Staff Memo

Bankruptcy at the time of COVID-19 – The Swedish experience

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Abstract

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In this paper, I study Swedish limited liability firms (aktiebolag) that filed for bankruptcy during the first four months of the COVID-19 pandemic (March-June 2020). The analysis employs detailed financial statement information and Credit Registry data (KRITA). I show that the firms that filed for bankruptcy after the pandemic struck (COVID bankruptcies) already showed weaknesses in 2018. For the group of firms for which data is available, COVID bankruptcies had a statistically higher probability of default than their competitors both in December 2018 and 2019, and at the beginning of 2020. However, firms that filed for bankruptcy in May and June 2020 had, in December 2019, a lower probability of default than firms that filed in January and February 2020. Therefore, at least at the beginning, the crisis may have facilitated the exit of mostly financially weak firms from the market. However, as the pandemic continued, I cannot exclude that relatively healthier firms were also affected.

Keywords: COVID-19 pandemic, bankruptcy, corporate sector vulnerabilities, financial stability, real economy

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Abstract in Swedish

I denna studie analyserar jag aktiebolag som ansökte om konkurs under de första fyra månaderna av coronapandemin (mars-juni 2020). Analysen är baserad på information från finansiella rapporter och från kreditdatabasen KRITA. I studien visar jag att dessa företag hade en svag finansiell ställning redan 2018. I de fall där data finns tillgängliga, kan jag också visa att dessa företag hade statistiskt signifikant högre sannolikhet för fallissemang än andra företag i samma bransch i december 2018 och 2019 samt i början av 2020. De företag som ansökte om konkurs i maj och juni 2020 hade dock i december 2019 en lägre sannolikhet att drabbas av fallissemang än de företag som ansökte om konkurs i januari och februari 2020. Således kan pandemin, åtminstone i början, ha bidragit till att mestadels finansiellt svaga företag ansökte om konkurs. Men det går inte utesluta att även mer välmående företag har påverkats i takt med att pandemin fortsatte.

1. Introduction

This memo studies the characteristics of Swedish non-financial limited liability firms (aktiebolag) that filed to initiate bankruptcy or restructuring proceedings at the beginning of the COVID-19 pandemic (March-June 2020). Using firms' financial statements from 2018, I study several firms' characteristics to understand whether these firms showed any sign of financial weakness even before the pandemic started. For a subsample of firms, I study the one-year-ahead probability of default reported to the Swedish Credit Registry (KRITA) by the credit institutions lending to them.

The pandemic resulting from the spread of COVID-19 has led to one of the most serious shocks to hit the global economy this century. With a large number of people infected by the virus, and a staggering number of deaths worldwide, the pandemic has changed people habits as well as disrupted demand and supply chains. The economic consequences are severe and the effects are likely to be seen for years to come.[1]

In countries where lockdowns were implemented to contain the spread of the virus, the resulting economic loss has been dramatic: at the end of August 2020, in the United States, real GDP is estimated to have fallen by almost 32% during the second quarter of the year (Bureau of Economic Analysis, 2020). At the end of September 2020, the UK reported that its GDP fell more than 20% in the first half of 2020 (Office for National Statistics, 2020). Even in Sweden, where a lockdown was never imposed, output fell by 8.6% in the second quarter of 2020 compared to the first quarter, and in September, the Riksbank estimated this year's GDP to contract by 3.9% (Sveriges Riksbank, September 2020). The Swedish National Institute of Economic Research (Konjunkturinstitutet, KI) expects unemployment to climb from 6.8% to 10% during the winter (Konjunkturinstitutet, 2020).

At the time of writing this memo, even though several countries around the world are entering a second wave of infection, there are still positive signs that global demand and supply chains are gradually recovering. Yet, when the pandemic hit, many firms reported an unprecedented decline in revenues and experienced a liquidity crunch.

While under normal conditions, a firm can address a liquidity shortage by borrowing short-term or by managing working capital, this was not the case during the pandemic. Many firms, especially small and medium-sized enterprises (SMEs) that are usually dependent on bank loans, had difficulties accessing new funds at short notice. As a consequence, the main worry became that this liquidity crisis could become a solvency crisis.

In Sweden, the worry of a large wave of bankruptcies materialized almost as soon as the pandemic struck. In fact, an abnormal number of firms filed for bankruptcy already in March, even though the government and the Riksbank had started announcing their first support packages. In May, after the programs were up and running, bankruptcy filings slowed down substantially but normalized only in June (see Figure 1 in Section 4.1 for details).

While Sweden registered an increase in the number of bankruptcies filed during the first months of the pandemic, neighbouring countries and many countries in the euro area have shown a different trend. Denmark and Norway, for example, have reported a *decrease* in the number of bankruptcy filings in 2020 compared to last year. France and Germany also reported similar patterns (see *Financial Stability Report 2020:2* (Sveriges Riksbank, November 2020)).

This difference could be simply explained by data quality issues, measurement errors, different reference periods or delays in processing filings, due to lockdowns. Yet, it could

[1] For more discussion on this topic see, for example, Wolf (2020) and Kozlowski et al. (2020).

also be argued that some of the difference may be driven by the type of government intervention.

The Swedish government, like many other governments, has employed an array of programs to support non-financial firms during the pandemic.[2] Among those, Sweden and most Euro area countries employed public loan guarantee programs, tax deferrals and tax relief schemes and, in some countries, for example Germany, credit moratoria were also announced.[3]

These programs have undoubtedly provided important support to the non-financial sector. However, the large decrease in the number of bankruptcies in many countries around the world also suggests that these programs may have introduced some distortions in the economic system.

Bankruptcy is a natural economic process that should help the system rid itself of inefficient firms (White, 1989). Inefficient firms, for example, are less competitive firms that use obsolete technologies or produce goods and services for which demand has faded. During an economic downturn, as they become less and less productive, these firms exit the market allowing resources to be reallocated (Caballero and Hammour, 1994).

Nevertheless, the probability of a firm exiting the market not only depends on how productive the firm is but also on its access to credit (Holtz-Eakin et al., 1994; Musso and Schiavo, 2008; and Osotimehin and Pappadà, 2015). Osotimehin and Pappadà (2015) show that credit frictions modify the selection of firms that fail so that even highly productive firms faced with financial difficulties may cease operations. However, they also show that these latter bankruptcies do not eliminate the average rise in productivity after a recession or a financial crisis because the shock mostly increases the failure rate of low-productivity firms.

While concerns about stabilizing unemployment would suggest that, at a time like this, all firms should receive help to overcome their liquidity problems while demand and supply chains recover, the literature summarized above suggests caution. In fact, the aim should not be to avoid (or postpone) all bankruptcy but to avoid liquidity-constrained but otherwise healthy firms failing. This conclusion is also in line with the argument of Boot et al. (2020) that governments should not reward firms that already showed poor performance even before the pandemic started (*legacy poor performance)*. Indeed, when the pandemic struck many governments did not grant unconditional support to all firms.

To be eligible for government support in Sweden, firms had to prove that they were not in financial difficulty before the COVID-19 pandemic.[4] One could argue that this requirement may have contributed to the surge in bankruptcy filings among firms that could not apply for support. However, already in normal times, filing for bankruptcy is a costly decision to make even for an inefficient firm (White, 1989) and, in general, it takes time before a firm decides to file. One could expect then that a healthy firm, even if faced by a substantial and mostly unexpected liquidity shock, would need time before it ran out of options. Therefore, to better understand what has happened in Sweden during the first months of the pandemic and especially to inform future policy decisions, I study the type of firms that filed for bankruptcy directly after the outbreak of the pandemic.

[2] Policymakers around the word acted quickly and employed a variety of measures such as tax cuts and deferrals and credit guarantees. Central banks lowered policy rates, expanded asset purchase programs, and, in some cases, even started financing companies directly. Capital and liquidity buffers were relaxed. Debt service moratoriums and prohibitions on evictions were suggested or mandated. More details can be found here: Sveriges Riksbank (May 2020) and ESRB (2020) and ECB (2020).

[3] Debt moratoria allow firms affected (or expecting to be affected) by the COVID-19 shock to suspend the payment of their obligations for the duration of the moratorium period. Public loans guarantees schemes help firms (with no financial difficulties at the end of 2019) accessing financing by transferring some of the credit risk and potential credit losses from banks to governments. Tax deferrals and tax relief programs vary between countries but they usually involve a deferral in the payment of VAT taxes or temporary reduction or deferral of payroll tax obligations or employees' social security contributions.

[4] This was particularly relevant for firms trying to get help to temporarily lay-off people (stöd för korttidsarbete). See Tillväxtverket (2020) for more details.

To begin with, while it may seem intuitive that firms that usually file for bankruptcy have worse financial ratios than firms that do not, during a deep economic crisis this cannot be taken for granted. As mentioned above, during the pandemic the main worry has been that the firms that filed for bankruptcy may not have done so in normal times, i.e. they were financially healthy firms hit by a liquidity crisis. My analysis shows that this was not the case. Compared with their peers, by industry and size, the average firm that filed for bankruptcy over the period March-June 2020 was highly indebted and had already performed quite poorly in 2018. I also document that these firms had a significantly higher probability of default (at one-year horizon) than their competitors in December 2018 and 2019 and at the beginning of 2020.

Another relevant question is whether the firms that filed for bankruptcy during the pandemic where similar to those that filed for bankruptcy before the pandemic struck. This is important because, even though COVID bankruptcies were financially weaker than their average competitor was in 2018, one could wonder why they did not file until the pandemic hit.

To study this issue, I use the data from 2018 and ask the following question: all else equal, at the end of 2018, what firm characteristic may have affected the ability of COVID bankruptcies not to file for bankruptcy before? By and large, my results suggest that, with respect to firms that filed in the fourteen months before, less leverage, more liquidity and less exposure to refinancing risk have most likely allowed COVID bankruptcies to postpone filing until the pandemic struck.

I also show that, in December 2019, the firms that filed for bankruptcy in May and June 2020 had a statistically lower probability of default than the firms that filed in January and February, while firms that filed in March and April were statistically indistinguishable from the latter. This result suggests that, while in March and April the firms that filed for bankruptcy were very similar to those that had filed immediately before the pandemic started, as the pandemic continued slightly healthier firms were also affected. Therefore, it is possible that these firms, without the pandemic, may have been able to postpone filing for bankruptcy. However, whether this might have been the case or not can be better understood only when more recent accounting data are available.

Even in light of the caveat discussed above, the results in this study suggest that the crisis might have been *one of the factors* that contributed to a firm's decision to file for bankruptcy, but most of the firms that filed were already vulnerable in 2018.[5] Hence, at least at the beginning, the pandemic might have facilitated the exit of less financially healthy firms from the market.

My conclusions are consistent with the argument that, despite the strain they inflict on economic systems and societies, financial crises tend to accelerate structural changes. For example, some recent empirical evidence (McGowan et al., 2017a; McGowan et al., 2017b; McGowan et al., 2018) suggests that, in Sweden, the way the insolvency regime is designed may discourage weak firms from seeking exit from the market.[6] Hence, even if faced with difficulties, many firms may postpone filing for bankruptcy as long as possible.[7] My results suggest that the COVID-19 pandemic might have just simply changed the rules of the game.

[5] Importantly, considering that growth in Sweden was modest in 2019 (Sveriges Riksbank, February 2020a), profitability, solvency and liquidity of COVID bankruptcies and their competitors may look weaker if calculated at the end of 2019. Unfortunately, the data for 2019 are not available at the time this paper is written.

[6] Table 1 in McGowan et al. (2018) suggests that the personal cost of bankruptcy to entrepreneurs, the lack of early warning systems and special insolvency procedures for SMEs are some of the main features that contribute to delaying the initiation (and increase the length) of insolvency proceedings in Sweden.

[7] In a related staff memo published in September (Cella, 2020), I study the specific phenomenon of zombie firms in Sweden. Zombie firms are also financially weak firms but their definition is quite strict. Zombie firms, in fact, are identified as old firms (at least 10 years old from their registration date) that struggle to repay the interest on their debt for at least three consecutive years. While many weak firms can also be classified as zombie firms, this does not mean that all weak firms are zombie firms. For instance, in the sample of the firms that filed for bankruptcy over the period March-June 2020, only 9% of the total could also have been classified as zombie firms.

Finally, as Becker et al. (2020) discuss, current policies may leave the corporate sector more levered. Hence, the fact that a large number of financially weak firms have already exited the market can be positive from a financial stability perspective. Moreover, since distressed firms tend to sell assets and reduce investments and employment, the fact that they exit the market is beneficial for the real economy as a whole, especially if resources are redistributed toward more productive firms.

The rest of this paper is organized as follows. Section 2 describes the data and the methodology. Section 3 provides more information about bankruptcy during the period March-June 2020 and compares it with historical data to gain a better picture of the importance of the pandemic for the Swedish economy. Section 4 illustrates the results of my analyses and Section 5 concludes with a discussion and remarks for future work.

2. Data

In this study, the main source of data is the Serrano database provided by Bisnode.[8] This database contains detailed financial statement information for all Swedish limited liability companies (aktiebolag) that have reported to the Swedish Companies Registration Office (Bolagsverket) over the period 2002-2018. Besides all main accounting variables, from Serrano, I also know the registration date of each firm and whether it belongs to a group or not. Serrano also reports the Swedish Standard Industrial Classification 2007 code (SNI07 codes) for each firm in the database. I use this code to identify the industry to which each firm belongs and to identify non-financial firms.

Using data from Bolagsverket, Bisnode also provides a detailed list of all the firms that filed for bankruptcy and reorganizations.[9] Using this list, I identify all the Swedish non-financial limited liability firms that filed for either bankruptcy or restructuring over the period March-June 2020. The initial sample contains 2,581 limited liability firms that initiated bankruptcy proceedings and 182 firms that initiated restructuring proceedings over the period March-June 2020. After matching this sample with Serrano, I am left with a sample of 2,066 firms, of which 1,897 filed for bankruptcy and 169 filed for restructuring. After dropping all firms in the financial industry (SNI07 64110-66309) from the latter sample, the final sample includes 1,720 firms (166 restructuring and 1,554 bankruptcies). For the sake of brevity, I refer to these firms as *"COVID bankruptcies"*.

