of total operating costs. Next, we estimate

operating costs as follows.

$$OP\_COSTS20_{ij} = Op\_COSTS19_{ij} *(1+ (\%REV\_CHG\_IND\_20_j * \eta_{i,t}))$$

Finally, we calculate the net income for 2020 employing the total operating costs.

$$NI20\_EL_{ij} = REV20_{ij} - OP\_COSTS20_{ij} +/- (NON\_OP\_COSTS19_{ij}) - TAX20_{ij}$$

And subsequently, the expected equity in 2020 for each firm ($EQ20\_EL_{ij}$):

$$EQ20\_EL_{ij}= E19_{ij} + NI20\_EL_{ij}$$

## Appendix E: Variables List and Definitions

| Variable | Definition |
| --- | --- |
| ALL_INT_SAV | Average amount saved with all interventions (source: our calculation) |
| ALL_INT_SAV_LISTED | Average amount saved with all interventions and LISTED estimations (source: our calculation) |
| ALL_INT_SAV_EL | Average amount saved with all interventions and total operating costs elasticity (source: our calculation) |
| $AMT19_{ij}$ | Amortization charges as reported in the 2019 income statements for firm (i) operating in sector (j) (source: AIDA database) |
| AMT_SAV20 | Estimated amount saved due to the suspension and postponement of the depreciation and amortization charges (source: our calculation) |
| $AMT\_SAV20_{ij}$ | Estimated amount saved due to the suspension and postponement of the depreciation and amortization charges for firm (i) operating in sector (j) (source: our calculation) |
| $DEPR19_{ij}$ | Depreciation charges as reported in the 2019 income statement for firm (i) operating in sector (j) (source: AIDA database) |
| Employees19 | Total number of employees in 2019 (source: AIDA database) |
| Employees_risk | Total number of employees in distressed firms (source: our calculation) |
| EQ19 | Total equity in 2019 (source: AIDA database) |
| $EQ19_{ij}$ | Equity 2019 for firm (i) operating in sector (j) (source: AIDA database) |
| EQ20 | Estimation of equity 2020 (source: our calculation) |
| $EQ20_{ij}$ | Estimation of equity 2020 for firm (i) operating in sector (j) (source: our calculation) |
| EQ20_ALL | Expected equity in 2020 once we take into account all interventions (source: our calculation) |
| $EQ20\_ALL_{ij}$ | Expected equity in 2020 once we take into account all interventions for firm (i) operating in sector (j) (source: our calculation) |
| EQ20_ALLOW | Expected equity in 2020 considering the cost savings due to a one-off contribution to lost revenues (source: our calculation) |
| EQ20_AMT | Expected equity 2020 considering the depreciation and amortization savings (source: our calculation) |
| $EQ20\_AMT_{ij}$ | Expected equity 2020 considering the depreciation and amortization savings for firm (i) operating in sector (j) (source: our calculation) |
| EQ20_LISTED_ALL | Expected equity in 2020 with changes in revenues reported by Italian listed firms considering all interventions (source: our calculation) |
| EQ20_LISTED | Expected equity in 2020 with changes in revenues reported by Italian listed firms (source: our calculation) |

| | |
|---|---|
| EQ20_LISTED$_{ij}$ | Expected equity in 2020 with changes in revenues reported by Italian listed firms (i) operating in sector (j) (source: our calculation) |
| EQ20_EL | Expected equity in 2020 with total operating costs elasticity (source: our calculation) |
| EQ20_EL$_{ij}$ | Expected equity in 2020 with total operating costs elasticity for firm (i) operating in sector (j) (source: our calculation) |
| EQ20_EL_ALL | Expected equity in 2020 with total operating costs elasticity considering all interventions (source: our calculation) |
| EQ20_FUR | Expected equity 2020 considering the cost savings due to the furlough (source: our calculation) |
| EQ20_FUR$_{ij}$ | Expected equity 2020 considering the cost savings due to the furlough for firm (i) operating in sector (j) (source: our calculation) |
| EQ20_RENT | Expected equity 2020 considering the one-off contribution towards rental expenses (source: our calculation) |
| EQ_MISS20 | Total amount needed to replenish equity above legal thresholds to reinstate viability for firm (source: our calculation) |
| EQ_MISS20$_{ij}$ | Amount needed to replenish equity above legal thresholds to reinstate viability for firm (i) operating in sector (j) (source: our calculation) |
| Equity_below_legal | Total number of firms with equity above zero but below legal requirements. (source: our calculation) |
| Equity_neg | Total number of companies with negative equity. (source: our calculation) |
| FC19$_{ij}$ | Fixed costs in 2019 for firm (i) operating in sector (j) (source: AIDA database) |
| Distressed_Firms | Total number of firms with equity below legal requirements. We define these companies as 'distressed companies'. This value is given by the sum of two variables, namely: *Equity_neg* plus *Equity_below_legal* (source: our calculation) |
| FIX_ASS_REV | Sum of net tangible assets net intangible assets and financial instruments like stocks in subsidiaries and joint ventures as reported in the 2019 balance sheet of the firm (source: AIDA database) |
| FIX_ASS_REV$_{ij}$ | Sum of net tangible assets, net intangible assets and financial instruments such as shares in subsidiaries and joint ventures as reported in the 2019 balance sheet for firm (i) operating in sector (j) (source: AIDA database) |
| FIX_ASS_REV_REQ | Total revaluation of fixed assets required to replenish equity capital above the legal threshold for firm (source: our calculation) |
| FIX_ASS_REV_REQ$_{ij}$ | Revaluation of fixed assets required to replenish equity capital above the legal threshold for firm (i) operating in sector (j) (source: our calculation) |
| FUR_FEES20$_{ij}$ | Fees incurred by firm (i) operating in sector (j) to access the furlough (source: our calculation) |

