

**Sectoral analysis of start-up funding in the UK raised pre
and post COVID-19**

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Abstract

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The COVID-19 pandemic has had severe economic repercussions. This study aims to cover the impact of the COVID-19 pandemic on the ability of start-ups in the UK to raise funds from private investors. The basic tenet was to answer the question - How much has the COVID-19 pandemic affected the ability of start-ups and SMEs in the UK from different sectors to raise equity from private investors?

To understand the impacts, the capital filings of a total of 12 start-ups from 3 sectors were extracted for a period of 4 years spanning from 2018 to 2021. The data for pre COVID-19 (2018-2019) was compared against that of post COVID-19 (2020-2021) to find out if there was any indication of the start-ups being adversely affected by the consequences of the pandemic with respect to their fund-raising capabilities. Using percentage differences to compare the changes against one another on a standalone basis, age basis, and also sector-wise. It was found that the pharmaceutical industry expanded dramatically, particularly for late-stage pharmaceutical companies. Early-stage retail companies, on the other hand, saw a decrease in both revenue and share price. In terms of amounts raised and prices per share, all sectors' pharmaceuticals, technology, and retail performed well. As a result of the findings, it can be concluded that the COVID-19 crisis did not necessarily affect the ability of start-ups to secure external funding.

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Chapter 1 - Introduction

Startups, especially those that are growing rapidly, are important sources of innovation as well as job creation. For these reasons, policymakers work hard to create effective ecosystems that foster the growth of innovative startups. Continued policy support for starting up is crucial to high growth, but the long-term impact of the COVID-19 crisis is still far from obliterated and remains to be seen. When COVID-19 happened, the world was in shock. Although there had been many pandemics before this one, COVID-19 is particularly more gripping than the other recent ones like SARS or MERS owing to its higher fatality rate. There were other economic shocks too in the recent past like the sub-prime mortgage lending crisis in 2008 that led to huge impacts on the global economies and had consequences that have been far researched and studied. Ever since COVID-19, the world has started living differently. Be it wearing masks and/or more frequent use of sanitizers, working/studying remotely, restricted socializing and travelling, and so on. All these changes have compelled humans to re-evaluate our priorities, change our way of living, conducting business and socializing even. Economies around the world will likely need more innovation and economic growth than ever in the coming months given the present constraints (Reypens, 2020). The economic effects of COVID-19 on listed companies can and have been attempted to be quantified by using their publicly available data from stock exchanges. However, the same cannot be as easily quantified and measured for private companies and early-stage startups.

Post the 2008 financial crisis, SMEs have had difficulty obtaining finance, creating obstacles to their growth. As of late 2008, lending to SMEs in the UK had declined, turned negative by late 2009, and remained negative in 2010, 2011, and 2012. Consequently, SMEs have become less able to access external credit (Cowling, et al, 2012). Following a period of unusually loose credit conditions (Davis, 2011), the supply of bank financing for SMEs has tightened. As a consequence of the financial crisis, banks have become more risk-averse and tightened their lending standards, where before they aggressively loaned in order to gain market share. Additionally, due to new financial regulations (Basel III), banks must hold more capital. The demand for bank financing from SMEs has declined, in part due to the economic conditions,

which have discouraged firms from investing, and in part due to a perception amongst many business owners that their loan applications will be rejected (Cowling et al., 2012). According to Hutton and Nightingale (2012), the number of discouraged borrowers has increased sharply during the recession. In addition to a decline in housing prices, the financial crisis has also led to a decline in the abilities of entrepreneurs to provide capital to their businesses with housing assets (Reuschke and MacLennan, 2012).

But the nature of the 2008 sub-prime lending crisis which was more of a man-made crisis (in a way) was different as compared to the crisis at hand. Not much research has been conducted previously on the effects of other previous epidemics like that of SARS or MERS outbreak, plague, Zika or Ebola virus on businesses and investment sentiments of investors. This poses the question of the variability of the effects these events have on economic growth of a country or business environment in a country. Hence, the need to investigate the same is evident now more than ever.

Certain sectors have had brutal effects on their businesses in these unprecedented times whereas, certain industries have thrived providing innovative solutions to the modern ever-evolving problems. Sectors like IT (edtech, media streaming and media sharing, professional collaborative technologies), Pharma, and pharma ancillary services, and others have witnessed exponential growth and opportunity. On the other hand, sectors like consumer durables, fast fashion, and others have seen their demand being dampened quite harshly. According to Vidovic, L., 2022, Airlines, Automobiles, Energy Equipment & Services, Hotels, Restaurants & Leisure, and Specialty Retail were the five industries most affected by COVID-19, while Communications Equipment, Health Care Equipment & Supplies, Life Science Tools & Services, Pharmaceuticals, and Real Estate Investment Trusts were the five industries that were the least affected. This leaves a gap to explore the differences in the impacts these industries have faced from the same event, in this case COVID-19.

With that in mind it is only imperative to study the sectoral impact and compare the findings against one another. This study is aimed at providing an insight into the abilities of startups to raise funds when most needed and analyze the difference (if any) sector-wise in the funds the startups were able to raise in the post COVID-19 period as compared what they were able to raise before the advent of COVID-19. With

this end goal, the following research objectives are laid out to be attempted to achieve by undergoing this study.

1) **Research Objectives** –

- Quantify the increase or decrease in the amount of funds raised by start-ups post COVID-19.
- Provide sector-wise bifurcation of amounts raised and price per share pre and post COVID-19 and the increase or decrease in the same
- Identify sectors with highest and lowest percentage change in share prices and amounts raised pre and post COVID-19.

With these objectives to move forward, it is also worth noting that considering the time and resource constraint of this study, only 3 sectors namely Technology, Pharmaceuticals, and Retail have been mapped under the scope of this study.

The remainder of this report is structured as follows – Chapter 2 covers a detailed review of literature bringing out a research gap and the need and importance of studying this gap. A brief layout of the methodology followed to achieve the objectives of this study are laid out in chapter 3. Findings and analysis derived from the data collected are reported in Chapter 4. Chapter 5 discusses the finding and analysis derived in chapter 4 against the backdrop of the research objectives laid out in the introduction. Chapter 6 concludes this study and also highlights the limitations of this study and scope for future research.

Chapter 2 - Literature Review

This chapter has been broadly divided into 2 themes to investigate the previous research done in the context of this study. This will lay the groundwork for carrying out the research at hand.

1) Learnings from previous crisis:

Disasters can be natural or man-made but they all have consequences on the economy it affects and the businesses operating in those economies. More often than not, these crises are not avoidable until after they are recognized as an emergency situation. In such times, managing or mitigating the effects of the disaster is often the best way to tackle such situations. Unfortunately, to manage such crises, it is critical to be well prepared and have sufficient resources. Moreno, A., Ongena, S., Ventula Veghazy, A., and Wagner, A. F. (2020) investigate the connections between the 2008-09 Great Recession and the current pandemic. They argue that the methods used to combat the previous crisis may have an impact on the severity of the current crises' outcomes. Governments that accumulated debt to bail out their country's banks may have diverted resources away from critical sectors such as public health services. This, in turn, may have limited those countries' ability to contain the virus's spread and provide adequate health care to the sick. Similarly, job losses in the aftermath of the Great Recession, particularly among young people, may have increased the incentive for younger generations to live at home with their parents. The close proximity of younger and older people, with the latter being more susceptible to infection, may have resulted in higher mortality rates during the pandemic. Finally, forbearing bank supervisors who allowed banks to keep shell firms on their balance sheets after the previous crisis may have created the conditions for public funds to fall into the hands of failing companies rather than healthy ones during the current crisis.

