The Visible Hand when Revenues Stop: Evidence from Loan and Stock Markets during Covid19*

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Abstract

We document that public interventions in the corporate sector during the Covid19 pandemic help firms access bank loans, cushion liquidity shortfalls, and boost their market valuations. We use firm-level data on Covid19-related news to trace firms' liquidity shocks in several European countries, which differ in public spending for fiscal stimulus and debt guarantees to corporations. As market valuations rebound in spite of the deterioration of firms' revenues, interventions drive a part of the disconnect between markets and the real economy. Remarkably, the financial sector internalizes part of the benefits of interventions targeting non-financial firms. To interpret these results, we lay out a moral hazard model of corporate borrowing and public interventions. The model suggests that interventions in the corporate sector are effective to mitigate incentive problems leading to credit market failures. Lenders benefit from loan guarantees as a compensation to finance firms with severe debt overhang problems.

Keywords: corporate debt, debt overhang, guarantees, market failure, public interventions, market value.

JEL Classification Numbers: G01, G32, G38, H81.

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1 Introduction

As a response to the Covid19 pandemic, governments all around the world have devoted considerable resources to subsidizing the corporate sector and stimulate recovery. Public interventions commonly take the form of immediate fiscal support and subsidies to corporate borrowing, such as guarantees on corporate debt. A number of stark facts emerges from the Covid19 period. Firms appear to issue debt, as Acharya and Steffen (2020) and Halling, Yu, and Zechner (2020) suggest. At the same time, European stock markets have rebounded almost completely from an unprecedented initial shock, in spite of the deterioration of real economic indicators. This disconnect between markets and the real economy appears to be more pronounced in countries that allocate a higher fraction of their Gross Domestic Product (GDP) to support corporations.

We draw a connection among these facts. To do so, we study how public interventions in the corporate sector affect the market for corporate loans. In the aftermath of the Great Recession, a theoretical literature has developed to study market failures and public interventions that help restore market efficiency. Key contributions include Bolton, Santos, and Scheinkman (2011), Farhi and Tirole (2012), Tirole (2012), Malherbe (2014), and Heider, Hoerova, and Holthausen (2015). Do public interventions affect the firm borrowing channel[1]? That is, are they effective to help firms cope with liquidity shortfalls? To the extent that market valuations offer a forward-looking outlook about firms' prospects, do they suggest that firms benefit from interventions? Do firms pass their liquidity shocks on to banks through the market for corporate loans?

Public interventions in Europe during the Covid19 period serve as a lab to empirically investigate these questions. First, uniform data that capture country-level heterogeneity in public interventions in the corporate sector are available. Second, local confinement events induce variation in firm-level liquidity shocks, which we trace from news about halting of firms' operations. To do so, we collect firm-level data on Covid19-related news across European countries from the S&P Market Intelligence database. Nevertheless, our empirical strategy needs to confront with limited data availability. Data on public interventions are

[1]Khwaja and Mian (2008) contrast a firm borrowing channel and a bank lending channel, i.e. "the inability of banks to cushion borrowing firms against bank-specific liquidity shocks".

not available at the individual firm's level. In addition, as we do not have access to a pan-European credit registry, bank-firm relationships are not observed.

Our study of the market for corporate loans builds on the "granular instrumental variables" (GIVs) approach, which Gabaix and Koijen (2020) formalize. Following Gabaix and Koijen (2020), we exploit idiosyncratic liquidity shocks, which we trace with firm-level news, to construct an instrument for an aggregate endogenous variable, namely country-level liquidity shocks. A simple comparison of the growth of corporate loans in the Covid19 period across countries with different liquidity shocks and public interventions would raise three major concerns. First, aggregate liquidity shocks might be the outcome of credit market failures, and not vice versa. GIVs exploits idiosyncratic shocks to large ("granular") firms, which propagate into aggregate ones, to construct a valid instrument and alleviate this simultaneity bias. Second, an omitted variable bias arises as we aggregate news at the country level. Aggregate liquidity shortfalls correlate with a host of country-level variables. To the extent the exclusion restriction of the GIVs is satisfied, they help cope with omitted aggregate variables. Third, aggregate credit contractions might trigger government interventions. To mitigate the scope for this second simultaneity bias, we take advantage of data from the transparency exercise of the European Banking Authority (EBA). The transparency exercise discloses bank-level data on loan exposures to each European country as of December 2019 and June 2020. As an outcome variable, we then consider the growth in corporate loans for a given bank outside their home country. The rationale for this choice is that public interventions are fairly unlikely to be introduced to support lending by foreign banks[2].

We combine the GIVs approach with a second building block of our empirical analysis, namely the fixed-effect methodology in the seminal paper of Khwaja and Mian (2008). To determine how interventions affect the firm borrowing channel, we focus on banks' lending to the corporate sectors of multiple (foreign) countries. Such corporate sectors differ in their exposure to liquidity shocks, which we instrument with GIVs based on firm-level news, and in the public support they receive. We include bank fixed effects and we consider first-differenced data around the Covid19 period. Doing so, we compare how the same bank's

[2]In a similar vein, Jiménez, Ongena, Peydró, and Saurina (2014) rely on the Spanish credit registry as a lab to study the effects on monetary policy on bank risk-taking. The identification assumption in Jiménez, Ongena, Peydró, and Saurina (2014) is that the monetary policy decisions of the European Central Bank are fairly exogenous to Spanish banks' risk-taking.

loan growth to firms in one country changes relative to firms in countries that face different liquidity shocks and public interventions. As firm-level news trace shocks that do not affect bank credit directly, this within-bank comparison plausibly absorbs bank-specific changes in credit supply. Thus, estimated differences in loan growth plausibly originate from the firm borrowing channel.

Across a number of empirical specifications, we find that public interventions are effective in allowing firms hit by liquidity shocks to borrow additional funds from banks. Consistent with Acharya and Steffen (2020) and Halling, Yu, and Zechner (2020), during the Covid19 period firms manage to raise additional debt, while they do not generally issue equity. Different types of public interventions have different effects on the firm borrowing channel. Specifically, loan guarantees and loan support increase firms' debt capacity. Instead, immediate fiscal support to corporations creates a substitution effect, which leads firms to rely less on bank credit.

We then turn to market valuations of firms and banks. Although the arrival of negative news reduces the market valuations of firms, the stock valuations in the Covid19 period increase in public spending for interventions as a fraction of GDP. Firms' revenues do not follow the same pattern and do not appear to immediately respond to interventions. Taken together, these results suggest that interventions drive a part of the disconnect between markets and the real economy. Overall, results are consistent with investors perceiving interventions as valuable to improve firms' long-run prospects. Remarkably, we find that banks' market valuations benefit from public interventions when they are exposed to affected firms. Our results point to the market for corporate loans being a channel through which firms pass their liquidity shocks to the financial sector.

To interpret our results, we develop a moral-hazard model of corporate investment and financing and public interventions. In the model, which is based on Holmström and Tirole (1997), a firm borrows from an external lender to finance an investment project with positive net present value. The firm is endogenously financially constrained because of the moral hazard problem in which the firm's insiders can shirk and entertain a private benefit. The model features an externality that we map into the Covid19 liquidity shock. The Covid19 shock is an unexpected funding need that is revealed between the firm's decision to undertake the project and its completion. An interpretation of the funding need is that a lockdown cuts

the intermediary revenues needed to cover the operating expenses. The model highlights the scope for government interventions. The government maximizes welfare net of its deficit. Immediate liquidity support to the corporate sector helps restore access to financial markets and successfully complete the project. However, when the shock is sufficiently large and the entrepreneur has taken on significant debt already, the classic debt overhang problem as in Myers (1977) arises. Immediate liquidity support does not ensure the continuation of the project as it is not profitable for the entrepreneur to continue putting effort. Lenders must instead be compensated and guarantees on corporate debt, which result in a state-contingent transfer to lenders in case of default, can encourage them to fund the project.

Altogether, our results suggest that public interventions in the corporate sector are successful in increasing the market valuations of firms hit by the Covid19 shock. To the extent that market valuations reflect future firms' prospects, public interventions that provide immediate liquidity support and expand firms' borrowing capacity through debt guarantees and additional loans are beneficial for the real economy in the long run. Importantly, according to market valuations, the financial sector internalizes part of the benefits of interventions specifically targeting non-financial firms. We interpret this finding through the lens of our model as corporate debt guarantees compensating lenders to fund firms with large funding needs and debt overhang problems.

In Section 2, we describe the institutional background and establish a set of stylized aggregate facts. In Section 3, we describe our data sources and present summary statistics. Our empirical strategy and results are presented in Section 4. In Section 5, we interpret our results through the lens of the model. Section 6 concludes.

Related Literature. This paper offers contributions to three main strands of the literature. First, our work relates to the literature on market failures, which create a scope for public interventions as tools to rejuvenate markets in recessions. Since the seminal paper of Akerlof (1970), recent applied theoretical contributions have emerged in the context of the Great Recession of 2008, such as Bolton, Santos, and Scheinkman (2011), Farhi and Tirole (2012), Tirole (2012), Malherbe (2014), and Heider, Hoerova, and Holthausen (2015). In comparison to these studies, we use the Covid19 pandemic as a lab to observe heterogeneous public interventions across European countries and interpret their empirical implications for

corporate policies and market valuations through the lens of a model of corporate borrowing and interventions.

Second, our study relates to a recent but rapidly growing literature that links the implications of the Covid19 pandemic for credit markets to stock market returns. Contributions include Acharya, Engle, and Steffen (2020), Acharya and Steffen (2020), Altavilla, Barbiero, Boucinha, and Burlon (2020), Crouzet and Tourre (2020), Fahlenbrach, Rageth, and Stulz (2020), Halling, Yu, and Zechner (2020), Li, Strahan, and Zhang (2020), and Ramelli and Wagner (2020). Our empirical analysis complements these studies by focusing on the role of public interventions in corporate credit markets.

Finally, and more broadly, our analysis relates to the emerging literature at the interface of corporate borrowing and asset prices. Gamba and Triantis (2008), Gomes and Schmid (2010), Kuehn and Schmid (2014), Glover (2016), Friewald, Nagler, and Wagner (2018), Green (2018), Ippolito, Steri, and Tebaldi (2017), Gamba, Aranda, and Saretto (2018), and Chaderina, Weiss, and Zechner (2020), offer recent contributions in this area. In this context, our study highlights the importance of the active role of public interventions for the understanding of the relationship between corporate credit and asset prices in recessions.

2 Institutional Background and Aggregate Facts

This section first describes the institutional background of public interventions in Europe during the Covid19 pandemic and the available measures at the country level. Then, we establish empirical facts that serve as a basis for the following analyses.

2.1 Interventions in Europe

The Covid19 pandemic has led to unprecedented interventions of governments around the world. Government interventions targeting non-financial firms during the pandemic can be classified in two broad categories: (i) *immediate support* and (ii) *guarantees and loans support*. In the first case, firms receive cash immediately they do not need to reimburse. Thus, immediate liquidity support measures "pure" government spending. In the second case, firms receive additional liquidity support in the form of guarantees on loans and additional loans (including deferred expenses) that they must reimburse in the future.

The IMF forecasts that the immediate support from governments in advanced economies will be close to 9% of GDP in 2020, with guarantees and loans support amounting to 11% of GDP (IMF Fiscal Monitor, Oct. 2020). In the European Union, immediate support and guarantees and loans support amount respectively to 3.8% and 6.9% of GDP. There is however a wide variation in the level of government support across countries, with guarantees and loans support representing more than a quarter of GDP in Germany but less than 5% of GDP in the Netherlands.

Figure 1 shows the level of government support for the United States and for 17 European countries. To compute the size of government interventions we use the list of government interventions of Bruegel (2020) and the IMF Fiscal Monitor which include measures until October 2020.[3] Immediate support measures include the cost of partial unemployment schemes. They also include forgone revenues such as reductions in taxes or social security contributions. The second type of interventions are guarantees and loans support. These include the cost of providing guarantees, loans or equity injections to firms. It also includes measures to defer the payment of taxes and social contributions.

Figure 1 suggests that European countries differ both in the overall level of government interventions provided as well as in the mix of immediate versus guarantees and loans support measures. Countries such as Italy allocated relatively few resources to immediate support (4.9% of GDP) but sizable resources to guarantees and loans support (33% of GDP). Other countries such as Greece provided little support both in terms of immediate liquidity interventions and guarantees and loans support (6.8% and 1.5% respectively).

2.2 Market Valuations and the Real Economy

All markets plunged during the onset of the Covid19 pandemic, with maximum losses ranging from roughly 30% for the French Index CAC40 to a maximum around 50% for the Greek Index ASE from January 1st, 2020 to end of March 2020. All markets then substantially recovered from April to September, although the recovery was uneven across countries. The recovery rates from trough to September 1st, 2020 range from 6% for the Spanish market to

[3]See `https://www.bruegel.org/publications/datasets/covid-national-dataset/` and `https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19` for the full list of measures and classification. Data retrieved on November 13, 2020.

around 30% for the German market. Figure 4 in appendix depicts the performance of the main European stock market indices from January 1st, 2020 to September 1st, 2020. We detail the complete list of indices in Appendix B.

Unlike the stock markets, the real economy had not experienced a recovery by September 2020. Both GDP and hours worked steadily decline during the second quarter of 2020, despite the stock market recovery. In the second quarter of 2020, GDP has fallen between 7% for Denmark to almost 23% for the UK, while hours worked have declined by 6% for the Netherlands to 24% for Spain. These points are illustrated in Figure 5 in appendix, which shows the dynamics of GDP growth and hours worked for the same countries from 2019Q1 to 2020Q2.

