Venture Capital and the Survival of Entrepreneurial Firms in Crisis Periods: The Case of COVID-19.

Marek Kacer
The University of Leeds, UK and
University of Economics in Bratislava, Slovakia
M.Kacer@leeds.ac.uk

Nicholas Wilson*
The University of Leeds, UK
n.wilson@lubs.leeds.ac.uk.

Sana Zouari
The University of Leeds, UK
S.Zouari@leeds.ac.uk

Marc Cowling
Oxford Brookes University, UK
mcowling@brookes.ac.uk

*Corresponding author

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Abstract

This study investigates the resilience of entrepreneurial firms during the pandemic, focusing on UK companies that secured equity financing before the COVID-19 pandemic. Investors include venture capital and growth finance funds (both domestic and international), crowdfunding platforms, business angels, government venture capital funds, and individuals. Grounded in the resource-based view (RBV) and signalling theories, our hypotheses suggest that equity-backed firms possess sufficient resources to withstand the pandemic, but with variations by investor type. We model the bankruptcy risk of these firms during the COVID-19 period compared to the pre-COVID era, considering factors such as investor type, deal history (timing, magnitude, and duration), and various financial and non-financial characteristics. Additionally, we examine the use of policy interventions, such as guaranteed loans (LGS), by some equity-backed companies, analysing loan recipients' characteristics, financing combinations, and their relationship with insolvency risk. These findings provide insights into the role of equity financing across a range of investor types in venture survival during crises with significant policy implications.

Plain English Summary: This study examines how well UK companies with equity financing before the COVID-19 pandemic managed to survive during the pandemic. It examines different types of investors, such as venture capital funds, crowdfunding platforms, and government funds. The study suggests that companies with equity backing had enough resources to get through the pandemic, but this varied depending on the type of investor. It analyses the risk of these companies going bankrupt during the pandemic compared to before it, considering factors such as the type of investor and the history of their deals. Additionally, it examines how some companies used government-guaranteed loans and how this affected their risk of insolvency. These findings provide insights into how different types of equity financing can help companies survive during crises. The results have important policy implications relating to the design of loan guarantee schemes and convertible loan schemes that can be targeted at equity-backed companies.

Keywords: COVID-19. Entrepreneurial Firms. Bankruptcy. Government Interventions. Equity investors

JEL Classifications: G33, H81, L2

1. Introduction

This study examines the influence of the COVID-19 pandemic on bankruptcy trends and policy interventions, with a specific focus on equity-financed businesses in the UK's small- and medium-sized enterprise (SME) landscape. The objective is to evaluate the consequences of the pandemic on equity-backed firms at various stages of development and with respect to different categories of investors. Equity investments can originate from various investor types, such as venture capital, venture capital trusts (VC), foreign venture capital (FVC), business angels (BA), government venture funds (GVC), equity crowd funding (ECF) and individual investors (IN), each possessing distinctive traits and advantages.

Equity finance is important in funding potential high-growth companies that have a disproportionate impact on economic growth, productivity, and innovation spillovers, or disruptive technologies that have wider long-term benefits for the economy. Moreover, these businesses drive the growth and development of important new and transformative sectors (e.g., artificial intelligence, clean energy, life sciences, and financial innovation). Nonetheless, this crucial segment of business has faced 'market failures' in debt and equity provisions. Information asymmetries and misalignment between investors and investees create equity gaps (Wilson et al., 2019), early-stage funding deficiencies, and the ‘Valley of Death' (Wilson et al., 2018). The crisis could pose additional challenges for new ventures attempting to raise equity, existing ventures heavily reliant on rounds of venture capital investments seeking follow-on funding, and equity investors in (re)appraising the prospects of their portfolio of investments through the crisis (Brown & Rocha, 2020; Brown et al., 2020).

The policy challenge was to prevent an immediate liquidity crisis for firms, a cascade of business failure and job losses, while ensuring the preservation of 'creative destruction' (Dorr et al., 2022; Demmou, 2021; Gambirage, 2023), which protects innovations, redeploys resources, and preserves the viable businesses essential for recovery. The unprecedented scale of policy interventions during the pandemic provided substantial government-guaranteed loans to businesses (Cowling et al., 2023b), with limited additional support for equity finance, leading many equity-backed firms to utilise COVID loans (debt). A large proportion of loans was administered without the usual credit checks and relied on businesses' self-certification of eligibility criteria. Loan Guarantee Schemes (LGS) have been criticised for creating adverse

selection and moral hazard problems, particularly pandemic loan schemes (Cowling et al., 2023a). For earlier-stage equity-financed firms and those backed by smaller equity finance players, loan schemes presented a unique opportunity to increase liquidity and survival prospects (Dorr et al., 2022; Gambirage et al., 2023) and attract or retain equity investment (Kazembalaghi et al., 2024).

The construction of a database that combines information on equity finance deals, investor types, and the government-guaranteed loan portfolio with a database of companies in the United Kingdom has resulted in a valuable resource for examining the consequences of the COVID-19 pandemic on businesses and the efficacy of governmental policy measures, with a particular focus on the advantages and shortcomings of LGS. Our study is the first to model the pattern of insolvency among equity-financed companies in the UK, a critical group of small, growing, and innovative businesses susceptible to market failures in both the provision of debt and equity finance. We contribute to the bankruptcy prediction literature by estimating failure models specific to equity-backed firms that deal with endogeneity and incorporating variables relevant to this segment (Altman et al., 2010). Additionally, we provide novel evidence of the impact of different types of equity investors and the use of guaranteed loans on the pattern of insolvency during a period of uncertainty. Our research builds on theory to contribute to the growing body of literature on firm resilience and failure during times of crisis, *in contrast to* the findings of Dorr et al. (2022) in the German context and Wang et al. (2020) in the US, which both demonstrate that policy interventions can result in a backlog of insolvencies, or an "insolvency-gap," with significant negative consequences for economic dynamism.

This analysis revealed several interesting findings. Our estimated models predicting insolvency incorporate a range of variables reflecting pre-COVID performance, financial health (risk), and equity deal history, controlling for a wide range of non-financial, sector, and location variables, combined to produce a strong predictive accuracy (AUC 0.72) and useful insights into the failure characteristics of equity-backed firms. Our analysis of the time periods confirmed a general reduction in insolvencies during the initial COVID period. FVC firms have a lower failure rate than other equity-backed firms, and those backed by ECF, BA, and GVC are more likely to exit through bankruptcy. Analysing the deal history, the time from the first deal is strongly negative, suggesting that longer-established ventures are less likely to face

bankruptcy. However, ventures with more investment rounds and later stages have slightly higher exit risk.

When controlling for all firm characteristics, there is no evidence of an insolvency gap during the COVID period. This suggests that equity-funded companies characteristics similar to those of the pre-COVID period did not have a higher (or lower) insolvency rate. However, the exception is GVC backed firms, which have a lower insolvency rate in the COVID period; the odds of insolvency are 36% smaller for government-funded companies during the crisis period than in the pre-COVID period. There is weak evidence of an insolvency gap among GVC-funded companies.

The LGS was designed to help firms survive the early stages of COVID, so the expectation is that having a loan would reduce insolvency risk. However, for this sub-sample of the company population, we find a positive sign for the COVID loan dummy variable. Equity-backed firms with COVID loans have a higher risk of failure, controlling for firm characteristics and pre-COVID risk. This result is robust, even after controlling for self-selection bias. We investigate interactions with investor types, and the effect of the coefficient on COVID loans on insolvency is reversed (cancelled out) for BA and GVC, again robust to self-selection bias. The tests for the selection of the loan scheme involved estimating multivariate models that determined the probability of receiving a loan. This model was extended to profile recipients of additional equity deals and firms with loans and deals.

An important finding is that among equity-backed firms risky companies self-select COVID loans. In terms of the likelihood of having a COVID loan, ECF are more likely to have a loan (also there is some evidence for BA), whereas VC and FVC are less likely than other investor types. However, with respect to follow-on equity funding, compared to individual investors, the VC and BA funded companies are more likely to receive additional equity (other investor types are not significantly different). Moreover, BA and ECF are more likely to have a combination of both COVID loan and additional equity injections.

The remainder of this paper is organised as follows. In Section 2 we provide background on the crisis and policy interventions to support business. In Section 3, we discuss relevant literature and develop our hypotheses. Section 4 discusses the data and the methodology used to test the hypotheses. We present the results, robustness tests, and

conclusions in Sections 5 and 6. Additional analysis and empirical evidence on insolvency patterns and trends in equity investments is provided in the supplementary appendix.

2. The Covid crisis and the policy intervention

The COVID-19 pandemic has resulted in a significant decline in economic activity, representing one of the largest collapses in the history of the UK. To mitigate the spread of the virus, the government restricted a wide range of economic activities, which negatively affected numerous businesses. In April 2020, the UK experienced a 25.1% decrease in GDP, followed by a recession, with an average GDP decline of 9.9% in 2020[1]. The economy has seen either weak or no growth from 2020 to the end of 2022. The COVID-19 crisis led to a severe economic downturn that affected most entrepreneurial activities and the financial situation of companies owing to interrupted supply chains, reduced demand, required changes in working practices and distribution channels, and the generally uncertain environment facing both businesses and lenders.[2] The impacts varied across sectors and, of course, some companies had to adapt quickly to meet dramatic increases in the demand for products and services (e.g., e-commerce, telecommunications, healthcare, AI/IT, finance).

Recent studies focusing on COVID-19 provide evidence that SMEs deferred investments (Thorgren & Williams, 2020), increased their use of bootstrap financing measures to mitigate the negative consequences of the crisis (Block et al., 2021), and faced a significant reduction in entrepreneurial and innovation activities (Brown et al., 2020). Cowling et al. (2020b) found that in the period pre COVID 8.6% of small businesses faced immediate danger (lacking cash reserves) and 61% were vulnerable over the medium term, showing no signs of accumulating cash reserves or retained profits to endure an extended lockdown period.[3]

High-growth companies, including innovative technology- and knowledge-intensive firms dependent on equity financing and multiple rounds of venture capital, were particularly vulnerable during this period. The COVID-19 pandemic has exemplified market failure, which requires government intervention to safeguard the economy. Public policy aimed to mitigate

[1] Coronavirus and the impact on output in the UK economy - Office for National Statistics (ons.gov.uk)
[2] Appendix A2 provides further details on the investment and insolvencies patterns during the COVID-19 crisis.
[3] The structural issues in the UK were highlighted in Lee et al. (2015) who note that limited access to financing for innovative firms and credit rationing that affected SMEs and the economy as a whole.

the economic damage from reduced activity and prevent a chain reaction of bankruptcies that could further harm recovery. Additionally, uncertainty impedes lenders' risk assessment of loans and equity finance as well as firms' ability to project sales, cash flow, and investment returns. Many governments have introduced emergency aid programs to financially support entrepreneurs during the crisis (Dorr et al., 2022; Bertschek et al., 2024), enhancing their capacity to maintain employment, avoiding cash-flow issues, and preventing widespread insolvencies post-lockdown (OECD, 2020).

The UK government has initiated a range of interventions in response to the pandemic. The Coronavirus Job Retention Scheme (CJRS) offered grants to cover a proportion of the salaries of furloughed staff. The overall scale of the interventions is estimated to be £143.2bn (OBR, March 2022). Within this package, a range of business loan schemes were launched, with the government acting as a guarantor, providing some £81.2bn in guaranteed loans to businesses of all sizes. The Loan Schemes (CBILS, CLBILS[4]) and the (BBLS[5]) were aimed at providing loans to help prevent otherwise viable businesses from failing. These interventions were part of a wider portfolio of government policies to support SMEs and protect the economy when credit supply was constrained. The size and scope of these interventions were extremely high, covering 94% of all lending to SMEs during the early pandemic period[6]. The schemes were designed and introduced rapidly, administered without the usual credit checks, and relied on 'self-certification' for eligibility.

The Future Fund was an additional government scheme that was set up specifically to support, with convertible loans, a small number of potentially viable UK-based companies facing difficulties in raising equity financing due to the COVID-19 pandemic and administered by the British Business Bank. These firms are not included in the sample[7]. Moreover, the government introduced temporary changes to the insolvency legislation (i.e. the Corporate

[4] Coronavirus Business Interruption Loan Scheme (CBILS); Coronavirus Large Business Interruption Loan Scheme (CLBILS)
[5] Bounce Back Loan Scheme (BBLS)
[6] HM Treasury coronavirus (COVID-19) business loan scheme statistics - GOV.UK (www.gov.uk)
[7] See https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4683934 for an analysis of the Future Fund

Insolvency and Governance Act 2020) which helped delay the insolvency process for some firms[8]. These measures were phased out on October 1, 2021.

3. Literature review and hypotheses

3.1 Equity finance and investor types

Studies of equity-backed companies focus exclusively on the activities of formal Venture Capital funds, and "announced" deals and therefore provide detailed information on the investor(s)-investee(s). However, a unique aspect of our analysis is that we consider a diverse range of investor types, from large established funds to individual equity investors and digital platforms. Specifically, we focus on venture capital, venture capital trusts (VC), foreign venture capital (FVC), business angels (BA), government venture funds (GVC), equity crowd funding (ECF) and individual investors (IN).

3.1.1 Venture capital

VC include both early- and late-stage investments (Cumming & Walz, 2010). In exchange for shares, these funds provide capital and management expertise to the venture to create value and consequently generate capital gains on exit (Caselli & Negri, 2018). Private Equity is often associated with funding the buyout of established companies with majority ownership, but it is also involved in funding the venture and growth stages of new ventures, which are included in this study as VC. VC funds invested in multiple companies typically have a lifespan of eight to twelve years. Individual portfolio companies (investees) can take many years to commercialize (Gantenbein et al., 2013). Therefore, VCs provide sufficient capital to cover the years of cumulative losses.

The entrepreneurship literature documents that in addition to providing finance, VC firms play an important role in supporting and enhancing their portfolio companies. Due to diligence, they gather and act on credible "signals" of the quality of the venture and the entrepreneurs' expertise (Higgins & Gulati, 2006). Moreover, VCs build their own record of success and expertise (Manigart et al., 2002) by managing successive portfolios of ventures to

[8] The latter introduced measures to give companies the 'breathing space' to maximise their chance of survival; measures to temporarily suspend parts of insolvency law to allow companies to continue trading through the pandemic without the threat of liability for wrongful trading; and measures to protect companies from creditor action. Moreover, there were temporary easements on company filing requirements and annual general meetings.

exit. Having a VC relationship helps the venture build a reputation in the market, overcoming the liability of newness (Ragozzino & Blevins, 2016).

Empirical literature indicates that VC investors showed resilience during past crises (Lavery & Wilson, 2024; Gompers et al., 2020). For instance, Buchner et al. (2014) discovered that VC-backed firms experienced smaller declines in employment and sales than non-VC-backed firms during the financial crisis, attributing this to the monitoring, strategic guidance, and financial support from VC firms. Gompers et al. (2020, 2021) surveyed over 1,000 VCs in the US to investigate the impact of COVID-19 on VCs and their investees and found that approximately 48% of portfolio companies were negatively affected by the pandemic. However, VCs adapted by offering additional support and dedicating more time to guiding their portfolio companies during the crisis. Gompers et al. (2022) also found that private equity managers were heavily involved in the operations, governance, and financing of their portfolio companies, particularly those that were the hardest hit by the pandemic.

When VC investments fall short of expectations, decision-makers face a dilemma: they continue to hope for improvement (Guler, 2007) or abandon the project and recognize losses (Li & Chi, 2013). Given the high failure rate of VC projects (Puri & Zarutskie, 2012), investors must often decide on abandonment or liquidation, requiring expertise. The finite lifespan of VC funds necessitates exiting investments within a set period, limiting time and motivation to sustain underperforming ventures ("living dead" or "zombie" cases) through additional funding (Ragozzino & Blevins, 2016). VCs understand that not all ventures have succeeded. After a certain cumulative investment or number of funding rounds, VCs decide whether to continue financing or shut down their business (Ragozzino & Blevins, 2016). Each investee has a threshold investment level and duration at which the VC reassesses the decision to continue or abandon.

3.1.2 Business angels

BAs are informal equity finance investors with a long history (Shane, 2009). These private, high net worth individuals invest in early stage ventures (van Osnabrugge, 2000) and conduct due diligence, often using informal procedures and personal connections with founders. BAs actively oversee and monitor their investments. Unlike VCs, BAs invest their own funds, giving them strong incentives to protect and grow their assets and coordinate actions accordingly. According to agency theory, BAs face different incentives and constraints because

they are principals in their investments and bear all downside risks (Edelman et al., 2017). Owing to information asymmetries, BAs implement control and supervisory mechanisms by monitoring entrepreneurial firms (Shane & Cable, 2002). The COVID-19 crisis tested investor resilience. Surveys showed BAs continued investing during the early stages of COVID-19 and planned to keep investing (Mason & Botelho, 2021). A 2020 British Business Bank survey of over 650 BAs revealed their selective engagement with portfolios during the crisis, supporting firms in achieving growth milestones, surviving, and leveraging new opportunities (British Business Bank, 2020).