All non-financial firms in the sample at the end of 2018 that did not file for bankruptcy in March-June 2020 represent the sample of "competitors." For competitor firms, I have 463,838 observations in total. The sample of competitor firms in 2018 includes 3,528 firms that initiated bankruptcy or restructuring proceedings in 2019 and in January and February 2020. I refer to these latter firms as "*other bankrupt firms*". [10]

[8] To ensure a robust analysis and data quality, I follow the methodology employed by Kalemli-Ozcan et al. (2015) as closely as possible. Please refer to Cella (2020) for details. Also notice that, consistent with common practices, I winsorize all of the relevant variables at the 5% level by year and sector. However, not winsorizing at all does not change the overall conclusions of this study.

[9] In general, bankruptcy codes contain two main options for financially distressed firms: a. restructuring and b. liquidation. If a financially distressed firm's going-concern value is greater than its current liquidation value (the market value of total assets), then the firm may attempt to restructure its liabilities in order to continue its activities. However, when the firm is worth more to creditors if liquidated, then the firm or any of its creditor can file to the courts for liquidation proceedings. Insolvency proceedings for non-financial firms are mainly regulated in the Swedish Bankruptcy Act / Konkurslagen 1987:672 (Bankruptcy Act, 1987) and the Company Reconstruction Act / Lag 1996:764 om företagsrekonstruktion (Company Reorganisation Act, 1996). More details about the Swedish legal system for bankruptcies can be found in the Appendix.

[10] The firms in my analysis all initiated bankruptcy or restructuring proceedings but, as far as I know, were not ruled bankrupt or were not granted the opportunity to restructure in the same month they filed. Therefore, calling these firms bankrupt may seem quite a stretch. In fact, it may be more appropriate to refer to them as "firms in financial distress". However, for the sake of simplicity, and to avoid repeating too often the period of time I am referring to, I opted to name the two groups "other bankrupt firms" (if they filed before the COVID-19 pandemic started) and "COVID bankruptcies" (if they filed over the period March-June 2020).

In the analyses, I consider all firms as independent firms (also referred to as stand-alone firms), even if they belong to a group, and I compare COVID bankruptcies with their competitors and the group of other bankrupt firms by industry and size. However, groups are usually more diversified, and, importantly, firms within a group may have access to additional funding through the group's internal financial market. Therefore, firms belonging to a group may handle a crisis like the current one better than stand-alone firms.[11] To address this concern, in the regression analysis, I include a dummy variable (Independent) to control for whether a firm belongs to a group or not.

In the regression analysis, I also control for firm age and firm size. Firm age is (the logarithm of) the number of years from the firm's registration while firm size is captured by (the logarithm of) total assets. Finally, I also include dummy variables for the finest SNI07 codes to control for time-invariant industry characteristics.

When plotting the results, I group all firms into four size quartiles (micro, small, medium and large) [12] and ten industries: Hotels and Restaurants (H&R), Public Services (PublServ), Transportation (TRA), Construction (CO), Energy (EN), Wholesale and Retail Trade (WRT), Manufacturing (MAN), Real Estate (RE), Other (O) and Private Services (PrivServ). The industry labelled as Private Services (PrivServ) includes firms in the following sectors: information technology, professional, scientific and technical services, corporate services, other services. The industry labelled as Public Services groups includes firms in public administration, education, health care, arts and entertainment. In the group of Others, I collect firms in agriculture, mining, environment and those with a missing SNI07 code. Once groups have been created, in the graphs, industries are sorted by contribution to total assets, from the smallest one (H&R) to the largest one (PrivServ).

The next section describes some of the relevant literature and provides a detailed description of the variables employed in this study.

3. Variables Description

Many distressed firms suffer from a combination of financial and/or economic distress. A firm in financial distress experiences a shortfall in the cash flow it needs to meet its obligations but its business model does not necessarily have problems. On the other hand, a firm in economic distress has an unsustainable business model and will not be viable without asset restructuring.

Among the factors that contribute to a firm's distress, Altman et al. (2019) indicate poor performance, high financial leverage, liquidity issues and sensitivity to funding shocks.[13] A firm's poor operating performance may result, for example, from international competition, overcapacity, lack of competitiveness, commodity price shocks, and cyclicality.

Financial leverage is one of the main contributing factors to a firm's financial distress because, while it helps firms invest and grow, high financial leverage exacerbates the effect of poor operating performance on the likelihood of corporate failure. One of the main sources of funding risk for a firm is refinancing risk. When a firm needs to refinance its debt, it faces the risk of doing so at a significantly higher interest rate (Froot et al., 1993). A firm also faces the risk that lenders could underestimate its continuation value and refuse to refinance its debt. In this case, the firm may face liquidation. To minimize

[11] Consistent with this observation, only about 30 percent of the firms that went bankrupt over the period March-June 2020 belonged to a group in 2018.

[12] The average firm in the group of micro firms has total assets of about SEK 176,135, while the average firm in the group of large firms reports about SEK 210 million in total assets.

[13] Altman et al. (2019) also describe other factors that contribute to a firm distress: lack of technological innovation, relatively high new business formation rates in certain periods, deregulation of key industries and unexpected liabilities.

refinancing risk, a firm should have less debt or more leverage with a longer maturity (Diamond, 1991). Interestingly, Harford et al. (2014) find that firms mitigate refinancing risk by increasing their cash holdings. Given the evidence in the literature, I start by studying a firm's leverage, interest coverage ratio and refinancing risk. Then, I investigate performance, liquidity and working capital efficiency.

A firm's leverage is calculated as the ratio between its financial debt and the sum of its financial debt and equity. Financial debt is given by the sum of long-term debt (excluding "other non-current liabilities"[14]) and short-term loans. While a firm's leverage measures its ability to meet obligations over the long run, the firm's ability to pay interest expenses on its outstanding liabilities is captured by its interest coverage ratio (henceforth ICR). The ICR is obtained as the ratio between a firm's earnings before interest and taxes (EBIT), and its interest expenses.[15] Finally, because of data limitations, the best proxy for refinancing risk that I can use is the percent of short-term debt from credit institutions with respect to a firm's total assets.

A firm's performance is calculated by its return on assets obtained as the ratio between its earnings before interest and taxes (EBIT) and its total assets. This measure captures the firm's return on each unit invested in assets.

I conduct the firms' liquidity analysis by focusing on firms' current assets and current liabilities. Total current liabilities represent a firm's short-term obligations to financial institutions and suppliers. By and large, firms borrow money from banks and other credit institutions.[16] These contracts can have both short-term and long-term maturities. The short-term part of these financial agreements is reported as short-term liabilities and is included in the balance sheet under total current liabilities.

Firms also owe money (usually due within 30 days) to suppliers for materials and services received but not paid for. The balance of money owed to suppliers of goods and labour is recorded as accounts payable. Finally, besides short-term loans from credit institutions and suppliers, current liabilities include accounts payable and other liabilities with a term of one year or less. These include accrued liabilities (e.g. rent that needs to be paid); taxes due to the tax authorities (e.g. VAT), employer's contributions, dividends scheduled but not distributed yet, etc.

While total current liabilities give us a picture of a firm's short-term financial obligations, total current assets collect all the assets it can liquidate quickly (i.e. within a year) and therefore summarize how much liquidity the firm has to meet short-term obligations. So like current liabilities, current assets are also reported on a firm's balance sheet and usually include several items of different liquidity.

Cash and marketable securities are the most liquid assets a firm owns. While cash reserves are accumulated to create a cash buffer available to the firm, some firms invest part of this money to get a return on it. These investments (like investments in money market funds) can be normally considered the same as cash.

Current assets also includes inventories, other receivables and accounts receivable. Inventories represent the value of goods used in the production process or finished goods ready to be sold. Other receivables are taxes and prepaid expenses that the firm expects to receive within a short period. Accounts receivable are the balance of money due to a firm for goods or services delivered or used but not yet paid for by customers. In other words, the customer's accounts payable balance normally shows up in the supplier's balance sheet as accounts receivable. Accounts payable and accounts receivable reflect a firm's "trade credit" agreements.

[14] Other non-current liabilities include, for example, lease liabilities and convertible loans

[15] If the firm belongs to a group, this variable is calculated using "external interest" which is the interest the firm pays on the debt obtained from financial institutions not belonging to the group.

[16] See Appendix for a discussion of the importance of firms' financing choices for the transmission of monetary policy.

A firm's trade credit activities are an important source of contagion risk within and between industries (Jacobson and von Schedvin, 2015), but they are also an important way for a firm to finance its operations. Therefore, I start my analysis by studying liquidity ratios, but I also analyse how much of the total assets of a firm are represented by trade credit.

The most common liquidity ratio used for understanding a firm's liquidity is the quick ratio (also known as the acid-test ratio). This ratio is given by total current assets (minus inventory since this cannot be liquidated quickly) divided by total current liabilities. This ratio captures whether a firm has enough short-term resources to meet its short-term obligations. As a rule of thumb, healthy firms should have a quick ratio above one, which indicates that they can easily cover all of their current liabilities with the assets they can immediately liquidate. However, while in a functioning economy firms can rely on their customers to pay their bills on time, and on being able to sell their marketable securities without incurring a large liquidity discount, in a crisis like the current one, these things cannot be taken for granted.

A large number of firms have seen their sales drop dramatically and thus they may not be able to fulfil their obligations. This suggests that many accounts receivable balances will remain unpaid for longer than expected and accounts payable will remain untouched. Moreover, together with the direct crisis in the product and service market, financial markets are also experiencing large uncertainty. Especially at the beginning of the pandemic, many securities could only be liquidated at a large discount.

To give a very simple example of how liquidity can dry-up in the corporate system, assume that, in the worst possible scenario, a company is not able to liquidate its most liquid investments as desired and that the money it is supposed to receive from its customers will not be paid when expected. At the same time, the firm still needs to honour all its short-term financial obligations. In these circumstances, one can reasonably conclude that the firm will be able to pay these liabilities only using cash on hand. For this reason, I calculate an alternative "quick ratio" that I call "quick ratio cash" which only uses cash in its numerator.

The quick ratio cash gives us a snapshot of how much of its total current liabilities a firm can pay just by drawing down on its cash balances at a specific point in time. While we cannot expect firms to have cash on hand to cover all their short-term liabilities, the larger the quick ratio cash, the better the firm's liquidity. Moreover, focusing on cash only, one is also able to better assess the importance of other short-term assets for a firm's liquidity by looking at the difference between the quick ratio and the quick ratio cash. Finally, to gauge how much cash on hand each unit of sale generates, I use the ratio of cash and marketable securities to sales (LA/S): the more cash is retained, the better a firm's liquidity. Of course, one needs to keep in mind that a firm's liquidity can deteriorate (or improve) quickly and that any measure of liquidity needs to be interpreted with caution.

Next, I study the dependence of a firm on its trade credit partners and how much the firm contributes to extending credit to customers and suppliers. To do so, I rely on three ratios. I use the receivable turnover ratio to understand how much credit a firm gives to a customer for each unit sold. This ratio is calculated as accounts receivable divided by sales (AR/S). To measure how much a firm borrows from its trade creditors to generate each unit of sales, I employ the ratio between accounts payable and sales (AP/S). This measure captures the importance of trade credit by telling us how reliant a firm is on credit from its trade partners and how well the firm is able to cover those liabilities by generating sales. Therefore, the smaller the payable turnover, the less credit from suppliers the firm needs to generate sales. The smaller the receivable turnover, the less credit a firm extends to its customers.

In the next section, I discuss the main results of this study. I will start by describing the bankruptcies that occurred in Sweden over the period March-June 2020 and how they compare with historical trends. Then, I will look at the descriptive statistics of the main ratios illustrated above and conclude with an analysis of the probability of default of these firms.

4. Bankruptcy of Swedish Firms during the COVID-19 Pandemic: Results

4.1 Bankruptcy of Swedish firms during the COVID-19 pandemic: A historical perspective

During the spring of 2020, the world economy was hit hard by the first wave of the COVID-19 pandemic. While the virus had already started spreading in China in 2019, the first cases in Europe were reported in France and Italy in February. Sweden registered its first death related to the virus in March.

To counter the spread of the coronavirus, governments around the globe started imposing lock-downs, social distancing, and travel restrictions in early March. In Sweden, the Public Health Agency (Folkhälsomyndigheten) recommended people to stay at home as much as possible: to work from home and avoid public transportation. Limits on the number of people that could gather at close quarters were also imposed.

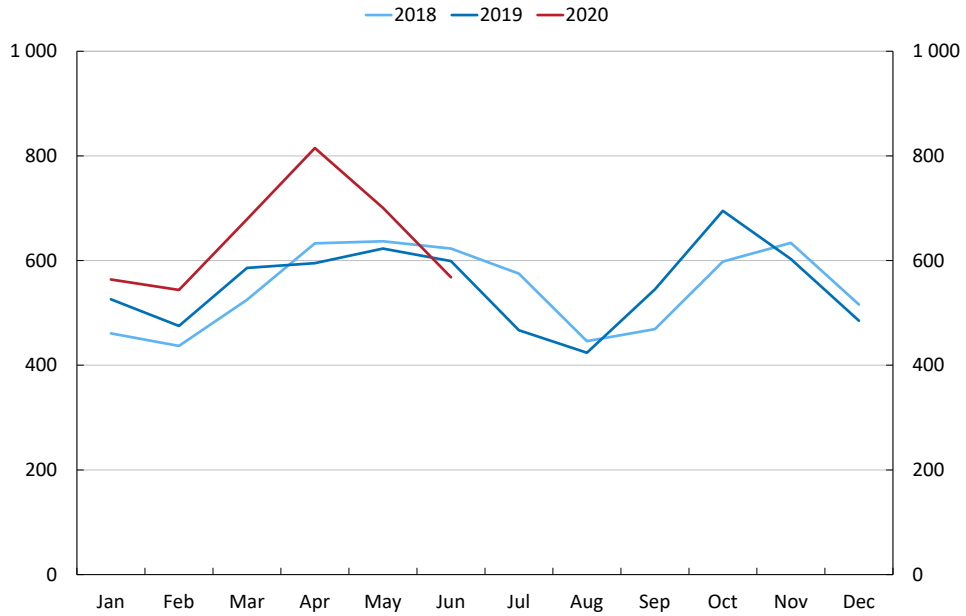
These measures had an immediate effect on the movement of people and caused a substantial slowdown in economic activity throughout the country. Moreover, as a small, open economy, Sweden has also been affected by the demand and supply shocks that resulted from restrictions imposed around the world.

A large number of limited liability firms already filed for bankruptcy in March 2020, and despite the measures put in place by the government, such as the possibility to defer tax payments, and the Riksbank's pledge to help firms to obtain liquidity, bankruptcy filings increased further during April as shown in Figure 1.