| | |
|---|---|
| INT19$_{ij}$ | Net intangible assets as reported in the 2019 balance sheet for firm (i) operating in sector (j) (source: AIDA database) |
| LAB_SAV20 | Estimation amount saved due to the furlough (source: our calculation) |
| LAB_SAV20$_{ij}$ | Estimation amount saved due to the furlough for firm (i) operating in sector (j) (source: our calculation) |
| Loans_risk | Total bank debt in distressed firms (source: our calculation) |
| NI19 | Net income in 2019 (source: AIDA database) |
| NI20 | Estimation of net income 2020 with baseline scenario (source: our calculation) |
| NI20$_{ij}$ | Estimation of net income 2020 for firm (i) operating in sector (j) (source: our calculation) |
| NI20_ALL | Estimation of net income 2020 considering the cost savings due to all interventions (source: our calculation) |
| NI20_ALL$_{ij}$ | Estimation of net income 2020 considering the cost savings due to all interventions for firm (i) operating in sector (j) (source: our calculation) |
| NI20_ALLOW20 | Estimation of net income 2020 considering the cost savings due to one-off contribution to lost revenues (source: our calculation) |
| NI20_AMT | Estimation net income 2020 considering the cost savings due to the option offered to all firms to suspend and postpone depreciation and amortization charges for fixed tangible and intangible assets in 2020 (source: our calculation) |
| NI20_AMT$_{ij}$ | Estimation of net income 2020 considering the cost savings due to the option offered to all firms to suspend and postpone depreciation and amortization charges for fixed tangible and intangible assets in 2020 for firm (i) operating in sector (j) (source: our calculation) |

| | |
|---|---|
| NI20_LISTED | Estimation of net income 2020 with changes in revenues reported by Italian listed firms (source: our calculation) |
| NI20_LISTED$_{ij}$ | Estimation of net income 2020 with changes in revenues reported by Italian listed firms for firm (i) operating in sector (j) (source: our calculation) |
| NI20_LISTED_ALL | Estimation of net income 2020 with changes in revenues reported by Italian listed firms considering all interventions (source: our calculation) |
| NI20_EL | Estimation of net income 2020 with elasticity of elasticity of total operating costs (source: our calculation) |
| NI20_EL$_{ij}$ | Estimation of net income 2020 with total operating costs elasticity for firm (i) operating in sector (j) (source: our calculation) |
| NI20_EL_ALL | Estimation of net income with total operating costs elasticity considering all interventions (source: our calculation) |
| NI20_FUR | Estimation of net income 2020 considering the cost savings due to the furlough (source: our calculation) |
| NI20_FUR$_{ij}$ | Estimation of net income 2020 considering the cost savings due to the furlough in 2020 for firm (i) operating in sector (j) (source: our calculation) |
| NI20_RENT | Estimation net income 2020 considering the one-off contribution towards rental expenses (source: our calculation) |
| NON_OP_ITEMS19$_{ij}$ | Non-operating items (interest and charges and adjustments to the carrying amounts of financial assets) in 2019 for firm (i) operating in sector (j) (source: AIDA database) |
| OP_COSTS$_{it}$ | It is the natural logarithm of the the total operating costs of firm (i) at time (t) (source: AIDA database) |
| OP_COSTS19$_{ij}$ | Total operating costs 2019 for firm (i) operating in sector (j) (source: AIDA database) |
| OP_COSTS20$_{ij}$ | Total operating costs 2020 for firm (i) operating in sector (j) (source: our calculation) |
| OP_VAR_COSTS$_{it}$ | It is the natural logarithm of total variable costs (e.g. raw materials, consumables, and merchandise and services) for firm (*i*) at time (*t*) (source: AIDA database) |
| OP_VAR_COSTS19$_{ij}$ | Total variable costs 2019 (e.g. raw materials, consumables and merchandise and services) for firm (i) operating in sector (j) (source: AIDA database) |
| OP_VAR_COSTS20$_{ij}$ | Total variable costs 2020 (e.g. raw materials, consumables, and merchandise and services) for firm (i) operating in sector (j) (source: our calculation) |
| FIN_INST19$_{ij}$ | Financial instruments such as shares in subsidiaries and joint ventures as reported in the 2019 balance sheet for firm (i) operating in sector (j) (source: AIDA database) |
| REV$_{it}$ | It is the natural logarithm of revenues for firm (i*) at time (*t*). (source: AIDA database) |
| REV19 | Total revenues 2019 (source: AIDA database) |
| REV19$_{ij}$ | Revenues 2019 for firm (i) operating in sector (j) (source: AIDA database) |