Bell, A. R., Lacey, H., and Prescott, A. (2020) look at the lessons from the Black Death of 1348-51 that may still be relevant today. They argue that restricting freedom of movement, particularly if done for an extended period of time, can breed resentment and lead to social unrest and political turmoil. Events in fourteenth-century England

suggest that when social tensions are high due to a pandemic, governments must act quickly to address social injustice. History also demonstrates that the psychological reactions of crisis-affected populations can lead to nationalistic tendencies. Halikiopoulou, D. (2020) expands on this by focusing on the rise of populism in Europe. The author distinguishes between countries where populist movements already dominate and those where populists are in opposition parties. A pandemic and the ensuing economic downturn may provide an opportunity for populists in opposition to gain more support from voters who are most affected by the downturn.

Scott, P. (2020) examines the United Kingdom's experience during the First and Second World Wars, as well as the Great Recession, to shed light on the fiscal implications of COVID-19 and the likely consequences for British taxpayers. He contends that any austerity measures enacted in the aftermath of the current pandemic would be misguided. Fiscal austerity may have the unintended consequence of slowing economic growth and causing mass unemployment, whereas a less fiscally conservative approach would result in a stronger and more sustainable recovery.

Busetto, F., Dufour, A., and Varotto, S. (2020) broaden the scope of fiscal policy analysis to include continental Europe. They demonstrate how pre-existing debt levels affect governments' ability to sustain their pandemic-affected economies. Germany's relatively low debt-to-GDP ratio has enabled it to implement a "fiscal bazooka" to protect its economy without incurring the cost of significantly higher borrowing costs. Italy, on the other hand, is expected to face a more punitive increase in borrowing costs as a result of its more restrained fiscal expansion. This, in turn, would exacerbate the country's already bleak growth prospects.

Billio, M., Costola, M., Mazzari, F., and Pelizzon, L., (2020) look at the repo market to investigate financing costs in European countries. A repo market is a market where traders buy and sell assets with an agreement to repurchase (repo) them at a later date. The authors concentrate on the impact of monetary policy announcements made by the European Central Bank (ECB) during the pandemic on repo rates. They discover that countries on Europe's outskirts, such as Italy and Spain, may be heavily reliant on ECB support to keep their repo rates in line with those of other countries. The ECB's announcement that it would not intervene to support countries with higher sovereign risk was enough to cause a significant divergence in their repo rates from those of low-

risk countries. Following an ECB announcement clarifying that the Central Bank would indeed support weaker economies, repo rates were immediately realigned. This highlights the critical role that monetary policy can play in mitigating the pandemic's impact on financial markets.

Since the European sovereign debt crisis in 2009-2010, the link between sovereign risk and bank risk has become more apparent. According to Andries, A., Ongena, S., and Sprincean, N. (2020), such a connection and feedback loop became stronger during the pandemic but are no longer as important as they were during the sovereign crisis. This is due in part to stricter bank regulation, which has made banks more resilient to periods of instability. Lazar, E. and Zhang, N. (2020) examine some aspects of the new bank rules in depth and conclude that they may lead to banks overestimating risk and maintaining higher-than-needed equity capital levels, both of which are unnecessary.

The spread of COVID-19 caused a strong reaction in the stock market. Ramelli, S. and Wagner, A. F. (2020) examine stock performance in 90 countries at various stages of the crisis: incubation, outbreak, fever, and recovery. They discover that highly leveraged companies exhibit more volatile behaviour, confirming the role of debt in amplifying economic shocks and uncertainty. Worryingly, corporate debt levels have risen since the outbreak began, potentially contributing to further market instability in the event of future virus outbreaks. This has reignited the debate over whether corporations should still be incentivized to incur debt by deducting interest payments from their taxes. The authors also conduct an industry analysis, revealing how the crisis impacted energy companies, banks, consumer services, and the transportation sector the most. Dufour, A. (2020) examines these effects at the country level in the United States and the United Kingdom and finds similar patterns. Banks are suffering as loan defaults are expected to rise and low interest rates squeeze profit margins. Bank stocks have been further weighed down by regulatory restrictions on dividend payouts. Energy companies, particularly oil companies, have experienced the largest drop in demand ever recorded. According to Kalyuzhnova, Y. and Lee, J. (2020), this, combined with persistent excess supply, created a "perfect storm" for the industry. Furthermore, demand may take some time to return to pre-pandemic levels. This could be due to lower oil consumption as a result of, among other things, changes in people's attitudes toward air travel and companies increasingly embracing work-from-home

practices and virtual meetings instead of international corporate travel. Tourism is an obvious victim of COVID-19 travel restrictions around the world. Palmer, A. (2020) considers the pandemic's short- and long-term effects on consumer behaviour. He claims that lifting restrictions will not automatically return us to pre-pandemic times. Tourists are likely to be more cautious when planning their vacations as a result of the lockdowns, at least in the short term.

Travel restrictions have also had a significant impact on the real estate industry. Furthermore, Mattarocci, G. and Roberti, S. (2020) contend that site-visit limitations, lower disposable income of householders, and falling revenues of commercial tenants all impacted the European residential and commercial real estate markets. The authors speculate that in the future, homeowners may seek larger homes in order to work from home more comfortably. Households and businesses may prefer to relocate outside of city centres because they are more affordable and have a lower infection risk because they are less densely populated. The current pandemic has also had an impact on the insurance industry. Sutcliffe, C. (2020) contends that the increased elderly mortality rates caused by COVID-19 may benefit life insurers and defined benefit pension funds in the short run, but only if further and widespread infection waves occur. He concludes that those who left their defined benefit pensions or cashed out their defined contribution pensions during the pandemic, when asset prices were low, are losers in this crisis.

Borri, N. (2020) examines Italy, the first country in Europe to experience high infection rates. He concludes that the Italian experience can be a useful case study for policymakers to assess the costs and benefits associated with different approaches to dealing with future waves based on a careful analysis of the measures taken in the country, which varied across cities and regions. COVID-19 containment measures, according to Donadelli, M., Gufler, I., and Castellini, M. (2020), were implemented late and poorly communicated by the Italian government. The resulting uncertainty has had the greatest impact on the construction, education, manufacturing, and hospitality sectors, potentially slowing their recovery.

Reduced air travel and road congestion in cities around the world have undoubtedly had a positive impact on the environment, resulting in lower levels of pollution and CO2 emissions. Battiston, S., Billio, M., and Monasterolo, I., (2020) examine Europe's

fiscal and monetary policies and question their short-term goal of returning the economy to "business as usual." Instead, the authors argue that adopting longer-term goals aimed at aligning with the EU Green Deal and corporate taxation policies would be more beneficial and cost-effective. Indeed, the European Central Bank recently adopted an environmentalist stance, which is consistent with the authors' proposed policy response.

During the pandemic, unemployment has skyrocketed. Razzu, G. (2020) investigates the pandemic's effects on the UK labor market, with a focus on gender inequality. His review of recent studies and data shows that unemployment has increased more for low-wage jobs and in industries such as retail, lodging, and food services, where women are more likely to be over-represented. He also discovers that, as a result of school closures, women are more likely than men to devote more time to childcare and household work, which may have a significant impact on their career prospects. The gender pay gap may have widened as a result of the current crisis, and the government's suspension of the requirement for large firms to publish gender pay differentials among their employees has not aided in bringing more equality to the UK labor market.

Mouritzen, M., Rezaei, S., and Liu, Y. (2020) investigate how the coronavirus affected the flow of international talent, focusing on the experiences of European researchers in China. Cross-country mobility of researchers can boost scientific productivity, with long-term economic benefits. The authors present preliminary evidence that a large proportion of European researchers who were based in China prior to the pandemic have now left the country and have no plans to return or are uncertain about doing so, which is cause for concern.

COVID-19 has also accelerated the corporate adoption of digital technology and artificial intelligence (AI). Pasha, N. (2020) delves into what this means in terms of the skillset that employees will need to develop in order to thrive in the new workplace. Adaptability emerges as a critical personal success quality. Liu, K. and Guo, H. (2020) go on to examine the business transformations brought about by AI, big data, and data analytics. They also talk about the ethical and cybersecurity implications. Finally, Chen examines how alternative data sources can be used to aid decision-making, particularly during critical periods such as the current pandemic. As a result, unlocking

the potential of new data sources may be critical to better equipping our society to face future crises.