Figure 1 shows the total number of bankruptcies in each month of 2020 and compares it with the total amount of bankruptcies filed in the same month of 2019 and 2018. The figure clearly illustrates that in March-May 2020, the number of bankruptcies filed was larger than during the same months in 2018 and 2019 but returned to a level in line with data in 2018 and 2019 in June.

Figure 1. Total number of bankruptcies each month, selected years

Number



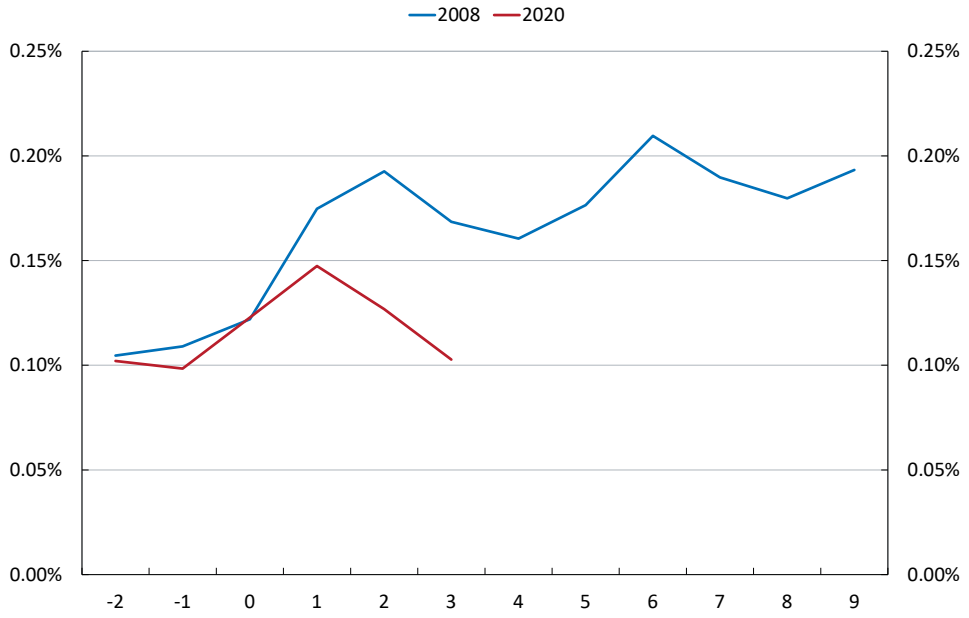
Note: Total number of bankruptcies initiated each month in 2018 (light blue line), 2019 (dark blue line) and 2020 (red line).

To better understand how the pandemic has affected the rate of bankruptcies, in Figure 2, I compare the data on bankruptcies during the spring of 2020 with the bankruptcies during the Global Financial Crisis (hereafter GFC). While the two crises are clearly very different in their nature, they both had a substantial effect on economic activity and therefore it is interesting to compare how bankruptcies evolved during the two periods.

To capture the dynamics at the beginning of the two crises and in the months afterwards, I create an event window where zero represents September 2008 for the GFC and March 2020 for the COVID-19 pandemic. For each crisis, I extended the window to show the first two months before the main event that triggered the respective crisis, and the first nine months after the GFC and the months of April (1), May (2) and June (3) for 2020.

Figure 2. Event study, percentage of companies bankrupted 2008-2009 and 2020

Percent



Note: Percentage of bankruptcies in the event window during the Global Financial Crisis, GFC, in 2008 (blue line) and the COVID-19 pandemic in 2020 (red line). The event windows are built around the month of September for the GFC, i.e. September 2008=0, and the month of March for the COVID-19 pandemic, i.e. March 2020=0.

Figure 2 shows an upward slope in the number of bankruptcies already before the beginning of the two crises. The two lines are basically indistinguishable up until the event occurred at time zero, and then they part one month after the beginning of the event, time 1. The blue line remains largely above the red line also at time 2 and time 3, and the gap between the two lines widens over time suggesting that the effect of the GFC on the rate of bankruptcy was larger than what we have seen with the COVID-19 pandemic so far.

Noticeably, in the nine months after the GFC, the bankruptcy rate never reverted to its pre-crisis level. During theCOVID-19 pandemic the trend seems to behave differently: already in June 2020, the bankruptcy rate had fully reverted to its pre-crisis level.[17] This difference may be driven by the fact that the shocks were different in their nature but also by the policy reaction that we saw immediately after the outbreak of the pandemic[18] as well as the policies put in place after the GFC to strengthen the financial system.

More than 10 years after the GFC, largely because of all of the measures employed to strengthen the financial system, the Swedish economy entered the COVID-19 pandemic with a relatively stronger financial system than in 2008 (Sveriges Riksbank, February 2020b), and this definitely helped the government, the Riksbank and other Swedish authorities to focus on firms and households from the beginning. The speed with which institutions acted and the scale of the economic support provided to the real economy seem to have achieved the desired effect of softening the immediate economic blow of the pandemic (as is also shown by recent GDP figures). Naturally, both policy makers and academics worry what will happen when eventually government support is withdrawn. In

[17] Also notice that data in the *Financial Stability Report 2020:2* (Sveriges Riksbank, November 2020), using data from Statistic Sweden, reports that the number of bankruptcy filings has continued to decrease in July and August. Moreover, the business and credit reference agency UC reports that bankruptcy has fallen 36% in October with respect to the same month in 2019 (UC, 2020) .

[18] Notice that after June 2020 the number of firms filing for bankruptcy has further decreased according to data from Statistics Sweden. For more details see *Financial Stability Report 2020:2 (*Sveriges Riksbank, November 2020).

the conclusions, I elaborate more on the risks that future policy changes may have for financial stability.

Overall, this section shows that the economic crisis caused by the COVID pandemic has been associated, so far, with a smaller amount of bankruptcy filings than during the GFC. Although the months of March and April in 2020, in particular, have been quite dramatic if we compare them with periods of normal economic conditions such as the same months in 2018 and 2019.

To understand the economic effects of the COVID bankruptcies, I start the next section by describing how bankruptcies were distributed across regions in Sweden and industries. Then, I proceed with the regression analysis of the firms' characteristics and probabilities of default.

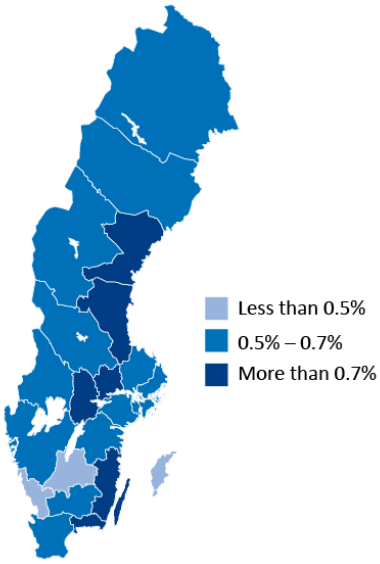
4.2 Bankruptcies in Sweden during the COVID-19 pandemic: Distribution by region and industry

In this section, to understand the economic consequences of the COVID bankruptcies, I focus on describing how these bankruptcies were distributed among the different geographical areas and among different industries.

To begin with, I illustrate how the firms that filed for bankruptcy in the period March-June 2020 were distributed across Swedish regions and industries. Using the address of each firm's headquarter in 2018, Figure 3 shows how bankruptcies are distributed by region each month.

Figure 3. Distribution of COVID bankruptcies by region

Percent

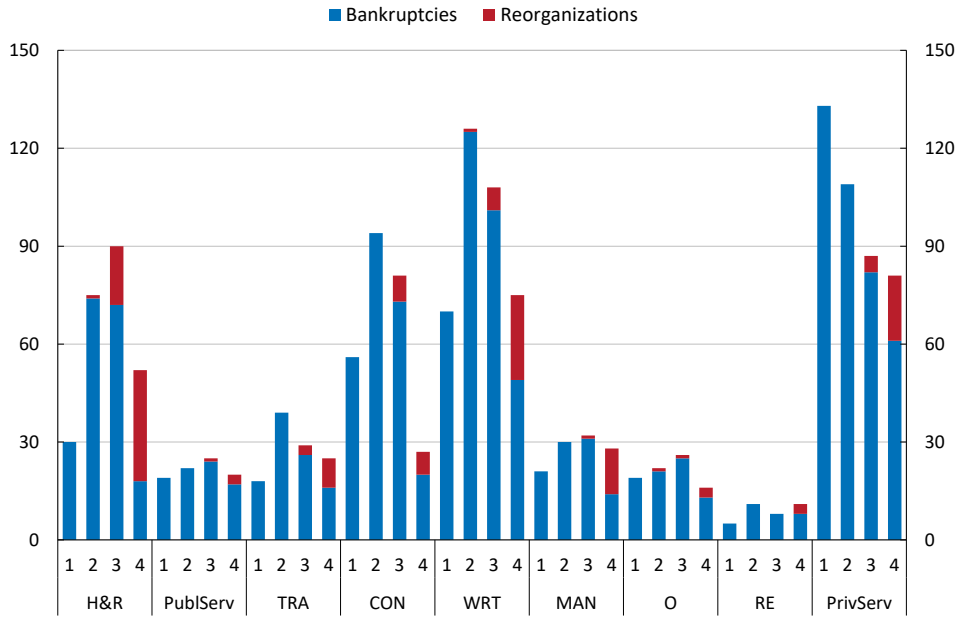


Note: In each region, the rate of bankruptcy is calculated as the total number of bankruptcies filed during March-June 2020 by firms headquartered in the region divided by the total number of firms with their headquarters in the same region. Firms' headquarters are obtained in 2018. Data include only limited liability firms.

Figure 3 shows that, with respect to the number of firms registered in each region, bankruptcy has affected virtually every region in Sweden, yet the effects were quite different. In relative terms, the most affected regions were Västernorrland, Gävleborg, Västmanland, Örebro County, Kalmar and Blekinge. These results give us a sense of the local effects of the COVID pandemic on the economy since it suggests that these areas may report large losses of tax revenues and, most likely, larger unemployment figures. Unfortunately, lack of data does not allow me to study these implications in more detail.

Next, Figure 4 shows how bankruptcies are distributed by industry and size.

Figure 4. Bankruptcies and reorganizations by industry and firms' asset size
Number of firms



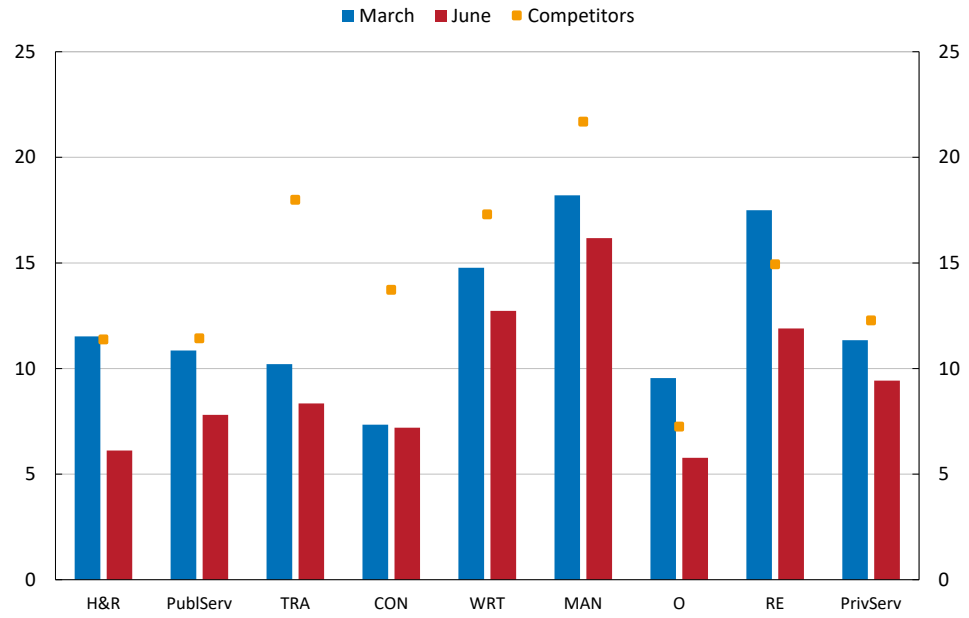
Note: The graph illustrates the total number of bankruptcies (the blue portion of each bar) and reorganizations (the red portion of each bar) filed over the period March-June 2020. Firms are grouped in nine industries: Hotel and Restaurants (H&R), Public Services (PublServ), Transportation (TRA), Construction (CO), Wholesale and Retail Trade (WRT), Manufacturing (MAN), Real Estate (RE), Other (O) and Private Services (PrivServ). The industry labelled as Private Services includes firms in the following industries: information technology, professional, scientific and technical services, corporate services, other services. The industry labelled as Public Services groups firms in public administration, education, health care, arts and entertainment. In the Other group, I collect firms in agriculture, mining, environment and those with no SNI code. Once groups are created, industries are sorted by total contribution to total assets, from the smallest one (H&R) to the largest one (PrivServ). Using total assets at the end of 2018, firms are grouped into size quartiles: micro, small, medium-large and large. The average firm in the group of micro firms has total assets of about SEK 176,135, while the average firm in the group of large firms reports about SEK 210 million in total assets.

The only industry for which I do not have any bankruptcies is the energy sector (SNI07 codes D: Electricity, Gas, Steam and Air Conditioning Supplies). Otherwise, COVID bankruptcies appear in all industries, and some industries are more affected than others. In particular, Figure 4 shows that the Hotel and Restaurant (H&R), Construction (CON), Wholesale and Retail Trade (WRT) and the Private Services (PrivServ) industries were the most affected. In these industries, mostly small and medium sized firms filed for bankruptcy while in the Private Services Industry (PrivServ), the largest number of bankruptcies was registered among micro firms.

Figure 5 adds another element to the broad picture of the COVID bankruptcies: it shows the firm age (calculated as number of years from registration). For the sake of brevity, Figure 5 shows the average age of COVID bankruptcies in the March and June, only. However, a figure that includes statistics for April and May can be obtained from the author.

Figure 5. Average firm age

Number of years



Note: Firm age is calculated as the number of years from a firm's year of registration. The group of competitors contain all the non-financial firms in the sample at the end of 2018 that did not file for bankruptcy in March-June 2020. The graph shows the average age of the firms that filed for bankruptcies in March (the blue bars) and June (the red bars). All firms are grouped in nine industries: Hotel and Restaurants (H&R), Public Services (PublServ), Transportation (TRA), Construction (CO), Wholesale and Retail Trade (WRT), Manufacturing (MAN), Real Estate (RE), Other (O) and Private Services (PrivServ). The industry labelled as Private Services include firms in the following industries: information technology, professional, scientific and technical services, corporate services, other services. The industry labelled as Public Services groups firms in public administration, education, health care, arts and entertainment. In the Other group, I collect firms in agriculture, mining, environment and those with no SNI code. Once groups are created, industries are sorted by total contribution to total assets, from the smallest one (H&R) to the largest one (PrivServ).

