

Private equity investments in early-stage financing during COVID-19

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ABSTRACT

Objective: This paper explores the trends of Private Equity (PE) investments and their financing strategies in early-stage financing during COVID-19. The questions asked are: How does a shock such as a global pandemic which led to a subsequent closure of every sector in every country affect the allocation of PE resources among portfolio start-ups? What are financing strategies of PE investors in such an environment?

Research Design & Methods: This study uses data sourced from S&P Global with all direct and completed investments by PE investors / sponsors between 2020 and 2022. Research methods to test the hypotheses include data visualisation, and regression and mediation analysis.

Findings: Data analysis indicates an initial muted performance in the first two quarters of 2020 in both number and volume of investments. The average investment was USD 3.48 million in 2020, to increased to USD 4.58 million in 2021, and increased again to USD 5.03 million in 2022, indicating increasing comfort among PE firms in investing within a changing environment. PE firms continued to invest in familiar regions including North America, Asia, and Europe, and showed selective participation through larger average investments in newer regions, such as the Caribbean. Seed financing was by far the largest financing stage both in terms of number (69% of sample) and volume (65% of sample) with pre-series B having largest average deal investments. Regression analysis revealed that foreign investments significantly influenced the relationship between offering type and deal size. While international offerings had a positive association with foreign investments, mediation analysis indicated that foreign capital ultimately decreased investment size.

Implications & Recommendations: This study highlights the resilience of global PE investments and their adaptive investment strategies during the COVID-19 pandemic. The rapid rebound in deal activity suggests that PE firms preferred investing in mature ecosystems and established sectors to position themselves to preserve value. Selective larger investments in emerging regions, such as the Caribbean, suggest opportunities for value creation. The mediating role of foreign PE investment on offering types and deal sizes indicates PE preference for simpler and lower-risk transactions during periods of heightened uncertainty.

Contribution & Value Added: First, this study enriches the literature PE financing and entrepreneurial activity. Second, it contributes to the growing literature on crises by examining the impact of COVID-19 on start-up financing. Third, this paper provides insights into strategic investing by PE firms during periods of heightened uncertainty. Finally, the examination of PE-investments in entrepreneurial activity adds to the study and practice of entrepreneurial finance by highlighting the role of foreign investments in deal making when faced with systemic risks and their strategies towards resilience and capital preservation.

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INTRODUCTION

The COVID-19 pandemic triggered a massive shock in economic markets the world over. At the onset of the pandemic in Q1 2020, governments and policy makers centred on the immediate measures to curtail the spread of the virus and protect the lives of citizens by restricting travel, closing public spaces, business centres and offices, and schools. Physical movement of people and goods were hindered, negatively affecting all industries including the financial systems of the world and how entrepreneurial deals were facilitated.

In 2019, however, PE firms worldwide had dry powder worth USD 2.5 trillion, money which was at an all-time high, and up 4.17% from the previous year, ready to be allocated. PE firms can be considered the most consummate deal makers operating today (Nolop, 2007), with their enormous capital in hand, and various strategies which could be employed in environments rife with uncertainty and information asymmetry.

In this study, we explore the trends of PE investments in early-stage financing between 2020 and 2022, and their response to the COVID-19 pandemic and its aftermath. It addresses the following questions: How does a shock such as a global pandemic which led to a subsequent closure of every sector in every country affect the allocation of PE resources among portfolio start-ups? What are financing strategies of PE investors in such an environment? Results indicate initial muted performance in deal volume and number followed by gradual recovery. PE investments flowed into tried and tested regions and sectors to preserve capital and select regions to grow revenue. Seed financing was the prevalent start-up type. Foreign investments were also notable, and international PE firms acting as “gatekeepers” that shaped deal structures and investment decisions. The rest of the paper is organized as follows. The next section provides a review of financing entrepreneurial start-ups and entrepreneurial activity during times of crises, with a focus on the COVID-19 pandemic. Next, the data used for the study is highlighted along with the methods used in this paper. It is followed by the analysis of data. The results of the analysis are subsequently presented and discussed. Finally, the study is summarized with concluding remarks and directions for future research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

COVID-19 and Other Financial Crises

The COVID-19 pandemic and the resulting crisis has had a plethora of negative connotations attached to it including being considered the worst economic downturn since the Great Depression in the 1930s (Gopinath, 2020), and the biggest crisis of modern times (Wojcik & Ioannou, 2020). It caused unprecedented disruptions to economic activity in every sector and in every country the world over (Goodell, 2020; Hassan *et al.*, 2020; Ludvigson *et al.*, 2020), and had even been labelled a ‘Black Swan’ event (Sequoia Capital, 2020; Taleb, 2007).

Bernake (1983) argued that crises events introduce shocks that ripple through the economy, causing financing systems to fail, and disrupting both local and international markets. Examples of crises over the last few decades include the Great Depression of the 1930s, the Technology Bubble of 2000, and the Global Financial Crisis of 2008. Bernake (2008) concluded that the Great Depression and the subsequent financial collapse affected monetary channels, disrupted worldwide mechanisms of credit, and even affected countries that did not have domestic banking crises.