The authors Burger P., et al. (2009) examine how a crisis affects public-private partnerships; identify nation and program-specific risks; and suggest methods to increase the appeal of public-private partnerships as well as rules for retaining value for money and budget protection. These fall under the broad category of how governments deal with rare, catastrophic disasters. They are of the opinion that the impact of the financial crisis and subsequent economic slump on public-private partnerships differs depending on whether the entity is in the operating, or development, or the pipeline phase. They layout that the depth of the effect of the crisis on the PPPs can be outlined as a function of threat and vulnerability. A threat is defined as the likelihood that some negative event will occur in the future, for example, through one of the channels identified below, and vulnerability is linked to PPP-specific or country-specific factors that capture the "preparedness" of the parties involved to either prevent a threat from materializing or cope with its adverse impact. Vulnerability may be defined as the parties' lack of capacity and/or motivation to guarantee that the actual output conforms as nearly as feasible to the planned outcome through adequate risk and project management. The possible impact on the PPP as a result of the combination of threats and vulnerabilities is referred to as the outcome, or risk realization.

The financial crisis hampered access to credit for both individuals and businesses. SMEs in countries such as Greece, Ireland, Italy, Portugal, and Spain were particularly hard hit. Banks were forced to close branches in countries which resulted in losses for firms on a local level, as demonstrated by Bonfim, Nogueira, and Ongena (2020). Local unemployment and economic conditions deteriorated as a result of a lack of local credit access. With a real estate boom underway in Spain, many young people have entered the labour force to work in the well-paying real estate construction sector. When the crisis hit, these individuals were out of work and out of money, but strong family networks kept them off the streets by relocating them to live with their families. Later, when conditions in Spain improved, this lost generation may have found it difficult to find work far away from their home town, as well as not wanting to move too far away from their now-aged parents or relatives. Overall, the financial crisis may have increased the prevalence of 20-to-30-year-olds living at home or in their

hometown in countries such as Spain and Italy (which was already prevalent). Furthermore, the living in close proximity of older and younger people as a result of the financial crisis may have made COVID-19 infections more likely and deadly, as younger people frequently carry the virus asymptotically while older adults appear to be more likely to succumb to it.

Investors point of view:

Unlike debt financing, equity financing is heavily reliant on intimate personal involvement between the two parties - investors and business owners (De Clercq and Sapienza, 2006). The pitch that entrepreneurs make to investors is an important component of the relational connection. Other key relational encounters between investors and entrepreneurs, such as spontaneous coffee dates, highlight critical aspects of the investment decision-making process. Personal understanding and closely 'vetting' the personnel involved to produce soft information decreases the informational opacity associated with start-ups. Because equity investors rely significantly on 'personal networks and face-to-face interactions in locating, analysing, and monitoring investment possibilities,' these close relationships are critical.

The obvious question for institutional and individual investors is how to structure an investment portfolio to be resilient to pandemic risk. González, M. O., Jareno, F., and Skinner, F. S. (2020) investigate the risk reduction that may result from diversifying portfolios into cryptocurrencies. They come to the conclusion that some cryptocurrencies (Ethereum and Bfinance) have the potential to control risk, whereas others (Bitcoin, Litecoin, and Tezos) are less effective. Risk reduction, however, comes at the expense of lower risk-adjusted returns.

Our ability to see family and friends, as well as participate in leisure activities, has been hampered by social distancing. For example, football fans all over Europe have been prevented from attending live matches, and as a result, the football industry has suffered financially. According to Reade, J. J. and Singleton, C. (2020), football's decision-makers should reconsider how resources are allocated within the industry in order to help it recover.

Arundale, K. and Mason, C. (2020) look at the coronavirus crisis through the eyes of private equity (PE) and venture capital (VC) firms. According to their assessment, the inevitable short-term contraction in this industry's activity will most likely return to pre-pandemic levels in the not-too-distant future. The undervaluation of public companies may present opportunities for private equity firms. Private equity-backed businesses contribute significantly to the global economy in terms of increased innovation, increased productivity, increased competitiveness, and, in the long run, increased employment opportunities. Many so-called "unicorns" (privately held start-up companies valued at more than \$1 billion) have been funded by venture capital. For example, venture capital funds 82 percent of the 190 European start-ups that have achieved unicorn status (EuropeanStartups.co, 2020). Private equity is less susceptible to the ups and downs of economic cycles due to its long-term investment horizons, with funds typically having lives of 10 years or more. Despite the scarcity of debt finance used to leverage deals, the asset class survived the 2008 financial crash with far fewer failures than some observers predicted. However, in the current economic climate, start-ups may struggle to find funding unless governments support their growth (Arundale, K. and Mason, C., 2020).

Antypas, N. (2020) predicts that private equity and hedge funds will be major players in the mergers and acquisitions market in the coming months. Prior to the pandemic, these companies had amassed a large amount of "dry powder," or capital available for investment. Furthermore, their long-term investment horizon makes them especially appealing to distressed companies.

In conclusion, we can say that a lot of factors go into starting, operating, and scaling small, private businesses into giant multi-national corporations. Some of these factors include government policies, consumer needs, emerging technologies, strategies, and availability of capital. But most importantly, the lack availability of funds for either capital needs or operational needs for start-ups or small businesses stunts growth even before these businesses can take off. In times of crisis and uncertainty, most businesses die a slow death due to inability to raise more funds. With this background, we will now try to quantify and examine the effect of COVID-19 on start-ups in the UK and their ability to raise funds in times of crisis.

Chapter 3 - Methodology

With the base laid out for building this study from the ground, we will now go back and look at the objectives of this research to lead us into our next logical step.

Research Objectives –

- Quantify the increase or decrease in the amount of funds raised by start-ups post COVID-19.
- Provide sector-wise bifurcation of amounts raised and price per share pre and post COVID-19 and the increase or decrease in the same.
- Identify sectors with highest and lowest percentage change in share prices and amounts raised pre and post COVID-19.

In this chapter we will lay out the roadmap of how this research is planned and structured in order to achieve the research objectives laid out in the earlier. This chapter covers the process implemented for sample selection, data sources, data collection, and the data analysis techniques used.

Sample selection: This study is focused on comparing the funds raised by 4 private companies chosen from each of the three sectors encompassing this research namely Pharmaceuticals, Technology, and Retail. The data for funds raised for the total of 16 companies was collected for a period spanning for a total of 4 years - 2 years prior to COVID (2018 and 2019) and two years post COVID (2020-2021). For the purpose of simplicity, it is assumed that COVID-19 event date occurred on 31st December 2019 which is a safe assumption considering the World Health Organization^[1] identified the first case of COVID-19 on the same day (<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline#!>).

A detailed background of each of the above sectors is provided below for context and reference with respect to this study.

1) Technology Sector - Digital technology, the primary driver of the fourth industrial revolution, is profoundly altering the global economic landscape. This process began nearly 20 years ago, but it really picked up speed when smartphone penetration

increased and 3G telecommunication technology was developed. Today, digital economic activities such as shopping online, calling a taxi, purchasing airline and train tickets, ordering food delivery, and even scheduling a doctor's appointment are all commonplace. Indeed, digital economic tools such as smartphones have become so popular that people who do not use them frequently struggle to make payments or connect with others. The so-called digital inequality problem arose precisely because the digital economy pervades almost every aspect of society. In many ways, digital technology alters the way the economy works (Chen 2016; Xiao 2017; Huang 2018). Millions of customers purchase goods from the same e-commerce platforms. Some social media platforms serve billions of users at the same time. The scale and speed of economic activity reached unprecedented levels in human history. Traditional financial institutions find it extremely difficult to promote financial inclusion, or the provision of financial services to underserved customers. However, thanks to the advancement of digital technology, it is now possible. Some digital lenders use big data, rather than financial data or collateral assets, to assess credit risk and make millions of loans each year without ever meeting the borrowers. Digital technology has triggered a true economic revolution.