Table 1 summarizes the stock market performance, and the growth rates in a set of macroeconomic indicators from the ECB during the first quarter of 2020 in Panel A ("Decline"), and during the second quarter of 2020 in Panel B ("Recovery"). The set of macroeconomic indicators includes GDP, hours worked, labor productivity, commercial vehicle registrations, and the unemployment rate. Overall, Figures 4 and 5 and Table 1 document a disconnect between the stock market performance and real economic activity from the beginning of the Covid19 pandemic.

2.3 Public Interventions and the Disconnect

We explore in Table 2 the cross-country correlations between government interventions, the stock market and economic indicators. Panel A provides an overview of the performance of stock prices by sector of activity. Sectors are defined using the Global Industry Classification Standards (GICS) developed by S&P Dow Jones Indices. The returns are computed from January 1st, 2020 to September 1st, 2020. Panel A shows that the stock performance of firms was also contrasted across sectors, with Technology and Healthcare stocks showing a strong performance and Financials and Energy stocks performing much more poorly.

In Panel B, we regress the sector returns for each country on the size of interventions as a share of GDP. The sample consists of the 17 European countries in Figure 1. The largest coefficient for immediate support measures is for the consumer goods sector. A higher level of guarantees and loan support is associated with higher returns for the financial sector as

well as for energy and healthcare stocks. The table shows heterogeneity in the correlations between sector performance and government interventions. Since the economic importance of each sector for each country's economy is heterogenous and we do not observe sector-level interventions for each country, most correlations are not statistically different from zero. Nevertheless, three facts emerge from the table. First, the magnitude of coefficients for immediate support is generally larger than that of guarantees and loans support. Second, the magnitude of the relationship between immediate support and stock prices decreases for sectors that experienced a larger fall due to the Covid19 shock (the sectors in Table 2 are sorted by the stock price performance of Panel A). For the guarantees and loans support, however, the correlation with sector performance seems to increase for worst hit sectors such as Financials or Energy and Utilities.

In Panel C, we compute the correlation between indicators of the short term economic performance and the interventions. The indicators include total employment, GDP, hours worked and productivity. For each series, we compute the percentage change between the 2020Q2 and the 2019Q2 values. The correlation between immediate interventions is positive for all variables. A higher immediate intervention is associated with higher employment, higher GDP, more hours worked and higher productivity. However the correlations become negative when including loans and guarantees support measures, to the exception of employment.

3 Data and Summary Statistics

3.1 Data Sources

To isolate firms affected by the impact of the Covid19 pandemic, we collect key development news at the firm level from the S&P Market Intelligence database. Our sample consists of 2626 European firms that reported key development headlines or key development abstracts containing the words "coronavirus" or "covid" from February 1st, 2020 to September 1st, 2020. UK firms are the most represented in the sample (37%), followed by German (11%), Swedish (8%), and French (7%) firms. The most represented sectors are Industrials (20%), Healthcare (19%), Consumer (18%), Technology (17%), and Financials (12%).

S&P Market Intelligence classifies Covid19-related key development news into 50 categories, which we list in the Appendix. Covid19-related news in the sample are classified more

often as "Product-Related Announcement" (13%), followed by the category "Corporate Guidance: Unusual Event" (10%), "Corporate Guidance: New or Confirmed" (9%), and "Client Announcement" (9%), "Dividend Cancellation or Suspension" (7%), and "Halt or Resumption of Operations, Unusual Events" (5%). The latter category is especially important in that it refers to suspension ("halt") and continuation ("resumption") of operations directly related to confinement and de-confinement events.

We further split Covid19-related news into 1248 "bad" news and 1259 "good" news according to the news categories and to keywords in the key development headlines and abstracts. For example, "Dividend Cancellation or Suspension" is classified as a bad news, while "Product-related Announcement" and "Client Announcement" are classified as good news in that they refer to the launch of new products and to the acquisition of new customers. Other classifications of news into bad and good news instead require some textual analysis. In particular, we classify news of the S&P "Halt or Resumption of Operations, Unusual Events" category as "Halt of Operations" when the keywords "close", "halt", "suspend", or "cease" appear, and as "Resumption of Operations" when we identify the words "reopen" or "resume". We report the complete list of Covid19-related news categories classified as good news or bad news is Appendix C.

3.2 Summary Statistics

Firms. Table 3 reports descriptive statistics about corporate policies for the firms in our sample of Covid19-related news. Financial data are from S&P Market Intelligence. Panels A and B respectively describe corporate policies in the pre-Covid19 period (2019Q4) and in the post-Covid19 period (2020Q2). In the pre-Covid19 period, the average firm in our sample is 3.5 years old, has 27 USD billions of total assets, has a debt-to-asset ratio of 27%, and holds 15% of assets in cash. A comparison of the two panels reveals that average total assets increased from 27 USD billion to 36 USD billion from June 2019 to June 2020, average leverage increased from 27% to 28%, and average cash holdings increased from 15% to 16%. The six-month percentage change in revenues drops from roughly 6% to -27%, which reflects the effect of the pandemic and lockdown policies on firms' operations. Panel B shows that, on the liability side, the negative revenue growth is associated with a negative equity growth around -5%. Remarkably, firms instead increased their debt levels by 5.41% from December

2019 to June 2020. Finally, the average stock return of firms in the sample is -16% in the pandemic period, with a standard deviation of 60%.

News. Panel A of Table 4 reports the average number of news per firm in our sample. The average number of both bad and good news is roughly 0.5 during the pandemic. The maximum number of bad news per firm is 4 while the maximum number of good news is 5. 48% of news of a firm are bad news, while the average number of news in the halt of operations category is 0.04.

Panel B shows the same summary statistics of Panel A for each country.[4] Danish firms report the most bad news per firm, while French, Belgian and Dutch firms report more good news per firm. The ratio of bad news to total news is relatively high in Portugal (67%), Denmark (59%) and Germany (53%) and relatively low in France (37%), Italy (39%), Belgium (40%) and Greece (40%). Halt of operations news are frequent in Italy (0.04 news per firm), Netherlands, Spain, Germany and the UK (0.03 news per firm).

Finally, Panel C reports descriptive statistics of news by sector. The sectors that are affected the most by bad news are Consumer Goods (0.72 news per firm), Real Estate (0.66 news per firm), and Industrials (0.64 news per firm). Healthcare is by a large margin the sector that records the most good news (1.01 news per firm). Real Estate, Industrials, Financials and Consumer Goods report a large fraction of bad news (above 60%). Halt of operations news are mostly found in the Consumer Good (0.11 news per firm), Materials (0.07 news per firm), and Real Estate (0.07 news per firm) sectors.

Banks. The bank-level and credit flows analyses in Section 4 rely on the 127 banks that participated in the "2020 EU-Wide Transparency Exercise" of the European Banking Authority.[5] The transparency exercise discloses bank-level data on loan exposures to each country and sector in our sample as of December 2019 and June 2020. We also use accounting data from S&P Market Intelligence and stock prices from Datastream for the 46 publicly traded banks. We then construct bank-level measures of exposure to (i) government interventions

[4]We do not report the news statistics for Hungary given that we have only 2 observations.

[5]The bank-level data are available from: `https://eba.europa.eu/risk-analysis-and-data/eu-wide-transparency-exercise`, visited on March 25, 2021.

and (ii) firms' bad news. To do so, we weight each country-level intervention by the bank's country exposures and each sector-level ratio of bad news to all Covid19-related news by the bank's exposure to the sector as of December 2019.

Table 5 reports descriptive statistics on (i) bank exposures to interventions and news, (ii) accounting variables as of December 2019, and (iii) stock returns from January 1st, 2020 until September 1st, 2020. The average bank is exposed to 58% of the bad news that firms report. Banks are, on average, exposed to countries that allocate an average spending of 10.8% of the country's GDP to public interventions related to Covid19. The average bank is more exposed to guarantees and loans support (roughly 18%) than to immediate support (roughly 5%). The average bank stock return is -52% from January 1st, 2020 to September 1st, 2020. The stock returns of all 46 banks in the sample are negative during the Covid19 period, with a standard deviation of 32%. As of December 2019, the average bank has 562 USD billion in assets, a capital to risk-weighted assets ratio of 16.72%, and a Tier 1 leverage ratio (ratio of Tier 1 capital to on- and off-balance sheet items) of 7%. The average ratio of risk-weighted assets to total assets is 44%, while the average ratio of non-performing loans to all customer loans is 7%.

3.3 The Impact of Covid19 on Corporate Policies

Empirical Specification. We relate the Covid19 shock to three corporate policies: changes in revenues, changes in the equity of the firm, and changes in debt. In the model, the pandemic creates a funding need in the intermediary period. This reduces revenues and the net worth of the firm, and increases its debt. Table 6 reports estimates from the following regression specification:

$$policy_f = \alpha_c + \alpha_s + \beta_1 badNews_f + \beta_2 goodNews_f + \Gamma^T X_f + \epsilon_f \tag{1}$$

where the dependent variable $policy_f$ is $revenueGrowth_f$, defined as the six-month percentage change in the firm's total revenues as of June 2020, in Panel A, $equityGrowth_f$, defined as the six-month percentage change in the firm's total equity as of June 2020, in Panel B and $debtGrowth_f$, defined as the six-month percentage change in the firm's total debt as of June 2020, in Panel C. The coefficients α_c and α_s are respectively country and sector fixed effects.

The variables on the right-hand side are: $badNews_f$, defined as the number of Covid19-related bad news reported by the firm from February 1st, 2020 until September 1st, 2020; $goodNews_f$, defined as the number of Covid19-related good news reported by the firm from February 1st, 2020 until September 1st, 2020. The set of firm-level controls X_f includes $size_f$, defined as the logarithm of the firm's total assets as of December 2019; $leverage_f$, defined as the ratio of the firm's total debt to its total assets as of December 2019; and age_f, defined as the firm's age in years since creation, as of September 2020.

Revenues. Panel A of Table 6 reports estimates from the specification (1), where the dependent variable is revenue growth during the Covid19 period. The estimate on $badNews_f$ in the leftmost column is negative and statistically significant. Instead, the estimated coefficient for $goodNews_f$ is not statistically significant. In the most stringent specification of column (4), which includes firm-level controls, and country $\times$ sector fixed effects, the point estimate for the coefficient on $badNews_f$ is -9.15, statistically significant at the one percent level. Thus, an additional negative piece of news for a firm during the Covid19 period results is associated with a contraction of revenues of 9.15%.

Finally, the rightmost column of Panel A considers a particularly negative piece of news, that is a halt of operations due to Covid19 restrictions. The variable $Haltnews_f$ is an indicator taking the value of one if a news about firm f halting its operating activities due to Covid19 is released during the Covid19 period, and of zero otherwise. The estimated coefficient, which is statistically significant at the one percent level, indicates that firms that were forced to stop production in the Covid19 period experienced an average contraction in revenues around 37%. Notice that the estimated coefficient is not 100 percent in that, for example, news often refer only to specific factories, branches or stores as described in Appendix C.

Overall, the results in the table indicate that firms that received negative news from Covid19 experienced a substantial contraction in revenues, while this is not the case for firms that received more positive news.

Equity. In Table B of Table 6, the dependent variable is the growth in a firm's equity during the Covid19 period. Similar to the results in Panel A, good news have no significant impact on a firm's equity growth, while the coefficient on $badNews_f$ is negative and statistically significant. The point estimate in the most stringent specification of column 4 shows

that an additional negative piece of news results in a reduction of firm's equity during the Covid19 period of 4.45%. Because equity growth reflects both internal equity growth through profits and external equity issuance, a negative coefficient indicates that firms do not manage to completely absorb income shortfalls during the Covid19 period with equity issuance. Interestingly, the coefficient on $Haltnews_f$ is negative but not statistically significant. This result possibly reflects substantial heterogeneity in the ability of firms accessing external equity to overcome severe restrictions from Covid19. In addition, some firms might experience a reduction in equity issuance costs or a positive liquidity shock because of firm-level public interventions.

Overall, the results in Panel B highlight a reduction in the shareholders' equity of firms that received negative news from Covid19, consistent with the large costs of equity issuance extensively documented in the corporate finance literature.

Debt. Panel C of Table 6 considers debt growth during the Covid19 period as the dependent variable. Remarkably, debt growth during the Covid19 period is positively related to $badNews_f$. An additional negative piece of news results in an increase in debt of 4.67%. The coefficient on $Haltnews_f$ in the rightmost column is large and positive and statistically significant at the one percent level. Firms that stop their operations due to the Covid19 shock increase their debt stock by roughly 23% during the Covid19 period. In contrast, good news about firms do not appear to influence debt growth. As in Panels A and B, all coefficients related to good news are not statistically different from zero.

4 Empirical Analysis

4.1 Public Interventions and Firms' Market Valuations

This section examines the effect Covid19 news and public interventions on the stock market valuations of non-financial firms.

Empirical Specifications. Tables 7 and 8 examine, in turn, the stock market response to Covid19-related news for non-financial firms and the effect of public interventions on their market valuations. The estimates in Table 7 are from the empirical specification (1), in which

the dependent variable is the realized stock return from January 1st, 2020 to September 1st, 2020.