The collapse of the Technology Bubble in 2000 had a large body of academic research limited to the United States, mostly due to the location of the crisis. Townsend (2015) concluded that venture capitalists (VCs) most exposed to the information technology sector were more likely to invest in non-information technology sector companies following the collapse. The study also noted that information technology-focused VCs with sufficient capital exhibited a similar shift, due to expected liquidity constraints in the future. Although the average funding per round increased during this period (De Vries & Block, 2010), the firms that received financing were in general, more mature than those funded before the bubble collapsed (Green, 2004; De Vries & Block, 2010).

The 2008 Financial Crisis caused a liquidity supply shock, leading to a collapse in available financing. Limited studies (Conti *et al.*, 2019) on the impact of the financial crisis suggest an overall negative impact on entrepreneurial activity.

Block *et al.* (2010) noted that capital commitments to US venture funds unexpectedly fell from USD 28.6 billion in 2008 to USD 15.2 billion in 2009, a 47% decrease from the previous year. Results also indicated a decrease in both the amount of capital raised per funding round (Block & Sandner, 2009; Block *et al.*, 2010; and De Vries & Block, 2011) and the number of financing rounds (Block & Sandner, 2009; Block *et al.*, 2010; and De Vries & Block, 2010; Conti *et al.*, 2019). Gemson (2024) concluded that PE firms showed heightened risk aversion during this period and, rather than exiting the market, altered deal selection parameters while choosing targets.

While the pandemic and its aftermath are rightfully characterised a crisis, academic literature emphasises important contrasts with earlier crises such as the Technology Bubble of 2000 and the Global Financial Crisis of 2008. Lagarde (2020) stressed that the crisis that arose from the pandemic is exogenous, with sources detached from economic fundamentals.

Conditions just prior to the pandemic showed little indication of a slowdown in entrepreneurial financing. From the fundraising perspective, dry powder had steadily increased world-wide over the past decade. In 2019, the volume of global dry powder reached an all-time high of USD 2.5 trillion, up from USD 2.4 trillion in 2018.

On March 11th, 2020, the World Health Organization declared COVID-19 a global pandemic, triggering widespread economic shutdowns and severely disrupting entrepreneurial and financial systems. Howell *et al.* (2020) noted an immediate decrease in the number of funding rounds in the United States, between March and April 2020. However, they argue that possible funding decisions were more likely to be influenced by determinants rather than liquidity concerns. While past crises (2000 Tech Bubble and 2008 Financial Crisis) had liquidity constraints, the liquidity crisis during COVID-19 was relatively short-lived due to the aggressive intervention of central banks. Instead, economic shutdowns, unemployment, and solvency concerns became larger issues for businesses.

Global data indicates that as many as half of all small firms temporarily ceased trading since the lockdown and as many as 60% of small and medium-term enterprises SMEs were at risk of running out of cash reserves (Bartik *et al.*, 2020; Cowling *et al.*, 2020; Giupponi & Landais, 2020). Brown *et al.* (2020) found the volume of new equity transactions in the UK declined markedly following the outbreak of the COVID-19, with seed financing – capital to the most nascent entrepreneurial start-ups facing the greatest obstacles obtaining financing – being most acutely affected.

Early-stage Financings in Times of Crisis

Financing is an essential element of the start-up ecosystem. It provides the much-needed capital to firms that are often deemed unsuitable for traditional means of financing such as bank loans and other forms of debt. Such companies usually lack stable cash flows (Berger & Udell, 1998), have few tangible assets to warrant as collateral and could face the threat of operating losses for many years (Gompers, 1999) making them very risky. However, they are known to offer high potential returns and are vital to the economy by fostering radical innovation, technical advancement, employment growth, and higher aggregate incomes to society.

Capital in such environments comes from business angels and private equity (PE), including venture capitalists (VCs) (Hall & Lerner, 2010; Kerr *et al.*, 2014) who help create this impact (Mason, 1999; Samila & Sorenson, 2011; Nanda & Rhodes-Kropf, 2013) and are a key ingredient for the development and growth of innovative start-ups (Breschi *et al.*, 2021).

Beyond capital provision, early-stage financing is predicated on the need for a close engagement between entrepreneurs and investors (De Clercq & Sapienza, 2006) translating into relational interactions including oral pitches entrepreneurs undertake to secure investments (Clark, 2008), social impromptu meetings for coffee to emphasise crucial parts of the decision making process (Huang & Knight, 2017), and other activities that could generate soft information and reduce information opacity associated with start-ups (Shane & Cable, 2002) helping investors structure deals appropriately to ensure success.

Brown *et al.* (2020) opined that the unique nature of entrepreneurial finance may make it highly susceptible to shocks, such as one arising from the crisis after the Covid-19 pandemic. Gompers *et al.* (2022) demonstrated how the pandemic affected the overall strategy and operations of PE firms, requiring them to seek innovative ways to respond to heightened uncertainty. Based on a survey of more than 200 PE managers, the authors concluded that the industry adapted over time and from more “normal” times, for both preservation and creation of value.

The internationalization of PE is an ongoing trend (Aizenman & Kendall, 2008) with foreign PE firms contributing capital (Humphery-Jenner & Suchard, 2013) and stimulating international syndication and expansion across borders to build geographically diversified portfolios (Tykova & Schertler, 2011), including investments in emerging markets. While PE investments have been shown to increase deal or project sizes (Gemson & Rajan, 2011) and provide certification effects (Megginson & Weiss, 1991), extant literature on foreign PE on domestic firms and performance provides mixed results (Rojec & Knell, 2018) with positive, negative, and neutral spillover effects that vary from region to region.