3.1.3 Equity crowdfunding

ECF has evolved rapidly in the last decade (Kazembalaghi et al., 2024). Like professional investors (BAs and VCs), ECF are typically used by smaller, younger firms with substantial information asymmetry issues. Drover et al. (2017) shows that firms completing successful crowdfunding campaigns on established platforms are more likely to attract VC because of the diligence for subsequent financing. Specifically, a startup with successful crowdfunding gains certification from a crowd, enhancing its appeal to professional investors (Herve & Schwienbacher, 2018). ECF acts as a commercialization pre-test, where a successful campaign reduces information asymmetry, suggesting that VCs believe that the project is promising, thus encouraging their investment. Unlike professional investors, ECF platforms employ contractual covenants less frequently, such as liquidation preferences, to protect their investments (Hornuf & Schwienbacher, 2016). Brown et al. (2018) note that equity crowdfunding is generally preferred to other forms of equity financing because it involves weaker control rights requirements.

ECF platforms saw an unexpected rise in investment activities during the COVID-19 crisis (Kazembalaghi et al., 2024). This growth is attributed to enhanced due diligence processes prior to listing ventures on digital platforms, which attract higher-quality firms. Additionally, big data analytics improved due to diligence, drawing more professional investors (VCs and BAs) to digital platforms during the COVID period. The usual in-person due diligence practices were disrupted by lockdown. Kazembalaghi et al. (2024) examined the interaction between public support mechanisms and equity finance dynamics during the pandemic. They focus on 660 early stage and innovative ‘seed funding’ ECF campaigns listed on a UK platform. The authors suggest that these ventures use government LGS loans,

providing a liquidity certification effect that helps equity investors manage risk for ventures lacking credit information. Consequently, these ventures secured equity following funding, aiding in recapitalization, and improving gearing ratios (Kazembalaghi et al., 2024, p. 3). Thus, LGS supports improved equity funding and the performance of seed firms during the COVID period. These findings align with the literature that highlights the positive impact of digitalization on entrepreneurial finance, creating new financial avenues that complement traditional intermediaries (Bertoni et al., 2022).

3.1.4 Government venture capital

GVC funds are established and utilised within the framework of policy interventions and socioeconomic goals (Colombo et al., 2016). These interventions address 'market failure' arising from informational asymmetries between investors and opportunities, leading to funding shortages for firms at specific developmental stages, emerging industries, or localities (Colombo et al., 2016). GVC investments aim to correct these imbalances by investing in businesses deemed too risky for other financiers, fostering innovation and growth with broader economic and regional benefits (Wilson et al., 2019), and advancing socioeconomic goals such as diversity, sustainability, and other ESG objectives. This contrasts with specialized investors, such as professional VC funds or BAs, who support only rigorously selected companies due to limited resources and high return expectations (Alperovych et al., 2020). Government early stage funding and the associated due diligence can signal credibility to attract further investment. Government interventions have sought to bridge second equity gaps (Mason, 2016; Wilson et al., 2018) through tax policies, regional funds, or targeting 'priority sectors' such as CleanTech and DeepTech, supporting regional development and job creation (Leleux & Surlemont, 2003; Alperovych et al., 2020).

3.1.5 Foreign (overseas) investors

Equity finance involves FVC investors, who can provide resources, finance, managerial, and technological expertise. These investors enhance local venture capitalists' value-adding activities by offering insights into foreign markets and connections with global customers, suppliers, and executives (Mäkelä & Maula, 2005), as well as synergies with other investments. Funding from FVC can indicate a start-up's global potential. Research shows that international syndicates foster the growth of their portfolio companies (Devigne et al., 2013) and contribute expertise despite challenges in information collection and monitoring due to geographic and

cultural distances (Dai et al., 2012). These investors are less likely to fund firms in countries with weak investor protection and disclosure (Leuz et al., 2009; Kho et al., 2009). The UK is a favourable market for FVC, offering high potential opportunities and a supportive investor ecosystem.

3.1.6 Individual investors

Many new start-ups are funded by founders and a network of informal investors prior to attracting more formal VC. They are often classified as friends, family members, or business owning colleagues. IN usually has less money to invest; therefore, multiple individual investors may be needed to meet the financing goals of the business. Moreover, these investors may have no relevant industry experience, business skills, or guidance to contribute to the business. The success rate of these businesses is related to the initial number of investors and the quality of the entrepreneurial team in terms of the likelihood of attracting additional funds and achieving their growth aspirations (Song & Schwienbacher, 2024).

In summary, professional VC funds and experienced BAs are known for their active support of portfolio companies, providing financial and 'relational' capital, strategic guidance, operational support, and networking to ensure survival and growth (Gompers & Lerner, 2004). VC involvement enhances access to resources, knowledge, and contacts, which are essential to resilience and growth. However, not all equity investors are actively involved in a firm or have access to expertise and resources. Equity finance is often provided by informal networks of small private investors, and this large subsample of SMEs was included in the study. Thus, investor types vary in formality, the range and specializations of their portfolio of investees, their investment time horizons, and the extent to which they are *actively engaged* in supporting their investees with resources and expertise in addition to the provision of finance.

3.3 Hypothesis development

Drawing on the resource-based view (RBV) of firms' dynamic capabilities and resilience, our analysis examines firms' survival and failure in crises. Resilience, as defined in economics literature, entails firms' effective resource utilization to rebuild, recover, or cope with disruptions (Dormady et al., 2019; Rose, 2004; Graveline & Grémont, 2017). Additionally, sorting theories by Eeckhout and Kircher (2011) offer insights into investor selection and continuation decisions.

Equity finance, termed 'patient capital,' provides necessary funding for five to ten years to cover innovation, development, and financial losses due to the risks and uncertainties of new product development and market entry (Lerner & Nanda, 2020). Firms with equity backing before COVID should have adequate capital reserves, making the crisis period largely irrelevant. Those that require further investment rounds during this period are likely to receive it. However, evidence indicates that some early stage ventures struggle to raise additional funds amid COVID-induced uncertainty. Moreover, venture capitalists acknowledge that not all ventures will succeed, and after a certain level of cumulative investment, decide whether to continue financing or close the business (Ragozzino & Blevins, 2016).

Resource-based theories emphasize the importance of a firm's resources and capabilities (Zahra & Filatotchev, 2004) in maintaining business resilience in response to external shocks and challenges. These theories posit that a firm's ability to withstand and recover from disruptions is closely linked to its specific resources and how effectively it can utilise them. Firms that receive backing from established and experienced investors benefit from such backing. Some investors possess a pool of managerial expertise and can leverage their business networks and strong ties with banks and credit providers to provide additional funding and resources when an investee faces challenges (Lavery et al., 2023).

Equity-funded firms are anticipated to be resilient during crises because of investor diligence in selecting and resourcing high-potential targets (Lavery & Wilson, 2024). Pascal et al. (2013) and Modl (2020) note that experienced investors excel in their discerning selection decisions. High-quality founders favour experienced investors for their value-adding activities and the sorting process that matches investors and startups based on specific traits (Gompers et al., 2020). Investors typically seek significant future returns, making optimal investment decisions crucial for both returns and personal rewards (Wright & Robbie, 1998). When deciding whether to continue or abandon a venture, investors assess its performance, risks, and expected returns. If a venture underperforms or poses excessive risks, the investor may abandon it based on portfolio strategy, investment horizon, and risk tolerance. Thus, when investments do not meet expectations, decision makers face a liquidation dilemma: they may persevere to allow for potential improvement and enhance commitment (Guler, 2007) or terminate the project, accepting certain losses (Li & Chi, 2013).

The COVID-19 crisis could have led to financial distress and failure of viable firms without support. For equity-backed firms, we do not anticipate a change in insolvency rates due to COVID-19, because these firms are likely to have sufficient financial resources or can obtain additional equity. This is especially true for ventures with recent cumulative investments: the higher the sunk costs and cumulative investment, or the extent of R&D, the more likely they are to receive support during the crisis. We control for cumulative equity investments and the timing of investment rounds before COVID-19. Firms that face operational issues are supported by their investors, whereas equity investors do not extend the lifespan of unviable ventures. This leads to the following hypothesis:

H1: *Equity funded companies are not expected to experience higher incidence of insolvent exits during the COVID period.*

Our study includes various investor types that provide equity across all investment stages, differing in their active involvement in governance (principal-agent relationship) and the resources they contribute. VCs engage in extensive and costly selection processes to identify promising targets with specific characteristics (Gompers et al., 2016). They invest in strong prospects, anticipating that these firms will not break even or generate profits for several years, sometimes up to 10-12 years (Gantenbein et al., 2013). Thus, we do not expect the insolvency patterns of VC-backed firms to change during crises.

BAs maintain a close principal-agent relationship, often holding significant financial stakes and personal relationships with founders and directors. Because they are highly networked, BAs are likely to have robust connections with banks and financial institutions. Mason and Botelho (2021) provide evidence that BAs supported their investees during the COVID-19 period by additional follow-on investments. In this line we expect viable firms backed by BAs to secure financial support to weather a crisis.

The ECF model targets start-up and early stage funding, with ownership dispersed among the crowd despite the presence of a lead investor. Shareholders can influence governance, but the principal-agent relationship is less direct than hands-on VCs or BAs. Crowdfunded ventures are prone to higher failure rates owing to market saturation, inexperienced founders, inadequate due diligence, limited post-funding support, and high

expectations from numerous small investors, making them vulnerable to economic changes. However, this does not imply a higher failure rate than during normal periods.

GVCs invest in achieving broader policy objectives, complementing other measures such as tax advantages for investors, regional funds, ESG goals, and infrastructure development (e.g., science parks, innovation hubs, and accelerators) to foster innovation, growth, and a dynamic economy. Firms backed by GVCs are expected to receive support during crises. As professional VCs, FVCs invest in later-stage ventures with scale-up potential and clear exit strategies, suggesting resilience through the crisis. Conversely, firms supported by individual investors are the most vulnerable, anticipating the highest failure rate during the crisis.

This leads to the following hypothesis:

H2: *The impact of COVID crisis on insolvent exits differs based on the investor type and extent of active involvement.*

> **H2a***: Firms backed by VC, FVC and BA do not experience a different likelihood of insolvent exits than other investor types. This does not change during crisis.*
>
> **H2b***: Firms backed by ECF do experience higher insolvent-exit rate than other investor-types generally. This does not change during crisis.*
>
> **H2c***: Firms backed by GVC have a higher insolvent exit rate than other investor types. This does change during crisis.*

We propose that a subset of equity-backed firms struggled during the COVID-19 period, facing difficulties or inability to raise additional equity. Information asymmetries between investors and investees, which worsen during crises, hinder small, growing, and innovative companies from securing financing (Gompers & Lerner, 2004). For early stage ventures, due diligence does not fully reveal long-term prospects and business valuations (Wilson et al., 2019), making them reliant on credible signals of venture quality and the entrepreneur's expertise (Higgins & Gulati, 2006). Ventures with weaker signals were less likely to obtain additional equity during COVID-19 and resorted to alternative funding for liquidity and survival.

We suggest that equity-backed firms that do not have active support from their investors because of perceived risk are more likely to utilise (select into) guaranteed loan schemes to help ride the COVID period. For some firms, accessing loan financing may be a strategy to bolster finances as a means of attracting additional equity. In this respect, Kazembalaghi et al.

(2024) suggest the 'liquidity certification effect' of acquiring a COVID-guaranteed loan-aided seed ECF firm in securing additional equity finance. For others, guaranteed loans were an option to attempt to secure survival-pending recovery and/or to refinance debt. However, there are potential disadvantages to the LGS. The indiscriminate lending, particularly the BBLS added additional 'noise' for lenders resulting in adverse selection by lenders Gai et al., 2016) and moral hazard. Lenders have a 100% guarantee of losses, and borrowers have low interest rates and limited credit checks. Consequently, guaranteed loans were likely advanced to unviable businesses, increasing their insolvency risk. Our third hypothesis was as follows:

H3 *Equity funded firms with guaranteed loans have a higher insolvency rate during the COVID-19 crisis.*

It is plausible that companies lacking financing and nearing failure before the COVID-19 pandemic would seize guaranteed loan opportunities to enhance their survival prospects, particularly under lenient conditions. The funds can refine existing high-interest bank loans and release collateral. For viable firms needing financial help to weather temporary lockdown-induced difficulties and reduced economic activity, the COVID loan can act as a bridge. However, for non-viable companies, COVID loans may merely postpone their inevitable collapse until the funds are depleted. Moreover, once external support is withdrawn, companies burdened with additional debt and creditors are likely to go bankrupt, increasing their insolvencies.

Early stage companies that lack additional equity funding face a higher risk of failure than other businesses. The funding from guaranteed loan schemes may have been inadequate for smaller firms already in a weak financial state before the pandemic. Descriptive analysis shows that many loan recipients reached their borrowing capacity (loan sales ratio of 25%), indicating unmet borrowing demand and ongoing precariousness. However, the risk of failure may be reduced if the company is backed by a BA with strong banking ties or involves GVC support, leading to the fourth hypothesis:

H4: *The impact of COVID loan on the likelihood of insolvent exit will vary by investor-type.*

4. Data and Methodology

4.1 Sample Selection

For our empirical analysis, we construct a database containing firm- and deal-level data on equity-funded companies in the UK. The equity deal data, sourced from the Beauhurst database, include equity deals from 2011 to the present[9], detailing deal value, company evolution stage, funding round, investor identity, and the industry sector. To identify equity-funded companies active at the start of the COVID-19 period, we compiled data on firms that received equity finance before the pandemic and tracked all insolvent exits using data from the Office of National Statistics (ONS). Additionally, we have exclusive access to data on the COVID guaranteed loan schemes[10], detailing loans granted to each company, and payment history, covering all administered loans. Furthermore, we can identify equity-backed firms that received additional equity finance during the COVID-19 period (April 1, 2020, to March 31, 2023), allowing us to pinpoint the sub-sample that received both loan and equity finance.

For our analysis, we selected firms with at least one round of equity finance before the pandemic, specifically on or before March 31, 2020, resulting in 20,053 equity-backed companies. Panel A of Table 1 presents the sample-selection criteria. We excluded 2,492 companies lacking financial accounts in the three years before March 31, 2020; 392 companies already in insolvency; 896 companies with missing values for key variables; 220 Northern Ireland companies; 2,009 holding companies due to complex financial structures and inability to link the equity funding and/or covid loan to a specific subsidiary; and 258 companies without completed equity deals. These restrictions produced a sample of firms active during the COVID period for our estimations. During this period, 653 firms entered the legal insolvency stage (bankruptcy). Of the 13,786 companies analysed, 6,234 (45%) acquired guaranteed loans (COVID loans).

[9] The data provider Beauhurst defines the equity funding as follows: "When we talk about equity investment, we are referring to the issuance and sale of new shares by a company to fund its growth. To us, the mere sale of existing shares does not constitute equity investment. When existing shares are bought, that money goes to whichever shareholders have sold shares – not to the company." (available at https://help.beauhurst.com/en/articles/8879510-what-are-the-beauhurst-tracking-triggers#h_00e8159c99, accessed 10/6/2024)

[10] The COVID loan portfolio is drawn from the Information Management System of the COVID loan guarantee scheme administered by the British Business Bank (Business Interruption Loan Scheme(s), Bounce Back Loan Scheme)

Table 1 here

We then examine insolvency risk and the pandemic, referencing Dorr et al. (2022), by using comparable firms from the pre-crisis period without policy intervention as a control group. Following similar sample selection steps, we created a three-year pre-COVID historical control sample of equity-backed firms starting from Q2 2017, comprising 12,033 firms, with 8,531 meeting the selection criteria. During this pre-crisis period, 466 firms entered insolvency. Panel B of Table 1 details the sample-selection process.