The estimates of Table 8 are from the following regression:

$$Return_f = \alpha_c \times \alpha_s + \beta_1 Haltnews_f + \beta_2 Haltnews_f \times Interventions_c + \Gamma^T X_f + \epsilon_f, \quad (2)$$

where the dependent variable, $Return_f$, is the stock return of firm f from January 1st, 2020 to September 1st, 2020. The coefficients α_c and α_s are respectively country and sector fixed effects. The variables on the right-hand side are: $Interventions_c$, defined as the government spending for interventions in country c as a percentage of the country's GDP; $Haltnews_f$ is an indicator variable equal to one if firms halt their operations due to Covid19 as they report between January 1st, 2020 to September 1st, 2020. Note that, given the set of fixed effects, the country-level variable $Interventions_c$ cannot be included separately in this specification. Columns 4 to 6 of Table 8 include firm-level controls. The set of firm-level controls X_f includes $size_f$, defined as the logarithm of the firm's total assets as of December 2019; $leverage_f$, defined as the ratio of the firm's total debt to its total assets as of December 2019; and age_f, defined as the firm's age in years since creation, as of September 2020.

Market Response to Covid19. Table 7 shows that, not surprisingly, the arrival of good news increases the market value of firms during the Covid19 period, while bad news reduce it. The specification in column 4, which includes country $\times$ sector fixed effects, shows that an additional negative piece of news reduces the stock return by approximately 4pp during the sample period. In contrast, the arrival of an additional good piece of news increases the stock return by roughly 9pp. Finally, the rightmost column shows that the coefficient on $Haltnews_f$ is -0.13. Thus, firms stopping their operations due to Covid19 experience a drop in market value around 13%.

Market Valuations and Interventions. Table 8 documents a positive effect of government interventions on the market valuations of the corporate sector in the Covid19 period. First, the first line of estimates in Table 8 shows the effect of $Haltnews_f$ in the absence of public interventions. The estimate in column 4 implies that the value of firms stopping their operations due to Covid19 drops by 43% in a country with no expenditures for public interventions to support firms. Second, the coefficient on $Interventions_c \times Haltnews_f$ is

positive and stable to the value of 0.01, and it is statistically significant at the five percent level in column 4. Thus, the effect of an additional piece of halt of operations news on market valuations is reduced by 1% for countries with a 1pp higher intensity of interventions in the corporate sector as a fraction of GDP. For example, the value of $Interventions_c$ in Greece is 8%. As a result, the marginal effect of an additional unit of halt of operations news on firms' valuations is -35%. In contrast, the value of $Interventions_c$ is 39% in Germany and the resulting marginal effect of halt of operations news on firms' valuations is -4%. This suggests that public interventions substantially reduce the negative effects of firms' halt of operations due to Covid19 on firms' market value.

Columns 2 and 5 report the same estimates replacing $Interventions_c$ by immediate fiscal support only ($Immediate_c$), while columns 3 and 6 replace $Interventions_c$ by guarantees and loans support ($Guarantees_c$). A comparison of the effects of $Immediate_c$ vs. $Guarantees_c$ highlights that debt guarantees, rather than immediate liquidity injections, are responsible for the higher market valuations in the corporate sector, all else equal. In all specifications of Table 8, $Immediate_c$ is not statistically significant at the ten percent level. In contrast, the coefficient on $Guarantees_c \times Haltnews_f$ is positive and statistically significant at the five percent level in column 6. The estimates in column 6 create again large disparities in how market values are affected by halt of operations news given the intensity of guarantees and loan support in a country. Taking the same example as above: in Greece, the value of $Guarantees_c$ is 1.5%, while in Germany $Guarantees_c$ is 31%. As a result of guarantees and loan support measures only, the market valuations of firms hit by the Covid19 shock even increase in Germany (by 25%), while they decrease by 34% in Greece.

Summary and Discussion. Taken together, the estimates from Table 7 indicate that the Covid19 shock has a negative impact on market valuations of non-financial firms. However, public interventions, and in particular guarantees and loans support measures, appear to be reflected in market valuations. The effect of loan and guarantees support on stock valuations is statistically significant at the five percent level, while the effect of immediate support measures is not statistically different from zero. These results are broadly aligned with the model we introduce in Section 5. Both types of government interventions support the value of the firm, although through different mechanisms. immediate support are transfers to the firm, while guarantees are transfers to the lenders of the firm. Guarantees nevertheless

benefit the firm through competition between lenders, as this lowers the funding cost of the firm. In our model, all benefits in fact accrue to the firm as there is perfect competition between lenders.

The empirical results suggest that guarantees have a larger effect on the value of the firm than immediate support. One interpretation is that the immediate support helps the firm to respond to exceptional costs related to the pandemic but does not substantially change the prospects of the firm, while guarantees provide more support over future periods. Finally, we also remark in Table 11 in the Appendix, that the interventions do not affect real economic activity at the firm as measured by its revenues during the pandemic. This is consistent with public interventions explaining, in part, the disconnect between market values and real economic activity as highlighted in Section 2.

4.2 Public Interventions and Bank Market Valuations

Empirical Specifications. Table 9 relates the market valuations of banks to their exposure to public interventions and examines whether banks' market valuations respond to public interventions when banks are exposed to firms which have received bad news related to Covid19. Estimates are based on the following specification:

$$Return_b = \beta_0 + \beta_1 Badnews_b + \beta_2 Interventions_b + \beta_3 Badnews_b \times Interventions_b + \Gamma^T X_b + \epsilon_b, \tag{3}$$

where the dependent variable, $Return_b$, is the stock return of bank b from January 1st, 2020 to September 1st, 2020. The main variable on the right-hand side is $Interventions_b$, defined as $\sum_c w_{b,c} Interventions_c$ where the weights $w_{b,c}$ are based on the bank cross-country corporate exposures as of December 2019 as published in the transparency exercise of the EBA. In Panel A, the exposure to public interventions of bank b is derived accounting for all country exposures of the bank. In Panel B, we exclude the domestic exposures and replace $Interventions_b$ by $Foreign_Interventions_b$ that captures the average exposure of the bank to foreign public interventions. $Badnews_b$ is defined as $\sum_c w_{b,c} bad\,news_c/(bad\,news_c + good\,news_c)$. It is the ratio of the number of bad news in country c to the sum of bad news and good news in the country. The set of bank-level controls X_b includes $size_b$, defined as the logarithm of the bank's total assets as of December 2019; $tier1LVGR_b$, defined as the

ratio of the bank's Tier 1 capital to its total on-balance sheet and off-balance sheet assets as of December 2019; and $RWA/Assets_b$, defined as the ratio of the bank's risk-weighted assets to its total assets as of December 2019.

Market Valuations and Interventions. The estimates reported on the first line of Panel A of Table 9 show that, in general, banks' valuations also suffer from the exposures of banks to firms hit the Covid19 shock. The estimate of β_1 is negative and significant at the ten percent level in column 1, and implies that the stock market valuation of the bank decreases by 0.5% if its exposure to bad Covid19-related firm news increases by 1pp. The estimate is even more negative and significant at the one percent level if the bank is only exposed to countries with no government support to firms (column 2). In this case, banks with a one pp higher exposure to bad news see their stock market valuations decrease by 1%.

The effect of the bank exposure to firms affected by the Covid19 shock on bank stock returns is dampened when the firms reporting bad news are located in countries that spend more to support domestic firms. The estimate of β_3 in column 2 is positive and significant at the five percent level. A 1pp higher exposure of a bank to public interventions mitigates the effect of bank's exposure to Covid19-affected firms on bank stock prices by 0.1%. If we take the example of a bank A lending 100% of its corporate loan portfolio to German firms and a bank B lending 100% of its corporate loans to Greek firms, a 1pp. increase of the bank exposure to firms affected by the Covid19 shock leads to an increase of bank A's valuation by 2.8% but a decrease of bank B's valuation by 0.2%.

In columns 3 and 4 of Panel A of Table 9 we replace the bank exposure to public interventions $Interventions_b$ by its two main components, namely immediate fiscal support ($Immediate_b$) and guarantees and loans support ($Guarantees_b$). As for the effect of interventions on firms' market valuations, it seems that market valuations of banks respond more to the guarantees and loans support type of intervention than the immediate fiscal support. The estimate of β_3 is significant at the 10 percent level in column 4, implying in the example above that a 1pp increase of the bank exposure to firms affected by the Covid19 shock leads to an increase of bank A's valuation by 3.5% but a decrease of bank B's valuation by 0.6%. Therefore, based on the cross-country corporate loan exposures of banks and the variation in countries' intervention intensity, we observe contrasting effects on bank market valuations of their exposure to firms hit by the Covid19 shock.

We address concerns related to reverse causality and the well-documented bank-sovereign feedback loop in Panel B of Table 9, where we only consider the exposure of banks to foreign interventions. The rationale for this additional test is that a bank is less likely to influence fiscal decisions of foreign countries compared to domestic fiscal decisions. The estimates reported in Panel B are qualitatively similar and their economic significance is slightly smaller as expected. The results in this panel suggest that banks benefit from foreign public interventions intended to support firms during the pandemic.

Summary and Discussion. Bankruptcies of firms are particularly costly for financial intermediaries. This not only holds in the model in Section 5, where the recovery rate is normalized to zero, but also a large literature has documented the costs of bankruptcies (see e.g. Aghion, Hart, and Moore (1992)). The main objective of government interventions is to avoid bankruptcies of firms due to the exceptional costs related to the pandemic. A continuation of firms supported by government interventions is thus also supportive of the financial sector. While the banking sector has so far avoided the large bailouts that occurred in the global financial crisis, it is thus important to emphasize that it benefited indirectly from the unprecedented interventions in the non-financial sector.

4.3 Public Interventions and Credit Allocation

This section presents our results on the firm borrowing channel during the pandemic. Some firms experience a liquidity shock as the pandemic affects their operations, finances, and investments. We trace liquidity shocks at the firm level using the number of Covid19-related bad news as a fraction of all reported news (both good and bad). As one can infer from the examples of bad news reported in Appendix C2, firms reporting a larger fraction of Covid19-related bad news will likely demand more liquidity. However, once we aggregate this firm-level bad news index at the country level, other country-level variables (including macroeconomic variables) might correlate with the bad news index of the country. To address this concern, we adopt an instrumental variable approach strategy in the spirit of granular instrumental variables (GIVs) of Gabaix and Koijen (2020). We exploit the idiosyncratic news of large firms in the country reflecting their impossibility to operate based on Covid19 sanitary rules. Then, as we study the effectiveness of public interventions in restoring access to credit for firms, we also show the results focusing on foreign credit flows only.

Empirical Specifications. Our methodological approach relies on bank credit flows to corporations in a country, bank fixed effects and GIVs to isolate the liquidity shock of firms in a country. In the specification below A_{bc} represents credit flows from bank b to firms in country c. We want to consistently estimate β in the following specification:

$$A_{bc} = \alpha_b + \beta Badnews_c + \Gamma^T X_c + \epsilon_{bc},$$

where A_{bc} is the difference in the bank b exposure to country c between December 2019 and June 2020, α_b are bank fixed effects, and $Badnews_c$ is the average bad news index of a firm in country c. We also include potential confounders X_c describing the state of the corporate sector before the pandemic in the country as controls in the regression.

Despite the inclusion of control variables X_c, $Badnews_c$ might still correlate with other omitted variables describing the corporate sector in country c. Therefore, we take advantage of firm-level data to construct a granular instrument for $Badnews_c$. We construct a cross-sectional counterpart of a GIV based on firms' halt of operations news:

$$\widetilde{Halt}_c = \sum_{f \in c} w_{fc} Haltnews_f - \frac{1}{F} \sum_{f \in c} Haltnews_f, \tag{4}$$

where $w_{fc} = total\,assets_{fc} / \sum_{f \in c} total\,assets_{fc}$ based no firms' total assets as of December 2019, and F is the total number of firms in country c in our sample. The variable $Haltnews_f$ is an indicator taking the value of one if a news about firm f halting its operating activities due to Covid19 is released during the Covid19 period, and of zero otherwise. The relevance assumption for the validity of the instrument will be satisfied when Covid19-related bad news in a country are sufficiently represented by halt of operations news. In other words, the compliant countries are countries that are subject to strict Covid19 sanitary rules that prohibits firms to operate normally. We are estimating a local average treatment effect (LATE) for these countries. The exclusion restriction is formulated as $\mathrm{E}(\widetilde{Halt}_c, \epsilon_{bc}) = 0$. The exclusion restriction implies that the instrument capturing halt of operations news of large firms in the country correlate with country corporate credit shock only through the average bad news index of firms in the country.

The first stage regression is:

$$Badnews_c = \alpha_b + \gamma \widetilde{Halt}_c + \Gamma^T X_c + \nu_{bc}, \tag{5}$$

where $\widetilde{Halt}_c$ is defined in equation (4). The set of controls X_c includes the total number of firms in the country in our sample, the average firm profitability in the country as of December 2019, the average leverage of firms in the country as of December 2019, the logarithm of firms' total assets in the country as of December 2019, the average age of firms in the country, and the proportion of SME firms in the country as of December 2019. The estimates of γ of this first stage regression are reported in Panel A of Table 10. In all specifications, the estimate of γ is positive and significant at the one percent level, with a point estimate of 0.44 in column 2 that also include the country-level controls X_c. The concern of a weak instrument is alleviated with the Cragg-Donald F statistic well above the critical values (Stock and Yogo (2005)) in all reported specifications of Table 10. In columns 1 and 2 we estimate the parameter on the entire dataset of cross-country bank credit flows. In columns 3 and 4 the sample is restricted to foreign bank credit flows only (all domestic flows are excluded from the dataset). For the first stage regression, the sample restriction entails that the dependent variable are all the bad news a bank is exposed to through its corporate exposures in columns 1 and 2, while it is only the foreign bad news in columns 3 and 4. $Badnews_c$ is then instrumented with $\hat{\gamma}\widetilde{Halt}_c$.