When the world was hit by COVID-19 in 2020, the digital economy played a critical role. Because social isolation and lockdown were the only effective ways to control the virus's spread, many economic activities came to a halt. This was most noticeable in restaurants, theaters, theme parks, and airports, among other places. However, in some cases, digital technology has aided in the transition of offline economic activities to online platforms. As a result, food delivery increased, e-commerce increased, and online meetings and teaching increased. Many businesses remained open by allowing their employees to work from home. In short, the digital economy served as an important macroeconomic stabilizer during COVID-19. If there had been no digital economic activities, the economy would have collapsed much faster and for a much longer period of time (Huang, Y., Qiu, H. and Wang, J.Y.,2021). With technology pervading every aspect of life including personal and professional, the importance of the same cannot be stressed upon enough.

2) Pharmaceuticals Sector - The COVID-19 pandemic is forcing experimentation throughout the health-care system, including the use of drug prices to fund innovation. It has also highlighted the available mechanisms for funding life sciences research,

development, manufacturing, and distribution. The traditional innovation strategy began with scientific discovery funded by government and philanthropic grants, followed by product commercialization funded by pharmaceutical industry revenues and capital investments. According to one estimate, governmental and philanthropic grants fund roughly one-third of total investment in the life sciences (an estimated total investment of \$194.2 billion in 2018), with the remainder funded by the life sciences industry.

As the pandemic ends, some of the new initiatives will be phased out. However, the observed changes reflect deeper trends that are likely to persist. In the United States, public and political opposition to high drug prices is unlikely to abate. Prior to the onset of the COVID-19 pandemic, drug prices in the United States had come under scrutiny due to the financial burden they impose on public and private budgets. Congress and the Trump administration proposed far more restrictive drug pricing legislation than previous initiatives; however, the proposed legislation was still significantly more limited than that used in other high-income countries. During the early stages of the pandemic, criticism of the pharmaceutical industry was muted, but it is now resurfacing. President Joseph Biden's health-care policy platform includes allowing Medicare to negotiate prices with drug manufacturers, linking prices charged in the United States to prices charged in other high-income countries, and prohibiting post-launch price increases. It is neither efficient nor equitable for US taxpayers and patients to pay drug prices that are significantly higher than those paid in other high-income countries, even if these prices likely contribute to drug development that benefits many people around the world. Price increases after launch that are not supported by new evidence of clinical benefit cannot be justified as cost-based or value-based pricing principles. Rising drug prices are passed on directly to patients in the fragmented and competitive US health insurance market, further burdening patients with the most severe illnesses who require access to the most expensive therapies. High drug prices in the United States in comparison to other countries are a direct subsidy to foreign competitors. Because of the high prices, non-US pharmaceutical companies can repatriate large profits from the US market and fund expanded research and production capabilities at home, whereas US pharmaceutical companies do not profit in the same way from sales abroad. This is in contrast to public funding mechanisms, such as grants and tax breaks, which are intended to favour

domestic research, product development, and manufacturing. The limitations of pharmaceutical industry profits as a source of financing go beyond the scale of investment to include its direction. The traditional framework focuses on investments in competitively protected therapeutic niches rather than those with the greatest social need. Prices remain high, and investment in treatments targeting rare orphan diseases and therapies based on cutting-edge gene and cell technologies remains strong. However, the pharmaceutical industry has been limiting its investments in major public health conditions (such as cardiovascular diseases), new antibiotics to combat drug-resistant infections, and the treatment of neglected diseases prevalent in low-income countries. The prices and revenues that can be charged in these domains do not meet the return-on-investment thresholds demanded by the pharmaceutical industry's investors.

During the pandemic, there has also been a significant shift in the funding of product commercialization. Government agencies and philanthropic organizations are pledging large sums not only to support research, but also to fund late-stage product development, manufacturing capacity expansion, and efficient distribution systems. Historically, the pharmaceutical industry has provided the majority of funding for these activities. The policy question now is whether the shift toward public funding and away from private sources will be maintained after the COVID-19 pandemic has passed, or whether life science funding will revert to the status quo. Given the size and importance of drug discovery and product commercialization, this has significant implications for medicine and health care in the future.

The broad contours of funding for COVID-19 tests and treatments are emerging. Much, if not the majority, of global investments have been financed by governmental entities, with the US government contributing the lion's share. These investments go well beyond basic and clinical research. Through Operation Warp Speed and the Biomedical Advanced Research and Development Authority, the US federal government invested \$11 billion in late-stage vaccine development and manufacturing capacity in 2020. Some of these contracts include a prepurchase component in which the company agrees to supply a certain number of vaccine doses. The therapeutics subdivision of the Pharma industry is also receiving significant public investment. The two most prominent monoclonal antibodies (by Regeneron and Lilly) have been commercialized with substantial government support. Both products are based on

therapeutic research platforms established with government funding prior to the COVID-19 pandemic, but product commercialization and manufacturing received significant additional funding in 2020. Separately, the National Institutes of Health (NIH) Rapid Acceleration of Diagnostics program has committed \$1.5 billion to the development of COVID-19 diagnostic tests. The specifics of the federal contracts are mostly kept private (Robinson, J.C., 2021).

3) Retail Sector - While the long-term effects of COVID-19 are unknown, the immediate impact on retail is significant. Retailers of essential goods such as food, groceries, and healthcare are seeing increased demand for home delivery while dealing with inventory, supply chain management, and delivery challenges. Non-essential goods retailers, such as apparel and footwear, are seeing a significant drop in sales and must find new ways to reach and engage customers who shop from home in order to stay in business. To meet the demand created by the crisis, some manufacturers and retailers are pivoting and changing their product mix (e.g., shoe manufacturers creating facemasks, spirit manufacturers using the same alcohol ingredient for producing and selling hand sanitizers). While retailers must consider the immediate, short-term needs to survive in this market, it is also critical to consider the landscape for retailers after the pandemic. Roggeveen, A.L. and Sethuraman, R. (2020) discuss how some of the new behaviors adopted by retailers and consumers during the pandemic are very likely to become the new normal. Customers are also likely to become accustomed to new shopping methods. Online grocery shopping with home delivery, for example, is likely to become more common. Grocers must then figure out how to make online shopping more similar to in-person shopping in order to encourage impulse purchases. Other consumer behaviors and interests will also change. Consumers may become accustomed to working out at home, subscribe to online fitness classes, and be more likely to purchase an in-home exercise bike rather than a gym membership. Furthermore, customers may grow accustomed to being able to access new movie releases from the comfort of their own homes and become unwilling to return to movie theaters. Future academic research must therefore strive to understand the pandemic's short- and long-term impact on consumer behavior, as well as provide guidance on how retailers should adapt to these changes.

Since the basic scope of the research is to analyze the ability of start-ups to raise funds, the companies selected were categorized into two broad categories – Early-stage startups and Later stage startups. There is no specific definition that defined a startup to be in either of the one. For the purpose of this research, an early-stage startup is considered to be one that was incorporated 3 years or after the period of scope that is 2018-2021. So, any company that was incorporated in 2015 or later than 2015 is considered to be an early-stage startup for the purpose of this study. Similarly, any company incorporated prior to 2015 is considered to be a later stage company for the scope of this study. The following list categorizes the selected sample companies by their age.