4.2 Methodology

To test our hypotheses, we estimated several multivariate binary logistic regression models that determine failure (exit). Logistic regression is a conditional probability function, where the probability of failure is determined by a set of several covariates and the respective vectors of coefficients α_k that measure the effect of this set of covariates on the probability of failure. Subscript *i* represents each firm. Baseline regression in this study was estimated using the following equation:

$$P(y_i = 1|\Omega) = 1/\{1 + exp[-(\alpha_0 + COVID_i^T \alpha_1 + Investor\_types_i^T \alpha_2 + Equity\_deals\_variables_i^T \alpha_3 + Financial\_ratios_i^T \alpha_4 + Non\_financial\_variables_i^T \alpha_5 + Fixed\_effects_i^T \alpha_6)]\} \quad (1)$$

where y_i is an indicator of an insolvent exit following the last available financial account[11]. $COVID_i$ is the vector that captures COVID-related main independent variables. The content differed based on the hypotheses tested. Our models include either an indicator of the *COVID Period* (Hypothesis 1) or indicator(s) of the *COVID Period* with interactions for investor types (Hypothesis 2). The *COVID Period* is equal to unity in the COVID period (financial accounts submitted from April 2017 to March 2020) and zero in the pre-COVID period (accounts submitted from April 2014 to March 2017).

We construct an indicator of firms that obtained a *COVID Loan* and indicators of the *COVID Loan* with its interactions with the firms' investor type. Hypotheses 3 and 4 are tested

[11] Because insolvency is a legal process that can proceed through many steps and alternate routes it is not possible to measure the outcome (insolvency) in a 'time to failure' context. Indeed, the insolvency process (liquidation) can continue long after the business has ceased trading. Hence, we use the discrete time, where the last full filing of accounts is used as the date of closure of the business.

using the *COVID Loan* indicator and its interactions with investor type. The *COVID Loan* variable equals unity if a company has at least one COVID loan and zero otherwise. The vector *ITV* represents investor-type variables. We generated indicators for the most frequent investor types (VC, BA, ECF, GVC, and FVC).[12] We add a series of control variables known to affect the likelihood of insolvency. These control variables are classified into four categories: equity deal variables, firm-level financial ratios and non-financial variables, and fixed effects (sectors and region).

The first category encompasses the characteristics of equity deals. We control for the investment stage, as research indicates that early stage SMEs (a proxy for age) are more prone to market exit (Kale & Arditi, 1998) and sensitive to macroeconomic conditions (Bonaccorsi di Patti & Gobbi, 2001) and monetary policies. Announced deals pertain to larger ventures with higher deal and investment values and better long-term prospects (Mohamed & Schwienbacher, 2016), resulting in a lower bankruptcy rate. We assess the 'signals of quality' in entrepreneurial firms by evaluating venture capitalists' previous engagements. Following Ragozzino and Bevins (2016), we generate variables related to the history of deals for equity-backed firms, including the number of investment rounds, cumulative investment amount, investment purpose (R&D or job creation), and time span since the first and last deals. The number of rounds and cumulative investments by previous equity backers signal survival and growth potential, while recent rounds indicate recent appraisals, due diligence, and valuations. We capture additional deal information by including the investment round, the time from the first deal, and the time from the last deal. Companies with more funding rounds are presumed to be less likely to fail, whereas those farthest from their last deal may be more prone to insolvency. We also account for investment purposes (R&D and job creation) without assuming their direction of impact on insolvency. Additionally, we consider a potential non-linear (quadratic) relationship between the total accumulated investment and insolvency. A

[12] In our analysis, we focus on the most frequent investor types. There are other investor types in our data such as corporate VC, accelerators, private investment vehicles, charities and not-for-profit companies, family offices, bank VC, etc. but their lower frequencies do not warrant separate analysis. Moreover, about 70% of equity deals are funded by investors with an undisclosed identity. We assume these are private individuals who differ from business angels in that although they are higher net worth individuals, they are not actively investing in a portfolio of ventures. Nevertheless, even these undisclosed deals fund issuance of new equity to support growth of the companies. This group of the private individual investors, along with other investor types not included among the ones analysed in the paper, serves as a reference group.

threshold investment level likely exists where ventures achieve commercialization and revenue generation; failing this, investors may cut losses, withdraw funding, liquidate assets, or transfer intellectual property and technology. We control for this using a quadratic specification.

The second category encompasses the variables associated with a company's financial ratios. They represent important dimensions of a firm's financial performance: liquidity (working capital to total assets, current assets to total assets), leverage (current liabilities to total liabilities, short-term and long-term debt to total assets), and profitability (profit and loss account reserve to total assets). We conjecture that better financial performance, described by higher liquidity, lower leverage, and greater profitability, reduces the likelihood of insolvency, as widely evidenced in the failure prediction literature (Altman et al., 2010).

Following a well-established literature strand (Altman et al., 2010), we employ a comprehensive set of non-financial characteristics, including company size (measured by total assets)[13], indicators of asset charges, and indicators of no debt. Smaller firms are expected to be more prone to insolvency than larger firms due to variable cash flows, weaker customer and supplier relationships, and limited access to financial resources compared to larger firms (Muzi et al., 2023). Companies with pledged collateral are more likely to fail (Cowling et al., 2023a), whereas those without significant creditors (debt) face a lower likelihood (Wilson et al., 2023). A key determinant of insolvent exits is the ex-ante credit risk score at the last available financial year-end[14]. We also included an indicator for firms without risk scores. Credit score information helps control companies' financial health before the crisis; a higher score indicates worse creditworthiness and higher insolvency risk (Dorr et al., 2020). Finally, for the fourth category, we include the top-level industry sector (based on the detailed descriptor in the equity deals database) and location fixed effects.

5. Empirical Results

5.1 Descriptive statistics

[13] We allow for non-linear relationship between the company size and insolvency. This is because such a relationship has been reported in the literature (see for instance Altman et al., 2010), but also because the non-monotonous relationship has been detected during (unreported) preliminary bi-variate analysis.

[14] The details of the risk score are presented in the Appendix A3.

Table 2 presents descriptive statistics of explanatory variables from our analysis. Panel A includes statistics for the entire sample and the means for both pre-COVID and COVID-periods. The final column reports the difference-in-means test between these periods. Approximately 18% of companies in the sample were funded by VC investors, a figure consistent with the pre-COVID period but significantly different during the COVID period. BAs funded about 14% of the sample, with 15% pre-COVID and 14% during COVID. ECF platforms invested in 8% of the companies, with similar percentages in both periods. GVC funding was received by 7% of the sample, matching the pre-COVID subsample and showing a statistically significant increase to 8% during the COVID period. FVC funded 7% of companies on average, with differences noted between the pre-COVID and COVID periods[15]. Overall, the pre-COVID and COVID samples are similar, although the time since the last deal increased during the COVID period, indicating a drop in early-stage investment activity.

Table 2 here

Panel B presents the descriptive statistics for the COVID sample and subsets of companies that received or did not receive COVID loans. Notably, a smaller percentage of companies backed by VC, BA, or FVC investors utilised guaranteed loan facilities during the pandemic. The differences between the other characteristics are minimal, with some exceptions. Firms without prior debt were less likely to take COVID loans, whereas those with asset charges and more short-term debt were more inclined, possibly for refinancing. This subset of firms has a shorter time since the last deal, indicating that they were younger. Additionally, firms that received equity funding for R&D were less likely to use COVID loans. The multivariate profile of loan recipients is examined later.

5.2 Main results

Table 3 shows the impact of the COVID-19 crisis on the insolvency likelihood of equity-funded companies. Model specifications (1-8) predict the insolvency likelihood using various investor and investee characteristics and controls. The COVID period dummy variable is crucial for

[15] The sum of proportions for the indicated investor types is less than 100% because as mentioned earlier, there are other investor types, with the largest group being the small private undisclosed investors.

distinguishing between pre-crisis (0) and COVID (1) businesses. Model (1) includes only the COVID period dummy, showing a generally lower insolvency likelihood during COVID owing to policy interventions, noted as an insolvency gap (Figure 1, Appendix A2). Adding investor type (Model 2) reveals significant and positive coefficients for ECF, BA, and GVC-backed ventures, which are more likely to exit bankruptcy both before and during the crisis, when compared to the reference group of other and individual private investors. The modelling strategy then incorporates additional firm-specific and control variables, considering the value, rounds, and stages of deals pre-COVID in model (3).

Table 3 here

The ECF investor type maintains a significant positive coefficient, while the FVC indicator is significantly negative, lowering failure risk, compared to the reference group. The time since the first deal is strongly negative, suggesting that longer-established ventures are less likely to face bankruptcy. However, ventures with more investment rounds and later stages have slightly higher exit risk. Ventures with greater R&D investment are less likely to become insolvent. Including a quadratic term for total cumulative investment yields significant results, indicating that companies with investment rounds totalling over £5m face higher insolvency risk. This supports the 'waning momentum' concept proposed by Ragozzino and Blevins (2016), and signals negatively to potential investors. We propose that crises may induce 'sorting behaviour' among investors, leading to a reassessment of portfolio firm prospects and accelerating decisions to withdraw support from some ventures, making it challenging for them to secure further equity market investments.

Models 4-7 incorporate firm-specific financial and non-financial variables along with the ex-ante credit risk score, which reflects the firm's pre-COVID financial health and strongly predicts insolvency outcomes. Insolvency risk shows a non-linear relationship with total assets, modelled as a quadratic term in log assets, corroborating previous findings (Altman et al., 2010). Low-asset companies avoid liquidation, but insolvency risk rises with asset values up to £600,000, after which it declines. Traditional predictors of SME insolvency indicate that firms with higher liquidity, profitability, and lower leverage or those without debt are less likely to become insolvent. Conversely, companies with higher ex-ante risk scores exhibit increased insolvency rates.

Of particular interest and to support hypothesis H1, the coefficient of the COVID period is not statistically significant in the models with a richer set of explanatory variables. This suggests that the equity-funded companies, with similar characteristics as pre-COVID, did not have a higher insolvency rate during the three-year window from April 2020 to the end of March 2023 when compared with the pre-COVID period.

In terms of investor type, the results of the model with the largest set of explanatory variables (Model 8) suggest that funding from VC, BA, or FVC investors does not seem to impact the likelihood of insolvency when compared to the reference group of other and individual private investors, supporting hypothesis H2a. However, the presence of ECF or GVC investors is associated with a higher probability of insolvency. In economic terms, the odds of insolvency are 36% and 33% higher for ECF- and GVC-funded companies, respectively, although the coefficients are significant only at the 10% significance level.[16] These results appear to support the first part of hypotheses H2b and H2c.

To further test hypotheses H2a, H2b, and H2c, we include interaction terms between the COVID period and different types of investors, allowing us to examine whether specific investor types influence the effect of the COVID crisis on the likelihood of insolvency among equity-funded companies. These results support H2a, indicating that the presence of VC, BA, or FVC does not affect the probability of insolvency during the COVID-19 crisis. For H2b, although ECF-funded ventures generally show higher insolvency rates than other ventures, this difference is not significant across the time periods. Notably, for H2c, the interaction term between GVC and the COVID-19 crisis is negative and statistically significant, implying that GVC funded companies are less likely to become insolvent during the COVID-19 crisis than in the pre-COVID period. These ventures seemed to have received proactive support from investors during the crisis. Economically, the odds of insolvency are 36% smaller (exp(-0.451)*100%) for GVC funded companies during the crisis period than during the pre-COVID period (Model 8, Table 3).

[16] In the binary logistic regression, the exponentiated coefficients are interpreted as odds ratios. Therefore, for instance, the economic impact of the crowdfunding investor on insolvency is computed as (exp(0.308)-1)*100%=36% (Model 8, Table 3). It is interpreted as 36% increase in odds of insolvency relative to companies funded by other investors (such as corporate VC, accelerators, private investment vehicles, charities and not-for-profit companies, family offices, bank VC, or private investors with undisclosed identity).

Next, we test hypothesis H3 and investigate the impact of government loan guarantee scheme(s) on the likelihood of the insolvency of equity-funded companies. The results presented in Table 4 show a significant positive coefficient of COVID loans at the 1% level across all model specifications, which indicates that companies with a COVID loan are, on average, more likely to experience insolvent exit when compared to companies without these loans. The main effect is relatively strong in that, all else being equal, the odds of insolvent exit are higher by nearly 80% for a company with a COVID loan (model 8).

Table 4 here

To examine hypothesis H4, we include the interactions between COVID loans and investor types (Model 8 in Table 4). The results show that the interaction between COVID loans and BA is negative and statistically significant, which supports hypothesis H4. If we add the main effect of the COVID loan (0.584) and the interaction (-0.726), the resulting figure is negative (-0.142). This means that contrary to the main effect, COVID loans are associated with lower insolvency for companies funded by BA compared to reference group, with the odds ratio being lower by 13% ((exp(-0.142)-1) × 100%). Similarly, the interaction between COVID loans and GVC (H4) is negative and statistically significant (-0.746), suggesting that having access to a COVID loan and receiving funding from GVC reduces the odds of insolvency by 15% ((exp(0.584–0.746) - 1) × 100%).

5.3 Additional analysis and robustness checks

We perform additional analyses and robustness checks to verify our results regarding government intervention through the COVID loan scheme. The main analysis reveals that equity-funded companies with a COVID loan are more likely to face insolvency than those without, indicating that loans increased some firms' likelihood of insolvency, contrary to policy objectives. A primary concern in the literature is potential selection bias. Specifically, the positive correlation between COVID loans and insolvency might stem from financially constrained companies being more likely to take loans. Furthermore, examining the multivariate profile of equity-funded firms that opted for debt finance during the COVID period is insightful. To address the selection and endogeneity issues, we use methods that include estimating selection equations and employing matching techniques.

5.3.1 Profile of the companies with COVID loan, additional equity or both

To profile our sample of equity-backed companies that chose (or did not) to utilise COVID loan schemes, we estimate a logit model (1 = receiving COVID loan, 0 = not receiving COVID loan) using a specification similar to equation (1). Additionally, we identify firms that received an equity deal during the COVID period and analyse their characteristics. We also profile firms that have received both equity and guaranteed loans. The model results are presented in Table 5 (columns 1-3). Firms funded by BA investors and ECF platforms are more likely to access preferential loan financing compared to the reference group. ECF-funded firms with dispersed shareholders and selective criteria are less likely to provide additional resources during a crisis given expectations for seed ventures. BAs, as high net worth individuals, are likely to have strong reputations and relationships with banks, facilitating access to finance. Firms backed by VC and FVC funds are less likely to seek loan financing, supporting the idea that these funds invest more in developed companies and support them financially during crises. GVC-backed ventures do not differ from the reference group (other investor types or small private undisclosed investors) in terms of COVID loan uptake.

Table 5 here

The results indicate that companies investing in R&D are less likely to seek financing than those that increase their workforce. Similar to VC and FVC investors, R&D investment may indicate pre-commercialization, while employment growth suggests active trading and a need for working capital, making firms eligible for COVID loans. In particular, a higher ex ante risk score strongly predicts loan acquisition, implying that financially vulnerable firms accessed loans (no credit checks resulted in adverse selection). Despite having reserves that are likely intended for development rather than liquidity, these firms exhibit lower liquidity and higher working capital needs. Firm size also shows a non-linear effect; smaller firms have a higher demand for COVID loans until they reach approximately £225k in assets, after which the demand decreases. Companies with existing debt and asset charges are more likely to access loans, refine at lower costs, and remove asset charges. Therefore, these firms do not create additional financial resources and are prone to failure.

Additional models that determine the likelihood of additional rounds of equity are reported in columns (4-6). In Model 4, nearly all investor types (except GVC) are associated with providing additional equity for some firms compared to reference group. When we add

control variables (5) and regional and industry fixed effects (6), we find that VCs and BAs are most likely to provide equity injections, and those firms that have received more rounds of investment receive support. We found a quadratic relationship between additional equity and cumulative investment (£19.4m). Firms that had a recent deal (pre COVID) did not require additional funds.

The results for firms that acquired both loans and equity are interesting (models 7-9). Both BA- and ECF-backed firms are more likely to have both forms of finance. This may provide support for the 'liquidity certification' effects, uncovered in Kazembalaghi et al. (2024). Moreover, we expect BAs to have strong relationships with the investee bank, and it is rational to take a low-price loan for liquidity purposes or to refine existing debt.

5.3.2 Selection bias and endogeneity problem

The purpose of the policy intervention was to provide a financial buffer to help companies survive the COVID period in the face of severe challenges. However, it is likely that riskier firms self-select loan schemes and/or acquire loans, and creditors increase the likelihood of insolvent exit. To address the potential self-selection bias (endogeneity) in the insolvency model, we use Heckman's (1979) two-stage analysis, as shown in Table 6. The first-stage models access COVID loans as the dependent variable. Lennox et al. (2012) emphasize the need for "exclusion restrictions" in the Heckman procedure to avoid biased coefficients from multicollinearity. This restriction requires that at least one variable in the selection model be excluded from the performance model. To meet this requirement, we include an instrument in our selection model that is independent of the outcome equation but related to access to the COVID loan.