The second stage regression uses the instrumented variable $Badnews'_c$:

$$A_{bc} = \alpha_b + \beta Badnews'_c + \Gamma^T X_c + \xi_{bc}. \tag{6}$$

The estimates of this regression are reported in Panel B of Table 10. Columns 1, 2 and 3 show the results for all credit flows, while columns 4, 5 and 6 focus on foreign credit flows. In all specifications, we control for the level of the two types of interventions (immediate fiscal support and guarantees and loans support) in the country. The point estimate of β in column 2 is 1,522, which indicates that firms in a country borrow an additional EUR 15 million when the pandemic shock to firms is 1pp. higher. The estimate is however not statistically significant.

In addition, we consider how the estimate of β varies depending on the intensity of public

interventions in the corporate sector in columns 3 and 6 of Panel B of 10:

$$A_{bc} = \alpha_b + \beta_1 Badnews'_c + \beta_2 Intervention_c + \beta_3 Badnews'_c \times Intervention_c + \xi_{bc} \qquad (7)$$

The estimate of β_1 is significant (at the five percent level) in column 3, but not in column 6 that focuses on foreign credit. In the absence of public interventions in a country, the demand for domestic credit increases when firms are affected by the Covid19 shock. Most important, in both columns 3 and 6, the sign of β_3 differs depending on the type of public interventions (i.e., immediate fiscal support vs. guarantees and loans support). The estimate is negative when $Intervention_c = Immediate_c$, as immediate liquidity injections at the firm substitutes bank credit. Firms located in country with high immediate fiscal response do not increase bank borrowing as much. In contrast, the estimate of β_3 is positive and even significant in column 6 that focus on foreign credit. Therefore, firms affected by the Covid19 shock borrow more from foreign banks when they can benefit from guarantees and loans support. As a result, we note that firms with liquidity shocks during the pandemic borrow more from their domestic banks. Public interventions in the form of immediate fiscal response substitute bank credit. In addition, firms borrow more from foreign banks when the firms benefit from guarantees and loans support.

5 Interpretation of Empirical Results: A Model

In this section, we lay out a model based on the framework of Holmström and Tirole (1997). The model, albeit stylized, offers guidance to interpret the empirical results in Section 4 on the effect of Covid19 and public interventions in the corporate and in the financial sector.

5.1 Setup

Firm Borrowing. An entrepreneur has a project that returns $R(I)$ for an initial investment I with probability p. The project returns nothing with probability $1-p$. The entrepreneur can borrow from deep-pocketed investors to fund her project. Lenders must break even (so the return on their outside investment opportunity is normalized to zero) and the interest rate charged on debt is r.

The lending relationship is marred by moral hazard and the entrepreneur has the option to shirk. In this case it earns a private benefit B per unit invested and defaults with probability 1. The entrepreneur has some capital θ that can be used as collateral to overcome the moral hazard problem. The capital θ can be thought of as an illiquid asset such as real estate or machinery that cannot be used to invest in the project but can be seized in case of default of the borrower. The total amount of capital pledged by the borrower is C.

There are three periods indexed 0, 1 and 2. In period zero, the entrepreneur receives its endowment and chooses the amount to borrow I. In period 1, the entrepreneur receives some intermediary revenues and incurs some expenses. We assume in the baseline case that the intermediary revenues are just sufficient to cover the costs. When the (unexpected) pandemic hits, the entrepreneur is however left facing an additional funding need of ρ, as we explain below. The full return from the project is realized in period 2. If successful, the project returns $R(I)$, the investor pays back its loan and consumes the remaining profit. If the project is not successful, the return is zero and the investor defaults on its loan.

In period 0, the entrepreneur maximizes its profits:

$$\max_{I,C} p\left(R\left(I\right)-rI\right)-\left(1-p\right)C \tag{8}$$

subject to the incentive compatibility (IC) constraint:

$$p\left(R\left(I\right)-rI\right)-\left(1-p\right)C\geq BI-C. \tag{9}$$

The IC constraint (9) requires that the payoff of the entrepreneur in case of effort, on the left hand side, is higher than the payoff if she shirks (on the right hand side). The collateral pledged improves the incentive to exert effort as it lowers the payoff in case of default. The payoff to investors consists of the loan repayment rI (with probability p) and the collateral C that is seized in case of default. Investors must break even and their participation constraint is

$$prI+\left(1-p\right)C=I. \tag{10}$$

The collateral capacity constraint is:

$$C\leq\theta. \tag{11}$$

Shocks: Pandemic and Lockdown. In our setup, the Covid19 shock and the lockdown can be mapped into an unexpected funding need ρ that is revealed in period 1. If the entrepreneur cannot pay the expenses, we assume that the business is liquidated and the recovery rate is zero. One way to interpret the funding need is that a lockdown cuts the intermediary revenues of the firm that were expected to cover the operational expenses.

A key difference between the liquidity shock in Holmström and Tirole (1997) and the pandemic shock is that the pandemic is unexpected. In Holmström and Tirole (1997), agents know the probability that the shock may occur and take this risk into account when making their (ex-ante) borrowing and investment decision. In our model, the pandemic is unanticitipated and agents do not take it into account in period 0. The shock and the government intervention are thus studied from an ex-post perspective, in period 1, when agents have already made their borrowing and investment decisions.

Government Interventions. The government maximizes welfare while minimizing its deficit. Similar to Tirole (2012), the shadow cost of deficits is λ and we assume that $\lambda > \partial pR'\left(I^*\right)/\partial\theta$ so that in the baseline case without a pandemic the government does not intervene. The government has two instruments to intervene once the shock hits in period 1. The first one is an immediate support to the entrepreneur in period 1, labeled G_1. The second instrument is a loan guarantee, i.e. the transfer of a state contingent claim that pays G_2 to the lender to the bank in case of default.

We focus here on the government transfers as this is the most relevant in our model where financial markets are competitive and investors can fund any profitable project that is incentive compatible. If the government were to make a profit from an incentive compatible loan contract, private investors would compete to provide the loan at zero profit. If the incentive constraint binds, however, the lender must provide a transfer to the borrower to incentivize her to exert effort. Investors are unwilling to provide loans at a loss and we thus focus here on the subsidy provided by the government to solve the incentive problems, while the capital is provided by the private investors.

The objective function of the government is

$$\max_{G_1,G_2} W - \lambda\left(G_1 + (1-p)\,G_2\right)$$

where the welfare W is the sum of the profits of the entrepreneur and its financiers, $W = pR(I) - I$.

Timing. Figure 2 summarizes the timing of the model. In period 0, the entrepreneur receives its capital and chooses how much to borrow and invest I as well as the amount of capital to secure the loan, C. We then consider two cases in period 1: if there are no pandemic (the baseline scenario), the entrepreneur faces some expenses but also earns some intermediary revenues that cover exactly these costs. In case of pandemic, there are no interim revenues and the firm faces a funding need ρ. The firm takes on an additional loan for ρ with interest rate and collateral (r_1, C_1). The government intervenes through support transfers G_1 and G_2. In period 2, the project yields its payout $R(I)$ or zero. The entrepreneur pays back her debt or default (if the return is zero), and consumes the remaining profits.

Regularity conditions. The return function $R(I)$ is increasing and concave in I, i.e. $R'(I) > 0$ and $R''(I) < 0$. We assume that there is a small cost $\epsilon \to 0$ per unit of capital pledged so that, all else equal, the entrepreneur prefers to compensate the lender through interest rate payments then transfer of capital in case of default in (10). The entrepreneur thus pledges the minimum capital necessary to satisfy the IC (9).

5.2 No Covid19: Baseline and Borrowing in Period 0

We first study the borrowing and investment decision of the entrepreneur in the baseline case. This also determines the amount of debt and collateral of the entrepreneur in period 1 when the pandemic hits. In the baseline case, the interim revenues cover the expenses and the entrepreneur thus maximizes (8) subject to equations (9), (10) and (11). The next proposition summarizes the outcome in period 0.

Proposition 1. ***Investment in period 0.*** *If $\theta \geq \overline{\theta}$, the entrepreneur invests the first-best amount $I = R'^{-1}(1/p)$.*

If $\theta < \overline{\theta}$ The constrained investment is determined by the IC constraint with $C = \theta$:

$$pR(I) - (B+1)I + \theta = 0. \tag{12}$$

The threshold $\overline{\theta}$ is determined by equation (12) with $I = R'^{-1}(1/p)$.

Proof. See appendix A. □

Figure 3 shows the borrowing of the firm in the two regimes for different values of θ. If the capital available to the entrepreneur is high and above the threshold $\overline{\theta}$, investment is at the "first-best" level that would occur in the absence of moral hazard. If $\theta < \overline{\theta}$, the collateral constraint binds and the level of investment is determined by the amount of capital available to the entrepreneur.

5.3 Covid19 Shock: Funding Need ρ

The pandemic is an unexpected shock in period 1 that creates a need for funding ρ. We first solve in this subsection the case where the profit of the project after paying for the extra cost ρ remains above the payoff if the capital pledged in period 0 is seized, i.e. $pR(I^*) - I^* - \rho \geq -C^*$. In this case, the entrepreneur prefers to continue the project by borrowing an extra ρ than losing the collateral C^*.

Once the shock hits in period 0, the entrepreneur must obtain additional funding. The profitability of the project falls and the increased borrowing need worsens the incentive condition. The entrepreneur will thus have to pledge additional collateral.

Let I^* denote the investment of the entrepreneur and C^* the collateral pledged in proposition 1. The entrepreneur must borrow ρ to cover its costs, and does so through a loan contract with interest rate r_1 and extra collateral pledged C_1. The investors participate if the loan is incentive compatible and allows to break even. The incentive compatibility constraint of the entrepreneur becomes:

$$p\left(R\left(I^*\right) - rI^* - r_1\rho\right) - (1-p)\left(C^* + C_1\right) \geq BI^* + B\rho - C^* - C_1. \tag{13}$$

The additional funding need weakens the IC in two ways: first, it lowers the profit of the entrepreneur. Second, the larger loan increases the private benefits from shirking, by $B \times \rho$. The availability of collateral to pledge C_1 is thus key to ensure that the entrepreneur can borrow the required funds.

The new contract must also satisfy the participation constraint of private investors so:

$$pr_1\rho + (1-p)\,C_1 = \rho.$$

The entrepreneur undertakes the project if the profit after incurring the cost ρ remains greater than the potential loss of the collateral, which is the case here since $pR(I^*) - I^* - \rho \geq -C^*$.

Let $C_{need} = C^* + C_1$ be the collateral needed to allow the project to continue, where $C^* + C_1$ are taken from equation (13). If $C_{need} \leq \theta$, the entrepreneur has enough collateral to borrow from the market and keep the project going. If $C_{need} > \theta$, the entrepreneur is unable to borrow ρ from the market because of moral hazard, even if the project is still profitable. This creates scope for government intervention.

The government faces the following choice: if it does not inject the required collateral, the project is liquidated with a liquidation value of zero. If it injects the funds, this increases welfare as the project can go forward, at the cost of an immediate transfer of $G_1 = C_{need} - \theta$ weighted by the cost of deficits λ. The government intervenes if:

$$\lambda (C_{need} - \theta) < pR(I^*) - I^* - \rho.$$

The proposition below summarizes the different cases when $pR(I^*) - I^* - \rho \geq -C^*$.

Proposition 2. ***Suppressed demand.*** *If $C_{need} \leq \theta$, the private sector provides a loan ρ and the government does not intervene.*

If $C_{need} > \theta$ and $\lambda C_{need} < pR(I^*) - I^* - \rho$, the government provides immediate support $G_1 = C_{need} - \theta$ to the entrepreneur who pledges all her resources to borrow ρ and continue the project.

If $C_{need} > \theta$ and $\lambda C_{need} > pR(I^*) - I^* - \rho$, the government does not intervene and the project is liquidated.

Proof. See appendix A. □

5.4 Debt Overhang

Consider now the case where the project becomes unprofitable with the new costs ρ, i.e. $pR(I^*) - I^* - \rho < 0$. From a welfare point of view, the project should be continued in period 1 if the expected return of continuation is higher than the funding need ρ, i.e. $pR(I^*) - \rho \geq 0$. The investment made in period 0 is irrelevant to assess whether to continue the project as "bygones are bygones". The entrepreneur, however, has incurred debt to make the investment and she must pay back this debt. The entrepreneur will thus not wish to continue the project if $pR(I^*) - I^* - \rho \leq 0$, and outside investors are also unwilling to fund a project whose proceeds will mostly be used to pay back the debt owed to former lenders.

If $pR(I^*) - \rho \geq 0$ and $pR(I^*) - I^* - \rho \leq 0$, both the entrepreneur and the lender will therefore not continue the project even though it is socially desirable. This is a classic problem of debt overhang in the spirit of Myers (1977). In this case, an immediate support to the entrepreneur through G_1 will not be sufficient to ensure that the project is continued since the project in itself is not profitable for the entrepreneur. The investors must instead be compensated and the guarantees G_2 can play an important role to encourage investors to fund the project.