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| REV20 | Total revenues 2020 (source: our calculation) |
| $REV20_{ij}$ | Estimation revenues 2020 for firm (i) operating in sector (j) (source: our calculation) |
| REV20_LISTED | Estimation revenues 2020 with changes in revenues reported by Italian listed firms (source: our calculation) |
| $REV20\_LISTED_{ij}$ | Estimation revenues 2020 with changes in revenues reported by Italian listed firms (i) operating in sector (j) (source: our calculation) |
| REV_ALLOW20 | Estimation revenues 2020 considering one-off contribution in the form of a nonrefundable grant offered to firm that experienced a drop in revenues of at least one third in April 2020 versus 2019, with a 2019 turnover of less than €5M. We use the real change in April revenues as provided by the Italian Ministry of Economics (source: our calculation) |
| $REV\_ALLOW20_{ij}$ | Estimation revenues 2020 considering one-off contribution in the form of a nonrefundable grant offered to firm (i) operating in sector (j) that experienced a drop in revenues of at least one third in April 2020 versus 2019. with a 2019 turnover of less than €5M. We use the real change in April revenues as provided by the Italian Ministry of Economics (source: our calculation) |
| $RENT\_SAV20_{ij}$ | A one-off contribution of 60% of the monthly rental fees paid in March, April, and May 2020 for firm (i) operating in sector (j); eligible companies were those experiencing a drop of at least 50% of their revenues decrease compared to the same period in 2019 (source: our calculation) |
| $TAN19_{ij}$ | Net tangible assets as reported in the 2019 balance sheet for firm (i) operating in sector (j) (source: AIDA database) |
| $TAX20_{ij}$ | Estimation taxes on income 2020 for firm (i) operating in sector (j) (source: our calculation) |
| TOC19 | Total operating costs for 2019 (source: AIDA database) |
| TOC20 | Total operating costs for 2020 (source: our calculation) |
| TOC20_EL | Total operating costs 2020 with total operating costs elasticity (source: our calculation) |
| TOC20_EL_ALL | Total operating costs 2020 with total operating costs elasticity considering all interventions (source: our calculation) |
| Tot_assets19 | Total assets in 2019 (source: AIDA database) |
| Tot_loans19 | Total bank debt in 2019 (source: AIDA database) |
| TPE19 | Total costs for third-party lease and rental charges as reported in 2019 (source: AIDA database) |
| $TPE19_{ij}$ | Total costs of third-party lease and rental charges as reported in 2019 for firm (i) operating in sector (j) (source: AIDA database) |
| W&S19 | Total salary and wages costs for 2019 (source: AIDA database) |
| $W\&S19_{ij}$ | Salary and salary costs for firm (i) operating in sector (j) in 2019 (source: AIDA database) |

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| Allowance | Percentage of contribution paid to firm if the company experienced a 1/3 decrease in revenues in April 2020 versus April 2019 and the total revenues 2019 are in a specific range (source: our calculation) |
| %FUR_FIRMS$_j$ | The percentage of firms that resort to the furlough in each industry (j) (source: Bank of Italy and INPS report) |
| %FUR_EMP$_j$ | The average percentage of employees on temporary layoffs in each industry (j) (source: Bank of Italy and INPS report) |
| REV20_IND_CHG$_j$ | Change in revenues experienced in the relevant industry (j) as reported by the MEF data. Appendix A describes the methodology applied. (source: data provided by the Italian Ministry of Economics and Finance) |
| %REV_CHG_IND_20_LISTED$_j$ | 2020 changes in revenues by industry (j). Appendix C describes the methodology applied. (source: ORBIS BVD database) |
| $\beta_i$ | It is the % change in variable costs due to the % change in revenues. (source: our calculation) |
| $\eta_i$ | It is the % change in total operating costs due to the % change in revenues. (source: our calculation) |
| \|MIN_EQUITY\| | Minimum capital requirements according to the corporate legal form (source: our calculation) |

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