Following Bertoni et al. (2023), we constructed a regional instrumental variable representing the uptake of guaranteed loans, calculated as the ratio of guaranteed loans to the number of companies in each region. The theoretical basis for this instrument lies in the local nature of small business lending, which depends on loan providers' locations. Companies in regions with more loan providers are more likely to receive guaranteed loans, providing exogenous variation that does not affect insolvency (Bertoni et al. 2023). We estimate an a first-stage instrumental probit regression, with a second-stage main regression similar to Equation

1, using the inverse Mills ratio (IMR) from the first stage to control for selection bias in the second stage. In Table 6, Model 1 presents the first-stage regression results, while Models 2 and 3 show the second-stage results with and without interaction terms, respectively. The instrument's coefficient is significantly and positively related to the likelihood of accessing COVID loans. The IMR coefficient is significant in Models 2 and 3, suggesting that sample selection drives our results and indicating the importance of adjusting for endogeneity due to unobservable variables. However, the main results remain unchanged.

Table 6 here

Second, to further control for potential selection bias, we used Coarsened Exact Matching (CEM)[17] (Iacus et al., 2012) with and without replacement[18]. The idea of matching is to find firm observations that are reasonably comparable, thereby adjusting the distribution of pretreatment covariates by either excluding and/or re-weighting observations. The goal is to quasi-randomize the treatment assignment by ex-post balancing of treatment and control groups in terms of relevant characteristics that explain selection into treatment (COVID loans). The second part of Table 6 shows that the coefficient of COVID loans is positive and statistically significant, which confirms that our findings are robust to observable sample selection bias.

6. Summary and conclusion

This study aims to evaluate the consequences of the COVID-19 pandemic and related policy measures, particularly guaranteed loans, on the insolvency outcomes of equity-financed companies. First, using a unique dataset, we provide a large-scale analysis of the insolvency of equity-backed firms by estimating risk models specific to this segment. Our models facilitate examination of the relevance of investor classification while accounting for various firm-specific and performance characteristics that determine whether firms survive as viable entities during a crisis. The research aims to identify unique profiles of companies that fail, obtained

[17]Employing the variables that exhibited significant differences in means (measured by Rubin's B) between the companies with and without COVID loans. For matching, we follow Imbens & Wooldridge (2009) and we used those variables where the Cohen's d was greater than 0.2 in absolute value.

[18] In the former case, one control company (without a COVID loan) can be used for more than one treated company (with a COVID loan), whereas in the latter case one control company can be matched only to one treated company.

guaranteed loans, obtained additional equity, or utilised both financing methods during the crisis period.

Second, the study contributes to the RBV literature by finding that investor-types bring different levels of monitoring, support and resources to help survival and unveils the resilience of equity-funded companies during the COVID-19 crisis. Generally the insolvency rates of equity-backed firms did not differ significantly from those experienced in normal economic periods. This stability is attributed to the involvement of equity funders who act as patient (financial resources) and active investors (expertise), as well as government intervention. The study uncovers interesting variations in the insolvency risk of equity-funded companies during the pandemic, differentiating by investor type and in comparison to the pre-COVID era.

Specifically, the outcomes of the study reveal that firms funded by equity investors, VC, BA, ECF, and FVC, did not face a higher likelihood of insolvency during the pandemic when compared to the usual economic conditions and when controlling for firm-specific variables. On the other hand, companies backed by GVC exhibited a reduced likelihood of insolvency during the crisis. This may be due to the tendency of GVC to invest in riskier ventures, and pursue wider objectives, the additional support provided during periods of uncertainty is less discriminatory across their investees (Leleux & Surlemont, 2003; Alperovych et al., 2020). In line with earlier findings, we confirm that ECF-funded companies experience higher insolvency rates than other investor types, both before and during the COVID period. The increased insolvency rate may be explained by the higher risk of start-ups, diverse investor base, weaker control rights (Brown et al., 2018) or the less frequent use of contractual covenants (Hornuf & Schwienbacher, 2016).

Third, the analysis evidences the use of loan guarantees by equity-backed firms. Previous research on the COVID period has emphasized the effectiveness of guaranteed loans for SMEs, during the early stages of the pandemic (Wilson et al., 2023). However, our analysis suggests that equity-backed companies that received COVID loans were, on average, more likely to experience insolvency compared to those that did not receive such loans, even after accounting for self-selection bias. We suggest that the additional debt burden for less viable firms, that could not raise additional equity, led to default and insolvency actions by banks and other creditors. Interestingly, this effect was not observed for companies backed by BA and GVC. These investors are more likely to ensure that their investees could service payment on

the loan before taking on the debt and/or provide additional financial support to avoid default. Additionally, BAs are more inclined to utilise government-guaranteed loans to safeguard their investment whilst maintaining their reputation with banks.

Fourth, we investigate signalling and selection. Our findings point to companies funded by ECF acquiring guaranteed loans to signal their financial health to potential crowd investors; the loan provided a "liquidity certification effect" (Kazembalaghi et al., 2024). We suggest that the array of policy interventions enabled all companies to endure the immediate crisis, with the LGSs providing liquidity and serving as a positive signal, allowing firms on ECF platforms to secure additional equity investments and facilitating survival and growth. Firms receiving CBILS loans, that had risk-priced interest rates and were risk-screened, could have benefited from this signalling effect.

However, the BBLS was characterized by an unsystematic and indiscriminate lending approach. With a low interest rate and a maximum loan amount of £50k, repayable over up to 10 years, and the inclusion of a 100% loan guarantee and limited credit checks, the scheme encouraged a scattergun-lending approach. While these loans were crucial for small owner-managed firms and unincorporated businesses during the pandemic, they were insufficient for innovative and high-growth businesses in the pre-commercialization stage that required equity. Notably, most of the equity-backed samples that acquired a loan obtained the maximum loan amount (66%), indicating financial constraints. The loan size (max £50,000) was insufficient for survival; for investors and lenders, BBLS lending distorted credit information and signalling for some segments. The BBLS allowed banks to transfer the risk of existing loans to the LGS, and new lenders could expand their client base with a minimal risk of loss.

We conclude that there was a significant *adverse selection* in the loan scheme, attracting high-risk obligors who saw a chance of survival. However, once these funds were exhausted and other support mechanisms were withdrawn, the riskier companies faced additional debt and creditor actions, resulting in bankruptcy and increased insolvencies. The COVID loan only temporarily delayed company failure. Our analysis suggests that firms with pre-COVID short-term debt were likely using guaranteed loans to refinance at lower interest rates without significantly increasing the firms' liquidity. Our additional results provide evidence that the increased insolvencies were driven by companies with loans under the BBLS (see Appendix A6).

Finally, our study suggests implications for policy and practice. Importantly, there are implications for the design of the parameters of LGS (eligibility, interest rate, and the guarantee – %), which, we suggest, could be more fine-tuned to target different sectors, avoid adverse selection and incentivise lenders to minimize default/fraud by risk scoring and scrutiny. For equity investors, considering investments, this would provide a useful information. Moreover, 'convertible loans', as used in the Future Fund (FF), may have application for a wider range of equity-backed firms in the UK and lessons can be learned from evaluations of the FF intervention.

Moreover, from an economic perspective, insolvent failures can be viewed as a part of the competitive process of "creative destruction," reallocating resources to more efficient, innovative, and growing businesses (Legrand, 2017). There was concern that the large-scale intervention through the loan scheme could distort the competitive process, sustaining non-viable firms. We find that COVID loans did not prolong the life of unviable *equity-funded* businesses as the pandemic eased but actually expedited the liquidation process, releasing resources for redeployment elsewhere.

The analysis may have value for practitioners. The estimated insolvency risk models, specific to the characteristics of equity funded firms, can be applied and updated to allocate risk ratings and rankings to individual firms and therefore have real time relevance, and at the same time provide insights for potential investors and policy makers. These models could be developed further in future work to include founder and board characteristics and test predictive accuracy.

The study has several limitations, primarily due to data availability. The information on investor-type can be enhanced, using detailed shareholder records, to further aid our understanding of the characteristics and life-cycles of firms backed by small undisclosed investors. A significant limitation is the focus on the UK. Broadening the analysis to an international sample and to other periods of uncertainty would yield valuable insights. Future research could explore the characteristics of LGS recipients, including business directors and founders, to model loan defaults among equity-funded firms. In sum, our study has started to explore a research agenda that expands the understanding of entrepreneurial finance. It includes the role and actions of a broader range of equity investors and the impact on businesses receiving investments during crisis times.

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Table 1 Sample Selection Steps

		Insolvent Companies	Covid Loans
Panel A: Main estimation sample (covid period)			
Companies with at least one equity deal before 31/3/2020	20,053		
Less			
Companies without last available accounts between 1/4/2017 and 31/3/2020	-2,492		
Companies that became insolvent before 31/3/2020	-392		
Companies with missing values for explanatory variables	-896		
Companies with missing values for dependent variable (Northern Ireland)	-220		
Holding companies	-2,009		
Zero total investment	-258		
Final estimation sample	13,786	653	6,234
		Insolvent companies	
Panel B: Historical control sample			
Companies with at least one equity deal before 31/3/2017	12,033		
Less			
Companies without last available accounts between 1/4/2014 and 31/3/2017	-1,139		
Companies that became insolvent before 31/3/2017	-199		
Companies with missing values for explanatory variables	-504		
Companies with missing values for dependent variable (Northern Ireland)	-154		
Holding companies	-1,326		
Zero total investment	-180		
Final estimation sample	8,531	466	

Notes:

The table shows the steps involved in the preparation of the company level samples employed in the first part of the study. Panel A shows how the main covid period sample was constructed. This sample includes all eligible companies with an equity deal at the beginning of the covid period, i.e., as of 31st March of 2020. Panel B shows how the historical control sample has been constructed. The historical control sample includes all eligible companies that had an equity investor as of the 31st of March 2017. In each of these two samples, every observation corresponds to one company. The sample created by appending the two samples (the combined sample) has been used for quantification of differences in failure rates in the pre-covid and covid period. The main estimation sample was employed to quantify differences in failure rates for companies with and without a covid loan.

Table 2 Descriptive statistics

Panel A. Full sample	Whole sample					Pre-covid period	Covid period	
	(N = 22,317)					(N = 8,531)	(N = 13,786)	Difference
Variable name	Mean	SD	Min	Median	Max	Mean	Mean	Significance
Venture Capital (VC)	0.18	0.39	0.00	0.00	1.00	0.18	0.19	**
Business Angel (BA)	0.14	0.35	0.00	0.00	1.00	0.15	0.14	*
Crowd Funding (ECF)	0.08	0.28	0.00	0.00	1.00	0.08	0.09	
Government VC (GVC)	0.07	0.25	0.00	0.00	1.00	0.07	0.07	**
Foreign VC (FVC)	0.07	0.26	0.00	0.00	1.00	0.07	0.08	***
Seed Stage of Investment	0.56	0.50	0.00	1.00	1.00	0.56	0.56	
Venture Stage of Investment	0.31	0.46	0.00	0.00	1.00	0.31	0.30	
Growth Stage of Investment	0.08	0.27	0.00	0.00	1.00	0.08	0.07	*
Established Stage of Investment	0.06	0.23	0.00	0.00	1.00	0.05	0.06	**
Number of Rounds	2.29	1.73	1.00	2.00	16.00	2.13	2.38	***
Announced Deal	0.39	0.49	0.00	0.00	1.00	0.39	0.38	
LN(Total Investment)	12.80	1.82	6.06	12.69	21.00	12.66	12.88	***
Time from first deal (days)	1276.65	837.49	0.00	1131.00	3377.00	1023.29	1433.43	***
Time from last deal (days)	777.70	726.79	0.00	533.00	3373.00	628.17	870.23	***
Investment purpose (R&D)	0.04	0.21	0.00	0.00	1.00	0.02	0.06	***
Investment purpose (Job creation)	0.04	0.20	0.00	0.00	1.00	0.02	0.05	***
Working capital to total assets	-0.11	1.09	-2.99	0.21	1.00	-0.09	-0.12	*
Current assets to total assets	0.76	0.30	0.01	0.92	1.00	0.75	0.76	
Current liabilities to total liabilities	0.82	0.29	0.10	1.00	1.00	0.82	0.82	
Profit/loss account reserve to total assets	-1.36	1.72	-4.05	-0.73	0.98	-1.45	-1.30	***
Short and Long-term debt to total assets	0.16	0.28	0.00	0.00	0.82	0.16	0.16	
LN(Total Assets £m)	12.42	2.20	0.00	12.55	23.63	12.34	12.47	***
Indicator of charge on assets	0.07	0.26	0.00	0.00	1.00	0.08	0.07	
Indicator of no debt	0.50	0.50	0.00	0.00	1.00	0.51	0.49	***
Ex ante risk score	0.03	0.03	0.00	0.02	0.68	0.03	0.03	***
Missing risk score	0.04	0.21	0.00	0.00	1.00	0.04	0.05	***

Panel B. Covid period sample	Covid period					No covid loan	Covid loan	
	(N = 13,786)					(N = 7,552)	(N = 6,234)	Difference
Variable name	Mean	SD	Min	Median	Max	Mean	Mean	Significance
Venture Capital (VC)	0.19	0.39	0.00	0.00	1.00	0.23	0.14	***
Business Angel (BA)	0.14	0.34	0.00	0.00	1.00	0.15	0.12	***
Crowd Funding (ECF)	0.09	0.28	0.00	0.00	1.00	0.07	0.10	***
Government VC (GVC)	0.07	0.25	0.00	0.00	1.00	0.07	0.06	
Foreign VC (FVC)	0.08	0.27	0.00	0.00	1.00	0.11	0.04	***
Seed Stage of Investment	0.56	0.50	0.00	1.00	1.00	0.56	0.57	*
Venture Stage of Investment	0.30	0.46	0.00	0.00	1.00	0.29	0.32	***
Growth Stage of Investment	0.07	0.26	0.00	0.00	1.00	0.09	0.06	***
Established Stage of Investment	0.06	0.23	0.00	0.00	1.00	0.06	0.05	***
Number of Rounds	2.38	1.84	1.00	2.00	16.00	2.43	2.32	***
Announced Deal	0.38	0.49	0.00	0.00	1.00	0.42	0.34	***
LN(Total Investment)	12.88	1.85	8.21	12.79	21.00	13.09	12.63	***
Time from first deal (days)	1433.43	907.02	0.00	1295.50	3377.00	1516.40	1332.92	***
Time from last deal (days)	870.23	800.93	0.00	606.00	3373.00	940.64	784.94	***
Investment purpose (R&D)	0.06	0.23	0.00	0.00	1.00	0.07	0.04	***
Investment purpose (Job creation)	0.05	0.23	0.00	0.00	1.00	0.05	0.05	
Working capital to total assets	-0.12	1.12	-2.99	0.22	1.00	-0.12	-0.11	
Current assets to total assets	0.76	0.31	0.01	0.92	1.00	0.77	0.74	***
Current liabilities to total liabilities	0.82	0.29	0.10	1.00	1.00	0.83	0.81	***
Profit/loss account reserve to total assets	-1.30	1.74	-4.05	-0.67	0.98	-1.41	-1.17	***
Short and Long-term debt to total assets	0.16	0.27	0.00	0.00	0.82	0.14	0.19	***
LN(Total Assets £m)	12.47	2.26	0.00	12.63	23.63	12.45	12.49	
Indicator of charge on assets	0.07	0.26	0.00	0.00	1.00	0.06	0.09	***
Indicator of no debt	0.49	0.50	0.00	0.00	1.00	0.56	0.39	***
Ex ante risk score	0.03	0.03	0.00	0.02	0.68	0.03	0.03	***
Missing risk score	0.05	0.21	0.00	0.00	1.00	0.06	0.04	***

Notes:

This table shows summary statistics for variables included in our sample. All the variables are defined in Appendix in Table A1. We provide means, standard deviations, minimum, median and maximum for the full sample of 22,317 observations (Panel A) and for the covid period sample of 13,786 companies (Panel B). In the full sample, we provide the means for the pre-covid and covid period subsamples, along with the test of difference in means for the two subsamples in the last column. For the covid period sample, we provide the means for the subsamples based on covid loans, along with the test of difference.