Firm age is commonly used as a proxy to understand where a firm stands in its business cycle. For example, firms that are 10 years or older are considered more established/mature firms. As a firm ages, in fact, its business cycle matures and this means that its business model and products should be more established, although they may also become less innovative and thus less competitive. Importantly, older firms tend to be also more cash rich.

Figure 5 shows that across most of the industries, firms that filed for bankruptcy during March and June were younger than the average firm in the same industry. This was also mostly the case in April and May (unreported). On average, the industries with the oldest firms are Manufacturing (MAN), Wholesale and Retail Trade (WRT) and Transportation (TRA) with an average firm age of 19, 14 and 12 years respectively. The rest of the industries all have an average firm age of about 10 years. Among these industries, Transportation stands out because the firms that filed for bankruptcy were quite young

(around 10 years) with respect to the average of their competitors (18 years). A similar pattern can also be observed in Construction (CON), which is also one of the industries with the largest number of firms that filed for bankruptcy (see Figure 4).

Another interesting element is that the age of the firms that filed for bankruptcy decreases as the months go by. In other words, keeping the industry constant, in all industries with the exception of the Construction industry, the firms that filed for bankruptcy in June were younger than those that filed in March. In the Transportation industry, firms range from just less than 10 years in March to around 8 years in June, for example. This suggests that, as the crisis progressed, the characteristics of the firms that exited the market changed.

Since younger firms, which are usually less established firms, tend to have a higher probability of default than older firms (see Catchart et al. 2020 for a formal discussion), this result suggests that the firms that went into bankruptcy during the COVID-19 pandemic may have had different characteristics than those that filed for bankruptcy in other years. Thus, the next section will first study the characteristics of the firms that filed for bankruptcy during the pandemic with respect to their competitors and will then focus on the differences between them and the firms that filed for bankruptcy in 2019 and in January and February 2020.

4.3 Bankruptcy of Swedish firms during the COVID-19 pandemic: Main results

4.3.1 Descriptive statistics

In this section, I drill down into the characteristics of COVID bankruptcies and the other firms in the sample. Table 1.A in the Appendix provides detailed descriptive statistics for the firms used in this study: competitors, COVID bankruptcies and other bankrupt firms. However, I start this section by studying differences between firms in the different groups and then employ multivariate OLS regression analysis with fixed effects to ascertain that results are statistically significant. A first set of results are reported in Table 1. Key results from Table 1 are also summarized graphically in Figure 6 and Figure 7.[19]

[19] Figure 6 and Figure 7 are available with an industry and size break-down directly from the author.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Debt Ratios		Profitability	Trade Credit Ratios		Liquidity Ratios	
	Leverage	ICR	STD/TA	ROA	AR/S	AP/S	LA/S	QRC
COVID bankruptcies	0.210***	-56.684***	0.005***	-0.150***	-0.001	0.030***	-0.356***	-1.440***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.664)	(0.000)	(0.000)	(0.000)
Ln(Total Assets)	-0.005	17.489*	0.000	0.033**	0.001	0.005***	0.051	-0.023
	(0.535)	(0.082)	(0.546)	(0.024)	(0.662)	(0.000)	(0.381)	(0.758)
Ln(Firm Age)	-0.052***	-4.030	-0.001***	-0.026***	0.001	-0.002**	0.100***	0.343***
	(0.000)	(0.241)	(0.000)	(0.000)	(0.434)	(0.019)	(0.000)	(0.000)
Independent	-0.119***	7.934	0.001	0.050***	0.008***	-0.005***	0.371***	3.378**
	(0.000)	(0.321)	(0.294)	(0.000)	(0.000)	(0.001)	(0.002)	(0.018)
Observations	437,253	249,832	437,263	437,263	377,958	377,958	377,958	424,770
Adj. R-squared	0.148	0.096	0.163	0.121	0.073	0.0929	0.104	0.117

Table 1: Ratio Analysis in 2018: COVID bankruptcies in March-June 2020 versus competitors

Table 1 shows the results of OLS cross-sectional regressions. The independent variable of interest is *COVID bankruptcies.* This variable is a dummy variable that takes the value of one if the firm filed for bankruptcy over the period March-June 2020 and zero otherwise (i.e. the dummy equal to zero represents the competitor firms). As dependent variables, columns (1), (2) and (3) use ratios obtained by using financial debt, interest payment on debt and the proportion of assets financed with short-term debt, respectively. Column (4) shows results for profitability, which is captured by a firm's return on assets (ROA). Columns (5) and (6) focus on trade credit and show results using ratios based on accounts receivable and accounts payable, respectively. Finally, columns (7) and (8) focus on liquidity ratios and in particular on cash retention as a percentage of sales (column (7)) and quick ratio cash (column (8)). All variables are described in detail in Section 2. All regressions include industry-size fixed effects, together with robust standard errors clustered at the industry-size level. Robust p-values are reported in the parentheses underneath the coefficients and should be interpreted as follows *** p<0.01, ** p<0.05, * p<0.1.

Usually, firms that file for bankruptcy tend to have worse financial ratios than firms that do not file for bankruptcy. Nevertheless, during the pandemic the main worry has been that financially healthy firms have been affected and filed for bankruptcy even though they would have not done so in normal conditions. Therefore, the first thing that this study wants to clarify is whether, long before the virus was even reported in the news in China, the firms that filed for bankruptcy during the pandemic in Sweden were or were not financially as healthy as their closest competitors. To do so, Table 1 shows results for regression analyses including fixed effects for SNI07 industry codes interacted with quartiles of total assets quartiles (to capture the variation by size and industry).

Each column in Table 1 shows results for a different dependent variable: Leverage, Interest Coverage Ratio (ICR), Short-Term Debt over Total Assets (STD/TA), Accounts Receivable over Sales (AR/S), Accounts Payable over Sales (AR/S), Cash and cashable securities over Sales (LA/S) and Quick Ratio Cash (QRC) respectively. The independent variable of interest is a dummy variable (COVID bankruptcies) that is equal to one if the firm filed for bankruptcy in March-June 2020 and zero otherwise. Results are obtained after controlling for a firm size, age and ownership. All variables are calculated at the end of 2018.

Table 1 shows that, in December 2018, COVID bankruptcies had higher leverage and worse interest coverage ratio and profitability than the rest of the firms in the sample. They also used more short-term debt to finance their business, and relied more heavily on trade credit (account payables) than their competitors.[20]

Table 1 also shows that firms that initiated bankruptcy in March-June 2020 were quite illiquid: a. they generated significantly less cash from sales than their competitors did and had a much smaller quick ratio cash (as shown also in Figure 9). The control variables also provide some interesting insight. First, in 2018, older firms had less leverage, employed more long-term debt, were less profitable, relied less on trade credit and were more liquid than younger firms, while firms that did not belong to a group (stand-alone firms) were less levered, more profitable and liquid than those that did. These latter firms also

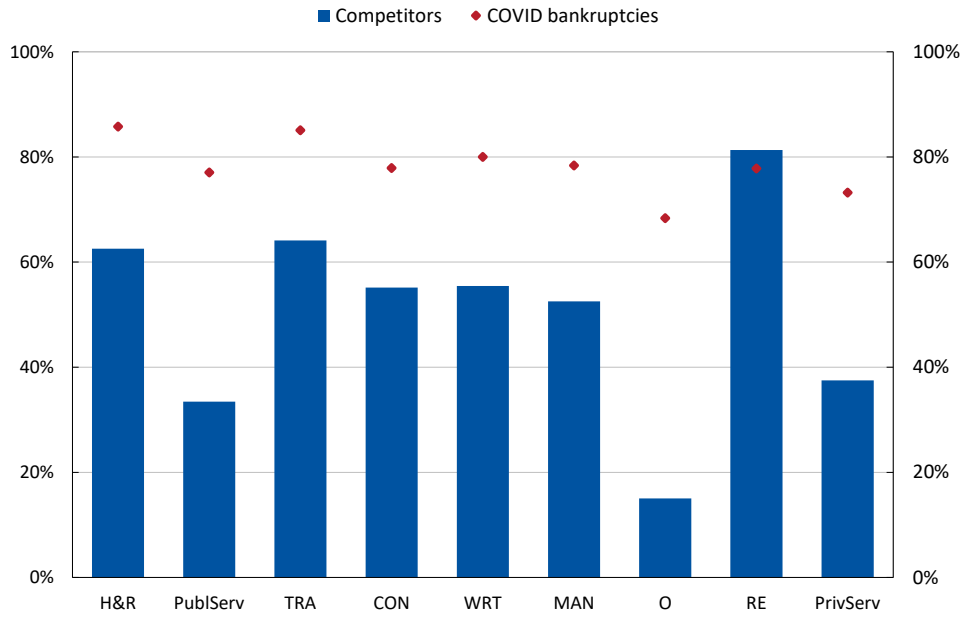
[20] This is consistent with the findings of Molina and Preve (2012) and Catchart et al. (2020) which show that firms in financial distress tend to use more trade credit than healthy firms do.

extended more credit to their clients (AR/TA) but received less credit from suppliers outside of the group (AP/TA). Results are both economically and statistically significant.

Results in columns (1) and (2) of Table 1 are also illustrated in Figure 6 and Figure 7. Figure 6 shows the median by industry of firms' leverage and Figure 7 shows the median interest coverage ratio (ICR). The graphs show the median for the group of COVID bankruptcies (the red dots) and the median for their competitors by industry (blue bars).

Figure 6. Median leverage by industry and size categories, 2018

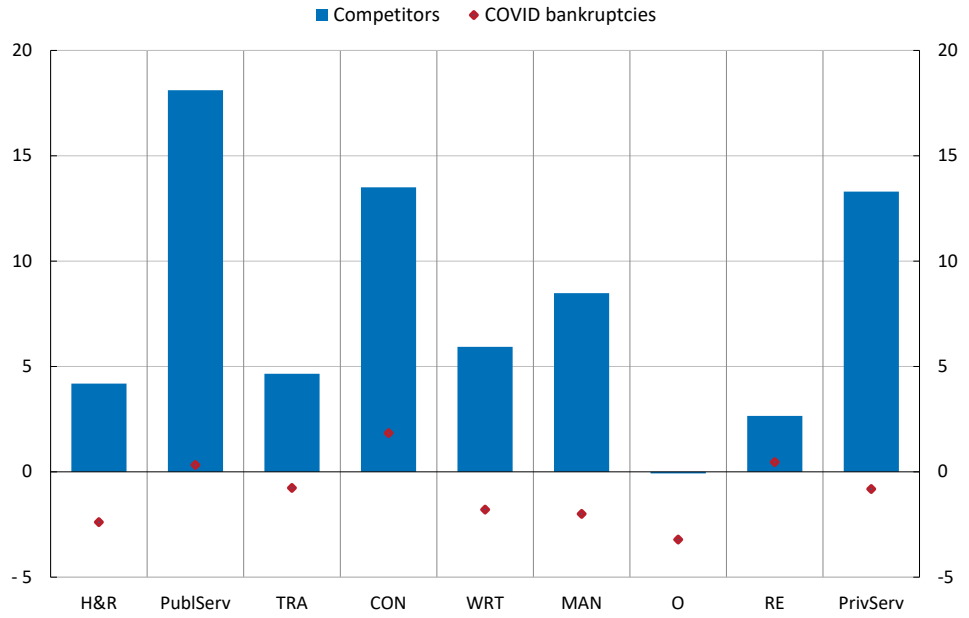
Percent



Note: Median financial leverage for COVID bankruptcies (red dots) and competitors by industry (blue bars). The group of competitors contains all the non-financial firms in the sample at the end of 2018 that did not file for bankruptcy in March-June 2020. A firm's leverage is calculated as the ratio between its financial debt and the sum of its financial debt and equity. Financial debt is given by the sum of long-term debt (excluding "other non-current liabilities") and short-term loans. The graph show nine industries: Hotel and Restaurants (H&R), Public Services (PublServ), Transportation (TRA), Construction (CO), Wholesale and Retail Trade (WRT), Manufacturing (MAN), Real Estate (RE), Other (O) and Private Services (PrivServ). A detailed description of the data and the industries can be found in Section 2 and Section 3.

Consistent with results in Column (1) of Table 1, Figure 6 shows that across all industries, the median COVID bankruptcy (red dot) was, in 2018, more levered than the median among competitors. Untabulated results also show that, in both samples, leverage increases with size, which means that larger firms use more leverage, consistent with the fact that large firms tend to be less financially constrained.

Figure 7. Median Interest Coverage Ratio by industry and size categories, 2018
Ratio



Note: Median interest coverage ratio, ICR, for COVID bankruptcies (red dots) and competitors by industry (blue bars). The group of competitors contain all the non-financial firms in the sample at the end of 2018 that did not file for bankruptcy in March-June 2020. The ICR is calculated as the ratio between the firm's profit before interest and taxes (EBIT), and interest expenses. The graph shows nine industries: Hotel and Restaurants (H&R), Public Services (PublServ), Transportation (TRA), Construction (CO), Wholesale and Retail Trade (WRT), Manufacturing (MAN), Real Estate (RE), Other (O) and Private Services (PrivServ). A detailed description of the data and the industries can be found in Section 2 and Section 3.

Figure 7 shows results for the median interest coverage ratio in 2018. In this case, it appears that the ICR across industries is almost always very close to zero or negative for the median COVID bankruptcy (red dot). This means that at least half of the COVID bankruptcies in the sample, already in 2018, were not able to cover the interest payments on their debt, and actually reported losses (often much) larger than the interest payments they were supposed to make. On the other hand, in most industries, the median competitor could easily repay interest on accumulated debt several times over. Unreported results show for example that the largest firms in the construction industry, for example, have a median ICR of almost 25.

Next, having established that COVID bankruptcies were on average financially weaker and less profitable than their competitors, I study (1) whether the variables that usually predict bankruptcy still continue to do so during the first months of the COVID-19 pandemic, and (2) whether any new variables that explain the COVID bankruptcies emerge. I also look at the bankruptcy rate by industry to confirm that the pandemic has had a particularly large impact on industries that rely more on social interaction (like the Hotels, and Restaurants industry). Results are reported in the next section.