Studies highlight mechanisms influencing these outcomes, including the competition effect (Al-datmaz & Brown, 2020), the absorptive capacity of local firms to incorporate technology transfers (Scott-Kennel, 2004), and the level of foreign presence. Institutional environments and investment climates were key determinants of positive effects of foreign PE investment on the domestic PE sector. Accordingly, the positive effect of foreign investment on offering structure is based on the premise that favourable ecosystems provided participants with adequate environments for support, growth, and success. With PE investors placing a much greater weight on revenue growth during COVID-19 (Gompers *et al.*, 2022), it is expected that investors structure transactions strategically to manage fund performance. We hypothesise that foreign PE structure their investments through specific offering structures to protect scale and, consequently, investment size.

It is therefore hypothesised that foreign investment is expected to affect offering types positively (negatively), which in turn, increases (decreases) the size of the investment. PE investments into target companies can be through a domestic offering, an international offering, or a global and domestic offering. These offerings represent transaction-level features agreed upon by the PE investor or sponsor and the target firm and may include foreign investor participation.

- H1:** The relationship between domestic offerings and investment size is mediated by foreign investment.
- H2:** The relationship between international offerings and investment size is mediated by foreign investment.
- H3:** The relationship between global and domestic offerings and investment size is mediated by foreign investment.

The mediating effect of foreign investment on deal offering and size of investment is described in Figure 1.

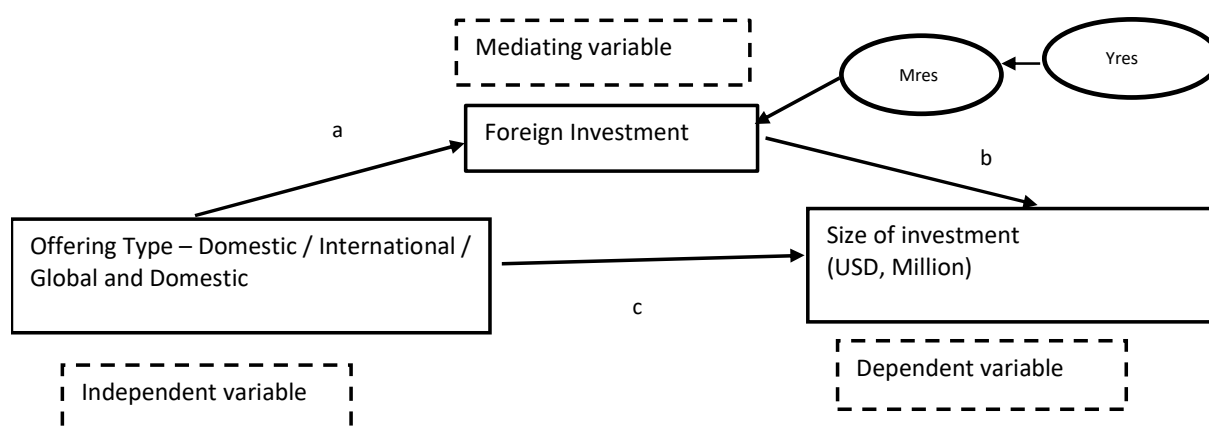


Figure 1. The mediating effect of foreign investment on offering type and size of investment

Source: own elaboration.

RESEARCH METHODOLOGY

The Sample

To examine PE investment strategies in entrepreneurial financing during the COVID-19 pandemic, data was sourced from S&P, covering all direct and completed investments by PE investors / sponsors between January 1, 2020, and December 31, 2022. This database contains details of completed PE investments globally, including investment date, portfolio company name, industry type, transaction type, transaction features, PE investor or sponsor, investment amount, and type of investment activity.

A capital investment by the PE investor or sponsor into a portfolio company (target) was taken as the unit of the analysis. This capital investment represents the transaction between the investee company (portfolio company / target) and the investor (PE investor(s) or sponsor(s)) and contains information about the parties in the transaction, financial arrangements, and deal characteristics. Details include name(s) of the PE investor or sponsor (investor), portfolio status, and activity, the portfolio company name (investee), the primary industry, and geographical region, deal amount (in USD, Million), and the portfolio status.

The final sample consisted of 12 123 PE investments, with a total investment value of USD 55 806.03 million. These investments span across 14 different industries across 8 different world regions and 100 different countries.

Summary Statistics

Table 1 presents summary statistics for the sample.