Table 3 Insolvency prediction models using pre-covid and covid period sample

	(1) Insolvency	(2) Insolvency	(3) Insolvency	(4) Insolvency	(5) Insolvency	(6) Insolvency	(7) Insolvency	(8) Insolvency
Covid Period Indicator	-0.150**	-0.147**	-0.117*	-0.0876	-0.0922	-0.0972	-0.0896	-0.0511
	(-2.41)	(-2.36)	(-1.77)	(-1.31)	(-1.37)	(-1.44)	(-1.32)	(-0.63)
Venture Capital (VC)		0.113	-0.0956	-0.0403	-0.0222	0.00369	0.0182	0.109
		(1.29)	(-0.96)	(-0.40)	(-0.21)	(0.04)	(0.17)	(0.74)
Business Angel (BA)		0.194**	0.0221	0.0741	0.0406	0.0411	0.0701	0.0864
		(2.19)	(0.23)	(0.77)	(0.41)	(0.42)	(0.70)	(0.60)
Crowd Funding (ECF)		0.640***	0.487***	0.489***	0.467***	0.382***	0.421***	0.308*
		(7.22)	(4.57)	(4.54)	(4.32)	(3.47)	(3.82)	(1.93)
Government VC (GVC)		0.264**	0.193	0.156	0.182	0.214*	0.0616	0.287*
		(2.36)	(1.61)	(1.29)	(1.49)	(1.72)	(0.47)	(1.66)
Foreign VC (FVC)		-0.211	-0.296**	-0.297**	-0.344**	-0.246*	-0.210	-0.282
		(-1.59)	(-2.18)	(-2.16)	(-2.42)	(-1.73)	(-1.47)	(-1.27)
Covid Period x Venture Capital								-0.145
								(-0.81)
Covid Period x Business Angel								-0.0235
								(-0.13)
Covid Period x Crowd Funding								0.191
								(1.01)
Covid Period x Government VC								-0.451*
								(-1.93)
Covid Period x Foreign VC								0.119
								(0.42)
Venture Stage of Investment			0.180**	0.195**	0.0838	0.0882	0.0809	0.0758
			(2.38)	(2.54)	(1.05)	(1.10)	(1.00)	(0.94)
Growth Stage of Investment			0.167	0.214*	0.0772	0.0568	0.0338	0.0269
			(1.34)	(1.67)	(0.57)	(0.42)	(0.25)	(0.20)
Established Stage of Investment			-0.253	-0.235	-0.309*	-0.367**	-0.414**	-0.414**
			(-1.48)	(-1.34)	(-1.74)	(-2.05)	(-2.31)	(-2.31)
Number of Rounds			0.0873***	0.0743**	0.0606**	0.0773**	0.0799***	0.0808***
			(2.93)	(2.51)	(2.04)	(2.56)	(2.64)	(2.67)
Announced Deal			-0.00786	-0.0241	0.0133	0.0486	0.00402	-0.00259
			(-0.08)	(-0.25)	(0.14)	(0.49)	(0.04)	(-0.03)
LN(Total Investment)			0.903***	0.920***	0.660**	0.694**	0.716***	0.705**
			(3.58)	(3.62)	(2.40)	(2.53)	(2.61)	(2.57)
LN(Total Investment) squared			-0.0293***	-0.0294***	-0.0221**	-0.0228**	-0.0232**	-0.0228**
			(-3.01)	(-3.01)	(-2.05)	(-2.12)	(-2.15)	(-2.11)
Time from first deal (days)			-0.000175**	-0.000223***	-0.000224***	-0.000235***	-0.000240***	-0.000237***
			(-2.14)	(-2.71)	(-2.68)	(-2.76)	(-2.83)	(-2.79)
Time from last deal (days)			0.0000396	0.0000194	0.0000367	0.0000554	0.0000457	0.0000455
			(0.46)	(0.22)	(0.41)	(0.62)	(0.51)	(0.51)
Investment purpose (R&D)			-0.341**	-0.311*	-0.332**	-0.254	-0.272	-0.266
			(-2.10)	(-1.90)	(-1.97)	(-1.50)	(-1.61)	(-1.57)

Investment purpose (Job creation)			-0.0378	0.00153	-0.0401	-0.0247	-0.0571	-0.0403
			(-0.24)	(0.01)	(-0.25)	(-0.16)	(-0.36)	(-0.25)
Working capital to total assets				-0.0902***	-0.142***	-0.131***	-0.129***	-0.130***
				(-2.62)	(-3.71)	(-3.43)	(-3.37)	(-3.39)
Current assets to total assets				-0.569***	-0.532***	-0.441***	-0.419***	-0.418***
				(-5.91)	(-5.21)	(-4.14)	(-3.90)	(-3.89)
Current liabilities to total liabilities				0.463**	0.227	0.209	0.198	0.194
				(2.55)	(1.16)	(1.04)	(0.99)	(0.96)
Profit/loss account reserve to total assets				-0.0448*	-0.0974***	-0.121***	-0.126***	-0.125***
				(-1.90)	(-3.36)	(-4.15)	(-4.30)	(-4.27)
Short and Long-term debt to total assets				1.074***	0.410**	0.401**	0.381*	0.372*
				(5.96)	(2.09)	(2.00)	(1.89)	(1.85)
LN(Total Assets £m)					0.920***	0.906***	0.894***	0.893***
					(4.43)	(4.33)	(4.26)	(4.26)
LN(Total Assets) squared					-0.0343***	-0.0341***	-0.0335***	-0.0335***
					(-4.11)	(-4.06)	(-3.98)	(-3.98)
Indicator of charge on assets					0.178*	0.197*	0.175	0.175
					(1.66)	(1.84)	(1.62)	(1.62)
Indicator of no debt					-0.328***	-0.257***	-0.237***	-0.239***
					(-3.91)	(-3.02)	(-2.77)	(-2.79)
Ex ante risk score					6.603***	5.469***	5.598***	5.574***
					(8.25)	(6.75)	(6.89)	(6.83)
Missing risk score					0.0295	0.152	0.177	0.176
					(0.17)	(0.85)	(0.99)	(0.99)
Constant	-2.851***	-2.982***	-9.675***	-10.07***	-13.77***	-13.99***	-14.33***	-14.26***
	(-59.84)	(-57.23)	(-5.90)	(-6.06)	(-7.04)	(-7.17)	(-7.34)	(-7.29)
Industry sector indicators	No	No	No	No	No	Yes	Yes	Yes
Regional indicators	No	No	No	No	No	No	Yes	Yes
Number of observations	22317	22317	22317	22317	22317	22317	22317	22317
Number of insolvencies	1119	1119	1119	1119	1119	1119	1119	1119
McFadden pseudo-R^2	0.000650	0.00827	0.0214	0.0367	0.0587	0.0729	0.0764	0.0771
Area under ROC curve (AUC)	0.518	0.562	0.619	0.655	0.697	0.714	0.718	0.718

Notes:

The table shows the estimation results for the models predicting insolvent exit using the pre-covid and covid period sample. The dependent variable is the indicator of the insolvent exit in the 3-year period either from 1st of April 2017 to 31st of March 2020 (pre-covid historical control subsample), or from 1st of April 2020 to 31st of March 2023 (covid-period subsample). The variables of interests are the indicator of the covid period (equals one if the observation comes from the covid period subsample and zero otherwise) and the interaction terms between the covid period and specific types of investors. The models are estimated using logistic regression. The statistical significance is indicated with asterisks where the *, **, and *** denote significance at 10%, 5% and 1% significance levels. The corresponding t-statistics are computed using robust standard errors. The variables are defined in the Appendix in Table A1.

Table 4 Insolvency prediction models using covid period sample

	(1) Insolvency	(2) Insolvency	(3) Insolvency	(4) Insolvency	(5) Insolvency	(6) Insolvency	(7) Insolvency	(8) Insolvency
Covid Loan Indicator	0.642***	0.632***	0.636***	0.628***	0.490***	0.428***	0.420***	0.584***
	(7.84)	(7.57)	(7.38)	(7.16)	(5.32)	(4.57)	(4.49)	(5.16)
Venture Capital (VC)		0.129	-0.0437	-0.00132	0.00228	0.0326	0.0294	-0.0781
		(1.11)	(-0.32)	(-0.01)	(0.02)	(0.23)	(0.21)	(-0.43)
Business Angel (BA)		0.186	0.0711	0.0976	0.0722	0.0655	0.0899	0.431**
		(1.60)	(0.55)	(0.75)	(0.55)	(0.50)	(0.68)	(2.48)
Crowd Funding (ECF)		0.706***	0.611***	0.603***	0.588***	0.498***	0.536***	0.674***
		(6.30)	(4.35)	(4.25)	(4.13)	(3.46)	(3.71)	(3.49)
Government VC (GVC)		-0.0418	-0.0374	-0.0451	-0.0123	0.0183	-0.0689	0.268
		(-0.25)	(-0.21)	(-0.25)	(-0.07)	(0.10)	(-0.37)	(1.16)
Foreign VC (FVC)		-0.0551	-0.181	-0.169	-0.225	-0.155	-0.116	-0.210
		(-0.32)	(-1.01)	(-0.94)	(-1.21)	(-0.84)	(-0.62)	(-0.88)
Covid Loan x Venture Capital								0.173
								(0.73)
Covid Loan x Business Angel								-0.726***
								(-3.05)
Covid Loan x Crowd Funding								-0.274
								(-1.17)
Covid Loan x Government VC								-0.746**
								(-2.15)
Covid Loan x Foreign VC								0.259
								(0.72)
Venture Stage of Investment			0.0746	0.119	0.0468	0.0626	0.0572	0.0555
			(0.74)	(1.15)	(0.44)	(0.59)	(0.54)	(0.52)
Growth Stage of Investment			0.101	0.203	0.107	0.111	0.0899	0.0870
			(0.60)	(1.17)	(0.60)	(0.62)	(0.50)	(0.48)
Established Stage of Investment			-0.537**	-0.451*	-0.481*	-0.515**	-0.566**	-0.549**
			(-2.22)	(-1.83)	(-1.93)	(-2.05)	(-2.24)	(-2.18)
Number of Rounds			0.0686*	0.0485	0.0454	0.0598	0.0621	0.0626
			(1.88)	(1.31)	(1.21)	(1.58)	(1.63)	(1.63)
Announced Deal			-0.104	-0.114	-0.0798	-0.0469	-0.0858	-0.0407
			(-0.78)	(-0.84)	(-0.59)	(-0.34)	(-0.63)	(-0.30)
LN(Total Investment)			0.508	0.512	0.365	0.397	0.422	0.445
			(1.58)	(1.58)	(1.03)	(1.12)	(1.20)	(1.24)
LN(Total Investment) squared			-0.0137	-0.0138	-0.0107	-0.0115	-0.0120	-0.0129
			(-1.10)	(-1.10)	(-0.76)	(-0.82)	(-0.86)	(-0.91)
Time from first deal (days)			-0.000182*	-0.000227**	-0.000228**	-0.000243**	-0.000250**	-0.000254**
			(-1.85)	(-2.27)	(-2.24)	(-2.36)	(-2.43)	(-2.45)
Time from last deal (days)			0.0000966	0.0000831	0.0000843	0.0000941	0.0000846	0.0000867
			(0.92)	(0.78)	(0.78)	(0.86)	(0.77)	(0.78)
Investment purpose (R&D)			-0.129	-0.105	-0.127	-0.0619	-0.0796	-0.0815
			(-0.68)	(-0.56)	(-0.66)	(-0.32)	(-0.41)	(-0.42)

Investment purpose (Job creation)			-0.0585	-0.0189	-0.0292	-0.00568	-0.0233	-0.00396
			(-0.32)	(-0.10)	(-0.16)	(-0.03)	(-0.13)	(-0.02)
Working capital to total assets				-0.0978**	-0.150***	-0.147***	-0.145***	-0.139***
				(-2.15)	(-3.01)	(-2.95)	(-2.92)	(-2.79)
Current assets to total assets				-0.487***	-0.451***	-0.375***	-0.358**	-0.375***
				(-3.83)	(-3.39)	(-2.68)	(-2.55)	(-2.67)
Current liabilities to total liabilities				0.0100	-0.204	-0.193	-0.200	-0.205
				(0.04)	(-0.79)	(-0.74)	(-0.76)	(-0.78)
Profit/loss account reserve to total assets				-0.0995***	-0.132***	-0.147***	-0.151***	-0.155***
				(-3.19)	(-3.55)	(-3.95)	(-4.04)	(-4.14)
Short and Long-term debt to total assets				0.343	-0.116	-0.114	-0.126	-0.141
				(1.40)	(-0.44)	(-0.43)	(-0.48)	(-0.53)
LN(Total Assets £m)					0.703***	0.724***	0.712***	0.686***
					(2.94)	(2.98)	(2.92)	(2.83)
LN(Total Assets) squared					-0.0260***	-0.0270***	-0.0265***	-0.0255**
					(-2.63)	(-2.70)	(-2.64)	(-2.55)
Indicator of charge on assets					-0.0278	0.00868	-0.0129	-0.00549
					(-0.18)	(0.06)	(-0.09)	(-0.04)
Indicator of no debt					-0.216**	-0.172	-0.158	-0.160
					(-2.00)	(-1.57)	(-1.44)	(-1.46)
Ex ante risk score					5.399***	4.108***	4.248***	4.228***
					(5.46)	(4.06)	(4.22)	(4.17)
Missing risk score					0.0640	0.179	0.208	0.202
					(0.30)	(0.82)	(0.96)	(0.93)
Constant	-3.338***	-3.463***	-7.606***	-7.434***	-10.48***	-10.86***	-11.19***	-11.27***
	(-52.79)	(-49.66)	(-3.65)	(-3.52)	(-4.33)	(-4.49)	(-4.64)	(-4.62)
Industry sector indicators	No	No	No	No	No	Yes	Yes	Yes
Regional indicators	No	No	No	No	No	No	Yes	Yes
Number of observations	13786	13786	13786	13786	13786	13786	13786	13786
Number of insolvencies	653	653	653	653	653	653	653	653
McFadden pseudo-R^2	0.0120	0.0203	0.0301	0.0418	0.0541	0.0658	0.0690	0.0726
Area under ROC curve (AUC)	0.579	0.611	0.645	0.669	0.695	0.707	0.711	0.715

Notes:

The table shows the estimation results for the insolvency prediction models using the covid period sample. The dependent variable is the indicator of the insolvent exit in the 3-year period from 1st of April 2020 to 31st of March 2023 (equals one if the company experienced an insolvent exit during the period and zero otherwise). The variables of interest are the indicator of the covid loan (equals one if the company has a loan under any of the three covid loan guarantee schemes and zero otherwise) and the interaction terms between the covid loan and the specific investor types. The models are estimated using logistic regression. The statistical significance is indicated with asterisks where the *, **, and *** denote significance at 10%, 5% and 1% significance levels. The corresponding t-statistics are computed using robust standard errors. The variables are defined in the Appendix in Table A1.