4.3.2 Firm bankruptcy at the time of the pandemic versus bankruptcy in normal time

In this section, I study whether the pandemic changed the characteristics of the firms that file for bankruptcy and investigate the differences between firms that filed for bankruptcy before and during the pandemic. Results are reported in Table 2.

	(1)	(2)	(3)
	COVID Bankruptcies	Other Bankruptcies	COVID Bankruptcies
	Competitors		Other Bankruptcies
Leverage	0.007***	0.021***	-0.053***
	(0.000)	(0.000)	(0.002)
Interest Coverage Ratio	-0.000	0.000	0.000***
	(0.481)	(0.754)	(0.002)
Short-Term Debt/Total Assets	-0.003	0.018	-0.460**
	(0.827)	(0.396)	(0.015)
Return on Assets	-0.008***	-0.023***	0.007
	(0.000)	(0.000)	(0.765)
Accounts Receivable/Sales	-0.004*	-0.017**	0.161*
	(0.071)	(0.014)	(0.057)
Accounts Payable/Sales	0.026***	0.070***	-0.242
	(0.003)	(0.008)	(0.126)
Liquid Assets/Sales	-0.000***	-0.001**	0.010
	(0.002)	(0.017)	(0.636)
Ln(Total Assets)	-0.001***	-0.002***	0.010
	(0.000)	(0.000)	(0.203)
Ln(Firm Age)	-0.001**	-0.003***	0.001
	(0.012)	(0.002)	(0.922)
Independent	-0.001	0.001*	-0.043*
	(0.247)	(0.076)	(0.098)
Hotels and Restaurants	0.015***	0.015***	0.222***
	(0.000)	(0.000)	(0.000)
Wholesale and Retail Trade	0.006***	0.014***	0.077***
	(0.000)	(0.000)	(0.003)
Arts and Entertainment	0.006***	0.008***	0.172***
	(0.000)	(0.000)	(0.000)
Additional Industry Dummies	YES	YES	YES
Observations	230,425	230,425	3,919
Adj. R-squared	0.00612	0.0180	0.0255

Table 2: COVID bankruptcies in March-June 2020 versus competitors and other bankrupt firms

Table 2 shows the results of multivariate OLS cross-sectional regressions. The tables shows different dependent variables. In column (1) the dependent variable is *COVID bankruptcies.* This variable is a dummy variable that takes the value of one if the firm filed for bankruptcy over the period March-June 2020 and zero otherwise. Column (2) compares bankruptcies in 2019 and January and February 2020 with all firms in 2018. The dependent variable in column (2) is a dummy variable that takes the value of one if the firm filed for bankruptcy over the period January 2019-February 2020 and zero otherwise. Column (3) compares directly COVID bankruptcy with other bankruptcies. The dummy variable then takes the value of one if the firm filed for bankruptcy over the period March-June 2020 and zero if a firm filed for bankruptcy in 2019 or over the months of January and February 2020. The independent variables are ratios obtained by using financial debt, interest payment on debt and the proportion of assets financed with short-term debt, respectively. All variables are described in detail in Section 2. All regressions include industry-fixed effects, together with robust standard errors clustered at the industry level. The results for the industry dummies are reported in Table 2.A in the appendix. Robust p-values are reported in the parentheses underneath the coefficients and should be interpreted as follows *** p<0.01, ** p<0.05, * p<0.1.

In Table 2, I employ a linear probability model. This model uses as a dependent variable a dummy variable equal to one if a firm has filed for bankruptcy and zero otherwise. The dummy variable capturing whether a firm has filed for bankruptcy is regressed on a set of firm characteristics to understand what characteristics contributed to the firms filing for bankruptcy. I also include industry dummies to capture variation at the industry level. The linear probability model is suited for this analysis because the coefficients of each of the independent variables can be interpreted as the change in the probability that the firm filed for bankruptcy holding the other repressors constant.

For convenience, in Table 2, I only report the coefficients of the industry dummies representing the most "socially intensive" industries: Hotels and Restaurants, Wholesale and Retail Trade, Arts and Entertainment. I do so because these industries have been particularly affected by the recommendation to limit social contacts. However, Table 2.A in the appendix shows the coefficients for all of the industry dummy variables.

Column (1) of Table 2 shows the characteristics associated with the firms that initiated bankruptcy in March-June 2020 (COVID bankruptcies) with respect to their competitors. In column (1) the dependent variable then is a dummy variable that is equal to one if a firm belongs to the group of COVID bankruptcies and zero otherwise (to capture all competitors firms). However, to better understand whether the pandemic contributed to the firms' decision to file for bankruptcy, one needs to understand which firms file for bankruptcies during normal times. This is what is captured in column (2). The dependent variable in column (2) is a dummy variable that takes the value of one if a firm filed for bankruptcy over the period January 2019-February 2020 and zero otherwise. Finally, in column (3), I compare directly the COVID bankruptcies and other bankrupt firms.

Table 2 illustrates some important facts. First, as suggested before, results in column (1) confirm that high leverage, low profitability, more dependency on accounts payable, and less liquidity all increased the probability that a firm filed for bankruptcy in March-June 2020. Column (2) shows that the same variables contributed to the probability that a firm filed for bankruptcy even before the pandemic began. By and large, this suggests that during the pandemic the same type of firms filed for bankruptcy as before the pandemic began. From a policy perspective, this is quite reassuring.

Once I have established that the COVID bankruptcies were vulnerable already in 2018 and that the crisis did not affect the composition of the group of firms that filed for bankruptcy, it is natural to think that the crisis most likely accelerated the decision to file itself. Therefore, I also want to understand what characteristic affected the probability of a firm filing during the pandemic rather than before. I do this in column (3).

Column (3) focuses on bankrupt firms only and studies what characteristics, in 2018, affected the decision of a firm to file for bankruptcy in March-June 2020 with respect to filing over the period January 2019-February 2020. Column (3) illustrates that the probability of "postponing filing for bankruptcy" is negatively associated to leverage and refinancing risk but positively associated with the firms' ability to repay interests on their debts and dependence from trade credit (accounts receivable). Therefore, with respect to firms that filed for bankruptcy before, COVID bankruptcies were most likely able to postpone bankruptcy because of less leverage, lower exposure to refinancing risk and larger ICR. These results are important because they highlight that, despite the fact they were financially weaker than their competitors in 2018, COVID bankruptcies might had not yet reached the point when bankruptcy was unavoidable.

The industry dummies shown in Table 2 also depict some interesting patterns. To begin with, column (1) in Table 2.A in the appendix shows that the industry with the largest coefficient is the Hotel and Restaurants industry. The coefficients of the dummy for the

Hotel and Restaurants industry show that firms that belonged to this industry had a 1.5% higher probability of filing for bankruptcy in March-June 2020. The coefficient of the industry dummy variable decreases to 0.6% if the firm belonged to the Art and Entertainment Industry or the Wholesale and Retail Trade industry. These results confirm that the Hotel and Restaurants industry has been particularly badly hit by the COVID pandemic with respect to the other industries. Interestingly, Table 2.A in the appendix shows that the industries of Corporate Services and Transportation have also been relatively more adversely affected. Finally, Column (2) in Table 2.A shows that, before the pandemic, there was more industry variation: the coefficients of the industry dummies are all quite similar, however firms that belonged to the Corporate Service industry had a slightly larger probability of filing for bankruptcy.

Overall, the results so far suggest that the firms that filed for bankruptcy during the first four months of the pandemic were already vulnerable in 2018. Additionally, when compared to firms that filed in the fourteen months before the pandemic arrived, the probability that a firm filed for bankruptcy during the pandemic was strongly affected by the firm's leverage, refinancing risk and, in particular, its ability to repay the interest on its debt. This suggests that, all else equal, had the pandemic not struck, the COVID bankruptcies may have been able to further postpone filings for bankruptcy. However, the fact that they would have been able to postpone filing for bankruptcy would not have been necessarily advantageous for neither the economy nor their creditors.

To better understand the point above, I next focus on the firms available in the Swedish Credit Registry (KRITA) and study the one-year-ahead probability of default reported by credit institutions. The main results of this analysis are in Table 3 and Table 4 in the next section.

4.3.3 Firms' probability of default

In this section, I study the one-year-ahead probability of default reported by credit institutions. For credit risk management purposes, and to comply with regulations, credit institutions calculate the probability that, within a year, a borrower defaults.

Default refers to borrowers violating an agreement with a creditor as specified by the contract with the lender.[21] When a firm misses a required interest or principal payment, a formal default occurs. Often, a default triggers a restructuring of debt payments or a formal bankruptcy filing. The one year-ahead probability of default is then the probability that, within a year, a borrower fails to fulfil its obligations under the terms agreed with the credit institutions lending the money. The results of this analysis are reported in Table 3 and Table 4. Table 3 compares the probability of default COVID bankruptcies with competitors, while Table 4 compares COVID bankruptcies with other bankrupt firms in January and February 2020.

[21] Technical defaults occur when a firm violates a provision other than a scheduled payment. For example, in the contract it may be specified that the firm needs to have a minimum current ratio or a max debt ratio. Violating a covenant usually leads to renegotiation rather than immediate repayment of the loan. However, the fact that borrowers violate covenants usually indicates a deterioration of their financial health.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					One Year ahead Probability of Default							
	Dec 2018	Dec 2019	Jan 2020	Feb 2020	Jan 2020	Feb 2020	Jan 2020	Feb 2020	Jan 2020	Feb 2020	Jan 2020	Feb 2020
COVID bankruptcies	0.030***	0.072***	0.079***	0.088***								
	(0.000)	(0.000)	(0.000)	(0.000)								
COVID bankruptcies in March					0.083***	0.109***						
					(0.000)	(0.000)						
COVID bankruptcies in April							0.095***	0.107***				
							(0.000)	(0.000)				
COVID bankruptcies in May									0.059***	0.047**		
									(0.002)	(0.020)		
COVID bankruptcies in June											0.065***	0.064***
											(0.004)	(0.003)
Loan Amount/Total Assets	0.001***	0.002*	0.002*	0.001	0.002*	0.001	0.002*	0.001	0.002*	0.001	0.002*	0.001
	(0.001)	(0.055)	(0.083)	(0.170)	(0.085)	(0.183)	(0.087)	(0.182)	(0.083)	(0.173)	(0.083)	(0.174)
Ln(Total Assets)	-0.003***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln(Firm Age)	0.000	-0.000**	-0.000**	-0.001***	-0.001**	-0.001***	-0.000**	-0.001***	-0.000*	-0.001***	-0.000	-0.001***
	(0.301)	(0.037)	(0.025)	(0.001)	(0.010)	(0.000)	(0.021)	(0.000)	(0.064)	(0.001)	(0.118)	(0.001)
Independent	-0.004***	-0.004***	-0.004***	-0.006***	-0.004***	-0.006***	-0.004***	-0.006***	-0.004***	-0.006***	-0.004***	-0.006***
	(0.003)	(0.002)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)
Observations	120,750	116,220	115,929	116,431	115,793	116,431	115,611	116,250	115,406	116,049	115,279	115,923
Adj. R-squared	0.0424	0.0386	0.0400	0.0338	0.0357	0.0304	0.0366	0.0304	0.0345	0.0276	0.0344	0.0278

Table 3: Analysis of the firms' probability of default

Table 3 shows the results of OLS cross-sectional regressions. The independent variables of interest are dummy variables that capture different sets of COVID bankruptcies. The variable *COVID bankruptcies* is a dummy variable that takes the value of one if the firm filed for bankruptcy in March-June 2020 and zero otherwise. The variable *COVID bankruptcies March* is a dummy variable that takes the value of one if the firm filed for bankruptcy in March 2020 and zero otherwise. The variable *COVID bankruptcies April* is a dummy variable that takes the value of one if the firm filed for bankruptcy in April 2020 and zero otherwise. The variable *COVID bankruptcies May* is a dummy variable that takes the value of one if the firm filed for bankruptcy in May 2020 and zero otherwise. The variable *COVID bankruptcies June* is a dummy variable that takes the value of one if the firm filed for bankruptcy in June 2020 and zero otherwise. The dependent variable of interest is the loan weighted average probability of default at a one-year horizon. For each firm, the probability of default and the loan amount given to each firm are obtained from the Swedish Credit Registry (KRITA) while all accounting variables are obtained from the Serrano database in December 2018. Each regression contains the following control variables: Nominal Loan Amount/Total Assets, Interest Coverage Ratio, Short-Term Debt to Total Assets, Return on Assets, Accounts Receivable/Sales, Accounts Payable/Sales, Liquid Assets/Sales, Fixed Assets/ Total Assets, Ln(Total Assets) and Ln(Firm Age). Control variables are omitted for the sake of brevity, but a full table can be found in the Appendix (Table 3.A). All variables are described in detail in Section 2. All regressions include industry-fixed effects, together with robust standard errors clustered at the industry level. Robust p-values are reported in the parentheses underneath the coefficients and should be interpreted as follows *** p<0.01, ** p<0.05, * p<0.1.

The probability of default used as the dependent variable in Table 3 and Table 4 comes from KRITA.[22] KRITA is a survey run by Statistics Sweden on behalf of the Riksbank to collect information on loans to companies and to the public sector. Eighteen monetary financial institutions are surveyed to compile the data collected in KRITA. After matching KRITA with Serrano, I am left with 187,811 non-financial firms in total, of which 977 filed for bankruptcy in March-June 2020 and 1,845 filed for bankruptcy between January 2019 and February 2020.

For each firm in KRITA and in each reference period, I know the probability of default one year ahead reported by each credit institution that lends to the firm and the amount borrowed. I use this latter amount to calculate my dependent variable of interest: a firm's loan-weighted average probability of default in December 2018, December 2019, January 2020 and February 2020, respectively. All regressions include industry-fixed effects and a large set of control variables including firm size. I also control for the total amount borrowed by the firm (as the sum of the nominal value of each loan reported in KRITA at each given time) divided by total assets.[23]

In the regressions in Table 3, I start by comparing the probability of default of COVID bankruptcies with that of their competitors in different periods: December 2018, December 2019, January 2020 and February 2020. To do so, I use as the independent variable the same dummy variable as in Table 1 in columns 1-4, but I also separately analyse firms that filed for bankruptcy in March, April, May and June, respectively, by calculating specific dummy variables.[24]

Results in Table 3, columns 1-4, show that, after controlling for all the characteristics studied previously and including industry-fixed effects, COVID bankruptcies show a higher probability of default than the rest of the sample in each period for which these probabilities are collected. Interestingly, as we move from December 2018 (column 1) to February 2020 (column 4), the coefficient of the dummy variable increases substantially (from 0.030 to 0.088) and remains highly statistically significant. This means that, after controlling for the amount borrowed, the ability to repay interest, profitability, size and more, as time passed, the credit institutions assigned a larger probability of default to firms that then filed for bankruptcy during the pandemic.