Table 1. Summary snapshot of PE investments in early-stage financing, 2020-2022

Time Period	Total Deals			With foreign PE investment		
	Number of deals	Volume of deals (USD, Million)	Average Size of Deal (USD, Million)	Number of deals	Volume of deals (USD, Million)	Average Size of Deal (USD, Million)
Qtr1, 2020	439	USD 1 463.17	USD 3.30	150	USD 534.52	USD 3.56
Qtr2, 2020	484	USD 1 640.25	USD 3.39	201	USD 737.67	USD 3.67
Qtr3, 2020	618	USD 2 164.02	USD 3.50	245	USD 1 055.03	USD 4.31
Qtr4, 2020	769	USD 2 842.73	USD 3.70	350	USD 1 452.86	USD 4.15
Qtr1, 2021	780	USD 3 086.37	USD 3.96	357	USD 1 575.90	USD 4.41
Qtr2, 2021	1 007	USD 4 530.56	USD 4.50	496	USD 2 497.88	USD 5.04
Qtr3, 2021	1 210	USD 5 492.2	USD 4.54	573	USD 2 822.31	USD 4.93
Qtr4, 2021	1 341	USD 7 140.34	USD 5.32	718	USD 4 349.50	USD 6.06
Qtr1, 2022	1 633	USD 8 199.13	USD 5.02	847	USD 4 377.74	USD 5.17
Qtr2, 2022	1 452	USD 7 132.09	USD 4.91	797	USD 4 620.42	USD 5.80
Qtr3, 2022	1 260	USD 5 812.23	USD 4.61	653	USD 3 114.45	USD 4.77
Qtr4, 2022	1 130	USD 6 302.94	USD 5.58	582	USD 4 113.73	USD 7.07
Total	12 123	USD 55 806.03		5 969	USD 31 252.00	

Source: own study of data, sourced from S&P Global.

An examination of Table 1 indicates a muted performance in investments in the first two quarters of 2020 in both number and volume of investments. Liquidity constraints were relatively short-lived, and number and volume of investments began to increase in pace from the third quarter of 2020 onwards, indicating that PE investors quickly adapted from more “normal” times (Gompers *et al.*, 2022). Q3 2020 clocked a 28% increase in number of deals and a 32% increase in volume of deals compared to Q2 2020, with similar increases in Q4 2020. While Q1 2021 had an increase in number and volume of deals, Q2 2022 showed sharp increases of 29% and 47% in number and volume as compared to the previous quarter. Declines in deal count were observed in the second, third, and fourth quarter of 2022; however, total volume rebounded in Q4 2022. Overall, PE investment activity in the start-up space followed an upward trajectory over the sample period.

Average investment size increased from approximately USD 3.48 million in 2020 to USD 4.58 million in 2021, and USD 5.03 million in 2022, representing a 67.7% increase from USD 3.33 million in Q1 2020 to USD 5.58 million in Q4 2022. Deals with foreign PE investment accounted for 49.24% by way of number and 56% by way of volume and followed similar pattern. Average deal size for transactions with foreign PE investment was USD 4.92 million, significantly larger as compared to USD 4.36 million for the full sample. Deals with foreign PE investment were significantly larger in volume and average deal size indicating their noticeable presence in deal activity.

Methods

This study examines the allocation of PE investments in start-up financing and analyses the determinants of PE investments during the COVID-19 pandemic. Specifically, it tests whether investment size depends on offering type and whether this relationship is mediated by foreign PE participation.

First, trends of PE activity were examined using data visualization techniques including, bar graphs and pie charts to illustrate changes in deal count, deal volume, and average deal size across world regions, industries, and financing stages. These visual tools facilitate intuitive interpretation of PE investment patterns in entrepreneurial financing.

Second, mediation analysis using linear regression was conducted to examine the determinants of deal size and explore how investment origins (foreign PE investments) mediate the relationship between deal offerings and size of the investment. The mediation framework proposed by Baron and Kenny (1986) was employed. In the first stage, the mediator was regressed on the independent variables; in the second stage, the dependent variable was regressed on the independent variable; and in the final stage, the dependent variable was regressed on both the independent variable and the mediator. While the independent variable was expected to show a statistical significance in the first two steps, in the third step, the independent variable turned non-significant, while the mediator emerged significant. Finally, the Sobel test was run to indicate the significance of the coefficients and standard errors.

The dependent variable is investment size, measured in 2015 US dollars. The mediating variable is foreign investment. Independent variables include domestic-only offering, foreign-only offering, and global and domestic offering, involving three sets of mediation analysis.

Variables examined in the mediation analysis included deal level characteristics such as foreign investment, domestic offering, international offering, and global and domestic offering which characterize the origin of the PE investment into the target.

Table 2 presents a list of variables used in the analysis.

The Hausman specification test (Hausman, 1978) was applied to assess potential endogeneity in foreign investments, domestic offerings, foreign offerings, and global and domestic offerings. A Hausman 2-stage model was applied to these four variables, and the predicted values of these variables were estimated and used in the mediation analysis.