Table 5 Profile of the companies with a covid loan, an additional equity funding, and both the covid loan and additional funding (selection models)

Dependent variable	(1) Covid Loan Indicator	(2) Covid Loan Indicator	(3) Covid Loan Indicator	(4) Add. Funding Indicator	(5) Add. Funding Indicator	(6) Add. Funding Indicator	(7) Covid Loan + Add. Funding Indicator	(8) Covid Loan + Add. Funding Indicator	(9) Covid Loan + Add. Funding Indicator
Venture Capital (VC)	-0.461***	-0.150**	-0.123*	0.560***	0.130*	0.148**	0.0755	-0.0618	-0.0414
	(-8.84)	(-2.29)	(-1.84)	(11.04)	(1.91)	(2.14)	(1.15)	(-0.77)	(-0.51)
Business Angel (BA)	0.0553	0.118*	0.147**	0.588***	0.277***	0.251***	0.439***	0.236***	0.232***
	(0.98)	(1.79)	(2.22)	(10.78)	(4.09)	(3.63)	(6.61)	(3.03)	(2.93)
Crowd Funding (ECF)	0.396***	0.393***	0.307***	0.465***	0.0569	0.105	0.665***	0.338***	0.311***
	(6.26)	(5.10)	(3.90)	(7.42)	(0.69)	(1.26)	(9.46)	(3.81)	(3.45)
Government VC (GVC)	0.118	0.105	0.119	0.0480	0.112	0.0255	0.0670	0.0618	0.0682
	(1.59)	(1.26)	(1.36)	(0.68)	(1.25)	(0.26)	(0.75)	(0.60)	(0.62)
Foreign VC (FVC)	-0.940***	-0.592***	-0.496***	0.249***	-0.00501	-0.0876	-0.590***	-0.446***	-0.444***
	(-11.46)	(-6.52)	(-5.43)	(3.42)	(-0.06)	(-1.00)	(-5.63)	(-3.99)	(-3.94)
Venture Stage of Investment		0.310***	0.298***		-0.121**	-0.106*		0.145**	0.149**
		(6.39)	(6.04)		(-2.22)	(-1.91)		(2.36)	(2.39)
Growth Stage of Investment		0.0676	0.00311		-0.530***	-0.472***		-0.0801	-0.0774
		(0.78)	(0.04)		(-5.07)	(-4.47)		(-0.65)	(-0.62)
Established Stage of Investment		-0.102	-0.233**		-0.886***	-0.808***		-0.777***	-0.775***
		(-1.11)	(-2.48)		(-7.46)	(-6.64)		(-4.88)	(-4.82)
Number of Rounds		0.0561***	0.0721***		0.115***	0.103***		0.140***	0.138***
		(2.66)	(3.38)		(5.22)	(4.59)		(5.79)	(5.68)
Announced Deal		-0.124**	-0.0960		-0.104	-0.141**		-0.127	-0.135*
		(-2.03)	(-1.54)		(-1.53)	(-2.04)		(-1.60)	(-1.69)
LN(Total Investment)		0.903***	0.907***		0.736***	0.716***		1.744***	1.727***
		(6.10)	(6.08)		(4.60)	(4.44)		(7.70)	(7.61)
LN(Total Investment) squared		-0.0431***	-0.0421***		-0.0207***	-0.0211***		-0.0666***	-0.0661***
		(-7.21)	(-7.00)		(-3.34)	(-3.38)		(-7.64)	(-7.56)
Time from first deal (days)		-0.0000318	-0.0000484		-0.000343***	-0.000328***		-0.000312***	-0.000306***
		(-0.63)	(-0.95)		(-6.49)	(-6.10)		(-5.13)	(-4.98)
Time from last deal (days)		-0.000339***	-0.000340***		-0.00145***	-0.00145***		-0.00115***	-0.00115***
		(-6.44)	(-6.36)		(-20.08)	(-19.97)		(-13.96)	(-13.82)
Investment purpose (R&D)		-0.365***	-0.297***		0.169*	0.144		-0.250**	-0.222**
		(-3.91)	(-3.17)		(1.85)	(1.56)		(-2.36)	(-2.07)
Investment purpose (Job creation)		0.329***	0.311***		0.0178	0.0235		0.232**	0.220**
		(3.65)	(3.40)		(0.19)	(0.25)		(2.30)	(2.16)
Working capital to total assets		-0.117***	-0.114***		0.142***	0.136***		0.0228	0.0196
		(-4.62)	(-4.44)		(5.02)	(4.76)		(0.68)	(0.58)
Current assets to total assets		-0.159**	-0.133*		-0.0205	-0.0167		-0.217**	-0.200**
		(-2.34)	(-1.91)		(-0.26)	(-0.21)		(-2.45)	(-2.22)
Current liabilities to total liabilities		0.912***	0.881***		-0.0130	0.0651		0.335**	0.375**
		(7.29)	(6.91)		(-0.09)	(0.45)		(2.06)	(2.29)
Profit/loss account reserve to total assets		0.0738***	0.0534***		-0.0752***	-0.0654***		-0.0516***	-0.0557***
		(4.65)	(3.31)		(-4.36)	(-3.77)		(-2.59)	(-2.77)

Short and Long-term debt to total assets		0.709***	0.683***		-0.0201	0.0476		0.174	0.209
		(5.30)	(5.02)		(-0.13)	(0.31)		(1.02)	(1.22)
LN(Total Assets £m)		1.678***	1.682***		0.189*	0.186*		0.815***	0.806***
		(12.02)	(11.86)		(1.88)	(1.81)		(4.07)	(4.01)
LN(Total Assets) squared		-0.0674***	-0.0678***		-0.00500	-0.00419		-0.0324***	-0.0317***
		(-12.03)	(-11.93)		(-1.21)	(-1.00)		(-4.02)	(-3.92)
Indicator of charge on assets		0.471***	0.463***		-0.103	-0.0801		0.264***	0.270***
		(6.12)	(5.94)		(-1.20)	(-0.92)		(2.83)	(2.89)
Indicator of no debt		-0.762***	-0.706***		0.136**	0.0950		-0.339***	-0.331***
		(-15.46)	(-14.07)		(2.39)	(1.64)		(-5.30)	(-5.11)
Ex ante risk score		4.197***	2.616***		1.287*	1.631**		3.199***	2.432***
		(5.67)	(3.50)		(1.77)	(2.16)		(4.03)	(2.99)
Missing risk score		-0.201**	-0.252***		0.0974	0.151		-0.0975	-0.0667
		(-2.15)	(-2.64)		(0.97)	(1.48)		(-0.81)	(-0.54)
Constant	-0.0945***	-14.97***	-15.19***	-0.907***	-7.203***	-7.322***	-1.694***	-17.21***	-17.35***
	(-4.66)	(-13.98)	(-14.08)	(-40.86)	(-7.05)	(-7.11)	(-61.13)	(-10.79)	(-10.91)
Industry sector indicators	No	No	Yes	No	No	Yes	No	No	Yes
Regional indicators	No	No	Yes	No	No	Yes	No	No	Yes
Number of observations	13786	13786	13786	13786	13786	13786	13786	13786	13786
Companies with covid loan/funding/both	6234	6234	6234	4756	4756	4756	2356	2356	2356
McFadden pseudo-R^2	0.0213	0.114	0.130	0.0303	0.235	0.246	0.0136	0.145	0.149
Area under ROC curve (AUC)	0.569	0.722	0.738	0.591	0.820	0.825	0.564	0.769	0.773

Notes:

The table shows the estimation results for the models quantifying differences between various groups of companies using the covid period sample. In models 1-3 the dependent variable is the indicator of covid loan (equals one if the company has a loan under any of the three covid loan guarantee schemes and zero otherwise). In models 4-6 the dependent variable is the indicator of additional equity funding in the 3-year period from 1st of April 2020 to 31st of March 2023 (equals one if the company received the additional equity funding, and zero otherwise). In models 7-9 the dependent variable is the indicator of both the covid loan and additional equity funding. The models are estimated using logistic regression. The statistical significance is indicated with asterisks where the *, **, and *** denote significance at 10%, 5% and 1% significance levels. The corresponding z-statistics are computed using robust standard errors. The variables are defined in the Appendix in Table A1.

Table 6 Selection

	Heckman selection model			Matching			
	1st stage	2nd stage		Without replacement		With replacement	
Dependent variable	Covid Loan	Insolvency	Insolvency	Insolvency	Insolvency	Insolvency	Insolvency
Covid Loan		0.0811**	0.0970***	0.419***	0.585***	0.296***	0.387***
		(2.41)	(2.82)	(3.95)	(4.56)	(3.43)	(3.85)
Covid Loan x Venture Capital			0.0130		0.129		0.190
			(1.20)		(0.47)		(0.78)
Covid Loan x Business Angel			-0.0344***		-0.742***		-0.558**
			(-3.00)		(-2.63)		(-2.12)
Covid Loan x Crowd Funding			0.00131		-0.0942		-0.202
			(0.10)		(-0.33)		(-0.84)
Covid Loan x Government VC			-0.0333**		-0.825**		-0.335
			(-2.22)		(-2.03)		(-0.82)
Covid Loan x Foreign VC			0.0179		-0.155		-0.0653
			(1.02)		(-0.34)		(-0.14)
Instrument	1.573***						
	(5.73)						
Inverse Mills Ratio (lambda)		-0.0387*	-0.0463**				
		(-1.88)	(-2.20)				
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13786	13786	13786	9932	9932	12408	12408

Notes:

The table shows the relevant results for the models that take potential non-random selection into account. Firstly, we use Heckman two-stage selection approach. In the first step, we estimate probit model where the dependent variable is the covid loan. Here, following Bertoni et al. (2023), we use number of guaranteed loans divided by number of companies in each region. In the second stage, we include the inverse Mills ratios into the linear probability controlling for potential self-selection. The inverse Mills ratios were computed using the predicted values based on the probit model. The full set of control variables is included but not reported for the sake of brevity. Secondly, we present the main estimation results for the models re-estimated using the matched samples. We used coarsened exact matching with and without replacement, employing the variables

that exhibited significant differences in means (measured by Rubin's B) between the companies with and without covid loans. The statistical significance of the individual estimated coefficients is based on robust standard errors and is indicated with asterisks (*, **, and *** denote statistical significance at 10%, 5%, and 1% level, respectively). The variables are defined in Appendix in Table A1.

Supplementary Appendix

Table A1 Definition of variables

	Definition	Source
Main dependent variables		
Insolvency	Equals unity if the company exited via insolvency during the observation window, i.e., between 1/4/2020 and 31/3/2023 (or between 1/4/2017 and 31/3/2020 for companies in the historical control sample)	Office for National Statistics
Loan default	Equals unity if a company defaulted on a covid loan and the government guarantee has been demanded, zero otherwise	IMS
Main independent variables		
Covid period indicator	Equals unity if the observation is on a company entering the covid period, zero otherwise	Own computation
Covid loan indicator	Equals unity if a company has at least one covid loan, zero otherwise	IMS
Investor type variables		
Venture Capital (VC)	Equals unity if the company has a venture capital investor, zero otherwise	Beauhurst
Business Angel (BA)	Equals unity if the company has a business angel investor, zero otherwise	Beauhurst
Crowd Funding (ECF)	Equals unity if the company has a crowd funding investor, zero otherwise	Beauhurst
Government VC (GVC)	Equals unity if the company has a government VC investor, zero otherwise	Beauhurst
Foreign VC (FVC)	Equals unity if the company has an equity investor based outside of the UK, zero otherwise	Beauhurst
Equity deals variables		
Seed Stage of Investment	Equals unity if the company was in the seed stage of evolution at the time of the last equity deal before the 31/3/2020 (or 31/3/2017 for companies in the historical control sample), zero otherwise	Beauhurst
Venture Stage of Investment	Equals unity if the company was in the venture stage of evolution at the time of the last equity deal before the 31/3/2020 (or 31/3/2017 for companies in the historical control sample), zero otherwise	Beauhurst
Growth Stage of Investment	Equals unity if the company was in the growth stage of evolution at the time of the last equity deal before the 31/3/2020 (or 31/3/2017 for companies in the historical control sample), zero otherwise	Beauhurst
Established Stage of Investment	Equals unity if the company was in the establishes stage of evolution at the time of the last equity deal before the 31/3/2020 (or 31/3/2017 for companies in the historical control sample), zero otherwise	Beauhurst
Number of Rounds	Number of rounds of equity funding into the company	Beauhurst
Announced Deal	Equals unity if any of the equity deal has been publicly announced, zero otherwise	Beauhurst
LN(Total Investment)	Logarithm of total sum (in £) of all equity funding deals	Beauhurst
LN(Total Investment) squared	Logarithm of total sum of all equity funding deals squared	Beauhurst
Time from First Deal (days)	Time in days from the first equity deal to the 31st of March 2020 (or 31/3/2017 for the companies in the historical control sample)	Beauhurst
Time from Last Deal (days)	Time in days from the last equity deal to the 31st of March 2020 (or 31/3/2017 for the companies in the historical control sample)	Beauhurst
Investment Purpose (R&D)	Equals unity if at least one equity deal was ear-marked for the research and development purpose, zero otherwise	Beauhurst
Investment Purpose (Job creation)	Equals unity if at least one equity deal was ear-marked for the job creation purpose, zero otherwise	Beauhurst
Firm financial ratios		
Working Capital to Total Assets	Financial ratio, net working capital divided by total assets, winsorised at the 5th and the 95th percentile	Creditsafe
Current Assets to Total Assets	Financial ratio, current assets divided by total assets, winsorised at the 5th and the 95th percentile	Creditsafe
Current Liabilities to Total Liabilities	Financial ratio, current liabilities divided by total liabilities, winsorised at the 5th and the 95th percentile	Creditsafe
Short and Long-term Debt to Total Assets	Financial ratio, short- and long-term debt divided by total assets, winsorised at the 5th and the 95th percentile	Creditsafe

Profit/Loss Account Reserve to Total Assets	Financial ratio, profit or loss account reserve divided by total assets, winsorised at the 5th and the 95th percentile	Creditsafe
Firm non-financial variables		
LN(Total Assets)	Logarithm of total assets (in £)	Creditsafe
LN(Total Assets) squared	Equals to the logarithm of total assets squared	Creditsafe
Indicator of Charge on Assets	Equals unity if the company has at least one creditors' charge on assets, zero otherwise	Creditsafe
Indicator of No Debt	Equals unity if the company has no debt, i.e., the short- and long-term debt are equal to zero, zero otherwise	Creditsafe
Ex-ante Risk Score	Insolvency risk score computed using information from the last available accounts on or before the 31/3/2020 (or 31/3/2017 for companies in the historical control sample). Details are presented in Appendix in Table A2. If the risk score is not available /company was not risk-rated, it is set to zero.	Own computation
Missing Risk Score	Equals unity if the company has not been risk rated, i.e., does not have an ex ante risk score, zero otherwise	Own computation
Industry sector		
Sector (Media)	Equals unity if the company is operating in the media top level sector, zero otherwise	Beauhurst
Sector (Industrial)	Equals unity if the company is operating in the industrial top level sector, zero otherwise	Beauhurst
Sector (Infrastructure)	Equals unity if the company is operating in the infrastructure top level sector, zero otherwise	Beauhurst
Sector (Retail)	Equals unity if the company is operating in the retail top level sector, zero otherwise	Beauhurst
Sector (Crafts)	Equals unity if the company is operating in the crafts top level sector, zero otherwise	Beauhurst
Sector (Leisure)	Equals unity if the company is operating in the leisure top level sector, zero otherwise	Beauhurst
Sector (Supply Chain)	Equals unity if the company is operating in the supply chain top level sector, zero otherwise	Beauhurst
Sector (Professional services)	Equals unity if the company is operating in the professional services top level sector, zero otherwise	Beauhurst
Sector (Trades)	Equals unity if the company is operating in the trades top level sector, zero otherwise	Beauhurst
Sector (Personal services)	Equals unity if the company is operating in the personal services top level sector, zero otherwise	Beauhurst
Sector (Technology)	Equals unity if the company is operating in the technology top level sector, zero otherwise	Beauhurst
Sector (Energy)	Equals unity if the company is operating in the energy top level sector, zero otherwise	Beauhurst
Region		
East Midlands	Equals unity if the company is based in the East Midlands region, zero otherwise	Beauhurst
East of England	Equals unity if the company is based in the East of England region, zero otherwise	Beauhurst
London	Equals unity if the company is based in the London region, zero otherwise	Creditsafe
North East	Equals unity if the company is based in the North East region, zero otherwise	Creditsafe
North West	Equals unity if the company is based in the North West region, zero otherwise	Creditsafe
Scotland	Equals unity if the company is based in the Scotland region, zero otherwise	Creditsafe
South East	Equals unity if the company is based in the South East region, zero otherwise	Creditsafe
South West	Equals unity if the company is based in the South West region, zero otherwise	Creditsafe
Wales	Equals unity if the company is based in the Wales region, zero otherwise	Creditsafe
West Midlands	Equals unity if the company is based in the West Midlands region, zero otherwise	Creditsafe
Yorkshire and The Humber	Equals unity if the company is based in the Yorkshire and The Humber region, zero otherwise	Creditsafe

Notes:

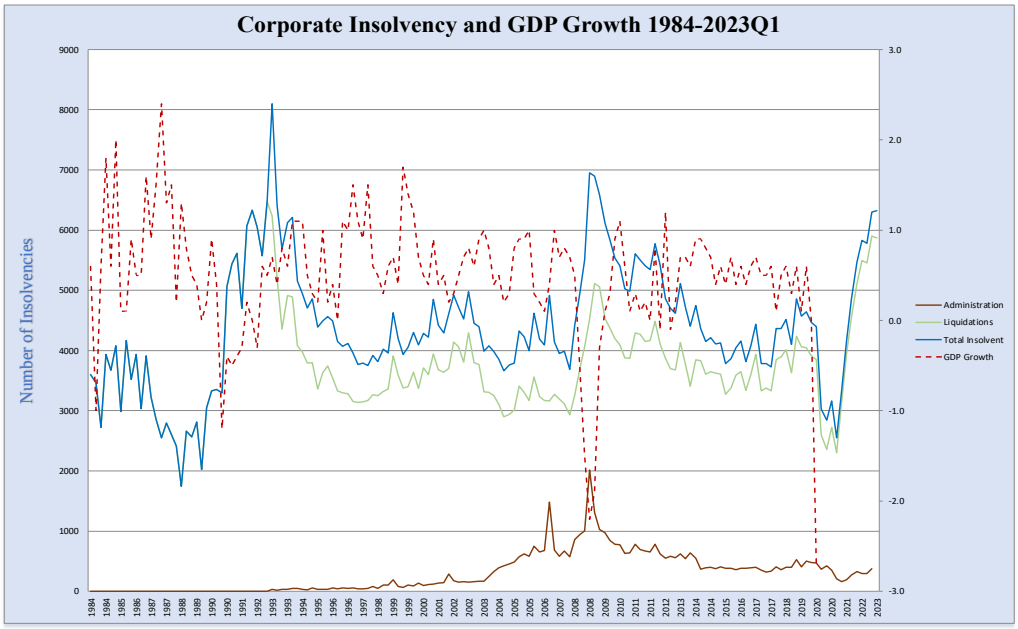
The table shows definition of each variable used in the study. The last column shows the source of the key data items needed to generate each variable. IMS stands for Information Management System of the Covid loan guarantee scheme.