The guarantees are a state contingent transfer where investors receive G_2 in case of default by the borrower. The participation constraint of the lender in period 1 for a loan of ρ with a guarantee G_2, interest rate and collateral (r_1, C_1) is:

$$pr_1\rho + (1-p)(C_1 + G_2) = \rho.$$

If the project is successful (with probability p), the lenders for the new loan earn $r_1\rho$. If the lender defaults, the lender seizes the collateral and receives the payoff of the government guarantee G_2. The guarantee therefore reduces the cost of financing of the firm and increases the profit of the entrepreneur. The expected amount that the entrepreneur must pay back is $\rho - (1-p)G_2$. The optimal guarantee ensures that the entrepreneur just breaks even (or makes a small profit $\epsilon \to 0$), i.e. G_2 solves

$$\begin{aligned} pR(I^*) - I^* - (\rho - (1-p)G_2) &= 0 \\ G_2 &= \frac{-pR(I^*) + I^* + \rho}{1-p} \end{aligned} \tag{14}$$

The government is willing to intervene if the benefits in terms of welfare outweigh the costs of the subsidy, i.e.

$$pR\left(I^*\right) - \rho - \lambda\left(1-p\right)G_2 > 0.$$

Plugging in the solution for G_2 in (14), the condition may be rewritten as

$$pR\left(I^*\right) - \rho - \lambda\left(-pR\left(I^*\right) + I^* + \rho\right) > 0,$$

i.e.

$$\left(1+\lambda\right)\left(pR\left(I^*\right) - \rho\right) - \lambda I^* > 0,$$

The next proposition summarizes the outcome with $pR\left(I^*\right) - I^* - \rho < 0$.

Proposition 3. ***Debt overhang.*** *If* $pR\left(I^*\right) - \rho \geq 0$ *and* $pR\left(I^*\right) - I^* - \rho \leq 0$*, the entrepreneur faces debt overhang. If*

$$\left(1+\lambda\right)\left(pR\left(I^*\right) - \rho\right) - \lambda I^* > 0,$$

the government provides a guarantee for the new loan of

$$G_2 = \frac{-pR\left(I^*\right) + I^* + \rho}{1-p}.$$

Once the guarantee is provided, the profit of the entrepreneur for continuing the project becomes positive again and the solution follows the case of Proposition 2 in the previous subsection.

5.5 Discussion

The pandemic creates substantial borrowing needs, as consumers are unable to spend and firms must continue to pay operational costs. In our model, we assume that these costs are incurred in period 1 and not recovered in period 2. In practice, part of these costs could be recovered in period 2 through pent-up demand. In both cases, financial intermediaries have an important role to play to respond to the shock, by channeling funds from savers to borrowers.

A key requirement for the flow of funds to operate is that firms must have sufficient capital to borrow. In this respect the unprecedented support of central banks in the form of asset purchases or lending programmes are important in preventing a crash of asset values, which then affect the capacity of the borrowers to take new loans. This is an important distinction between the Covid19 crisis and the global and sovereign debt crisis where the availability of collateral was a key concern.

The model also illustrates the scope for government interventions. If entrepreneurs are constrained by collateral availability, transfers can help restore their access to financial markets. If the shock is too large and the entrepreneur has taken on significant debt already, direct transfers may not be sufficient and the government must reduce the cost of funding by providing guarantees to new loans.

A general challenge when implementing the government interventions is to reduce the information asymmetries. A key feature of the model is the possibility for the entrepreneur to shirk and divert the funds. Parameters such as the level of private benefits B are hard to observe in practice and determining the appropriate level of supports will be challenging. Covenants, appropriate monitoring and sanctions are all useful to ensure that the funds are used efficiently.

6 Conclusions

After the outbreak of the Covid19 pandemic, stock markets have recovered almost completely from an unprecedented initial shock, despite a continued deterioration of real economic indicators. This disconnect between markets and the real economy comes to light amid substantial interventions targeting the corporate sector all around Europe. At the same time, corporations increased their debt stock. To interpret this evidence, we study public interventions in the corporate sector and their impact on the market for corporate loans.

We use public interventions in Europe during the Covid19 period serve as a lab to empirically investigate these questions. We propose an empirical analysis based on the "granular instrumental variables" (GIVs) approach in Gabaix and Koijen (2020) and the fixed-effects approach in Khwaja and Mian (2008). We find that public interventions, and especially loan guarantees, are effective in allowing firms affected by liquidity shocks to borrow additional funds from

banks. Both market valuations of firms and banks view these interventions favorably. A moral-hazard model of corporate investment and financing suggests that public interventions are beneficial for the real economy in the long run. The financial sector internalizes part of the benefits of interventions as corporate debt guarantees compensate lenders to provide liquidity to firms with severe debt overhang problems.

An important caveat in interpreting our results are data limitations. Because of the absence of granular firm-level data on public interventions, some of our conclusions are painted with a broad brush. These limitations call for follow-up studies which focus on specific interventions using detailed and proprietary data, as well as quantitative studies that interpret particular interventions through the lens of more sophisticated models.

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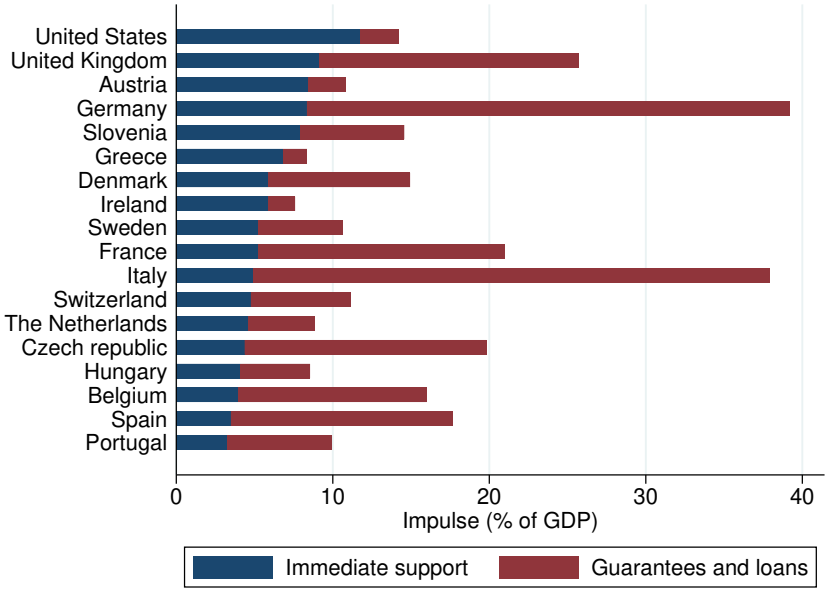


Figure 1: Cost of Government Interventions in Response to Covid19. The figure reports expenditures for (i) immediate support and (ii) guarantees and loans as a fraction of GDP. Immediate support provides firms with cash injections they do not need to reimburse. Guarantees and loans include guarantees on loans and additional loans (including deferred expenses), which firms have to reimburse in the future. Source: IMF (2020).

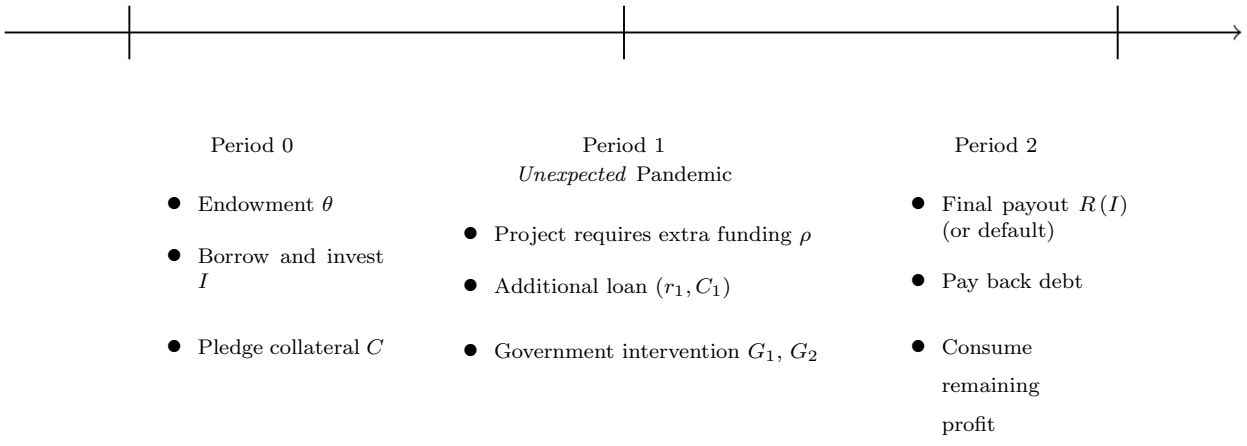


Figure 2: Model Timing. The figure illustrates the timing of events and decisions in the model of Section 5.

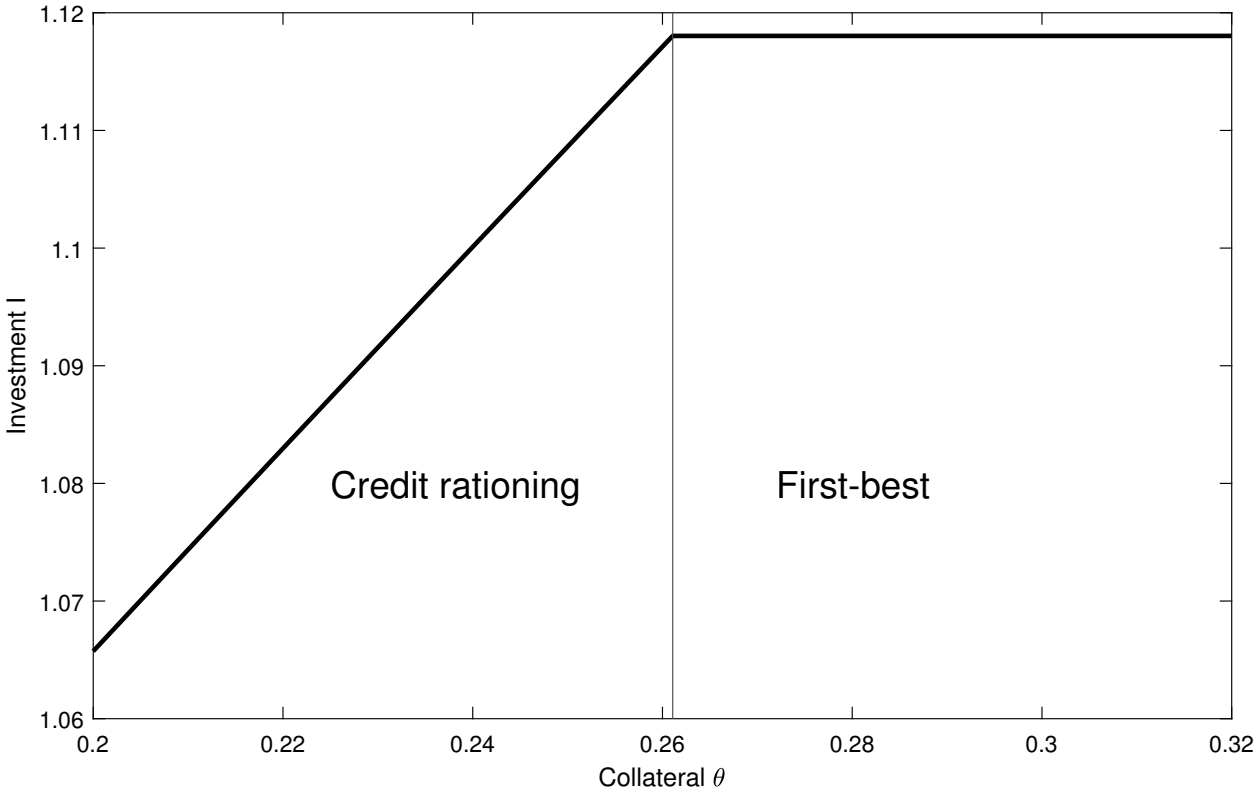


Figure 3: Firm Borrowing in Credit Crunch and First-Best Regimes The figure illustrate the borrowing policy in the two regimes that arise from the model in Section 5 for different values of θ. The remaining parameters are set as follows: $R(I) = 2\sqrt{I}$, $p = 0.8$, $B = 0.7$.

Table 1
Country-Level Economic Indicators and Market Valuations

This table summarizes the stock market performance (%), and the growth rates (%) in a set of macroeconomic indicators during the first quarter of 2020 in Panel A ("Decline"), and during the second quarter of 2020 in Panel B ("Recovery"). Sample of countries: Belgium, Germany, Denmark, Spain, France, the UK, Greece, Hungary, Italy, the Netherlands, and Portugal. Index Ret. is the stock market index return, Labor Prod. is labor productivity (per persons), Vehicle Reg. is the registration of commercial vehicles, Unempl. is the unemployment rate (as a % of labour force). All other indicators are self explanatory. Source: Datastream and ECB Statistical Data Warehouse.

Panel A: Decline (Dec 2019 to Mar 2020)

	Index Ret.	GDP	Hours Worked	Labor Prod.	Vehicle Reg.	Unempl.
Belgium	-30.99	-3.58	n.a.	-3.27	-85.26	-3.50
Denmark	-5.62	-2.03	-1.07	-2.02	-10.17	-2.26
France	-30.74	-6.05	-4.27	n.a.	-100.96	-8.82
Germany	-28.78	-2.04	-1.89	-2.00	-23.33	14.19
Greece	-49.59	-1.61	-9.90	n.a.	-53.20	n.a.
Hungary	-32.99	-0.39	-1.27	-0.10	-96.14	7.37
Italy	-32.11	-5.61	-7.99	-5.11	-19.73	-11.52
Netherlands	-22.36	-1.51	-1.39	-1.64	-66.16	-9.75
Portugal	-24.78	-3.83	-4.63	n.a.	-97.84	-8.08
Spain	-34.17	-5.35	-5.14	-4.39	n.a.	5.46
UK	-28.50	-2.21	-0.91	-2.85	-75.57	n.a.