Table 2. Variables used in the analysis

Variable	Represents	Meaning
Variables representing investments		
INV	Investment size / capital infusion into a deal (USD, Million)	The amount of capital infusion by the PE investor(s) / sponsor(s) into a target company on a specified date, i.e., the deal amount. The deal size or the investment size is used to represent the level of risk surrounding the transaction
VOL	Volume of Investment (USD, Million)	The sum of capital infusions by PE investor(s) / sponsor(s)
AVGINV	Average investment size (USD, Million)	The average size of capital infusion by PE investor(s) / sponsor(s) in a particular period into a particular silo (industry / region)
MAXINV	Maximum investment size (USD, Million)	The maximum amount of capital into a deal by PE investor(s) / sponsors in a particular time period / industry / region
Variables representing deal level characteristics		
PEENTRY	First PE investment into a target	This is a binary variable: 1 represents if the investment represented the first time the PE investor invested into the target, 0 otherwise
INCSTAKE	An investment of a PE firm into a target that represents an increase or decrease in original stake	This is a binary variable: 1 represents if the investment represented an increase or decrease in the original stake, 0 otherwise
NOINVEST	The number of PE investor(s) / sponsor(s) in that investment	1 if the PE investor invested alone, >1 to represent the number of investors in the syndicate
REGULD	Regulation D	This is a binary variable: 1 represents if the investment had a Regulation D feature, 0 otherwise
DOMOFF	Domestic Offering	This is a binary variable: 1 represents if the investment was using a domestic offering, 0 otherwise
INTOFF	International Offering	This is a binary variable: 1 represents if the investment was made using an international offering, 0 otherwise
GLDOMOFF	Global and domestic offering	This is a binary variable: 1 represents if the investment was made using a global and domestic offering, 0 otherwise
Variables representing world regions		
AFRICA / AISA / CARIBBEAN / EUROPE / MIDEAS / NORTHAMER / SOUTHAMER / OCEANIA	Investment in countries located in Africa / Asia / Caribbean / Europe / Middle East / North America / South America / Oceania	
LOWINCOME	Investments in low-income countries	
Variables representing industry		
AGRI / BIOTECH / FINAN / FOOD / HEALTH / INDUS / INFRA / MANU / MEDIA / RETAIL / SERVICES / TECH / OTHERS	Investments in the agriculture / biotechnology and pharmaceuticals / financial / food industry / health industry / industrials / infrastructure and real estate / manufacturing / media / retail sector / services sector / technology sector / others	
Variables representing stage of investment		
ACCEL / ANGEL / CROWD / PRESEED / PREA / PREB / SEED	Investments in accelerator financing / angel financing / Crowd funding / Pre seed financing / Pre-Series A / Pre-Series B / Seed Financing	

Source: own study.

RESULTS AND DISCUSSION

PE Investments Across World Regions

Figure 2 presents the geographical distributions of PE investments in entrepreneurial ventures across eight different world regions: Africa, North America, South America, Asia, Caribbean, Europe, the Middle East, and Oceania. These regions are classified based on the location of the country in which the target company is headquartered. Panel A presents the number of deals over the period, while Panels B and C present the total deal value (USD, Million), and average deal size (USD, Million), respectively.

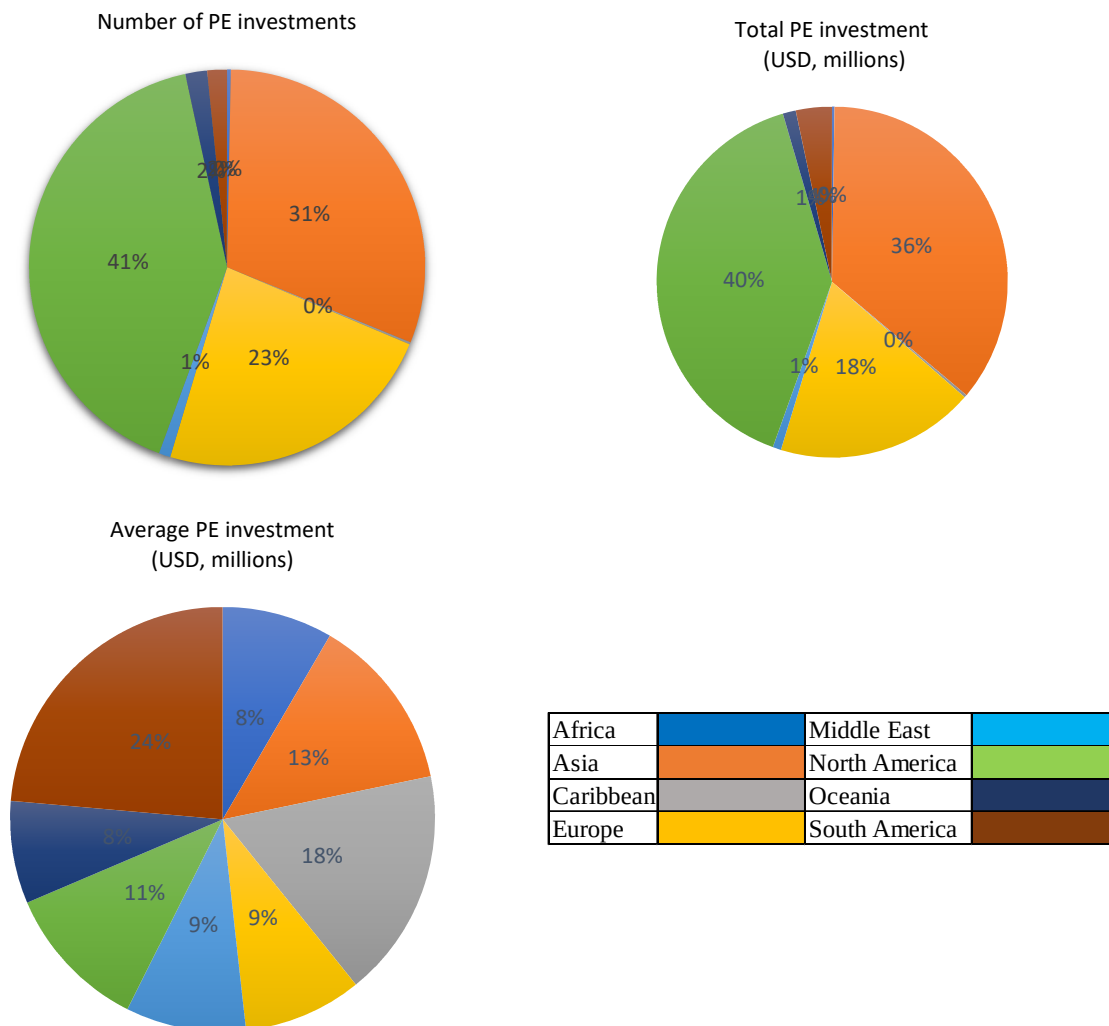


Figure 2. Summary of PE investments across world-regions, 2020-2022

Panel A: Total number of investments. Panel B: Total volume of PE investments (USD, Million),

Panel C: Average investment size (USD, Million).