Sector	Early Stage	Later Stage
IT	Cleo AI Ltd	CityFalcon Ltd
	Photospire Ltd	Zesty Ltd
Pharma	Bit Bio Ltd	Ablatus Therapeutics Ltd
	Omass Therapeutics Ltd	Healx Ltd
Retail	Simba Sleep Ltd	Taylor & Hart Ltd
	Patch Gardens Ltd	Bloom & Wild Ltd

Table 3.1: List of selected sample companies categorized by age

A brief description of the sample companies selected is provided below to provide better context and depth to the reader.

Technology Start-ups

- Cleo AI Ltd - Cleo AI Limited is a software company incorporated in late 2015. The company's main product is its money management mobile application that has helped its 4 million registered users to improve their relationship with money and financial health by using simplicity and humour. The application employs an artificial intelligence assistant to define a new category, one that goes beyond saving and budgeting to actually changing how the users feel about their finances. It gives them detailed information about their money through chat, while also recommending personalized financial products that increases the customer's ability to save. The company plans to launch new products and has raised funding from investors for enabling it to strategize and

market these products to the existing customers and also broaden its customer base. (Web.meetcleo.com, 2022) (O’Hear, S., 2022)

- Photospire Ltd – Photospire Limited began operations in February 2016 and is now known as Spirable. The company runs a creative performance platform that revolutionizes how brands and agencies create, automate, and optimize the most relevant and high-performing dynamic creative and video marketing across channels and formats. (Spirable, 2022)
- CityFalcon Ltd – The company was incorporated in June 2014 and operates as a fintech company. CityFalcon uses AI and Big Data to personalize content feeds from thousands of financial sources with a single paid subscription. Clients can access curated content, analytics, and insights through the web, mobile, and API. The company intends to use the funds raised to introduce better products and also penetrate the market deeper. (Prnewswire.co.uk, 2022)
- Zesty Ltd - Zesty Limited first started trading in late 2012. Through its integration functionality, the company's software enables connection to a hospital's electronic patient record or patient administration system and also provides a portal that allows patients to manage their hospital appointments, schedule and attend video-based consultations, read their clinical and administrative correspondence, and store copies of clinical records for future reference enabling both hospitals and patients to be on the same page. (Induction Healthcare Group, 2022)

Pharmaceuticals Start-ups

- Bit Bio Ltd - Dr. Mark Kotter founded the company in 2016 with the goal of developing a scalable technology platform through combining coding and biology concepts to provide human cells for research, drug discovery, and cell therapy, allowing for a new generation of medicines. According to the company, its technology will allow research and drug discovery to shift away from inappropriate models and toward research with cells that are actually affected by human disease. The company anticipates that its technology will improve research and drug discovery, reduce costs, and broaden the use of cell and tissue therapies. The company raised Series B funding in 2021 and has

hinted at using the fresh capital for accelerated clinical development of its product using gene engineering technology. (Bit.bio, 2022)

- Ablatus Therapeutics Ltd - Ablatus Therapeutics Ltd, a medical device company founded in 2015, has been developing and commercializing novel tissue ablation technology to treat the most difficult, and often inoperable, solid cancer tumors. When compared to other technologies, the company's Bimodal Electric Tissue Ablation (BETA) technology uses a combination of AC and DC power to prevent tissue damage caused by charring and thus increases the size of the zone that can be treated. The funds raised will be used to advance the development of the company's product toward the market, ultimately with the goal of improving patient outcomes. (Ablatus Therapeutics. 2022)
- OMass Therapeutics Ltd - OMass Therapeutics, founded in 2016, has created a proprietary drug discovery platform that combines novel biochemistry techniques, next-generation native mass spectrometry, and custom chemistry to allow for the investigation of protein interactions within their native ecosystem while avoiding the cell's perplexing complexity. The funds raised will be used to advance the company's pipeline of small molecule therapeutics for patients with immunological and genetic disorders, providing funding for two years and allowing the company to advance its lead program into preclinical development. (Wilson, J., 2022)
- HealX Ltd - Healx is an AI-powered and patient-inspired technology company that specializes in rare disease treatments. Healnet is the company's AI platform, which provides data-driven treatment predictions, reducing the time from discovery to clinic to as little as 24 months. Healx has partnered with patient groups to scale the impact of this approach by leveraging the power of AI and combining their knowledge, information, and expertise in order to discover new treatments and move them towards the clinic with the launch of the Rare Treatment Accelerator. Using the funds raised, the company intends to develop its therapeutic pipeline and launch its global Rare Treatment Accelerator program. The company was founded in 2014. (Healx, 2022)

Retail Start-ups

- Simba Sleep Ltd - The company, which was founded in February 2016, manufactures the multi-award-winning Simba Hybrid mattress line. The company is now present in nine different countries throughout Europe, Asia, and North America. Today, the brand is available in half of the UK's retail distribution network, and it has partnered with Canada's largest specialist sleep store in Canada. With the capital infusion, the company intends to increase profitability in core markets, accelerate and deepen its existing business in Canada, and fuel future expansion in China. (Tucker, C., 2022)
- Taylor & Hart Ltd - Nikolay Piriankov, David Sutton, and Shane Hunt founded Taylor & Hart in 2012. The company is a high-end e-jeweller that specializes in custom engagement and wedding rings. Each ring is individually designed, hallmarked, and hand-finished and the diamonds are graded by the Gemological Institute of America (GIA). The company offers delivery in over 20 countries and plans to open its own offline showroom. It intends to use the new funds to expand operations and make the customization and purchasing processes more efficient and seamless. (Ranaweera, M., 2022)
- Patch Gardens Ltd - Patch Gardens Limited assists customers in selecting the right plants for their space, delivering them to their door, and assisting them in caring for them through in-house plant doctors and related content. The company began operations in 2016 and is the first to have delivered over 2 million plants to 500,000 satisfied customers. The company has aspirations to expand into the Business-to-business market by creating a product that is convenient for businesses. (Hurst, S., 2019) (Daly, S., 2022) (Patchplants.com, 2022)
- Bloom & Wild Ltd - Bloom & Wild Limited was founded in 2013 with the goal of reimagining the flower category. Every year, over a billion flowers are purchased globally, and customer satisfaction scores in the industry are low due to high prices, unreliable quality, and limited differentiation. The company seeks to redefine the industry through a commitment to customer delight, supply chain innovation, and investment in technology, data science, and new

product development. Bloom & Wild has revolutionized the flower-delivery experience by providing consistently high quality, reasonable pricing, and a seamless digital purchase experience. It intends to use the capital infusion to expand further across Europe while also expanding the business through technology, hiring new talent, and forming new partnerships to spearhead a new brick-and-mortar push. (Lunden, I., 2021) (Shah, S., 2021)

To analyze and compare the fund-raising ability of startups and for the research to achieve its objectives it is critical that all the companies used in the research sample would have received funding in both periods – at least once in the pre COVID-19 period (2018-2019) and at least once in the post COVID-19 period (2020-2021). This condition was used as a qualifying criterion for selection of sample companies so as to avoid the need for manipulation of data at the analysis stage. All the companies selected in Table 3.1 above were verified to have met this condition.

Data source: The respective data for sample company was collected from the official company's registrar for the United Kingdom (<https://www.gov.uk/government/organisations/companies-house>) where every private company registered in the UK files its regulatory data including filings for every time a company raises funds. This data source is a primary source and hence it is assumed to be legitimate. It is also an easily accessible source making it verifiable and transparent.

Data Collection: The data collection process involved going to the data source website and looking up for the name of the company and verifying the incorporation date, business description and registered address from the website. Once the identity is verified, the company's filings were accessed from the filing history tab and looking at all filings filed for as Capital filings. These filings show any changes in the capital of the company. For the purpose of this research, the only filings that fall under the scope are the ones where fresh capital is infused and new allotment of shares is made. This data can be found in the Filings for 'Statement of Capital following an allotment of shares.' These filings contain data with respect to various types of shares issued and the price at which they are issued. The only shares considered are the ones that have been issued at a price higher than the face value that actually command premium over the share's face value which is considered in this case to be the funds raised. All the

capital allotment filings for each of the companies from 2018 to 2021 were accessed and the data for shares allotted and issue prices of the allotted share were recorded.