Panel B: Recovery (Mar 2020 to Jun 2020)

	Index Ret.	GDP	Hours Worked	Labor Prod.	Vehicle Reg.	Unempl.
Belgium	13.71	-12.86	n.a.	-12.06	55.92	8.70
Denmark	14.62	-7.18	-7.45	-3.98	-14.91	21.90
France	11.58	-14.86	-16.79	n.a.	100.19	-12.97
Germany	21.43	-10.19	-8.37	-8.82	-0.16	12.89
Greece	13.49	n.a.	-21.12	n.a.	49.58	n.a.
Hungary	7.79	-15.70	-13.92	-10.22	93.96	29.99
Italy	12.78	-13.69	-14.06	-11.19	-31.55	8.33
Netherlands	14.65	-8.88	-6.32	-5.75	13.44	39.29
Portugal	7.59	n.a.	-23.03	n.a.	73.15	17.34
Spain	6.37	-20.44	-24.10	-12.60	n.a.	8.47
UK	8.41	-22.78	-20.31	-22.12	37.43	n.a.

Table 2
Public Interventions and Market Valuations across Sectors

Panel A reports the return in percentage points of all listed firms globally in the Covid19 period, broken down by sector of activity. For each sector, the table reports the number of firms included and their total market capitalization in USD trillion. Panel B shows the result of pairwise regressions of stock returns by sector for the 17 European countries in Figure 1 on government interventions in % of GDP. Immediate Supp. is an abbreviation for Immediate Support and Guarantees & Loan Supp. is an abbreviation for Guarantees and Loan Support, as defined is Section 2. Panel C shows the correlation between the % change in selected economic indicators from 2019Q2 to 2020Q2 and interventions. Source: Datastream, ECB Statistical Data Warehouse, and IMF. Data on government interventions are retrieved as of October, 2020.

Panel A. Year to Date Stock Returns by Sector (Worldwide)

Sector	Return	N	Market Cap.
Technology	28.0	4,207	24.8
Healthcare	18.7	2,596	10.2
Consumer	12.6	6,345	22.4
Basic Materials	9.9	3,166	6.0
Industrials	7.8	4,740	10.5
Real Estate	-8.0	2,025	3.8
Financials	-11.5	4,401	13.7
Energy and Utilities	-12.1	1,811	8.5
All	8.8	29,291	107.2

Panel B. Pairwise regressions of Stock Returns on Interventions

Sector	All Interventions	Immediate Supp.	Guarantees & Loans
Technology	0	1.6	-0.1
Healthcare	0.5	0.1	0.5
Consumer	-0.2	3.3	-0.3
Basic Materials	-0.2	1.1	-0.2
Industrials	-0.1	0.7	-0.1
Real Estate	-0.1	1.7	-0.1
Financials	0.2	1.5	0.2
Energy and Utilities	0.8	0.7	0.8

Panel C: Correlations between Economic Indicators and Interventions

Indicator	All Interventions	Immediate Supp.	Guarantees & Loans
Employment (% change)	0.19	0.60	0.10
GDP (% change)	-0.41	0.30	-0.46
Hours worked (% change)	-0.22	0.35	-0.27
Productivity (% change)	-0.53	0.14	-0.56

Table 3
Summary Statistics: Firm Financials

The table reports descriptive statistics about corporate policies for the firms in our sample of Covid19-related news. Panel A describes corporate policies in the pre-Covid19 period (2019Q4). Panel B describes corporate policies in the post-Covid19 period (2020Q2) and stock returns from January 1, 2020 to September 1st, 2020. Total assets in billions of USD. Age is the number of years since creation. Leverage is the firm's debt to its total assets (%). Other ratios and growth variables are in percentage points. Sample: 2626 European firms that reported Covid19-related news from February 1st, 2020 to September 1st, 2020. Source: S&P Market Intelligence.

Panel A: Pre-Covid (2019Q4)

	Mean	St. Dev.	Min	Max
Total Assets	27.40	150.00	2.13	2720.00
Leverage	27.24	26.93	0.00	416.67
Cash/Assets	14.62	18.08	0.00	99.57
Revenue Growth	5.90	50.11	-100.00	679.41
Equity Growth	2.40	35.78	-100.00	206.19
Debt Growth	9.74	61.41	-100.00	624.16

Panel B: Post-Covid (2020Q2)

	Mean	St. Dev.	Min	Max
Total Assets	35.80	185.00	3.93	2950.00
Leverage	28.29	24.07	0.00	439.83
Cash/Assets	16.01	18.34	0.00	99.01
Revenue Growth	-27.22	60.66	-100.00	420.26
Equity Growth	-4.55	38.83	-100.00	545.56
Debt Growth	5.41	43.08	-100.00	447.09
Stock Return - Covid19 Period	-15.86	60.43	-100.00	631.09

Table 4
Summary Statistics: News

This table reports the average number of Covid19-related news per firm in our sample. Panel A reports descriptive statistics for all 2626 firms in our sample. Panel B shows the descriptive statistics by country. Panel C reports the descriptive statistics by sector. Covid19-related news categories are classified as good news or bad news as described in Appendix C. Bad news/All news is the ratio of the number of bad news to the total number of news reported by firms. "Halt of Operations news" are news affecting firms' operations directly related to confinement events. Source: S&P Market Intelligence.

Panel A: Aggregate Decriptive Statistics

	Mean	St. Dev.	Min	Max
Bad News	0.48	0.67	0.00	4.00
Good News	0.49	0.64	0.00	5.00
Bad News / All News	0.48	0.48	0.00	1.00
Halt of Operations News	0.04	0.19	0.00	1.00

Panel B: Country Averages

	Bad News	Good News	Bad News / All News	Halt of Oper.
Belgium	0.35	0.54	0.40	0.00
Denmark	0.60	0.40	0.59	0.01
France	0.37	0.59	0.37	0.01
Germany	0.45	0.44	0.53	0.03
Greece	0.20	0.30	0.40	0.00
Italy	0.30	0.42	0.39	0.04
Netherlands	0.43	0.54	0.41	0.03
Portugal	0.33	0.17	0.67	0.00
Spain	0.47	0.41	0.49	0.03
UK	0.48	0.52	0.45	0.03

Panel C: Sector Averages

	Bad News	Good News	Bad News / All News	Halt of Oper.
Consumer Goods	0.72	0.32	0.68	0.11
Energy and Utilities	0.28	0.44	0.38	0.03
Financials	0.49	0.27	0.62	0.01
Healthcare	0.16	1.01	0.12	0.00
Industrials	0.64	0.29	0.67	0.04
Materials	0.58	0.46	0.54	0.07
Real Estate	0.66	0.16	0.79	0.07
Technology	0.40	0.54	0.41	0.01

Table 5
Summary Statistics: Banks

This table reports descriptive statistics on (i) bank exposures to interventions and news, (ii) accounting variables as of December 2019, and (iii) stock returns from January 1st, 2020 until September 1st, 2020. $Interventions_Exposure_b = \sum_c w_{b,c} Interventions_c$, where the weights $w_{b,c}$ are based on the bank cross-country corporate exposures as of December 2019 as published by the EBA. The bank exposure to the two types of interventions, immediate support and guarantees and loans support, are defined the same way. $newsExposure_b = \sum_s w_{bs} badNews_s/(badNews_s + goodNews_s)$, where $badNews_s$ is the ratio of the number of bad news in sector s to the sum of bad news and good news in the sector, and the weights w_{bs} are based on the bank sector exposures as of December 2019 as published by the EBA. Total assets in trillions of USD. RWA are the bank's risk-weighted assets in thousands of USD. Tier1LVGR is the ratio of Tier 1 capital to on- and off-balance sheet assets. NPL/loans is the ratio of the non-performing loans to customer loans. All ratios are in percentage points. Sample: 85 banks that participated in the "2020 EU-Wide Transparency Exercise" of the European Banking Authority for which accounting variables are available, and the 46 publicly traded transparency exercise participating banks for stock returns. Source: S&P Market Intelligence, EBA and IMF.

	Obs	Mean	St. Dev.	Min	Max
Bad News Exposure	85.00	0.58	0.22	0.00	0.98
Interventions Exposure	85.00	10.80	4.19	0.00	16.59
Immediate Liq. Exposure	85.00	5.15	2.42	0.00	9.10
Guarantees/Loans Exposure	85.00	18.38	11.24	0.00	45.27
Feb1-Sep1 Stock Return	46.00	-52.26	31.82	-123.09	-5.75
Total Assets, Dec 2019	61.00	562.00	897.00	1.08	3760.00
Capital/RWA, Dec 2019	61.00	16.72	9.24	11.61	83.06
Tier1LVGR, Dec 2019	60.00	7.06	2.98	3.13	17.18
RWA/Assets, Dec 2019	60.00	43.67	16.55	3.59	74.79
NPL/Loans, Dec 2019	60.00	6.64	8.98	0.05	33.50

Table 6
Covid19 and Corporate Policies

This table reports estimates from specification (1), where the dependent variable $policy_f$ is the firm's revenue growth (Panel A), the firm's equity growth (Panel B), and the firm's debt growth (Panel C) during the Covid19 period. $Badnews_f$ is the number of Covid19-related bad news reported by the firm during the Covid19 period. $Goodnews_f$ is the number of Covid19-related good news reported by the firm during the Covid19 period. $Haltnews_f$ is an indicator taking the value of one if a news about firm f halting its operating activities due to Covid19 is released during the Covid19 period, and of zero otherwise.The set of firm-level controls includes $size_f$, defined as the logarithm of the firm's total assets as of December 2019; $leverage_f$, defined as the ratio of the firm's total debt to its total assets as of December 2019; and age_f, defined as the firm's age in years since creation, as of September 2020. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Revenues Growth					
	(1)	(2)	(3)	(4)	(5)
$Badnews_f$	-4.35*	-4.63*	-5.31*	-9.15***	
	(-1.70)	(-1.76)	(-1.93)	(-3.33)	
$Goodnews_f$	-0.03	0.20	-0.99	-0.88	
	(-0.01)	(0.07)	(-0.33)	(-0.30)	
$Haltnews_f$					-37.15***
					(-4.16)
Observations	909	909	851	772	772
R-squared	0.00	0.00	0.17	0.30	0.31
Firm Controls	NO	YES	YES	YES	YES
Country FE	NO	NO	YES	NO	NO
Sector FE	NO	NO	YES	NO	NO
Country*Sector FE	NO	NO	NO	YES	YES

Panel B: Equity Growth					
	(1)	(2)	(3)	(4)	(5)
$Badnews_f$	-3.62**	-3.04*	-4.54**	-4.45**	
	(-2.23)	(-1.81)	(-2.43)	(-2.17)	
$Goodnews_f$	0.42	0.18	-1.51	-0.33	
	(0.23)	(0.10)	(-0.74)	(-0.15)	
$Haltnews_f$					-4.70
					(-0.71)
Observations	946	946	884	808	808
R-squared	0.01	0.01	0.08	0.19	0.19
Firm Controls	NO	YES	YES	YES	YES
Country FE	NO	NO	YES	NO	NO
Sector FE	NO	NO	YES	NO	NO

	Panel C: Debt Growth				
	(1)	(2)	(3)	(4)	(5)
$Badnews_f$	3.47*	4.41**	4.98**	4.67*	
	(1.73)	(2.17)	(2.26)	(1.83)	
$Goodnews_f$	1.59	1.21	1.14	0.98	
	(0.72)	(0.55)	(0.48)	(0.36)	
$Haltnews_f$					23.31***
					(2.87)
Observations	936	936	877	800	800
R-squared	0.00	0.04	0.09	0.14	0.14
Firm Controls	NO	YES	YES	YES	YES
Country FE	NO	NO	YES	NO	NO
Sector FE	NO	NO	YES	NO	NO
Country*Sector FE	NO	NO	NO	YES	YES

Table 7
Covid19 and Market Valuations in the Corporate Sector

The table is a replica of Table 6, where the dependent variable $policy_{f,t}$ is the firm's stock return during the Covid19 period. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Stock Return				
	(1)	(2)	(3)	(4)	(5)
$badNews_{ft}$	-0.07***	-0.05**	-0.03	-0.04*	
	(-3.57)	(-2.33)	(-1.63)	(-1.82)	
$goodNews_{ft}$	0.10***	0.10***	0.09***	0.09***	
	(4.41)	(4.42)	(3.74)	(3.76)	
$Haltnews_{ft}$					-0.13*
					(-1.81)
Observations	1,145	1,145	1,098	1,017	1,017
R-squared	0.04	0.08	0.22	0.30	0.29
Firm Controls	NO	YES	YES	YES	YES
Country FE	NO	NO	YES	NO	NO
Sector FE	NO	NO	YES	NO	NO
Country*Sector FE	NO	NO	NO	YES	YES

Table 8
Covid19, Interventions, Market Valuations in the Corporate Sector

This table reports estimates from specification (2), where the dependent variable $Return_f$ is the firm's stock return during the Covid19 period. $Haltnews_f$ is an indicator taking the value of one if a news about firm f halting its operating activities due to Covid19 is released during the Covid19 period, and of zero otherwise. $Interventions_c$ is the cost of government interventions in country c as a percentage of the country's GDP. $Immediate_c$ is the cost of government immediate fiscal support in country c as a percentage of the country's GDP. $Guarantees_c$ is the cost of government guarantees and loans support in country c as a percentage of the country's GDP. The set of firm-level controls includes $size_f$, defined as the logarithm of the firm's total assets as of December 2019; $leverage_f$, defined as the ratio of the firm's total debt to its total assets as of December 2019; and age_f, defined as the firm's age in years since creation, as of September 2020. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Stock Return					
	(1)	(2)	(3)	(4)	(5)	(6)
$Haltnews_f$	-0.42***	-0.42**	-0.37***	-0.43***	-0.43**	-0.37***
	(-2.90)	(-2.11)	(-3.07)	(-2.99)	(-2.21)	(-3.07)
$Haltnews_f$*$Interventions_c$	0.01*			0.01**		
	(1.87)			(2.39)		
$Haltnews_f$*$Immediate_c$		0.03			0.04	
		(1.20)			(1.61)	
$Haltnews_f$*$Guarantees_c$			0.01*			0.02**
			(1.92)			(2.41)
Observations	1,048	1,048	1,048	1,048	1,048	1,048
R-squared	0.25	0.25	0.25	0.28	0.28	0.28
Firm Controls	NO	NO	NO	YES	YES	YES
Country*Sector FE	YES	YES	YES	YES	YES	YES