Source: own elaboration of data sourced from S&P Global.

Figure 2 provides insights into the geographical distribution of PE investments across regions. North America accounted for the largest percentage of deals, both in number (40.5% of the sample) and volume (39.5% of the sample) and comprises of USA, Canada, Mexico, and Bermuda. This result is unsurprising, as the United States has long been considered a leading start-up ecosystem. The findings confirm this characterisation, with 37.3% of PE-backed entrepreneurial firms in the sample being located in the United States. With its history of population, technology, entrepreneurial culture, and government regulation, the United States continues to lead globally in the start-up

space, with the technology sector the having number of PE investments (2361 deals). North America was followed by Asia (30.4% of number of investments and 35.5% of volume of investments) and then by Europe (23% of number of investments and 18.2% of volume of investments). While Europe has traditionally been viewed as a close rival to the United States in terms of the start-up ecosystem development, countries in Asia – particularly China and India – received sizable PE investments during the pandemic years. Collectively, North America, Asia, and Europe dominated the sample, accounting for 94% of deal count and 93.2% of total deal volume.

When average investment size is considered, the two largest investments during this period in South America and Asia were excluded from the analysis, as they skewed the sample being 275% and 248% larger than the average deal size, respectively. Average investments were highest in the Caribbean (notably the British Virgin Islands, BVI), followed by Asia and North America. While nations in the Caribbean have made starting a business much easier in recent years, the BVI are also known to be a tax haven, attracting offshore corporations and investors. The BVI and Cayman Islands was also added to the Organization for Economic Corporation and Development (OECD) white list in 2009, enhancing their global reputation.

Average PE investments into targets in Asia were USD 5.36 million, approximately 19.6% larger than average PE investments in North America. This was followed by investments in Asia, indicating that PE firms were comfortable operating as foreign investors. Average PE investments in Europe were USD 3.63 million, 4.39% lower than in Africa and 3.52% lower than in the Middle East, placing Europe sixth among world regions in terms of average PE investment size.

PE Investments Across Industry Types

Figure 3 indicates that PE investments in start-up financing spanned a wide range of industries. While PE (as VC) was historically concentrated in investments in the technology sector, its extreme success has caused it to expand its breath of investments into other industries. Nevertheless, the technology sector continues to dominate PE entrepreneurial financing between 2020 and 2022, accounting for the largest number of deals by number (42.98%) and volume (39.31%). This was followed by the media sector (12.04% of deals and 9.67% of volume) and the healthcare sector (8.74% of deals and 7.66% of volume).

The technology space has, in the past few decades, been the prime industry space for startups with this trend persistent in the sample too. The pandemic years also saw a notable increase in investments in interactive media and services and home entertainment companies, increasing the presence of media sector in both number of deals and volume of PE investment. This could be attributed to the shifts in work patterns and lifestyle priorities during lockdowns. Healthcare, another traditional hub for start-up activity, ranked third in terms on PE investment activity.

When average deal size is considered, the industrial sector, biotech and pharmaceuticals sector, financial sector, infrastructure and real estate sector, and manufacturing sector commanded larger than average deal sizes. Several large investments in the semi-conductor subsector (average investment size of USD 17.3 million) contributed to higher average deal size in the industrial sector. While infrastructure and real estate require large capital infusions (Gemson & Rajan, 2015), PE typically invest in later stage financing in these sectors.