Data Analysis: Once the raw data is collected, the total amounts raised for each company were calculated using the product of the shares allotted and the price per share values for both pre and post COVID-19 periods. The percentage differences were then calculated using the difference in the amounts raised pre and post COVID-19 for each company. The amounts raised pre and post COVID-19 for each sample in a specific sector were also added to arrive at total funds received for that sector and the difference between the two was then used to calculate the sectoral percentage change in the amounts raised pre and post COVID-19. Likewise, each sector had companies classified into either the early stage or the later stage. The percentage differences for each age group were also compared against the other age group for each sector.

Subsequently, the changes in the prices per share at which the sample companies raised funds are compared to analyze which group either sector-wise or age-wise fare better than the rest. Unlike absolute amount of funds raised, the price per share cannot be comparable on an absolute basis. Hence, only percentage differences pre and post COVID-19 for each sample company have been compared against companies from other sectors and against other age groups from the same industry.

Finally, from the previous analysis and available data of percentage changes in amounts raised and the percentage changes in the prices per share that were analyzed previously on a standalone basis are now analyzed against one another. This analysis can be used to identify if there is any change in the amount of funds raised that is brought about by the change in the share prices.

In chapter 4, the findings from this exercise of data collection, and data analysis are laid out. In the initial part of the analysis chapter, the amounts raised by the sample companies were compared on an individual, sector-wise, and also age basis. Secondly, comparisons of the percentage changes in the share prices are analyzed and lastly the percentage changes in the amounts raised and the prices per share were compared to distinguish if any similarities may be observed.

Chapter 4 - Findings and Analysis

In this section, we discuss the findings drawn and analyzed from the data collected and try to find probable reasons if any from any noticeable pattern in the amount of funds raised that we may or may not find. The objective of this entire exercise is to identify how much of an effect does a crisis have on the private companies as a whole and also to compare the sectoral impact if and how much has the COVID-19 pandemic specifically affected the 3 main sectors covered under the scope of this research.

To achieve the objective of this entire exercise, firstly the data is viewed as a whole for ascertaining the differences in the amounts raised pre and post the COVID-19 pandemic. Secondly, the data is then analyzed for differences between each sector.

It is critical to consider that the total amounts raised may depend on the capital requirements of each sector and may or may not be comparable. Therefore, the percentage differences in the share prices pre and post COVID-19 have been considered in addition to the total amounts raised to make them comparable and to provide better insight about the impact between sectors before and after COVID-19.

Tables 4.1, 4.2 and 4.3 provide a summary of the data collected for all the 12 companies from the three respective sectors. This data helps to understand how much funds did each of the companies raise individually and the rate at which these shares were issued.

Age	Name	Pre COVID-19			Post COVID-19		
		Shares	Rate/share	Amount (in £)	Shares	Rate/share	Amount (in £)
Early Stage	PhotoSpire Ltd	26,205	9.54	249,996	255,738	24.55	6,277,766
	Cleo AI Ltd	6,883,374	1.27	8,737,936	11,153,758	2.67	29,765,338
Later Stage	CityFalcon Ltd	96,504	7.5	723,780	302,386	9.47	2,864,505
	Zesty Ltd	103,441	8.46	875,111	122,989	6.35	780,654

*Table 4.1: Breakup for funds raised Pre and Post COVID-19 for companies in
Technology Sector*

From the data pertaining to the technology sector as seen in table 4.1, we can infer that all the companies with the exception of Zesty Ltd. have been successful in raising more funds in the post pandemic period as compared to before without compromising their price per share. Zesty Limited however, not only raised lesser funds but also issued higher number of shares as compared to the period before the pandemic, thereby affecting its price per share negatively.

Age	Name	Pre COVID-19			Post COVID-19		
		Shares	Rate/share	Amount (in £)	Shares	Rate/share	Amount (in £)
Early Stage	Bit Bio Ltd	777,001	4.25	3,300,005	1,641,721	75.19	123,438,572
	Omass						
	Therapeutics Ltd	10,769,231	1.3	14,000,000	14,999,999	1.3	19,499,999
Later Stage	Ablatus Therapeutics Ltd	871,935	1.29	1,124,796	1,176,997	1.29	1,518,326
	HealX Ltd	16,453,266	3.14	51,689,550	303,694	544.13	165,249,859

*Table 4.2: Breakup for funds raised Pre and Post COVID-19 for companies in
Pharmaceuticals Sector*

Table 4.2 shows the breakup of funds raised for the companies in the pharmaceuticals sector. It is observed that Omass Therapeutics Ltd. and Ablatus Therapeutics Ltd. have both managed to raise more funds but have had no changes in their price per share. On the other hand, however, Bit Bio Ltd. and HealX Ltd. have both experienced remarkably high growth on both accounts – amount raised and also the price per share.

Age	Name	Pre COVID-19			Post COVID-19		
		Shares	Rate/share	Amount (in £)	Shares	Rate/share	Amount (in £)
Early Stage	Simba Sleep Ltd	317,084	129.2	40,967,238	87,724	50.35	4,417,149
	Patch Gardens Ltd	7,334,343	0.67	4,893,850	618,000	1	618,000
Later Stage	Taylor & Hart Ltd	382,381	13.17	5,036,547	67,154	37.29	2,504,090
	Bloom & Wild Ltd	56,684	266.1	15,083,644	69,875	1075.1	75,124,657

*Table 4.3: Breakup for funds raised Pre and Post COVID-19 for companies in **Retail** Sector*

From the numbers of the Retail sector in table 4.3, it can be seen that 3 out of the 4 companies have experienced a decline in total funds raised. Despite this, Simba Sleep Ltd. is the only company out of the four that experienced a drop in its share price. Whereas, Patch Gardens Ltd and Taylor & Hart Ltd could manage a handsome improvement in its price per share despite raising lesser funds as compared to the pre COVID-19 period. Lesser funds raised but at better prices could indicate reduced capital needs of the companies due to lack of demand as a consequence of the pandemic. Bloom & Wild Ltd. is the standalone outperformer from the sample companies in the retail sector that not only managed to raise more funds post COVID-19 as compared to pre COVID-19 but also did so at a significantly higher appreciation in its share price.

From Table 4.1, 4.2 and 4.3 we can construct Table 4.4 to show the differences in the amounts raised before and after the occurrence of the pandemic to draw appropriate conclusions.

Amounts in Millions of £

Sector	Pre COVID-19	Post COVID-19	% Change
Technology	10.59	39.69	275%
Pharmaceuticals	70.11	309.71	342%
Retail	65.98	82.66	25%
Total	146.68	432.06	195%

Table 4.4: Aggregate funds raised sector-wise pre and post COVID-19

As seen from the table, all the three sectors as a whole raised approximately 195% more funds in the two years immediately following the crisis than the immediate two years before it. The collected data showed that every sector has positive percentage differences implying that all of these sectors were successful in raising more funds after COVID-19 as compared to before. It is also worthy to note that the highest jump in the total funds raised was seen in the pharmaceuticals sector. It is worth pointing out that despite 3 out of 4 companies from the Retail sector experiencing a decline in the amounts raised, the net difference in the amounts raised pre and post COVID-19 is positive. The chart below shows how each sector was able to raise more funds and the jump in the amounts raised in absolute numbers following the crisis.