Table 9
Covid19, Interventions, Market Valuations in the Financial Sector

The table reports estimates from specification (3), where the dependent variable $Return_b$ is the bank's stock return during the Covid19 period. In Panel A: $Interventions_b = \sum_c w_{b,c} interventions_c$ where the weights $w_{b,c}$ are based on the bank cross-country corporate exposures as of December 2019 as published by the EBA. $Immediate_b$ and $Guarantees_b$ are derived in a similar way. In Panel B: $Foreign_Interventions_b$ that captures the average exposure of the bank to foreign public interventions. $Foreign_Immediate_b$ and $Foreign_Guarantees_b$ are derived in a similar way. $Badnews_b = \sum_c w_{bc} bad\,news_c/(bad\,news_c + good\,news_c)$ where $Badnews_c$ is the ratio of the number of bad news in country c to the sum of bad news and good news in the country. The set of bank-level controls X_b includes $size_b$, defined as the logarithm of the bank's total assets as of December 2019; $tier1LVGR_b$, defined as the ratio of the bank's Tier 1 capital to its total on-balance sheet and off-balance sheet assets as of December 2019; and $RWA/Assets_b$, defined as the ratio of the bank's risk-weighted assets to its total assets as of December 2019. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Bank Stock Return and Interventions

	(1)	(2)	(3)	(4)
$Badnews_b$	-0.45*	-1.08***	-0.57	-0.89***
	(-1.73)	(-3.37)	(-1.42)	(-3.18)
$Interventions_b$	0.00	-0.04*		
	(0.51)	(-1.98)		
$Badnews_b$*$Interventions_b$		0.10**		
		(2.04)		
$Immediate_b$			-0.08*	
			(-1.73)	
$Badnews_b$*$Immediate_b$			0.11	
			(1.02)	
$Guarantees_b$				-0.05*
				(-1.81)
$Badnews_b$*$Guarantees_b$				0.14*
				(1.94)
Observations	45	45	45	45
R-squared	0.27	0.32	0.33	0.32

Panel B: Bank Stock Return and Foreign Interventions				
	(1)	(2)	(3)	(4)
$Badnews_b$	-0.31	-0.87**	-0.53	-0.88***
	(-1.02)	(-2.20)	(-1.47)	(-2.96)
$Foreign\_Interventions_b$	-0.01	-0.03**		
	(-1.29)	(-2.19)		
$Badnews_b$*$Foreign\_Interventions_b$		0.07*		
		(1.78)		
$Foreign\_Immediate_b$			-0.07*	
			(-1.99)	
$Badnews_b$*$Foreign\_Immediate_b$			0.09	
			(1.15)	
$Foreign\_Guarantees_b$				-0.06**
				(-2.42)
$Badnews_b$*$Foreign\_Guarantees_b$				0.12**
				(2.36)
Observations	45	45	45	45
R-squared	0.29	0.33	0.36	0.32

Table 10
Covid19, Interventions, Bank Credit Allocation

The table reports estimates from first stage regression specification (5) in Panel A and second stage regression specification (6) in Panel B. The variable to instrument is the average bad news index of a firm in country c ($Badnews_c$). The dependent variable in the second stage is the difference in the bank b exposure to country c between December 2019 and June 2020 (A_{bc}). The instrumental variable is $\widetilde{Halt}_c$, as defined in equation (4).The instrumented variable is $Badnews'_c$. The variables $Immediate_c$ and $Guarantees_c$ respectively capture the intensity of immediate fiscal support and the intensity of guarantees and loans support in the corporate sector of country c. The set of controls X_c includes the total number of firms in the country in our sample, the average firm profitability in the country as of December 2019, the average leverage of firms in the country as of December 2019, the logarithm of firms' total assets in the country as of December 2019, the average age of firms in the country, and the proportion of SME firms in the country as of December 2019. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Panel A: First Stage			
	All bad news		Foreign bad news	
	(1)	(2)	(3)	(4)
$\widetilde{Halt}_c$	0.65***	0.44***	0.72***	0.57***
	(9.79)	(3.00)	(10.88)	(3.68)
Observations	731	724	611	604
R-squared	0.21	0.46	0.24	0.52
Country Controls	NO	YES	NO	YES
Bank FE	YES	YES	YES	YES

	Panel B: Second Stage					
	All credit			Foreign credit		
	(1)	(2)	(3)	(4)	(5)	(6)
$Badnews'_c$	14.46	15.22	371.01**	14.38	12.46	99.20
	(0.97)	(0.33)	(2.15)	(1.21)	(0.58)	(1.50)
$Immediate_c$	-87.57*	43.42	46.75	-17.42	19.89	-6.02
	(-1.84)	(0.94)	(0.89)	(-0.47)	(0.71)	(-0.22)
$Guarantees_c$	12.05	0.16	19.29	3.63	3.13	8.60
	(1.33)	(0.02)	(1.34)	(0.89)	(0.64)	(1.26)
$Badnews'_c{*}Immediate_c$			-82.02**			-24.99
			(-2.07)			(-1.63)
$Badnews'_c{*}Guarantees_c$			7.99*			3.90**
			(1.82)			(2.09)
Observations	546	539	539	433	426	426
R-squared	0.21	0.24	0.25	0.36	0.40	0.41
Country Controls	NO	YES	YES	NO	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES

Appendix

A. List of European Stock Indices

The following table lists the stock indices of countries in our sample. Sample of countries: Belgium, Germany, Denmark, Spain, France, the UK, Greece, Hungary, Italy, the Netherlands, and Portugal. Source: Datastream.

Country	Index Name
Belgium	BEL 20
Denmark	OMX COPENHAGEN (OMXC20)
France	CAC 40
Germany	DAX 30 PERFORMANCE
Hungary	BUX
Italy	FTSE MIB INDEX
Greece	ATHEX COMPOSITE
Netherlands	AEX ALL SHARE
Portugal	PSI-20
Spain	IBEX 35
United Kingdom	FTSE UK

B. Additional Figures and Tables

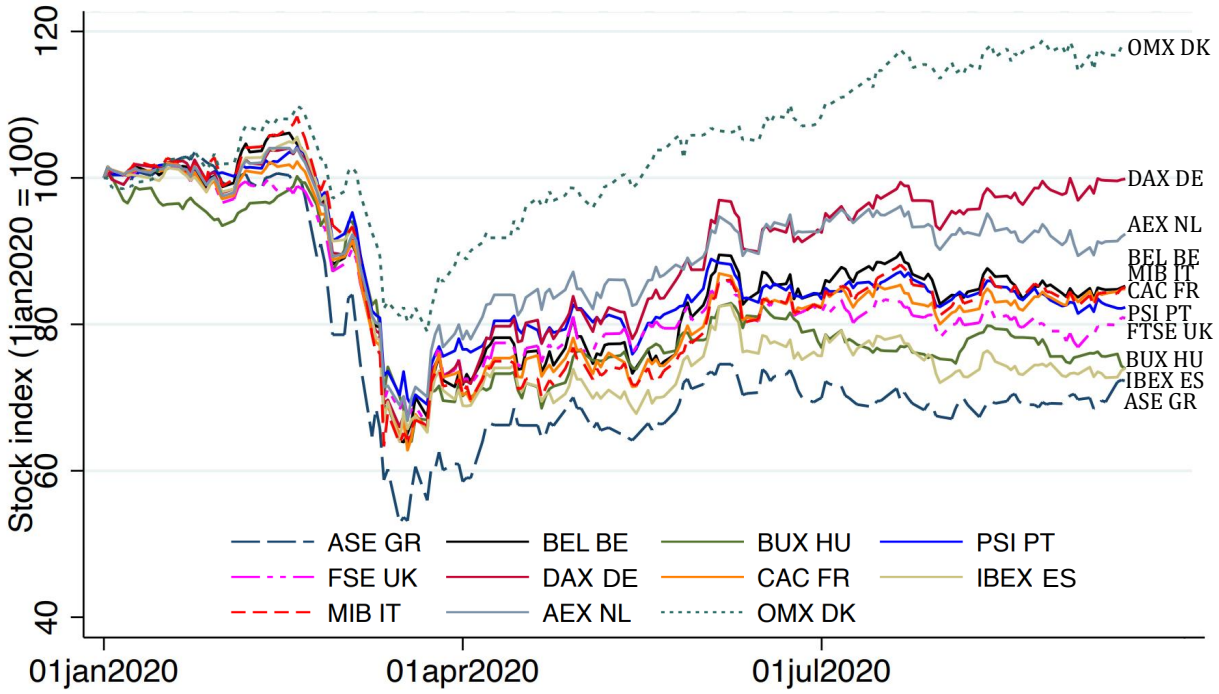


Figure 4: Market Valuations in the Covid19 Period. This figure shows the performance of the stock market indices of 11 European countries in our sample from January 1st, 2020 to September 1st, 2020. The value of the indices is normalized to a value of 100 on January 1st, 2020. Sample of countries: Belgium, Germany, Denmark, Spain, France, the UK, Greece, Hungary, Italy, the Netherlands, and Portugal. The complete list of indices is provided in Appendix B. Source: Datastream.

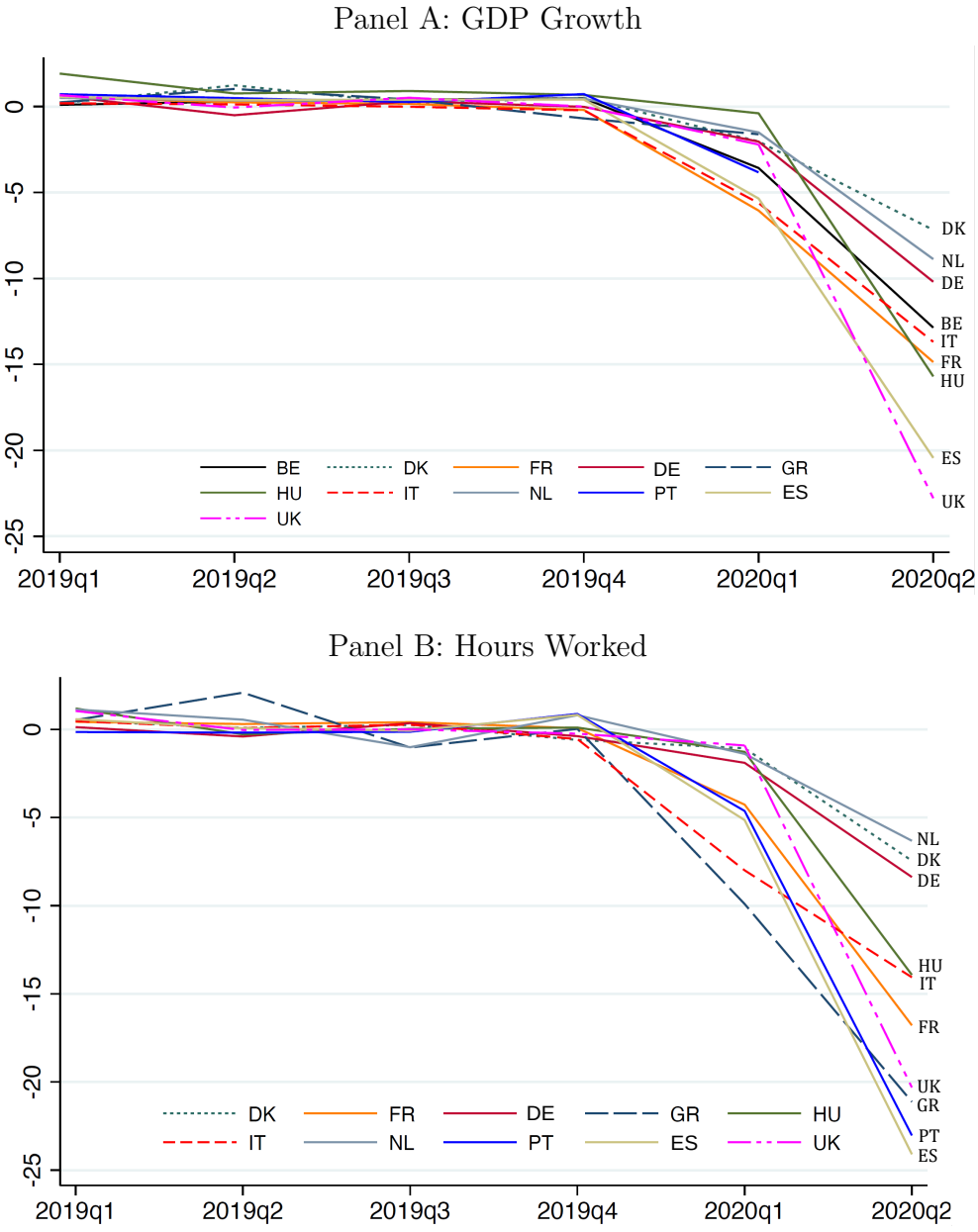


Figure 5: GDP Growth and Hours Worked in the Covid19 Period. This figure shows the dynamics of two key real economic indicators: the quarterly percentage GDP growth (Panel A) and the quarterly percentage change in hours worked (Panel B). Sample of countries: Belgium, Germany, Denmark, Spain, France, the UK, Greece, Hungary, Italy, the Netherlands, and Portugal. Sample period: 2019Q1 to 2020Q2. Source: ECB Statistical Data Warehouse.