When we look at *when* firms filed for bankruptcy (Table 3, columns 5-12), I focus on the one year ahead probabilities of default calculated by the credit institutions in the months of January and February 2020. This analysis shows that, both in January and February 2020, the firms that filed for bankruptcy in March and April had the highest probability of default with respect to the rest of the sample of competitors. As the time of bankruptcy goes by, it is also clear that while COVID bankruptcies keep showing higher probability of default than their competitors, the coefficients become economically smaller even though they remain highly statistically significant (see Table 3, columns (11) and (12)). Also interesting is the result that among all COVID bankruptcies, firms that filed in May had the smallest probability of default with respect to their competitors in both January and February.

The results so far suggest that while, at the beginning, the pandemic might have facilitated the exit of firms already quite vulnerable to bankruptcy, as time passed, slightly healthier firms might have also been affected. To substantiate this statement, in Table 4 and Table 5, I directly compare firms that filed for bankruptcy during each month of the pandemic with firms that filed for bankruptcy immediately before the pandemic started. In KRITA I

[22] KRITA is still an ongoing project and is continuously updated and improved. The results in this paper are based on a data extraction conducted on August 11, 2020.

[23] Results are economically and statistically unchanged if I use the individual probabilities of default reported by the banks as a dependent variable directly. The results are also unchanged if I include industry-size fixed effects instead of industry-fixed effects alone.

[24] When I produce the dummy variable for firms that filed for bankruptcy in May, for example, to isolate as much as possible the firms I am interested in, I removed from the sample the firms that filed for bankruptcy already in March and April. I did so for each month apart from the month of March.

have data for a total of 377 firms that filed for bankruptcy either in January or in February 2020.

	(1)	(2)	(3)	(4)
	One Year Ahead Probability of Default in December 2019			
COVID bankruptcies in March	-0.028			
	(0.232)			
COVID bankruptcies in April		-0.004		
		(0.875)		
COVID bankruptcies in May			-0.067***	
			(0.001)	
COVID bankruptcies in June				-0.053***
				(0.008)
Loan Amount/Total Assets	-0.001	0.000	0.001	0.001
	(0.380)	(0.900)	(0.535)	(0.265)
Ln(Total Assets)	0.005	0.003	0.004	0.005
	(0.442)	(0.600)	(0.406)	(0.411)
Ln(Firm Age)	0.020**	0.023*	0.015	0.019*
	(0.013)	(0.064)	(0.162)	(0.062)
Independent	-0.018	0.027	-0.021	-0.009
	(0.513)	(0.427)	(0.305)	(0.739)
Observations	487	514	441	409
Adj. R-squared	0.00361	0.0001	0.0225	0.0251

Table 4: Analysis of firms' probability of default. COVID bankruptcies versus other bankrupt firms in January and February 2020

Table 4 shows the results of OLS cross-sectional regressions. The independent variables of interest are dummy variables that capture different sets of COVID bankruptcies. The variable *COVID bankruptcies March* is a dummy variable that takes the value of one if the firm filed for bankruptcy in March 2020 and zero if a firm filed for bankruptcy in January of February 2020. The variable *COVID bankruptcies April* is a dummy variable that takes the value of one if the firm filed for bankruptcy in April 2020 and zero if a firm filed for bankruptcy in January of February 2020. The variable *COVID bankruptcies May* is a dummy variable that takes the value of one if the firm filed for bankruptcy in May 2020 and zero if a firm filed for bankruptcy in January of February 2020. The variable *COVID bankruptcies June* is a dummy variable that takes the value of one if the firm filed for bankruptcy in June 2020 and zero if a firm filed for bankruptcy in January of February 2020. The dependent variable of interest is the loan weighted average probability of default at a one-year horizon. For each firm, the probability of default and the loan amount given to each firms are obtained from the Swedish Credit Registry (KRITA) while all accounting variables are obtained from the Serrano database in December 2018. All variables are described in detail in Section 2. All regressions include industry-fixed effects, together with robust standard errors clustered at the industry level. Robust p-values are reported in the parentheses underneath the coefficients and should be interpreted as follows *** p<0.01, ** p<0.05, * p<0.1.

In Table 4, I look at the probability of default reported by credit institutions in the month of December 2019. I compare the firms that filed for bankruptcy during each of the first four months of the pandemic with the firms that filed for bankruptcy in January and February 2020. To do so, I use as the independent variable a dummy variable equal to one if a firm filed for bankruptcy in March, April, May and June, respectively, and zero if the firm filed for bankruptcy in January or February 2020.

Results in Table 4 show that COVID bankruptcies in March and April had, already in December 2019, a probability of default indistinguishable from that of firms that filed for bankruptcy in January and February. However, firms that filed for bankruptcy in May and June show a statistically lower probability of default than the firms that filed for bankruptcy in January and February.[25] This result suggests again that as the pandemic raged around the world, slightly healthier firms may have been affected. To substantiate this conclusion, in Table 5, I look at characteristics in 2018, of the COVID bankruptcies in May and June 2020 and of the firms that filed for bankruptcy in January and February 2020.

[25] Because of sample limitations, the regressions in Table 5 control for a smaller set of variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Debt Ratios		Profitability	Trade Credit Ratios		Liquidity Ratios	
	Leverage	ICR	STD/TA	ROA	AR/S	AP/S	LA/S	QRC
COVID bankruptcies	-0.032	1.183	0.001	-0.005	-0.001	-0.010	-0.001	0.213*
	(0.179)	(0.862)	(0.855)	(0.875)	(0.879)	(0.282)	(0.979)	(0.093)
Ln(Total Assets)	-0.055	1.804	-0.003	0.044	0.012*	0.015**	0.025	0.186
	(0.168)	(0.794)	(0.268)	(0.351)	(0.074)	(0.016)	(0.202)	(0.208)
Ln(Firm Age)	-0.026	-2.748	0.000	-0.003	-0.008**	-0.001	-0.035**	-0.070
	(0.144)	(0.349)	(0.895)	(0.862)	(0.021)	(0.800)	(0.046)	(0.159)
Independent	-0.030	2.133	0.001	0.012	0.016	0.014	-0.032	0.153**
	(0.335)	(0.790)	(0.773)	(0.725)	(0.200)	(0.149)	(0.636)	(0.013)
Observations	565	496	565	565	543	543	543	560
Adj. R-squared	0.0688	0.001	0.144	0.223	0.195	0.175	0.310	0.142

Table 5: Ratio Analysis in 2018: COVID bankruptcies versus bankrupt firms in January-February 2020
Table 5 shows the results of OLS cross-sectional regressions. The independent variable of interest is *COVID bankruptcies.* This variable is a dummy variable, which takes the value of one if a firm filed for bankruptcy over the period May-June 2020 and zero if a firm went over the months of January and February 2020. As dependent variables, columns (1), (2) and (3) use ratios obtained by using financial debt, interest payment on debt and the proportion of assets financed with short-term debt, respectively. Column (4) shows results for profitability, which is captured by a firm's return on assets (ROA). Columns (5) and (6) focus on trade credit and show results using ratios based on accounts receivable and accounts payable, respectively. Finally, columns (7) and (8) focus on liquidity ratios and in particular on cash retention as a percentage of sales (column (7)) and quick ratio cash (column (8)). All variables are described in detail in Section 2. All regressions include industry-size fixed effects, together with robust standard errors clustered at the industry-size level. Robust p-values are reported in the parentheses underneath the coefficients and should be interpreted as follows *** p<0.01, ** p<0.05, * p<0.1.

The regressions in Table 5 indicate that the average firm that filed for bankruptcy in May and June 2020, and for which I have data in KRITA, was statistically identical to the average firm that filed for bankruptcy in January and February 2020. The only characteristic that (weakly) differs between the two groups is the quick ratio cash (column (8)) since COVID bankrupted firms in 2018 had a higher quick ratio cash (QCR). Untabulated results show that this is also the case if we look at all the firms in Serrano rather than just those that can be found in both Serrano and KRITA.

These latter results suggest that, the average firm that filed for bankruptcy in May and June 2020 might have been slightly more liquid in 2018 than firms that filed for bankruptcy before the pandemic but overall it still showed significant weaknesses. However, liquidity can change quite quickly, and by the time they filed for bankruptcy in May and June, or even in December 2019, these firms could have had much less liquidity.

The only way to ascertain whether the firms that filed in May and June could have postponed filing for bankruptcy is to use more recent data. Unfortunately, accounting data for 2019 will be only available at the end of this year. However, it is also important to keep in mind that I do not have specific information on the firms' business model, product/service market and investment opportunities, all of which have an important role in assessing a firm's future cash-flows and, therefore, its ability to fulfil its debt obligations. For example, it may be that the lower probability of default in December 2019, when we still knew very little about the existence and diffusion of the virus in China, was driven by the fact that COVID bankruptcies had better prospects than other firms that went bankrupt in January and February to generate cashflows in the year ahead. However, these prospects might have looked quite different after the pandemic struck and this could have contributed to them filing for bankruptcy.

Despite the caveats discussed above, my analysis suggests that, even though it is rational to believe that, given the strength of the shock, healthier firms could have been affected, the firms that filed for bankruptcy were on average weak firms, but not all equally weak, even before the pandemic arrived. This observation then reinforces the earlier conclusion

that providing support to the average firm that filed for bankruptcy during the COVID-19 pandemic might only have helped them postpone the initiation of bankruptcy proceedings but may have not helped them survive in the long run (or after support ran out).

To conclude, in the next and final section of this study, I summarize the relevance of my results and describe how we can use the lessons learned from the bankruptcies in the early stage of the COVID-19 pandemic to make the financial system more resilient to future shocks.

5. Conclusions and Future Work

The COVID-19 pandemic has caused one of the worst crises of all time. In April, the IMF (2020) reported an estimated contraction in global gross domestic product (GDP) of about 3% in 2020. In June, the World Bank (2020) estimated that the global economy might shrink by 5.2% this year, second only to the recession that followed the Second World War. Still, the cost in terms of lives and people's well-being cannot yet be fully appreciated, and it may take years before we can understand the full picture. By studying the characteristics of the firms that were immediately affected by the crisis, I try to understand whether we can make our financial system more resilient to the continued threat of this pandemic and to future shocks.

My conclusions are two-fold. First, the crisis might have contributed to the exit of some firms that, already in 2018, showed quite weak financial ratios and poor profitability. For the subsample of firms available in KRITA, I also show that firms that filed for bankruptcy in March-June 2020 had a higher probability of default than their competitors in different periods preceding the COVID-pandemic and were statistically similar to firms that had filed for bankruptcy in the fourteen months before the pandemic started.

Importantly, while we now know that the average firm that filed for bankruptcy in March-June 2020 was already vulnerable in 2018, the fact that so many firms filed, with respect to the same period in 2019, created in itself a worry for financial stability and for the real economy. Fortunately, as shown in Figure 1, in June the number of bankruptcies was around the same level as in June 2019. Interestingly, data collected from Statistic Sweden (see Chapter 2 in the *Financial Stability Report 2020:2,* Sveriges Riksbank, November 2020) show that the number of bankruptcy filings has continued to decrease in July and August, and this is consistent with the normal trend that we observed during the summer of 2018 and 2019.

Nevertheless, it is important to remember that, some level of bankruptcy is normal and that the times are still challenging. Many firms may face difficulties in the months or even years ahead. Even financially healthy and productive firms may fail. However, as I discussed before, the employment of large support packages may slow down this process. Therefore, it will be interesting to see whether, as at the moment it is happening in other countries, the number of bankruptcies filed in Sweden also starts falling substantially below the level reported in 2019.[26]

If this is the case, then the lower number of bankruptcy filings could be, at least in part, driven by the fact that many vulnerable firms were not able to further postpone filing for bankruptcy and filed already during the spring of 2020. Moreover, during the summer, the international and domestic economic outlook looked more encouraging. In many countries, demand for goods and services picked up again while supply chains started recovering. This led to a more positive international (and domestic) economic outlook that

[26] The newspaper *Dagens Industri* reports that in October 2020 with respect to October 2019 the number of bankruptcies has decreased by 36% (Axelsson, 2020).

definitely benefited many firms around the world and in Sweden. Unfortunately, however, many countries, including Sweden, are currently seeing an increase in the number of infections and this may translate into a more uncertain economic outlook. Finally, even if we eventually register a lower rate of bankruptcy in 2020 than in the past, one should not forget that the bankruptcy rate could also be affected by the support that many firms obtain from the government. If this is the case, we need to be aware of a potential wave of bankruptcies when governmental support is gradually withdrawn.

Following the COVID-19 outbreak, all over the world and in Sweden, policy makers have employed extraordinary measures to support both firms and households.[27] However, as we learn how to live with the virus and economies recover, we can expect that, at some point, economic support will decrease and firms will be left to fend for themselves. Yet, at that stage, firms may be more fragile than when they entered the crisis. For example, given that at least for large firms, credit conditions may be currently favourable,[28] many firms may emerge from this crisis with more leverage than they had before the pandemic started. This may pose new challenges for financial stability.

To give an idea of the importance of this problem, I use the universe of firms in 2018, excluding all firms that already filed for bankruptcy or re-organization from January 2019 until June 2020, and identify all firms that have the highest leverage in the sample.

Then, to give a sense of their liquidity, I use the entire sample to group all firms based on their quick ratio cash above and below the median in each industry-size group. Finally, I group the highly levered firms in each liquidity bracket using their interest coverage ratio (below zero, between zero and one, above one). The results are summarized in Table 6.

	Highly Levered Firms					
	Low Quick Ratio Cash			High Quick Ratio Cash		
	ICR<0	0≤ICR≤1	ICR>1	ICR<0	0≤ICR≤1	ICR>1
% No of Firms	7.03%	1.09%	18.74%	0.92%	0.23%	4.62%
% No of Employees	11.26%	1.03%	29.93%	0.51%	0.17%	4.86%
% Total ST and LT Debt to MFI	14.46%	3.01%	14.92%	2.13%	0.84%	5.69%
Average (Short-term debt/Total Assets)	1.95%	2.75%	1.18%	0.91%	1.30%	1.06%

Table 6. Distribution of highly levered firms by liquidity and interest coverage ratio, in 2018. The figure shows results for highly levered firms with different liquidity and interest coverage ratio. The percentage number of firms, the percentage number of employees and the percentage debt to a financial institution are calculated with respect to the entire population of firms in 2018.