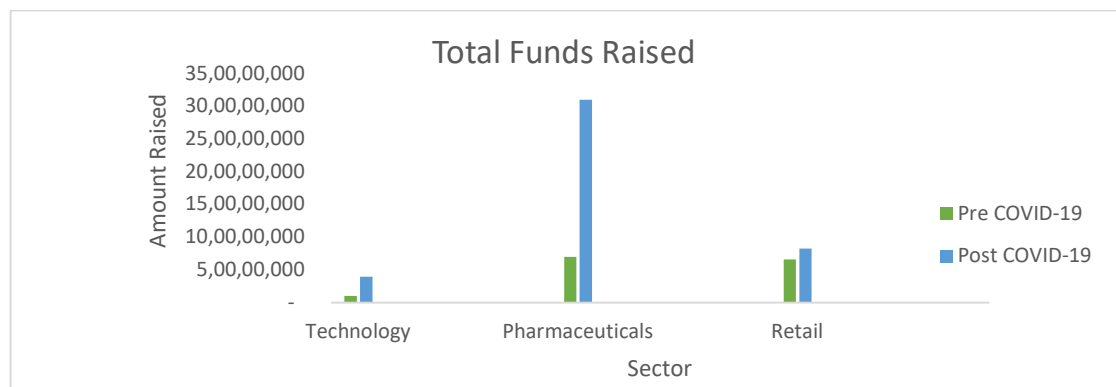


Chart 4.1: Difference in amounts raised Pre and Post COVID-19

It is important to note that the big jump in the pharmaceuticals sector could be attributed to it being a capital-intensive industry that requires huge investments in research and development and/or the nature of the crisis being a medical one making it more attractive for the investors.

Because the technology sector is not as capital consuming as the pharmaceuticals sector, the total amounts raised in the two sectors varies vastly. It is amply clear from table 4 that both the technology as well as the pharmaceuticals sectors have seen a 3-digit percentage increase in the funds raised. However, the size of the bars from Chart 4.1 depicts how the two sectors have inherently different Capital or Operational needs. It is critical to not be blinded by the size of the bar Post COVID-19 funds raised in the pharmaceuticals sector.

The 3-digit percentage jump in the technology sector can be said to have been contributed by the social distancing norms as a measure to contain the pandemic facilitating increased usage of technology for personal, professional, academic, and other reasons.

While each sector was successful in raising more funds in the post COVID-19 period as compared to the period before, it is essential to also view the data from an age point of view. Table 4.5 below gives a breakup of the funds raised by companies of the same age from a particular sector, throwing more light on how effect does age have on a company's fund-raising capabilities.

Amounts in Millions of £

Sector	Age	Pre COVID-19	Post COVID-19	Change
Technology	Early stage	8.99	36.04	301%
	Later Stage	1.60	3.65	128%
Pharmaceuticals	Early stage	17.30	142.94	726%
	Later Stage	52.81	166.77	216%
Retail	Early stage	45.86	5.04	-89%
	Later Stage	20.12	77.63	286%

Table 4.5: Breakup of funds raised by companies from same age-group

As clearly evident from table 4.5 above, the early-stage retail startups were the only group that raised lesser amount of total funds in the post COVID-19 period as they did before. This does not necessarily hint at the inability of these startups to raise funds. It could just be that these startups were just not seeking as much funds they were before COVID-19 possibly due to lack of demand due to COVID restrictions. While in contrast, all other groups from other sectors managed to raise at least double the funds than before if not more. The early-stage pharmaceutical companies however, managed to raise a staggering 726% more funds than before. It does not seem fair to judge a company's fund-raising capabilities merely by comparing the total amount of funds that were raised by the companies because there could be several reasons for which the companies might have raised higher or lower funds.

To gain a deeper insight about how much easier or difficult was it for the companies to raise the greater amount of funds the next part herein compares the share prices of the companies at which the funds were raised. However, as discussed in the beginning of this chapter, the share prices of different companies cannot be compared on a standalone basis. Hence, for the purpose of this study, the growth rates of the share prices have been compared to draw conclusions. The table below shows the rates at which the share prices of the companies changed over the course of the 4 years under review i.e., 2018-2021.

Sector	Age	Change in Share price	Industry average change in share price
Technology	Early stage	134%	67%
	Later Stage	1%	
Pharmaceuticals	Early stage	835%	4723%
	Later Stage	8610%	
Retail	Early stage	-6%	119%
	Later Stage	244%	

Table 4.6: Percentage change in price per share

From the last column in table 4.6 above, it is observed that the average share prices for the companies in the pharmaceuticals sector underwent the highest jump in their values from their prices in the 2 years prior to COVID-19 amongst the 3 sectors under review. Considering the nature of the pandemic and its impact on all economies across the globe one would expect the pharmaceutical sector to outperform the other sectors but the extent of outperformance quantified in this table is somewhat surreal. Whereas, it is also notable that the other two industries also have a positive difference between the share prices before and after COVID-19 implying the ability of the startups in these sectors to quickly and constantly adapt to the ever-evolving dynamic consequences of the COVID-19 pandemic and pivot their business models to meet the needs arising from the emergency at hand.

The breakup from table 6 shows the changes in the share prices between the early-stage companies and the later stage companies. We can see that the early-stage companies in the Technology sector were better able to negotiate their share prices as compared to the ones in the later stage. This can be attributable to the fact that technology sector is an ever-evolving one the newer companies that focus on solving more urgent and recent problems and providing more innovative and creative solutions to modern problems.

In the case of the pharmaceutical sector however, the later stage companies have been more successful in raising funds on favorable terms as compared to newer companies. The later stage companies have been able to increase their share prices 7775% (8610 - 835) more than the newer companies, which is a remarkable difference. It is safe to say that the companies that have been in the business longer, show more promise and have more research done to increase their marketability and the Investors have higher faith in such companies.

At this stage, a comparison between the percentage changes in the amount raised and the price per share seems like the logical next step. This will help to understand if a company is issuing more or lesser number of shares as compared to what it would have done pre- COVID-19 to raise the same amount of funds. If an investor invests \$1 million in a company with a pre-money valuation of \$4 million, the founders will own 80% ($\frac{4}{5}$ th) of the company after the investment. However, if the post-money valuation is \$4 million, the owners will own only 75% ($\frac{3}{4}$ th) of the company after the

investment. Consequently, the number of shares issued to raise the same amount of funds influence the price per share and if share price increases at the same rate as the increase in total funds raised, then it implies that the company issued the same number of shares as it would have earlier. This exercise will help us understand if the shareholders of the company are giving away a higher chunk of their business profits in order to secure the higher amount of funding as seen from our previous findings.

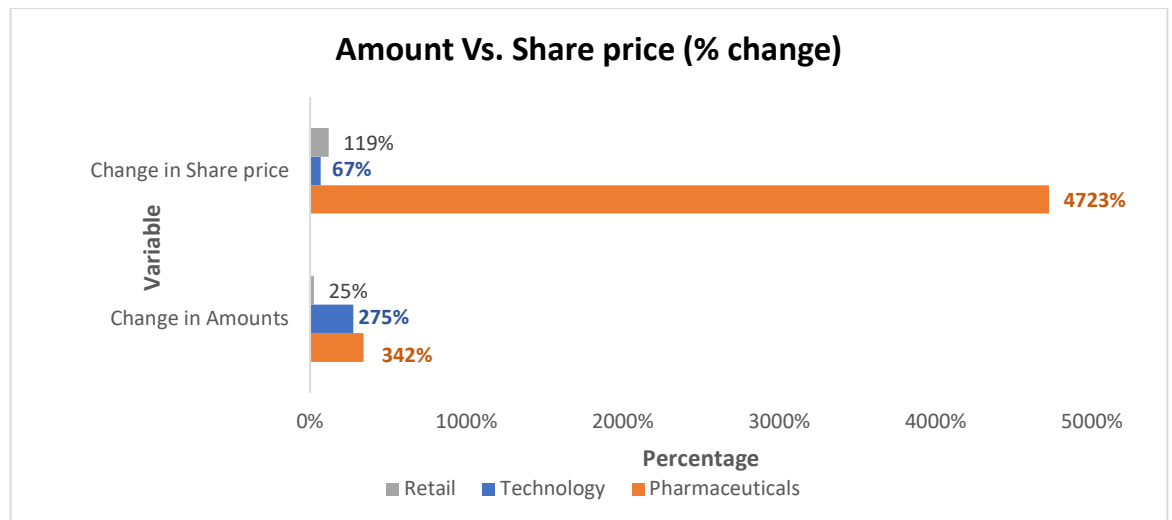


Chart 4.2: Comparing percentage changes in funds raised and share price

From the given chart it can be observed that for the pharmaceuticals and retail sector the jump in the share prices is greater than the jump in the amounts raised. This implies that the companies in these industries have issued lesser shares to raise the same or more amount of funds. Whereas, the companies in the technology sector have witnessed a higher jump in their funds raised as against the jump in their share prices which can be implied to say that the companies have given away a higher share of profits than they would have given away prior to the occurrence of the pandemic to raise the same amount of funds.