Table 11
Covid19, Interventions, Firm Revenues

This table reports estimates from specification (2), where the dependent variable is the firm's revenues growth during the Covid19 period. The coefficients α_s are sector fixed effects. $Interventions_c$ is the cost of government interventions in country c as a percentage of the country's GDP. $badNews_f$ is the number of Covid19-related bad news reported by the firm from February 1st, 2020 until September 1st, 2020. $goodNews_f$ is the number of Covid19-related good news reported by the firm from February 1st, 2020 until September 1st, 2020. The set of firm-level controls includes $size_f$, defined as the logarithm of the firm's total assets as of December 2019; $leverage_f$, defined as the ratio of the firm's total debt to its total assets as of December 2019; and age_f, defined as the firm's age in years since creation, as of September 2020. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Revenue Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
$Haltnews_f$	-23.73	16.09	-30.39**	-23.20	17.94	-30.13**
	(-1.59)	(0.56)	(-2.30)	(-1.55)	(0.62)	(-2.26)
$Haltnews_f$*$Interventions_c$	-0.65			-0.69		
	(-0.85)			(-0.91)		
$Haltnews_f$*$Immediate_c$		-8.72			-9.09	
		(-1.56)			(-1.62)	
$Haltnews_f$*$Guarantees_c$			-0.44			-0.47
			(-0.56)			(-0.61)
Observations	778	778	778	778	778	778
R-squared	0.30	0.31	0.30	0.30	0.31	0.30
Firm Controls	NO	NO	NO	YES	YES	YES
Country*Sector FE	YES	YES	YES	YES	YES	YES

C. Covid19-Related News Categories

C1. List of Covid19-Related News Categories

The following table lists the categories defined by S&P Market Intelligence to classify Covid19-related key development news of firms. The table also report the news classified in each category as a fraction of the total number of Covid19-related news in the sample. Covid19-related news are key development headlines or key development abstracts containing the words "coronavirus" or "covid" from February 1st, 2020 to September 1st, 2020. Source: S&P Market Intelligence.

Category	% Mentions
Product-related Announcement	13.42 %
Corporate Guidance: Unusual Event	9.95 %
Corporate Guidance: New or Confirmed	9.44 %
Client Announcement	8.54 %
Dividend Cancellation or Suspension	6.65 %
Halt or Resumption of Operations, Unusual Events	4.56 %
Strategic Alliance	4.23 %
M&A Rumors and Discussion	2.92 %
Conference	2.90 %
Dividend Decrease	2.85 %
Company Conference Presentation	2.24 %
Dividend Affirmation	2.19 %
Debt Financing	2.14 %
Sponsored Deal News	1.79 %
Announcement of Sales or Trading Statement	1.76 %
High-yield Bond News	1.71 %
Business Expansion	1.64 %
Other Executive or Board Change	1.56 %
Covenant-lite News	1.46 %
Secondary Story News	1.44 %
Institutional Loan News	1.36 %
Special Call	1.33 %
Distressed News	1.33 %
Discontinued Operations or Downsizing	1.21 %
Announcement of Earnings	1.21 %
Delayed Earnings Announcement	1.16 %
Amendment News	1.03 %
Corporate Guidance: Lowered	0.91 %

Seeking Financing or Partner	0.81 %
Seeking Acquisition or Investment	0.68 %
CEO Change	0.63 %
Default News	0.58 %
Impairments or Write Offs	0.55 %
M&A News	0.48 %
Corporate Guidance: Raised	0.45 %
M&A: Transaction Closing	0.45 %
Cross-border Deal News	0.38 %
Delisting	0.33 %
Repayment News	0.30 %
Lawsuits & Legal Issues	0.30 %
Leveraged Buyout News	0.30 %
Regulatory Authority: Compliance	0.20 %
Change in Company Bylaws or Rules	0.15 %
Special Dividend Announced	0.13 %
Target Communication	0.10 %
Investment Grade Loan News	0.08 %
CFO Change	0.08 %
Private Placement	0.05 %
Potential Privatization of Government Entity	0.03 %
Dividend Initiation	0.03 %

C2. Covid19-related News: Bad vs. Good News

Bad news include the categories:

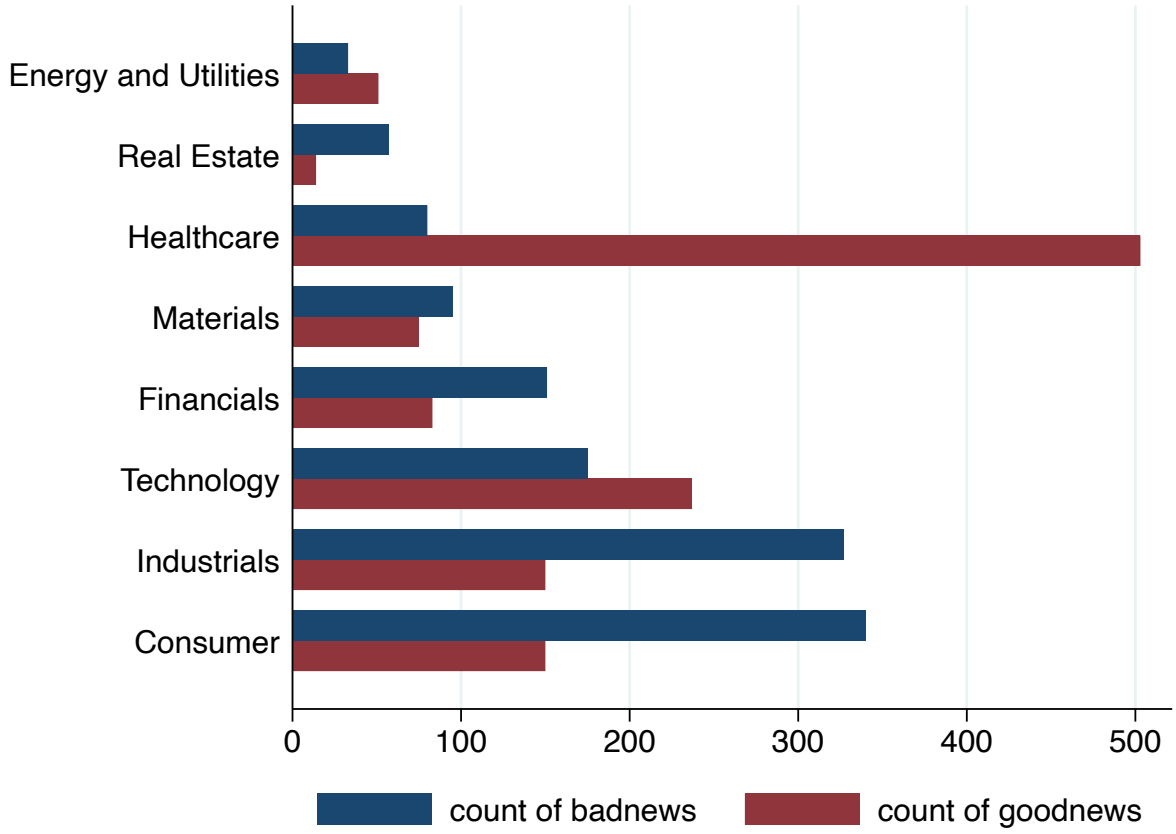
- Corporate Guidance Unusual Event
- Dividend Cancellation or Suspension
- Halt of Operations Unusual Event (when the keywords "close", "halt", "suspend", "cease" appear in the headline or abstract)
- Dividend Decrease
- Announcement of Sales or Trading
- Distressed News
- Discontinued Operations or Downsizing
- Delayed Earnings Announcement
- Corporate Guidance Lowered
- Seeking Financing or Partner
- Default News
- Impairments or Write Offs
- Delisting
- Repayment News
- Dividend Affirmation delays (when the keywords "postpone", "delay", "suspend", "cancel" appear in the headline or abstract)

Good news include the categories:

- Product-related Announcement
- Client Announcement
- Strategic Alliance
- Debt Financing

- Business Expansion
- Seeking Acquisition or Investment
- Corporate Guidance Raised
- Resumption of Operations Unusual (when the keywords"reopen", "resume"appear in the headline or abstract)

The following figure shows the number of bad Covid19-related news and the number of good Covid19-related news by sector. Covid19-related news are key development headlines or key development abstracts containing the words "coronavirus" or "covid" from February 1st, 2020 to September 1st, 2020. Source: S&P Market Intelligence.



C3. "Halt of Operations" News

Examples of "Halt of Operations" news:

- 03/18/2020 "BMW Closes Factories in Europe and South Africa Until 19 April"
- 03/16/2020 "DFL Deutsche Fuβball Liga Suspends Match Operations Due to the Current COVID-19 Situation"
- 03/31/2020 "eDreams ODIGEO Announces the Implementation of Temporary Labour Measures to Ensure Both the Protection of Its Workforce and Business Continuity During the COVID-19 Pandemic"
- 04/15/2020 "Energean Oil & Gas plc Announces Temporary Halt to Operations"s
- 03/17/2020 "FCA Italy and Maserati to Temporarily Suspend Production Across Majority of Their European Manufacturing Plants"
- 03/16/2020 "Ferrari Announces the Suspension of Production in Maranello and Modena Until 27 March 2020"
- 03/17/2020 "H & M Hennes & Mauritz AB Announces Temporarily Closing All Stores in Germany and the US"

D. Proof of Propositions

Proof of proposition 1 (Investment in period 0)

Proof. The entrepreneur maximizes equation (8) subject to (9), (10) and (11).

Plug (10) in (8) and (9). The program becomes

$$\max_{I,C} pR(I) - I$$

subject to

$$pR(I) - I \geq BI - C$$
$$C \leq \theta.$$

Let us first consider the case where the collateral constraint is slack. The investment that maximizes the objective is I_{FB}^* such that $pR'(I_{FB}^*) = 1$. We refer to this as the "first-best" investment level. To invest I_{FB}^*, the entrepreneur must pledge capital worth at least

$$C_{FB}^* = \overline{\theta} = -pR(I_{FB}^*) + (B+1) I_{FB}^*.$$

The interest rate on the loan is given by the participation constraint (10):

$$r = \frac{1}{p} - \frac{(1-p)\,C^*}{pI^*_{FB}}.$$

The capital amount $\overline{\theta}$ is the minimum amount of capital required to support the first-best investment level. If $\theta < \overline{\theta}$, the entrepreneur does not have enough capital to borrow the first-best investment I^*_{FB}. The incentive compatibility binds with $C = \theta$ and the investment level is given by the implicit solution of

$$pR(I) - (B+1)\,I + \theta = 0.$$

□

Proof of proposition 2

Proof. Let $\xi \in \{0,1\}$ be the decision to liquidate or continue the project and let I^* and C^* be the investment and capital used in period 0 (from proposition (1)). In period 1, the entrepreneur solves

$$\max_{\xi} \xi\left(pR(I^*) - I^* - \rho\right) + (1-\xi)\left(-C^*\right)$$

subject to the IC, the participation and the collateral constraint:

$$p\left(R(I^*) - rI^* - r_1\rho\right) - (1-p)\left(C^* + C_1\right) = BI^* + B\rho - C^* - C_1, \tag{15}$$

$$pr_1\rho + (1-p)\,C_1 = \rho, \tag{16}$$

$$C^* + C_1 \leq \theta.$$

Since $pR(I^*) - I^* - \rho \geq -C^*$, the entrepreneur wishes to continue the project and choose $\xi = 1$. This requires to borrow ρ, which is possible if the IC in equation (15) and the break-even constraint in (16) are satisfied. The total capital required to borrow ρ is given by (15) and (16):

$$C_{need} = C^* + C_1 = BI^* + B\rho - \left(pR(I^*) - I^* - \rho\right)$$

So if $C_{need} \leq \theta$ and $pR(I^*) - I^* - \rho \geq -C^*$, the entrepreneur borrows ρ, pledges $C_1 = BI^* + B\rho - (pR(I^*) - I^* - \rho) - C^*$ and the interest rate r_1 is given by (13). The government does not intervene since a transfer would not change welfare but would be costly.

Consider now the case where $C_{need} > \theta$ and $pR(I^*) - I^* - \rho \geq -C^*$. In this case, the entrepreneur would like to continue the project but she does not have the collateral required to do so.

The objective of the government is:

$$\max_{G_1,G_2} W - \lambda \left(G_1 + (1-p)\, G_2\right)$$

The government wishes the project to continue if $pR\left(I^*\right) - I^* - \rho \geq 0$. To ensure continuation, it would need to provide an immediate transfer $G_1 = C_{need} - \theta$, and the entrepreneur would then use this to pledge capital and borrow the funds. Thus, if

$$pR\left(I^*\right) - I^* - \rho - \lambda \left(C_{need} - \theta\right) \geq 0,$$

the government provides an immediate transfer of $C_{need} - \theta$, else it does not.

In the case where $pR\left(I^*\right) - I^* - \rho \geq -C^*$, we thus have

- If $C_{need} \leq \theta$, the entrepreneur borrows ρ and the project is continued

- If $C_{need} > \theta$ and $pR\left(I^*\right) - I^* - \rho - \lambda \left(C_{need} - \theta\right) \geq 0$, the government provides an immediate transfer $G_1 = C_{need} - \theta$.

- If $C_{need} > \theta$ and $pR\left(I^*\right) - I^* - \rho - \lambda \left(C_{need} - \theta\right) \leq 0$, the government does not intervene and the project is liquidated. □