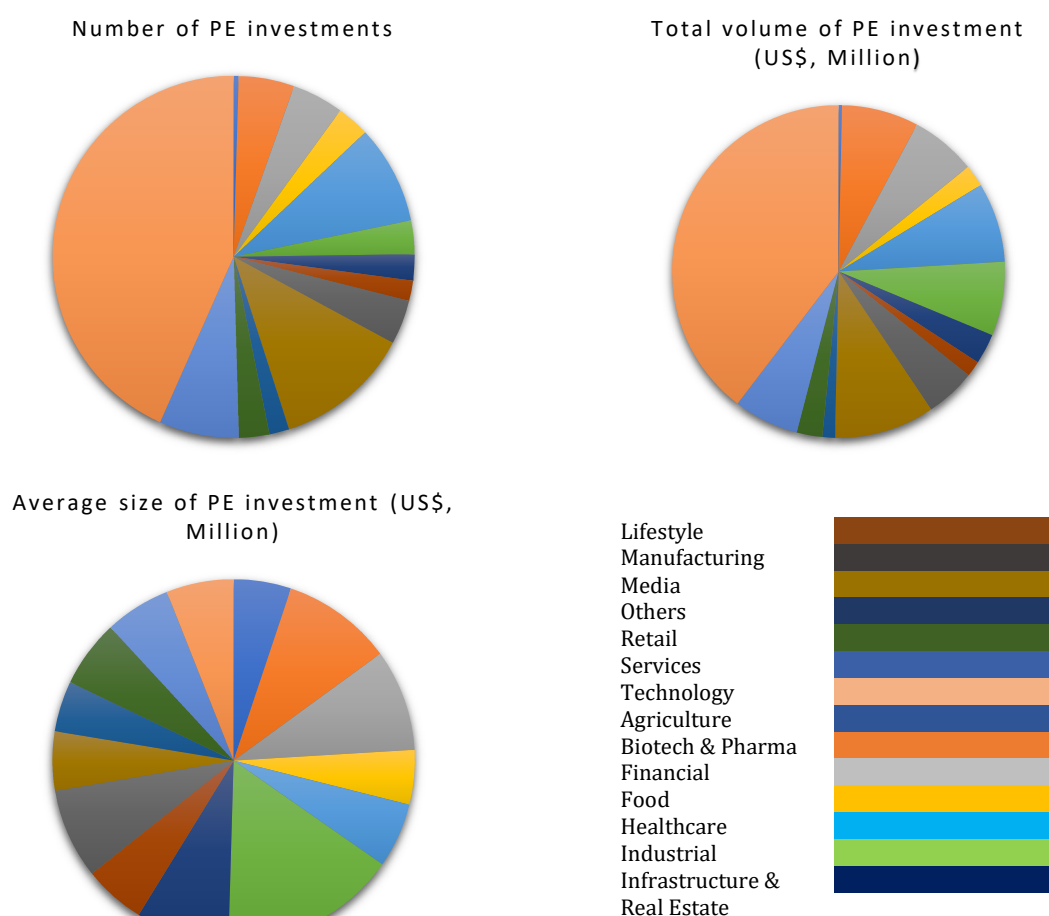


Figure 3. Summary of PE investments across industry types, 2020-2022

Panel A: Total number of investments. Panel B: Total volume of PE investments (USD, Million),
 Panel C: Average investment size (USD, Million). Panel C: Maximum investment size (USD, Million)

Source: own elaboration of data sourced from S&P Global.

PE Investments Across Start-up stages

Figure 4 presents the type or stage of entrepreneurial financing that received PE investments between 2020 and 2022. The financing stages include accelerator, bridge, angel financing, crowd-funding, pre-seed, pre-series A, pre-series B, and seed financing. Panel A presents the number of deals in each financing stage over the period in question 2020-2022, while Panel B and Panel C present the total deal amount (USD, Million) and the average deal amount (USD, Million) respectively of the sample.

Seed financing dominated PE investment activity, both in terms of number and volume. The sample included 8 354 rounds of seed financing, with a total value of approximately USD 36 billion, representing 69% of the deals by number and 65% of the deals by volume. The results from this study are different from Brown *et al.* (2020) who found that seed financing in the UK was most acutely affected by the crisis. Pre-series A ranked second with 1 655 deals contributing USD 9 966.67 million and angel funding with 1 037 deals totalling USD 5 721.92 million. The dominance of seed and pre-series A financing suggests PE investors favoured ventures that moved beyond ideation and validation phases, suggesting their preference for moderate-risk opportunities.

Accelerator and crowdfunding investments were rare (36 deals each), indicating that these models were not preferred by PE investors, perhaps due to information asymmetries and failure risks in these stages. While pre-series B accounted for only 1.1% of the number of deals in the sample and 3.7% of volume of deals in the sample, they recorded the highest average deal sizes with an average pre-series

B investment of USD 15.1 million, Despite abundant liquidity during this period, PE firms adopted to more selective screening and moderate-risk opportunities; however, they also indicated their willingness to make sizable investments once firms demonstrated scalability and resilience. In terms of average deal sizes, pre-series A investments were around USD 6 million while angel investments and crowdfunding investments were between USD 5 – USD 5.5 million. Pre-seed financing had the smallest average investment with USD 1.98 million.