Highly levered firms belong to the last tercile of the leverage distribution and have on average 84% leverage (firms in the bottom tercile of the distribution have on average 15% leverage, while firms in the middle tercile have on average 46% leverage). Highly levered firms with a quick ratio cash above the median (High Quick Ratio Cash) have an average quick ratio cash of about 2, while those below the median have an average quick ratio cash of about 0.27.

Table 6 also shows that among highly levered firms, almost 27% were less liquid than the median firm in their industry-size group and about 9% had an interest coverage ratio equal

[27] Just recently, the Swedish government has proposed a large package of reforms worth more than SEK 100 billion: Ministry of Finance, Government of Sweden (2020). The Riksbank will also continue with all the programmes launched so far this year and will hold the repo rate at zero per cent for the coming years.

[28] The *Riksbank's Business Survey September 2020* (Sveriges Riksbank, October 2020) reports that the major Swedish firms have not experienced difficulties to obtain funding since the spring. These firms report good access to liquidity and perceive that funding terms are favourable.

to or below one. From the data reported in Serrano, highly levered firms borrowed almost 41% of the total debt reported by all firms in the sample in 2018. Firms with an ICR below zero alone borrowed more than 16% of the total.

In 2018, the average firm in Serrano had a short-term debt to total asset ratio of 0.80% (non-reported), Table 6 shows a range that goes from 1.06% to 2.75%. All else equal, this suggests that the group of firms illustrated in Table 6 is not only more levered but may also be more exposed to refinancing risk than the average firm in the sample.

This group of firms is also important since it is not only numerically large but it also employs a large number of people. By definition, about 33% of the firms in the sample in 2018 appear in Table 6. Of this, almost 10% have an ICR equal to or below one. In total, almost 48% of the workforce in 2018 was employed in highly levered firms and 13% in highly levered firms with an ICR equal or below one.

If we look at the industry breakdown (untabulated), highly levered firms with an ICR equal to or below one can be found in all industries, but in some more than others. While there are very few in the Energy Sector (171 firms in total), I find a substantial number of them in the following industries: the Private Sector (10,772 firms, about 2.34% of the total number of firms in 2018), the Wholesale and Retail Trade Sector (7,123 firms, about 1.55% of the total number in 2018), the Construction Industry (4,935 firms, around 1.07% of the total number in 2018) and the Real Estate Industry (4,184 firms, which is about 0.91% of the total number of firms in 2018).

The statistics in Table 6 corroborate the idea that highly levered firms, in particular those with a poor ICR, are an important group of firms to study. This is particularly so since the crisis might already have had a major impact on them, and many may be further increasing their leverage.

Of course, since I do not have information on business models, detailed investments, etc., I cannot exclude the possibility that firms that are not in Table 6 may also be vulnerable. However, while we should study all firms in the economy to be aware of potential risks for financial stability and the real economy, to make the analysis more constructive, it is important to use some criteria to identify different degrees of risk.

To make this work most effectively, it would be ideal to have the list of firms that obtained support. If that list was available, then one could have an even better picture of the firms that may be most vulnerable in the future, especially when support decreases or runs out completely. Unfortunately, as of now, this list is not available to me. Nevertheless, starting by understanding the characteristics of the firms that filed for bankruptcy during the period March-June 2020, this study tries to offer a first glimpse of where vulnerabilities may be building up.

List of References

Acharya, Viral V., Tim Eisert, Christian Eufinger, and Christian Hirsch (2018), Real effects of the sovereign debt crisis in Europe: evidence from syndicated loans. *Review of Financial Studies* 31 (8), 2855-2896.

Adelino, Manuel, Miguel A. Ferreira, Mariassunta Giannetti, and Pedro Pires (2020), Trade credit and the transmission of unconventional monetary policy. *NBER Working Paper* no. 27077. National Bureau of Economic Research.

Altman, Edward I., Edith Hotchkiss and Wei Wang (2019), *Corporate financial distress, restructuring, and bankruptcy: analyze leveraged finance, distressed debt, and bankruptcy*. John Wiley & Sons.

Axelsson, Jonathan (2020) , Konkurserna minskar kraftigt: ”Mycket bättre än vad vi kanske hade väntat oss”. *Dagens industri*. 2 november 2020. https://www.di.se/live/konkurserna-minskar-kraftigt-mycket-battre-an-vad-vi-kanske-hade-vantat-oss/

Bankruptcy Act (1987) / Konkurslag (SFS 1987:672) [with updates]. Official translation of original text see *Ds 1998:41 Bankruptcy Act (1987:672).* Ds, departementsserien nr. 1998:41. Fritzes offentliga publikationer. https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/konkurslag-1987672_sfs-1987-672 .

Becker, Bo, Ulrich Hege, and Pierre Mella-Barral (2020), Corporate debt burdens threaten economic recovery after COVID-19: planning for debt restructuring should start now in Europe. In Agnès Bénassy-Quéré and Beatrice Weder di Mauro (ed.) *In the Time of Covid-19* p. 35 - 40. Centre for Economic Policy Research. Link to the article in VOXEU can be found here: https://voxeu.org/article/corporate-debt-burdens-threaten-economic-recovery-after-covid-19

Boot, Arnoud WA., Elena Carletti, Rainer Haselmann, Hans-Helmut Kotz, Jan Pieter Krahnen, Loriana Pelizzon, Stephen M. Schaefer, and Marti G. Subrahmanyam (2020), The coronavirus and financial stability. *SAFE Policy Letter* no 78. Leibniz Institute for Financial Research SAFE.

Bureau of Economic Analysis (2020), *Gross Domestic Product, 2nd Quarter 2020 (Second Estimate); Corporate Profits, 2nd Quarter 2020 (Preliminary Estimate).* News Release BEA 20-41, 27 August 2020. https://www.bea.gov/news/2020/gross-domestic-product-2nd-quarter-2020-second-estimate-corporate-profits-2nd-quarter#:~:text=Real%20gross%20domestic%20product%20(GDP,real%20GDP%20decreased%205.0%20percent Accessed September 2020.

Caballero, Ricardo J. and Mohamad L Hammour (1994), Cleansing effect of recessions. *American Economic Review* 84 (5), 1350-1368.

Cathcart, Lara, Alfonso Dufour, Ludovico Rossi, and Simone Varotto (2020), The differential impact of leverage on the default risk of small and large firms. *Journal of Corporate Finance* 60 (Feb) : 101541.

Cella, Cristina 2020, Zombie firms in Sweden: implications for the real economy and financial stability, *Staff Memo*, September 2020. Sverige Riksbank

Chakraborty, Indraneel, Itay Goldstein and Andrew MacKinlay (2020), Monetary stimulus and bank lending. *Journal of Financial Economics* 136 (1), 189-218 .

Company Reorganisation Act / Lag om företagsrekonstruktion (SFS 1996:764) https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-1996764-om-foretagsrekonstruktion_sfs-1996-764

Diamond, Douglas W. (1991), Debt maturity and liquidity risk. *Quarterly Journal of Economics* 106 (3), 709–737.

ECB (2020) Public loan guarantees and bank lending in the COVID-19 period. *ECB Economic Bulletin*, Issue 6, 2020. https://www.ecb.europa.eu/pub/economic-bulletin/focus/2020/html/ecb.ebbox202006_07~5a3b3d1f8f.en.html Accessed September 2020.

ESRB (2020), *Policy measures in response to the COVID-19 pandemic*. European Systemic Risk Board. https://www.esrb.europa.eu/home/search/coronavirus/html/index.en.html Accessed September 2020.

Fazzari, Steven, Hubbard, R. Glenn, and Bruce Petersen (1988), Financing constraints and corporate investment. *Brookings Papers on Economic Activity* 1988 (1), 141-195.

Foley-Fisher, Nathan, Rodney Ramcharan and Edison Yu (2016), The impact of unconventional monetary policy on firm financing constraints: evidence from the maturity extension program. *Journal of Financial Economics* 122 (2), 1-21.

Froot, Kenneth A., David S. Scharfstein, and Jeremy C. Stein (1993), Risk management: coordinating corporate investment and financing policies. *Journal of Finance* 48 (5), 1629–1658.

Gertler, Mark and Glenn R. Hubbard (1988), Financial factors in business fluctuations, in Financial Market Volatility. *Proceedings - Economic Policy Symposium - Jackson Hole.* Federal Reserve Bank of Kansas City, 33-78.

Gertler, Mark and Simon Gilchrist (1994), Monetary policy, business cycles, and the behavior of small manufacturing firms. *Quarterly Journal of Economics* 109 (2), 309-340.

Grosse-Rueschkamp, Benjamin, Sascha Steffen and Daniel Streitz (2019), A capital structure channel of monetary policy. *Journal of Financial Economics* 133 (2), 357-378.

Harford, Jarrad, Sandy Klasa, and William F. Maxwell (2014), Refinancing risk and cash holdings. The *Journal of Finance* 69 (3), 975-1012.

Holmstrom, Bengt and Jean Tirole (1997), Financial intermediation, loanable funds, and the real sector. *Quarterly Journal of Economics* 112 (3), 663-691.

Holtz-Eakin, Douglas, David Joulfaian and Harvey Rosen (1994), Sticking it out: entrepreneurial survival and liquidity constraints. *Journal of Political Economy* 102 (1), 53–75.

IMF, (2020), A crisis like no other, an uncertain recovery. *World Economic Outlook Update*. June 2020. International Monetary Fund.

Jacobson, Tor and Erik von Schedvin (2015), Trade credit and the propagation of corporate failure: an empirical analysis. *Econometrica* 83 (4), 1315-1171.

Kalemli-Ozcan, Sebnem, Bent Sorensen, Carolina Villegas-Sanchez, Vadym Volosovych and Sevcan Yesiltas (2015), How to construct nationally representative firm level data from the Orbis Global Database: new facts and aggregate implications. *NBER Working Paper* no. 21558. National Bureau of Economic Research.

Konjunkturinstitutet (2020) *Updated economic outlook*. August 2020. National Institute of Economic Research (NIER) / Konjunkturinstitutet. https://www.konj.se/english/publications/swedish-economy-report/swedish-economy/2020-08-21-updated-economic-outlook.html

Kozlowski, Julian, Laura Veldkamp, and Venky Venkateswaran (2020), Scarring body and mind: the long-term belief-scarring effects of COVID-19. *Working Paper Series* 2020-009A. Federal Reserve Bank of St. Louis.

McGowan, Müge Adalet, Dan Andrews, and Valentine Millot (2017a), Insolvency regimes, Zombie firms and capital reallocation." *OECD Economics Department Working Papers* no. 1399. OECD.

McGowan, Müge Adalet, Dan Andrews, and Valentine Millot (2017b), Insolvency regimes, technology diffusion and productivity growth: evidence from firms in OECD countries. OECD *Economics Department Working Papers* no. 1425. OECD.

McGowan, Müge Adalet, Dan Andrews, and Valentine Millot (2018), Insolvency regimes across countries. OECD Economics Department Working Papers no. 1504. OECD.

Ministry of Finance, Government of Sweden (2020), *Budget Bill for 2021: Working Sweden out of the crisis – together*. Press release 21 September 2020. https://www.government.se/press-releases/2020/09/budget-bill-for-2021-working-sweden-out-of-the-crisis--together/ Accessed September 2020.

Molina, Carlos A., and Lorenzo A. Preve (2012), An empirical analysis of the effect of financial distress on trade credit. Financial Management 41 (1), 187-205.

Musso, Patrick and Stefano Schiavo (2008), The impact of financial constraints on firm survival and growth. *Journal of Evolutionary Economics*. 18 (2), pp. 135–49.

Office for National Statistics (2020), *Gross Domestic Product: q-on-q4 growth rate CVM SA %* . UK Economic Accounts time series, September 2020. https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/ihyr/ukea Accessed September 2020.

Osotimehin, Sophie, and Francesco Pappadà (2017), Credit frictions and the cleansing effect of recessions. *The Economic Journal* 127 (602), 1153-1187.

Sverige Riksbank (February 2020a), *Monetary Policy Report*. February 2020. Sveriges riksbank.

Sveriges Riksbank (February 2020b), The Riksbank's measures during the global financial crisis 2007-2010. *Riksbank Study*. February 2020. Sveriges riksbank

Sveriges Riksbank (April 2020), *Monetary Policy Report.* April 2020. Sveriges riksbank.

Sveriges Riksbank (May 2020), The Riksbank's measures during the coronavirus pandemic. In *Financial Stability Report 2020:1.* May 2020. Sveriges riksbank. https://www.riksbank.se/globalassets/media/rapporter/fsr/fordjupningar/engelska/2020/200520/the-riksbanks-measures-during-the-coronavirus-pandemic-article-in-the-financial-stability-report-2020_1.pdf

Sveriges Riksbank (July 2020), *Monetary Policy Report*. July 2020. Sveriges riksbank.

Sveriges Riksbank (September 2020), *Monetary Policy Report*. September 2020. Sveriges riksbank.

Sveriges Riksbank (October 2020), Towards the new normal?. *The Riksbank's Business Survey September 2020.* https://www.riksbank.se/globalassets/media/rapporter/foretagsundersokning/engelska/2020/the-riksbanks-business-survey-towards-the-new-normal.pdf

Sveriges Riksbank (November 2020), *Financial Stability Report 2020:2.* November 2020. Sveriges riksbank.

Tillväxtverket (2020), *Testa om du har rätt till stöd för korttids-arbete*. https://tillvaxtverket.se/om-tillvaxtverket/information-och-stod-kring-coronakrisen/korttidsarbete/ansok-om-korttidsarbete/testa-ratt-till-stod.html Accessed September 2020.

Todorov, Karamfil (2020), Quantify the quantitative easing: on bonds and corporate debt issuance. *Journal of Financial Economics* 135 (2), 340-358.

UC (2020), *Konkurserna fortsätter minska kraftigt*. https://www.uc.se/konkursstatistik/ Accessed November 2020.

White, Michelle J. (1989), The corporate bankruptcy decision. *Journal of Economic Perspectives* 3, no. 2, 129-151.

Wolf, Martin (2020), After the Corona virus pandemic. [Video]. *Financial Times* 13 May 2020. https://www.ft.com/video/dafc3578-5c76-412a-8ba3-016495031bd1

World Bank (2020), Pandemic, recession: the global economy in crisis. *Global Economic Prospects*. June 2020. World Bank Group.