From the overall positive changes across all the sectors on account of amounts raised and share price differences, it is safe to derive that the overall ability of startups to raise funds in these three sectors post COVID-19 has increased noticeably even more so for the startups in the pharmaceutical space. It is also observed from tables 4.5 and

4.6, that the early-stage retail companies (retail startups having age of 3 years or lesser) suffered on account of both – amount of funds raised and also their price per share. Furthermore, it can also be observed from chart 4.2, that the inflow of funds to overall capital of companies is not costing the founders to dilute their stake in the business. This implies that the owners are not raising higher funds by way of sacrificing a higher share from the profits. This points to the faith of the investment community in the ever-increasing scope and exponential growth capabilities of the startup universe.

Chapter 5 - Discussion

At this point, it is imperative to go back and compare the findings from chapter 4 against the objectives set out.

- 1) Quantify the increase or decrease in the amount of funds raised by start-ups post COVID-19.

All three sectors raised collectively 195% more funds in the two years following the crisis than in the two years preceding it. On an individual basis, 8 out of the 12 sample companies raised higher funds in the post COVID-19 period. From an initial analysis we can say that 67.77% of the sample companies were able to raise higher funds post COVID-19 than they did previously. 3 out of the 4 that raised lesser funds in the post COVID-19 period are from the retail sector while remaining one is from the technology sector. We can say from this data that the fund-raising ability of startups did not take a hit for the worse.

- 2) Provide sector-wise bifurcation of amounts raised and price per share pre and post COVID-19 and the increase or decrease in the same.

According to the data analysis, every sector has a positive percentage difference, implying that all of these sectors were successful in raising more funds after COVID-19 than before. It is also worth noting that the pharmaceuticals sector saw the greatest increase in total funds raised of 342%. The technology sector witnessed a growth of 275% in the amount of total funds raised. It is worth noting that, despite three out of four retail companies experiencing a decrease in amounts raised, the net difference between pre and post COVID-19 amounts raised is positive. All sectors when split into early and later stage start-ups have also seen a 3-digit growth percentage with exception of early-stage retail start-ups. The early-stage retail startups raised 89% lesser funds in the post COVID-19 period.

When the share prices of the three sectors were compared, the pharmaceutical companies had the greatest increase in value from their prices two years prior to

COVID-19 – a jump of 4723% to be exact. It is also worth noting that the other two industries have a positive difference in share prices before and after COVID-19. The technology sector saw a jump of 67% and the retail sector saw a jump of 119% in its share prices. These statistics implying that startups in all the three sectors did not only raise more funds but also did so at premium valuations. That being said the later stage technology companies and the early-stage retail companies saw little to no growth in their share prices. While the later stage pharmaceutical companies saw a massive jump of 8610% in their prices.

- 3) Identify sectors with highest and lowest percentage change in share prices and amounts raised pre and post COVID-19.

The pharmaceutical sector is a clear winner amongst all the 3 sectors with highest percentage change witnessed in both – amount raised and price per share values. The retail sector saw the lowest percentage jump in the value of funds raised, however on account of price per share, the technology sector saw the least growth.

Chapter 6 - Conclusions, Limitations and Recommendations

The key **conclusions** that can be drawn at this point from this study include-

- 1) From a microscopic view, the pharmaceutical sector saw massive growth particularly the later stage pharmaceutical companies. Whereas, the early-stage retail companies experienced deceleration both amount-wise and share price-wise.
- 2) Using a macro lens, it can be viewed that all the sectors – pharmaceuticals, technology and retail performed positively with respect to amounts raised and prices per share.

When the results are viewed against the tenet based on which this study was initiated, it can be concluded from the findings that the crisis of COVID-19 did not necessarily affect the ability of start-ups to secure external funding.

While considering the impact of the above conclusions, it is also key to be aware about the **limitations** that surround this research that can be listed as follows –

- i) **Insufficient sample size** – Selecting sample companies from specific sectors considering the qualifying companies should have raised funds both in the pre and post COVID-19 periods definitely impacted the size as a lot of companies scouted for did not meet the qualifying condition. Also, number of sectors scoped under review limited the sample size even further. Insufficient sample size can adversely affect the ability to extend the scope of the conclusions drawn of larger groups. Also, considering uncertainty in the economy and business as a consequence of COVID-19 there was high growth in the number of start-ups born and also the number of start-ups that ceased operations. With so much uncertainty, it seemed difficult to estimate a correct sample size to be representative of the respective sectors.

Also, with so many new start-ups being born to bridge the dynamic gaps in an uncertain economy, it is almost impossible to classify some of these hybrid companies into a specific sector. For example, fintech companies

could very well likely be fit into financial services as well as it could fit into the technology sector. For the purpose of this research, Zesty Ltd is classified as a technology company as it provides a software for hospital administration and does not actually conduct medical research of any sort. Whereas, companies like Bit Bio Ltd and HealX Ltd are classified as pharmaceutical companies as they are conducting medical research albeit using software technology.

- ii) Time and resource limitation – Since this study aimed at comparing fund raising abilities for companies before and after COVID-19 it was essential for the time periods both before and after to be comparable and hence equal. And since only 2 years have passed after COVID-19 for which filings can be accessed we could only limit the study to two years prior to COVID-19 restricting the entire span of the study to be limited to a total of 4 years. Also, Due to limited time available to conduct thorough research and manually extract data from filings, there is limited scope for data to be extracted for a greater number of years, more companies or other industries thereby limiting the scope further.
- iii) Combined effect of COVID-19 and Brexit – As the scope of the study is limited to the UK geography, where the longstanding issue of BREXIT was also cemented in January 2020 which was around the same time as the effects of COVID-19 began appearing in the economy. However according to TUC, 2020, it was discovered that in most cases, the regions and sectors most affected by the economic impact of Covid-19 were not the same as the regions and sectors most vulnerable to Brexit (though there were some exceptions), but that the combined impact of both crises was greater than either would have been in isolation. The most vulnerable sectors to Brexit were automotive, transportation equipment, chemicals and chemical products, textiles, and services such as finance and communications. Hospitality, tourism, transportation, and arts, and entertainment are the ones that were most susceptible to the economic impact of COVID-19. The automotive industry is one of the sectors that has suffered as a result of COVID-19 and is expected to be severely impacted by Brexit.

These limitations however, provide basis for future research scope. Some **recommendations** for research of what could stem from this study include are -

There is further scope to extend this study in the future to other geographies, a bigger sample using more sectors, and also greater number of companies to provide a greater understanding of the sectoral impacts of COVID-19 depending on the availability of time and the accessibility of data. Classification of a greater number of sectors or hybrid sectors can provide deeper understanding about the growth potential each of these newly emerging technologies and businesses.

Further scope to study long term impacts also exists after reasonable amount of time have passed and the long-term economic impacts have been factored into the data. Where the data is available for longer period and the data is big enough, a wider variety of analysis techniques can be employed to analyse the data and draw conclusions better grounded with data.

Depending on the availability of data in the future, the economic impacts of Brexit and COVID-19 can also be attempted to be separated and compared against one another.

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