Appendix A2 – Investment and insolvencies patterns

In this section we provide some background on equity finance investment activity in UK up to the end of our sample period 2023Q1 and the trends in company bankruptcies based on official statistics and firm level records. The latter are used to indicate the insolvent exit of each registered company in the company data panel database discussed later [1].

Aggregate company insolvencies (1980's to 2020) along with GDP growth are presented in Figure 1. Insolvencies are generally counter cyclical where increases in insolvencies coincide with, or lag periods of contraction (negative growth) e.g. the financial crisis 2008. Insolvent exits can be viewed as part of the competitive process, 'creative destruction', that removes the inefficient and non-viable businesses from the economy such that resources are reallocated to the more efficient, innovative, and growing businesses that take their place. However, in the early covid period, the pattern differs, insolvencies drop below 'normal' levels after the severe contraction. A sizeable 'insolvency gap', the survival of non-viable businesses, is apparent through 2020 and into Spring/Summer 2021 primarily coinciding with the introduction of the covid loan guarantee schemes (March 2020 to March 2021) and the other policy interventions (Wilson et al., 2023). This is followed, however, a sharp increase in insolvencies in the period to 2023Q1.

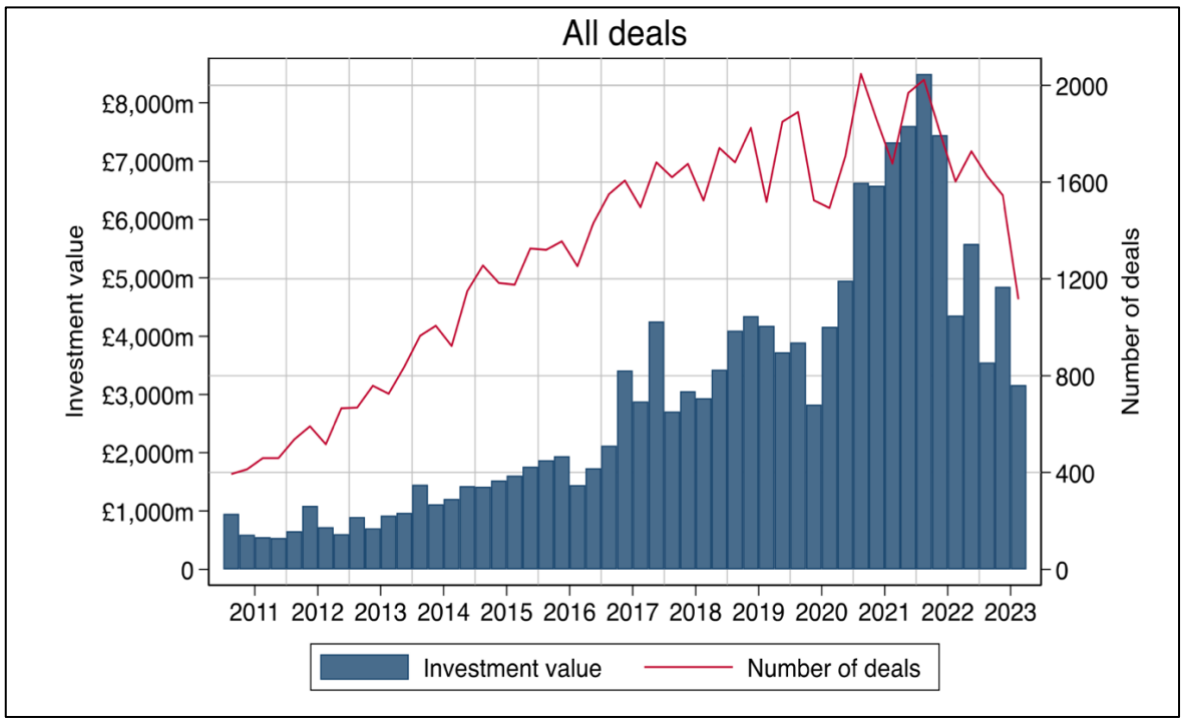
Figure 1 Corporate Insolvencies and GDP Growth



Overall investment activity of equity providers is shown in Figure 2 (Kacer et al., 2023). The deal data includes 66,748 deal-level observations over the period from 2011 to 2023Q4. In the pre-pandemic period up to and during 2020 equity investments showed strong growth in both the number of deals and the total investment volume in all investment stages reaching nearly £3.9bn of investment. Both the number of deals and the investment volume dropped somewhat in the second quarter of 2020 as the pandemic and lockdown impacted but investment recovered quickly and reached an overall record quarterly maximum in the total investment of over £8.5bn in the first quarter of 2022. The last two quarters of 2022, however, witness a sharp decline in investment in terms of both deal value and the number of deals, and the trend of gradual decrease continued till the end of the sample period in the third quarter of 2023.

[1] Bankruptcies (or insolvencies) arise when a company is unable to pay its creditors and are categorised as liquidations (compulsory (CL) or creditors voluntary (CVL)), and receiverships. Administrations and Creditors Voluntary Arrangements (CVA).

Figure 2 Equity Finance Deals 2011-2023Q4



Of particular interest in the pandemic is a marked overall increase in the average deal value driven, predominantly, by investors focusing on their later stage investments, higher rounds and announced investments. Because of the short-term pressures on equity finance markets (Gompers et al., 2021; Gompers et al., 2020; Cumming & Reardone, 2022) and investor uncertainty (British Business Bank, 2020), follow-on funding for early-stage ventures was in short supply and the Covid period saw a shift in funding priority aimed at protecting later stage investments. Nanda & Rhodes-Kropf (2013) confirmed that, generally, in downturns and periods of uncertainty, VCs choose to consolidate investments in their established ventures and away from new innovations. This shift in the pattern of investment has consequences for earlier stage equity financed companies that did not have an 'active' VC investor as a shareholder. Brown et al. (2020) analysing UK equity deals on Crunchbase noted that the decline in equity investments in the early stages of Covid-19 was particularly pronounced in seed finance, crucial for nascent start-ups. These ventures, the authors suggest, faced the greatest obstacles in obtaining finance during the crisis. Such firms likely sought alternative sources of finance and had a new opportunity for financing with the roll out of the guaranteed loan schemes.

British Business Bank (2020) https://www.british-businessbank.co.uk/wp-content/uploads/2020/06/British-Business-Bank-Small-Business-Equity-Tracker-2020-Report.pdf

Brown, R., Rocha, A., & Cowling, M. (2020). Financing entrepreneurship in times of crisis: exploring the impact of COVID-19 on the market for entrepreneurial finance in the United Kingdom. *International Small Business Journal*, 38(5), 380-390.

Cumming, D., & Reardon, R. S. (2022). COVID-19 and Entrepreneurial Processes in U.S. Equity Crowdfunding. *Journal of Small Business Management*.

Gompers, P.A., Gornall, W., Kaplan, S.N., & Strebulaev, I.A. (2020). How do venture capitalists make decisions? *Journal of Financial Economics*, 135(1),169–90. https://doi.org/10.1016/j.jfineco.2019.06.011

Gompers, P., Gornall, W., Kaplan, S.N., & Strebulaev, I.A. (2021). Venture Capitalists and COVID-19. *Journal of Financial and Quantitative Analysis*, 56(7): 2474-2499. https://dx.doi.org/10.2139/ssrn.3669345

Kacer, M., & Wilson, N. (2023). Supporting Innovative Start-Up and Growing Businesses: Equity Finance Provision through the Pandemic: Interim Report (March 23, 2023). *Leeds University Business School Working Paper*, Available at SSRN: https://ssrn.com/abstract=4456252 or http://dx.doi.org/10.2139/ssrn.4456252

Nanda, R., & Rhodes-Kropf, M. (2017). Financial risk and innovation. *Management Science* 63(4) 901-918. https://doi.org/10.1287/mnsc.2015.2350

Wilson, N., Kacer, M., & Cowling, M. (2023). Creative Destruction in a Crisis: Analysis of COVID Loan Schemes and Company Insolvency (September 1, 2023). Available at SSRN: https://ssrn.com/abstract=4589327 or http://dx.doi.org/10.2139/ssrn.4589327

Appendix A3 – Risk score models

The models employed for the ex-ante risk score calculation are presented in Table A3. The model specifications follow the relevant literature related to failure prediction models for SMEs (Altman, Sabato and Wilson, 2010). It is demonstrated in this stream of literature that the failure prediction models for SMEs comprising only financial variables (ratios) obtained from the publicly reported financial accounts are not sufficient to predict the financial situation of these companies reliably. This is because the scope of reported financial information, i.e., the set of balance sheet and profit and loss statement items, is relatively limited. Moreover, the financial accounts of smaller companies are not audited by external auditor and hence may not be reliable. In this situation, non-financial variables related to both company and industry sector convey vitally important additional information.

In our model, we use the financial variables computed using information reported even by the smallest companies: working capital to total assets, current assets to total assets, current liabilities to total liabilities, profit and loss account reserve to total assets, net worth to total assets, long-term liabilities to total assets and the change in net worth from previous year. Moreover, we include the indicator of reported non-zero cash (abridged accounts) and the indicator of reported pre-tax profit (full accounts). Then, we add the non-financial company-related information: natural logarithm of age, indicator of the risky age from 3 to 8 years, natural logarithm of board size and natural logarithm of total assets as a proxies of complexity and size, indicator of large company (real total assets higher than £12.9 million), indicator of being audited, indicator of modified auditor report (going concern or severe), indicator of charges on assets, number of late filing days, indicator of being a subsidiary company, indicator of a change in the number of directors, and indicator of a change in shareholders. Industry sector related information is included in the model in the form of indicators of 14 most populated sectors, to control for differences in baseline failure rates.

The dependent variable is an indicator of insolvent exit in the following 3 years after the submission of financial accounts. We estimated the coefficients for two estimation periods. We included relatively long periods allowed by our dataset covering all phases of business cycle. Thus, the predicted probabilities represent relatively stable through-the-cycle probability of default. The first model is estimated for observations covering the financial accounts covering accounting periods ending from 1998 to 2013. The observations are marked as insolvent if the exit occurred in the following three years after the financial year end and at the same time it is the last financial accounts before the exit. Thus, the model covers the exits until the end of 2016.[2] The second model is estimated for the observations covering accounts ending from 1998 to 2016. Similarly, the dependent variable covers exits until the end of 2019. Since it is well-known that the predicted probabilities from the logistic regression reflect the failure rate in the estimation period, to facilitate consistency between the risk score from the two periods the predicted score were calibrated to the same baseline failure rate of 1%.

The estimated coefficients for the failure prediction models are presented in Table A1. The first model was estimated using observations from 1998 to 2013 and was employed to predict the risk scores for the pre-covid period, i.e., for financial accounts ending between the 1st of April 2014 and the 31st of March 2017. The second model was estimated using observations from 1998 to 2016 and was employed to predict the risk scores for the covid period, i.e., for financial accounts ending between the 1st of April 2017 and the 31st of March 2020. The estimated coefficients for all variables in both models are strongly statistically significant and are consistent with expectations.

More specifically, working capital to total assets and ratio of current assets to total assets are associated with higher probability of failure. While this seems counter-intuitive, at first, since both are proxies of

[2] The predicted risk scores from this model will be used as a control variable – proxy for ex-ante probability of default – in the models covering the pre-covid period where the defaults will occur from the second quarter of 2017 to the first quarter of 2020. Since the risk score represent information about defaults only until the end of 2016, there will be no "information leak" that could potentially result in endogeneity due to reverse causality between the dependent variable – defaults in from 2017q2 to 2020q1 – and the risk score.

liquidity, the current assets are composed of three main components (cash, trade debt and inventories) with very different level of liquidity and behaviour. The positive coefficients for these two variables seem to be driven by less liquid components such as trade debt or inventories[3]. The proxies for leverage such as current liabilities to total liabilities and long-term liabilities to total assets are positively associated with failure probability, too. On the other hand, higher profitability (profit and loss account reserve to total assets), higher proportion of net worth to total assets, or increase in net worth are associated with lower failure rates. The indicators of non-zero cash and non-missing pre-tax profit attract negative sign. This means, that companies reporting richer financial information are less likely to fail, all else equal.

The coefficients of the non-financial variables suggest that older companies are less likely to fail, but there is usual risky age between 3 and 8 years, when the companies are more vulnerable (see Altman et al., 2010 for more detailed explanation). Companies with more directors are less likely to fail. On the other hand, the size is associated with the failure in the non-linear way in that the bigger companies are more likely to fail, but if the companies are very large, they are less likely to fail. The accounts of externally audited companies are more reliable and therefore these companies are less likely to fail. However, if the auditor issues a modified report with more serious comments, such companies are more likely to fail. So are the companies with charges of assets or late filing days. Subsidiaries are again less likely to fail. Finally, changes in board or shareholders' composition are likely associated with increased uncertainty leading companies to increased likelihood of failure.

Altman, E., Sabato, G., & Wilson, N. (2010). The value of non-financial information in small and medium-sized enterprise risk management, *Journal of Credit Risk.* 6, 1-33. https://doi.org/10.21314/JCR.2010.110

[3] Due to minimalistic requirements for small companies in the UK majority companies in our sample report just figures for current assets and not for their components.

Table A3 Estimation results for the failure prediction models used to predict ex-ante risk scores

	(1)	(2)
	Insolvent exit	Insolvent exit
Working capital to total assets	0.168***	0.134***
Current assets to total assets	0.363***	0.463***
Current liabilities to total liabilities	1.268***	1.288***
P&L account reserve to total assets	-0.841***	-0.782***
Net worth to total assets	-0.700***	-0.578***
Long-term liabilities to total assets	0.667***	0.738***
Change in net worth	-0.186***	-0.184***
Non-zero cash	-0.424***	-0.416***
Non-missing pre-tax profit	-0.0357***	-0.0487***
Age in years (log)	-0.154***	-0.159***
Indicator of age from 3 to 8 years	0.0384***	0.0752***
Size of board (log)	-0.425***	-0.407***
Total assets (log)	0.420***	0.418***
Indicator of large company	-1.777***	-1.838***
Indicator of being audited	-0.269***	-0.294***
Audit qualification (going concern or severe)	0.957***	0.986***
Indicator of charges on assets	0.594***	0.573***
Late filing days	0.00469***	0.00518***
Indicator of subsidiary company	-0.556***	-0.509***
Board change	0.415***	0.401***
Share change	0.247***	0.213***
Constant	-10.52***	-10.58***
Observations	16,945,251	22,705,814
Industry fixed effects	Yes	Yes
Estimation period	1998-2013	1998-2016
McFadden pseudo-R2	0.118	0.107
AUC (estimation sample)	0.809	0.795

* p<.1, ** p<.05, *** p<.01

Notes:

The table shows estimation results for failure prediction models. The models were estimated using logistic regression. The dependent variable in the model is the indicator of insolvent exit (administration or liquidation) within three years after financial year end. The unit of analysis is the company-year. The first model is estimated using period from 1998 to 2013, the second model is estimated for years 1998-2016. The asterisks denote the statistical significance of the estimated coefficients at usual significance levels (* 10%, ** 5%, *** 1%).