Appendix

A.1 The Swedish Bankruptcy System

Under Swedish law, bankruptcy proceedings may be initiated by the debtor itself or by a creditor. During bankruptcy, the assets of the firm are taken into the possession of an administrator on behalf of the creditors. A determination of insolvency is needed for the debtor to be declared bankrupt so that its assets can be liquidated and the value distributed to creditors. Technical insolvency exists when a firm is unable to meet its debts as they come due. However, this situation may be the symptom of a temporary cashflow or liquidity shortfall. Therefore, a debtor is considered insolvent when the incapacity to pay its debts is chronic. Balance sheet insolvency is particularly important and refers to when total liabilities exceed a fair valuation of total assets.

A bankruptcy filing needs to be submitted, in writing, to the district court where the debtor is domiciled. If the petition for bankruptcy is made by the debtor, insolvency is normally assumed, and not independently tested, unless there are special reasons not to do so (e.g. disagreement among the parties involved). If the bankruptcy petition is made by the creditor, the court will make an evaluation of the debtor's financial position in order to decide if the debtor is insolvent.

When a firm has temporary payment difficulties, it can file for restructuring proceedings and it does not lose control over the company and/or its assets. An administrator, appointed by the court, investigates whether the business is capable of continuing, in whole or in part, and if so, whether the debtor can reach a financial agreement with its creditors. . To obtain a ruling in favour of restructuring, the debtor must be unable pay its debts as they become due (i.e. the debtor has a temporary liquidity problem or is at risk of future lack of liquidity).

An application for a firm to start restructuring proceedings can be submitted by the debtor or even by a creditor with the debtor's consent. The application is submitted, in writing, to the district court where the debtor is domiciled. The application by a debtor must contain, among other information, a description of the company's finances and the reasons for the payment difficulties. The debtor also needs to nominate an administrator.

An application for restructuring proceedings filed by a creditor must contain information regarding the creditor's claim against the debtor, information about the debtor's difficulties in fulfilling payment obligations. The credit also must provide the name of a possible administrator.

A.2 Firms' Financing and the Transmission of Monetary Policy

A large number of firms borrow from credit institutions. In particular, small firms have limited access to financial markets and rely more on **financial intermediaries** (Gertler and Hubbard, 1988). This is the case because small firms are more **opaque** (Gertler and Gilchrist, 1994; Holmstrom and Tirole, 1997) and are more likely to face **liquidity constraints** (Fazzari et al., 1988). However, when credit institutions lend to non-financial firms, they expose themselves to the risk that these firms may not be able to repay their loans, therefore, they need to allocate for potential losses but also consider the impact that these losses may have in the future. While this credit risk is priced into the interest rate that financial institutions charge to their borrowers, the risk itself is not eliminated in the system. This means that if firms start going bankrupt in large numbers, financial institutions may face significant losses and these losses may spread quickly among financial institutions given their interconnectedness. Moreover, firms also borrow from

their suppliers and give credit to their customers. Trade credit then creates more interconnectedness between firms in different sectors and thus could help transmit risk into the financial system.

Bank credit is also a way for **conventional monetary** policy to support small firms. By keeping interest rates low, conventional monetary policy helps firms access cheaper funds. This is particularly important for small firms since these are more opaque than large firms and tend to pay higher interest rates on their loans. Of course, one could argue that access to credit and the risk premium charged to a firm are more important for small firms than the policy rate itself. However, in my setting, I interpret the policy rate as the first layer of a firm's interest rate. All else equal, if the policy rate is low, the firm should benefit from starting with a lower base rate.

Importantly, large firms may not only have more favourable conditions when borrowing from financial institutions, but they are also much more likely to **issue securities** (Foley-Fisher et al., 2016; Grosse-Rueschkamp et al., 2019; Todorov, 2020). Hence, **unconventional monetary policy** may also help ease their financial constraints by freeing up resources that can be allocated by the financial institutions to smaller firms (Acharya et al., 2018; Grosse-Rueschkamp et al., 2019; Chakraborty et al., 2020). Interestingly, Adelino et al. (2020) also document that firms that benefit from unconventional monetary policy tend to extend more trade credit to their customers. Hence, unconventional monetary policy can reach small firms both though a bank lending channel and a trade credit channel.

Finally, both conventional and unconventional monetary policy also affect aggregate demand in the economy. This should help the financing situation of both small and large companies indirectly (for instance, by increasing current and expected future income).

A.3 Extra Tables

	All Competitors in 2018				COVID bankruptcies, March-June 2020				Other Bankrupt Firms, January 2019-February 2020			
	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD
Leverage	463562	48.38%	46.24%	34.97%	1717	74.14%	78.72%	41.65%	3512	80.43%	86.12%	44.56%
Interest Coverage Ratio (ICR)	255866	93.690	5.243	285.143	1320	24.016	-0.848	196.033	2843	2.933	-1.891	106.710
Short-Term Debt/Total Assets (STD/TA)	463489	0.79%	0.00%	2.50%	1714	1.43%	0.00%	3.57%	3510	1.66%	0.00%	3.90%
Return on Assets (ROA)	463489	7.68%	4.12%	28.01%	1714	-9.00%	-1.24%	43.04%	3510	-12.53%	-3.41%	47.20%
Accounts Receivable/Sales (AR/S)	385357	0.091	0.052	0.114	1561	0.077	0.032	0.107	3265	0.076	0.037	0.101
Accounts Payable/Sales (AP/S)	385357	0.044	0.019	0.067	1561	0.075	0.050	0.080	3265	0.082	0.057	0.084
Liquid Assets/Sales (LA/S)	385357	0.718	0.195	1.917	1561	0.138	0.024	0.478	3265	0.146	0.020	0.845
Quick Ratio Cash (QRC)	447918	3.979	0.787	18.333	1690	0.755	0.090	5.135	3470	0.452	0.065	1.535
Number of Employees	463838	6	1	91	1720	9	2	45	3528	6	2	20
Total Assets (in 1'000 of SEK)	463838	40980	1614	1198874	1720	10329	1133	58431	3528	14563	1077	343805
Age	447461	13	8	14	1700	10	6	12	3496	10	6	11
Independent	463838	0.69	1.00	0.46	1720	0.70	1.00	0.46	3528	0.74	1.00	0.44

Table 1.A: Descriptive statistics

Table 1.A shows descriptive statistics for the main variables in this study. All variables are calculated in 2018. They are described in detail in Section 2.

	(1) COVID Bankruptcies	(2) Other Bankruptcies	(3) COVID Bankruptcies
	Competitors		Other Bankruptcies
Manufacturing	0.005***	0.013***	0.061**
	(0.000)	(0.000)	(0.030)
Environment	0.007***	0.015***	0.081***
	(0.000)	(0.000)	(0.007)
Construction	0.006***	0.016***	0.022
	(0.000)	(0.000)	(0.435)
Wholesale and Retail Trade	0.006***	0.014***	0.077***
	(0.000)	(0.000)	(0.003)
Transportation	0.008***	0.013***	0.140***
	(0.000)	(0.000)	(0.000)
Hotels and Restaurants	0.015***	0.015***	0.222***
	(0.000)	(0.000)	(0.000)
IT – Information and Communication	0.004***	0.011***	0.022
	(0.000)	(0.000)	(0.306)
Real Estate	-0.000	-0.000	-0.001
	(0.263)	(0.796)	(0.961)
Professional, Scientific and Technical Services	0.005***	0.011***	0.120***
	(0.000)	(0.000)	(0.000)
Corporate Services	0.008***	0.017***	0.077**
	(0.000)	(0.000)	(0.017)
Education	0.005***	0.014***	0.039
	(0.000)	(0.000)	(0.181)
Health Care	0.005***	0.013***	0.011
	(0.000)	(0.000)	(0.729)
Arts and Entertainment	0.006***	0.008***	0.172***
	(0.000)	(0.000)	(0.000)
Other Services	0.005***	0.012***	0.052*
	(0.000)	(0.000)	(0.072)
Missing	0.002***	0.004***	0.090***
	(0.002)	(0.000)	(0.004)
Observations	230,425	230,425	3,919
Adj. R-squared	0.00612	0.0180	0.0255

Table 2.A: COVID bankruptcies in March-June 2020 versus competitors and other bankrupt firms, cont.

Table 2.A shows results solely for the coefficients of the dummy variables included in the multivariate OLS cross-sectional regressions in Table 2. For each industry, the specific dummy variable is equal to one for the specific industry and zero otherwise. The industry of Agriculture is omitted because of collinearity. The industries of Energy (SNI07 codes D), Mining (SNI07 codes B), and Public Administration (SNI07 codes O) are dropped because of lack of variation. Also notice that the industry Environment refers to the SNI07 codes E: Water supply, sewerage, and waste management and remediation activities. In column (1) the dependent variable COVID bankruptcies. This variable is a dummy variable that takes the value of one if the firm filed for bankruptcy in March-June 2020 and zero otherwise. Column (2) compares bankruptcies in 2019 and January and February 2020 with all firms in 2018. The dependent variable in column (2) is a dummy variable that takes the value of one if the firm filed for bankruptcy in January 2019-February 2020 and zero otherwise. Column (3) compares directly COVID bankruptcy with other bankruptcies. The dummy variable then takes the value of one if the firm filed for bankruptcy in March-June 2020 and zero if a firm filed for bankruptcy in 2019 or during January and February 2020. The independent variables are ratios obtained by using financial debt, interest payment on debt and the proportion of assets financed with short-term debt, respectively. All variables are described in detail in Section 2. All regressions include robust standard errors clustered at the industry level. Robust p-values are reported in the parentheses underneath the coefficients and should be interpreted as follows *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	One Year Ahead Probability of Default											
	Dec 2018	Dec 2019	Jan 2020	Feb 2020	Jan 2020	Feb 2020	Jan 2020	Feb 2020	Jan 2020	Feb 2020	Jan 2020	Feb 2020
COVID bankruptcies Dummy	0.030***	0.072***	0.079***	0.088***								
	(0.000)	(0.000)	(0.000)	(0.000)								
COVID bankruptcies in March					0.083***	0.109***						
					(0.000)	(0.000)						
COVID bankruptcies in April							0.095***	0.107***				
							(0.000)	(0.000)				
COVID bankruptcies in May									0.059***	0.047**		
									(0.002)	(0.020)		
COVID bankruptcies in June											0.065***	0.064***
											(0.004)	(0.003)
Loan Amount/Total Assets	0.001***	0.002*	0.002*	0.001	0.002*	0.001	0.002*	0.001	0.002*	0.001	0.002*	0.001
	(0.001)	(0.055)	(0.083)	(0.170)	(0.085)	(0.183)	(0.087)	(0.182)	(0.083)	(0.173)	(0.083)	(0.174)
Interest Coverage Ratio	-0.000***	-0.000***	-0.000***	-0.000	-0.000***	-0.000	-0.000***	-0.000	-0.000***	-0.000	-0.000***	-0.000
	(0.002)	(0.002)	(0.001)	(0.112)	(0.002)	(0.121)	(0.002)	(0.105)	(0.002)	(0.133)	(0.002)	(0.137)
Short-term debt/Total Assets	0.118***	0.114***	0.117***	0.111***	0.117***	0.112***	0.115***	0.109***	0.116***	0.108***	0.115***	0.107***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Return on Assets	-0.017***	-0.028***	-0.028***	-0.030***	-0.029***	-0.031***	-0.028***	-0.030***	-0.028***	-0.030***	-0.028***	-0.029***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Accounts Receivable/Sales	-0.004	-0.006	-0.007	-0.010	-0.007	-0.010	-0.006	-0.009	-0.006	-0.009	-0.006	-0.009
	(0.617)	(0.448)	(0.426)	(0.296)	(0.415)	(0.299)	(0.434)	(0.318)	(0.444)	(0.324)	(0.455)	(0.335)
Accounts Payable/Sales	0.109***	0.102***	0.101***	0.102***	0.101***	0.103***	0.100***	0.102***	0.100***	0.102***	0.099***	0.102***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Liquid Assets/Sales	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.009)	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Ln(Total Assets)	-0.003***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln(Firm Age)	0.000	-0.000**	-0.000**	-0.001***	-0.001**	-0.001***	-0.000**	-0.001***	-0.000*	-0.001***	-0.000	-0.001***
	(0.301)	(0.037)	(0.025)	(0.001)	(0.010)	(0.000)	(0.021)	(0.000)	(0.064)	(0.001)	(0.118)	(0.001)
Independent	-0.004***	-0.004***	-0.004***	-0.006***	-0.004***	-0.006***	-0.004***	-0.006***	-0.004***	-0.006***	-0.004***	-0.006***
	(0.003)	(0.002)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)
Observations	120,750	116,220	115,929	116,431	115,793	116,431	115,611	116,250	115,406	116,049	115,279	115,923
Adj. R-squared	0.0424	0.0386	0.0400	0.0338	0.0357	0.0304	0.0366	0.0304	0.0345	0.0276	0.0344	0.0278

Table 3.A: Analysis of the firms' probability of default

Table 3.A shows the results of OLS cross-sectional regressions. The independent variables of interest are dummy variables that capture different sets of COVID bankruptcies. The variable *COVID bankruptcies* is a dummy variable that takes the value of one if the firm filed for bankruptcy in March-June 2020 and zero otherwise. The variable *COVID bankruptcies March* is a dummy variable that takes the value of one if the firm filed for bankruptcy in March 2020 and zero otherwise. The variable *COVID bankruptcies April* is a dummy variable that takes the value of one if the firm filed for bankruptcy in April 2020 and zero otherwise. The variable *COVID bankruptcies May* is a dummy variable that takes the value of one if the firm filed for bankruptcy in May 2020 and zero otherwise. The variable *COVID bankruptcies June* is a dummy variable that takes the value of one if the firm filed for bankruptcy in June 2020 and zero otherwise. The dependent variable of interest is the loan weighted average probability of default at a one-year horizon. For each firm, the probability of default and the loan amount given to each firm are obtained from the Swedish Credit Registry (KRITA) while all accounting variables are obtained from the Serrano database in December 2018. Each regression contains the following control variables: Nominal Loan Amount/Total Assets, Interest Coverage Ratio, Short-Term Debt to Total Assets, Return on Assets, Accounts Receivable/Sales, Accounts Payable/Sales, Liquid Assets/Sales, Fixed Assets/ Total Assets, Ln(Total Assets) and Ln(Firm Age). All variables are described in detail in Section 2. All regressions include industry-fixed effects, together with robust standard errors clustered at the industry level. Robust p-values are reported in the parentheses underneath the coefficients and should be interpreted as follows *** p<0.01, ** p<0.05, * p<0.1.

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