Appendix A4 – Impact of additional equity funding on insolvency

Table A4 Insolvency prediction models (with added indicator of additional equity funding during the first year of covid)

	(1) Insolvency	(2) Insolvency	(3) Insolvency	(4) Insolvency	(5) Insolvency	(6) Insolvency	(7) Insolvency	(8) Insolvency
Covid Loan Indicator	1.050***	0.935***	0.886***	1.108***	1.180***	1.072***	1.021***	1.195***
	(10.41)	(8.59)	(8.04)	(8.00)	(10.00)	(8.57)	(8.10)	(8.04)
Additional Funding Indicator	0.137	-0.121	-0.0854	-0.0812	0.475***	0.226	0.257	0.189
	(1.28)	(-1.05)	(-0.74)	(-0.70)	(2.65)	(1.20)	(1.35)	(1.00)
Covid Loan X Additional Funding					-0.499**	-0.509**	-0.502**	-0.399*
					(-2.24)	(-2.27)	(-2.22)	(-1.76)
Venture Capital (VC)	0.204	0.0605	0.0795	0.119	0.205	0.0626	0.0829	0.101
	(1.55)	(0.39)	(0.51)	(0.53)	(1.55)	(0.40)	(0.53)	(0.45)
Business Angel (BA)	0.0741	-0.0417	-0.0292	0.382*	0.0710	-0.0417	-0.0283	0.364*
	(0.55)	(-0.28)	(-0.20)	(1.83)	(0.53)	(-0.29)	(-0.19)	(1.73)
Crowd Funding (ECF)	0.675***	0.524***	0.483***	0.629***	0.684***	0.531***	0.490***	0.612**
	(5.31)	(3.24)	(2.95)	(2.61)	(5.37)	(3.29)	(2.99)	(2.56)
Government VC (GVC)	-0.0949	-0.0425	-0.103	0.226	-0.0983	-0.0490	-0.105	0.212
	(-0.49)	(-0.21)	(-0.48)	(0.78)	(-0.51)	(-0.24)	(-0.49)	(0.73)
Foreign VC (FVC)	0.0883	-0.0737	0.000887	-0.0991	0.0814	-0.0750	-0.00101	-0.0969
	(0.46)	(-0.35)	(0.00)	(-0.35)	(0.42)	(-0.36)	(-0.00)	(-0.34)
Covid Loan x Venture Capital				-0.105				-0.0718
				(-0.38)				(-0.26)
Covid Loan x Business Angel				-0.731***				-0.700**
				(-2.66)				(-2.54)
Covid Loan x Crowd Funding				-0.257				-0.225
				(-0.93)				(-0.82)
Covid Loan x Government VC				-0.605				-0.584
				(-1.51)				(-1.46)
Covid Loan x Foreign VC				0.162				0.166
				(0.40)				(0.41)
Venture Stage of Investment		-0.0599	-0.0377	-0.0346		-0.0555	-0.0333	-0.0316
		(-0.49)	(-0.31)	(-0.28)		(-0.45)	(-0.27)	(-0.26)
Growth Stage of Investment		0.108	0.109	0.102		0.115	0.115	0.108
		(0.54)	(0.54)	(0.50)		(0.57)	(0.57)	(0.53)
Established Stage of Investment		-0.882***	-0.927***	-0.907***		-0.877***	-0.920***	-0.903***
		(-2.61)	(-2.71)	(-2.65)		(-2.59)	(-2.69)	(-2.64)
Number of Rounds		0.0796*	0.0914**	0.0934**		0.0790*	0.0910**	0.0926**
		(1.84)	(2.08)	(2.12)		(1.84)	(2.08)	(2.11)
Announced Deal		-0.0525	-0.0655	-0.00994		-0.0523	-0.0659	-0.0122
		(-0.33)	(-0.42)	(-0.06)		(-0.33)	(-0.42)	(-0.08)
LN(Total Investment)		0.270	0.320	0.380		0.299	0.350	0.401
		(0.72)	(0.85)	(0.99)		(0.79)	(0.92)	(1.03)
LN(Total Investment) squared		-0.00660	-0.00801	-0.0104		-0.00760	-0.00904	-0.0111
		(-0.44)	(-0.54)	(-0.68)		(-0.50)	(-0.60)	(-0.72)

Time from first deal (days)		-0.000302**	-0.000317***	-0.000321***		-0.000303**	-0.000318***	-0.000322***
		(-2.49)	(-2.59)	(-2.62)		(-2.50)	(-2.60)	(-2.63)
Time from last deal (days)		0.0000531	0.0000622	0.0000666		0.0000634	0.0000727	0.0000737
		(0.40)	(0.47)	(0.50)		(0.48)	(0.55)	(0.55)
Investment purpose (R&D)		-0.239	-0.198	-0.219		-0.252	-0.215	-0.230
		(-1.08)	(-0.90)	(-1.00)		(-1.14)	(-0.98)	(-1.05)
Investment purpose (Job creation)		0.0393	0.0428	0.0665		0.0464	0.0506	0.0695
		(0.19)	(0.21)	(0.33)		(0.23)	(0.25)	(0.35)
Working capital to total assets		-0.0945	-0.0959*	-0.0891		-0.0967*	-0.0983*	-0.0918
		(-1.63)	(-1.65)	(-1.53)		(-1.66)	(-1.69)	(-1.57)
Current assets to total assets		-0.459***	-0.393**	-0.412**		-0.465***	-0.400**	-0.415**
		(-2.94)	(-2.40)	(-2.51)		(-2.96)	(-2.43)	(-2.52)
Current liabilities to total liabilities		-0.267	-0.279	-0.288		-0.285	-0.297	-0.302
		(-0.91)	(-0.94)	(-0.97)		(-0.97)	(-1.01)	(-1.02)
Profit/loss account reserve to total assets		-0.135***	-0.146***	-0.150***		-0.137***	-0.148***	-0.152***
		(-3.17)	(-3.44)	(-3.53)		(-3.22)	(-3.48)	(-3.56)
Short and Long-term debt to total assets		-0.115	-0.139	-0.157		-0.136	-0.158	-0.171
		(-0.39)	(-0.46)	(-0.52)		(-0.45)	(-0.53)	(-0.57)
LN(Total Assets £m)		0.595**	0.604**	0.571**		0.573**	0.583**	0.558**
		(2.31)	(2.30)	(2.19)		(2.23)	(2.23)	(2.14)
LN(Total Assets) squared		-0.0225**	-0.0229**	-0.0217*		-0.0217**	-0.0223**	-0.0213*
		(-2.05)	(-2.06)	(-1.95)		(-1.98)	(-2.00)	(-1.91)
Indicator of charge on assets		-0.0633	-0.0479	-0.0365		-0.0548	-0.0401	-0.0314
		(-0.36)	(-0.27)	(-0.21)		(-0.31)	(-0.23)	(-0.18)
Indicator of no debt		-0.108	-0.0653	-0.0666		-0.111	-0.0675	-0.0681
		(-0.86)	(-0.52)	(-0.53)		(-0.88)	(-0.53)	(-0.54)
Ex ante risk score		4.946***	4.010***	4.015***		4.892***	3.952***	3.965***
		(4.67)	(3.69)	(3.65)		(4.59)	(3.61)	(3.59)
Missing risk score		0.0681	0.213	0.212		0.0639	0.208	0.208
		(0.28)	(0.86)	(0.85)		(0.26)	(0.84)	(0.84)
Constant	-4.044***	-9.567***	-10.21***	-10.52***	-4.135***	-9.702***	-10.35***	-10.62***
	(-45.49)	(-3.99)	(-4.25)	(-4.30)	(-40.08)	(-4.03)	(-4.28)	(-4.32)
Industry sector indicators	No	No	Yes	Yes	No	No	Yes	Yes
Regional indicators	No	No	Yes	Yes	No	No	Yes	Yes
Number of observations	13628	13628	13628	13628	13628	13628	13628	13628
Number of insolvencies	495	495	495	495	495	495	495	495
McFadden pseudo-R^2	0.0370	0.0662	0.0767	0.0800	0.0382	0.0674	0.0778	0.0807
Area under ROC curve (AUC)	0.655	0.718	0.729	0.733	0.657	0.720	0.730	0.734

Notes:

The table shows the estimation results for the insolvency prediction models using the covid period sample. The dependent variable is the indicator of the insolvent exit in the 2-year period from 1st of April 2021 to 31st of March 2023 (equals one if the company experienced an insolvent exit during the period and zero otherwise). The variables of interest are the indicator of the covid loan (equals one if the company has a loan under any of the three covid loan guarantee schemes and zero otherwise) and the interaction terms between the covid loan and the specific investor types. The indicator of additional funding refers to the additional equity funding in the 1-year period from 1st of April

2020 to 31st of March 2021 (equals one if the company received the additional equity funding, and zero otherwise). The companies that became insolvent from the 1-year period from 1st of April 2020 to 31st of March 2021 were excluded from the estimation sample. The models are estimated using logistic regression. The statistical significance is indicated with asterisks where the *, **, and *** denote significance at 10%, 5% and 1% significance levels. The corresponding t-statistics are computed using robust standard errors. The variables are defined in the Appendix in Table A1.

Appendix A5 – Frequencies of individual investor types and take-up of COVID loans (COVID period sample)

Table A5 Cross tabulation between specific investor types and COVID loans

	Covid loan		
	No	Yes (BBLS)	Total
Venture Capital (VC)	1,759	843 (733)	2,602
Business Angel (BA)	1,107	767 (674)	1,874
Crowd Funding (ECF)	553	629 (573)	1,182
Government VC (GVC)	501	402 (329)	903
Foreign VC (FVC)	848	231 (201)	1,079
Total	7,552	6,234 (5,319)	13,786

Notes:
The BBLS indicates a company with COVID loan issued under Bounce Back Loan Scheme.

Appendix A6 – Impact of additional equity funding on insolvency

Table A6 Insolvency prediction models (with added interaction between the covid loan and BBLS indicator)

	(1) Insolvency	(2) Insolvency	(3) Insolvency	(4) Insolvency	(5) Insolvency	(6) Insolvency	(7) Insolvency	(8) Insolvency
Covid Loan Indicator	0.113	0.144	0.168	0.263	0.0977	0.00811	-0.00378	0.154
	(0.62)	(0.78)	(0.90)	(1.38)	(0.50)	(0.04)	(-0.02)	(0.74)
Covid Loan x BBLS	0.599***	0.552***	0.532***	0.409**	0.440**	0.472**	0.476**	0.487**
	(3.31)	(3.04)	(2.88)	(2.19)	(2.31)	(2.46)	(2.48)	(2.54)
Venture Capital (VC)		0.127	-0.0451	-0.00217	-0.000306	0.0291	0.0252	-0.0832
		(1.09)	(-0.33)	(-0.02)	(-0.00)	(0.21)	(0.18)	(-0.46)
Business Angel (BA)		0.180	0.0697	0.0973	0.0722	0.0649	0.0885	0.436**
		(1.55)	(0.54)	(0.74)	(0.55)	(0.49)	(0.67)	(2.51)
Crowd Funding (ECF)		0.689***	0.606***	0.601***	0.588***	0.496***	0.534***	0.685***
		(6.12)	(4.30)	(4.22)	(4.11)	(3.44)	(3.69)	(3.54)
Government VC (GVC)		-0.0296	-0.0262	-0.0378	-0.00396	0.0288	-0.0580	0.266
		(-0.18)	(-0.15)	(-0.21)	(-0.02)	(0.16)	(-0.31)	(1.15)
Foreign VC (FVC)		-0.0529	-0.182	-0.171	-0.225	-0.154	-0.115	-0.210
		(-0.31)	(-1.01)	(-0.95)	(-1.22)	(-0.83)	(-0.62)	(-0.89)
Covid Loan x Venture Capital								0.174
								(0.74)
Covid Loan x Business Angel								-0.739***
								(-3.11)
Covid Loan x Crowd Funding								-0.296
								(-1.27)
Covid Loan x Government VC								-0.722**
								(-2.08)
Covid Loan x Foreign VC								0.256
								(0.71)
Venture Stage of Investment			0.105	0.137	0.0586	0.0762	0.0709	0.0706
			(1.03)	(1.34)	(0.56)	(0.72)	(0.67)	(0.66)
Growth Stage of Investment			0.159	0.237	0.124	0.128	0.108	0.105
			(0.94)	(1.36)	(0.69)	(0.71)	(0.60)	(0.58)
Established Stage of Investment			-0.465*	-0.407*	-0.461*	-0.499**	-0.550**	-0.530**
			(-1.92)	(-1.65)	(-1.85)	(-1.99)	(-2.18)	(-2.10)
Number of Rounds			0.0620*	0.0447	0.0423	0.0565	0.0591	0.0592
			(1.68)	(1.20)	(1.12)	(1.48)	(1.54)	(1.54)
Announced Deal			-0.107	-0.116	-0.0815	-0.0473	-0.0857	-0.0395
			(-0.80)	(-0.86)	(-0.60)	(-0.35)	(-0.63)	(-0.29)
LN(Total Investment)			0.521	0.521	0.397	0.432	0.457	0.480
			(1.62)	(1.61)	(1.12)	(1.22)	(1.30)	(1.34)
LN(Total Investment) squared			-0.0141	-0.0140	-0.0121	-0.0131	-0.0136	-0.0145
			(-1.14)	(-1.12)	(-0.87)	(-0.94)	(-0.98)	(-1.03)
Time from first deal (days)			-0.000174*	-0.000219**	-0.000222**	-0.000235**	-0.000243**	-0.000247**

			(-1.76)	(-2.19)	(-2.17)	(-2.28)	(-2.35)	(-2.37)
Time from last deal (days)			0.000102	0.0000856	0.0000845	0.0000928	0.0000838	0.0000854
			(0.97)	(0.80)	(0.78)	(0.84)	(0.76)	(0.77)
Investment purpose (R&D)			-0.134	-0.110	-0.133	-0.0689	-0.0861	-0.0864
			(-0.71)	(-0.58)	(-0.69)	(-0.36)	(-0.45)	(-0.45)
Investment purpose (Job creation)			-0.0624	-0.0219	-0.0323	-0.00777	-0.0266	-0.0102
			(-0.34)	(-0.12)	(-0.17)	(-0.04)	(-0.15)	(-0.06)
Working capital to total assets				-0.0980**	-0.151***	-0.148***	-0.146***	-0.140***
				(-2.15)	(-3.03)	(-2.97)	(-2.94)	(-2.80)
Current assets to total assets				-0.487***	-0.439***	-0.362***	-0.345**	-0.362***
				(-3.85)	(-3.31)	(-2.60)	(-2.47)	(-2.58)
Current liabilities to total liabilities				0.00641	-0.194	-0.184	-0.191	-0.195
				(0.03)	(-0.76)	(-0.70)	(-0.73)	(-0.74)
Profit/loss account reserve to total assets				-0.0906***	-0.128***	-0.143***	-0.147***	-0.151***
				(-2.90)	(-3.46)	(-3.85)	(-3.95)	(-4.05)
Short and Long-term debt to total assets				0.340	-0.118	-0.119	-0.133	-0.148
				(1.40)	(-0.45)	(-0.45)	(-0.51)	(-0.56)
LN(Total Assets £m)					0.669***	0.685***	0.673***	0.645***
					(2.82)	(2.85)	(2.79)	(2.69)
LN(Total Assets) squared					-0.0241**	-0.0249**	-0.0244**	-0.0232**
					(-2.46)	(-2.51)	(-2.46)	(-2.35)
Indicator of charge on assets					0.00141	0.0392	0.0187	0.0279
					(0.01)	(0.26)	(0.12)	(0.18)
Indicator of no debt					-0.224**	-0.180*	-0.167	-0.170
					(-2.08)	(-1.65)	(-1.53)	(-1.56)
Ex ante risk score					5.240***	3.931***	4.071***	4.039***
					(5.33)	(3.89)	(4.05)	(4.00)
Missing risk score					0.0457	0.159	0.188	0.181
					(0.21)	(0.73)	(0.86)	(0.83)
Constant	-3.338***	-3.460***	-7.712***	-7.491***	-10.53***	-10.91***	-11.24***	-11.31***
	(-52.79)	(-49.69)	(-3.70)	(-3.55)	(-4.38)	(-4.54)	(-4.69)	(-4.67)
Industry sector indicators	No	No	No	No	No	Yes	Yes	Yes
Regional indicators	No	No	No	No	No	No	Yes	Yes
Number of observations	13786	13786	13786	13786	13786	13786	13786	13786
Number of insolvencies	653	653	653	653	653	653	653	653
McFadden pseudo-R^2	0.0144	0.0223	0.0319	0.0428	0.0552	0.0671	0.0703	0.0739
Area under ROC curve (AUC)	0.588	0.621	0.649	0.671	0.697	0.709	0.713	0.717

Notes:

The table shows the estimation results for the insolvency prediction models using the covid period sample. The dependent variable is the indicator of the insolvent exit in the 3-year period from 1st of April 2020 to 31st of March 2023 (equals one if the company experienced an insolvent exit during the period and zero otherwise). The variables of interest are the indicator of the covid loan (equals one if the company has a loan under any of the three covid loan guarantee schemes and zero otherwise) and the interaction terms between the covid loan and BBLS indicator. The indicator of BBLS equals unity for company with COVID loan issued under Bounce Back Loan Scheme and zero otherwise. The models are estimated using logistic regression. The statistical significance is indicated with asterisks where the *, **, and *** denote significance at 10%, 5% and 1% significance levels. The corresponding t-statistics are computed using robust standard errors. The variables are defined in the Appendix in Table A1.