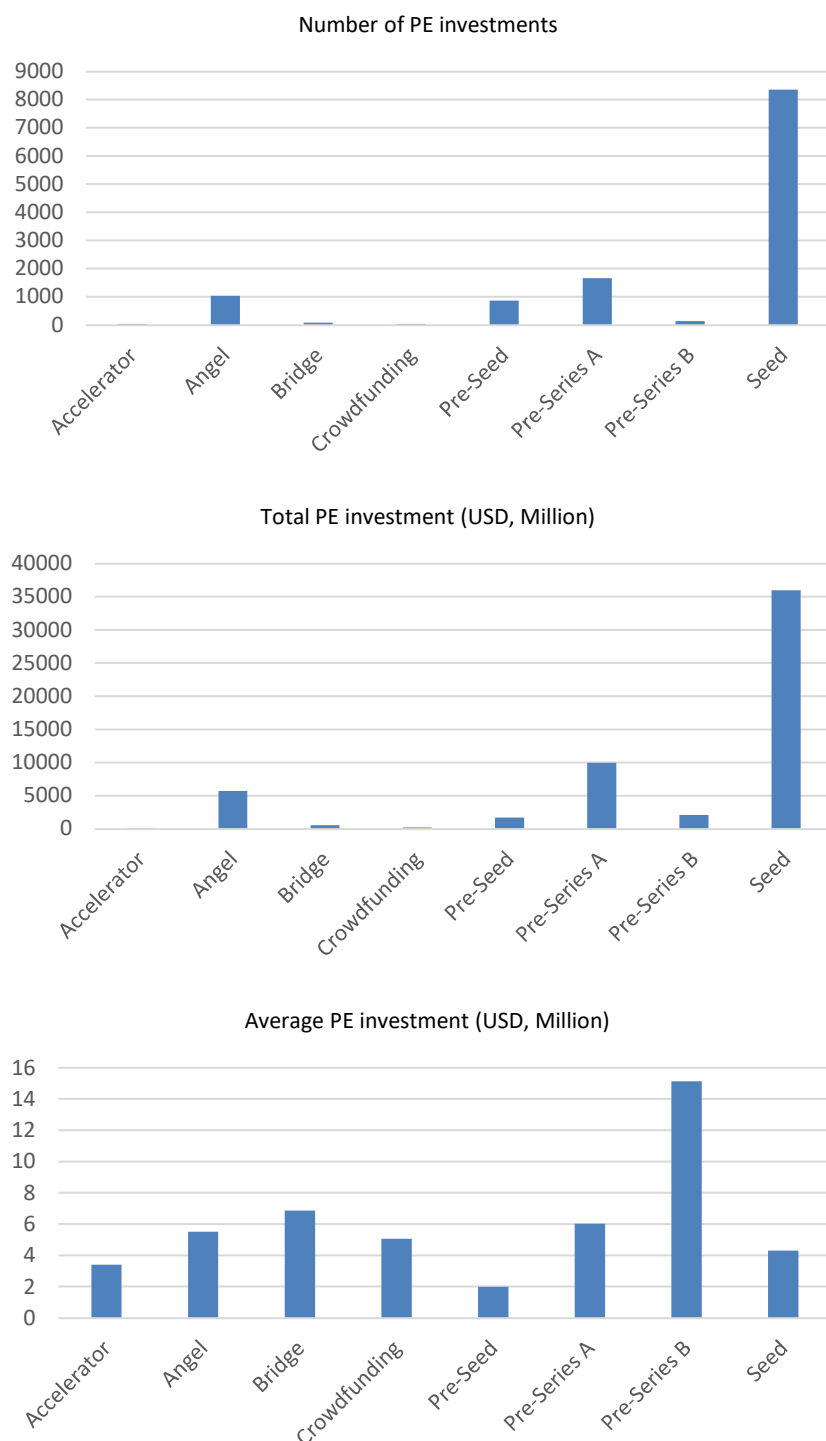


Figure 4. Summary of the data used for the analysis.
PE investments across various entrepreneurial financing stages between 2020-2022
 Source: own elaboration of data sourced from S&P Global.

The Mediating Effect of PE Foreign Investment on Offering Type

Table 3 presents the results of the mediation analysis run on R.

The results indicate that domestic offerings (DOMOFF), negatively and significantly affect the mediator variable FOREIGN under Step 2, Model 1 (-4.06 , $p < 0.001$). When DOMOFF and FOREIGN are included jointly in the regression, DOMOFF has no direct effect on investment size (-7.692 , $p > 0.10$), while FOREIGN exerts a negative and significant coefficient (-7.505 , $p < 0.01$) on size of the investment. These results are unchanged, even when control variables are included, indicating full mediation. The Sobel Test confirms the significance of the indirect effect (Test statistic 2.744 , Std Error 11.098 , $p < 0.05$).

Model 2 shows that international offerings (INTOFF) significantly and positively affect FOREIGN (3.832 , $p < 0.001$). When INTOFF and FOREIGN are jointly included in the regression, INTOFF loses significance (-10.441 , $p > 0.10$), while FOREIGN retains a negative and significant coefficient (-5.024 , $p < 0.05$) on size of the investment, indicating a full mediation. When control variables are included, INTOFF has no direct effect (-7.149 , $p > 0.10$), indicating a full mediation, while FOREIGN exerts a negative but non-significant coefficient (-3.248 , $p > 0.10$) on size of the investment. The Sobel Test confirms the significance of the indirect effect (Test statistic -2.512 , Std Error 7.644 , $p < 0.05$).

Model 3 indicates that global and domestic offerings (GLODOMOFF) positively and significantly affects FOREIGN (2.488 , $p < 0.001$). When GLODOMOFF and FOREIGN are jointly included in the regression, it is found that GLODOMOFF continues to retain its significance, although it emerges with a negative coefficient (-34.254 , $p < 0.001$). The magnitude of the coefficient increased (-20.954 to -34.254), indicating no partial mediating effects. When control variables are considered, GLODOMOFF was still negatively significant (-31.615 , $p < 0.01$). The increasing magnitude of the coefficient suggests no mediating effect, indicating that FOREIGN does not mediate the relationship between global and domestic offerings and investment size.

The regression analysis to examine determinants of size of PE investment indicated a mediating relationship between offering type and foreign investment. Foreign investments acted as a mediator with respect to types of offerings. Both purely domestic offerings and purely international offerings are positively mediated to the size of investment. However, an offering which has both global and domestic features is not affected by the present of foreign investment.

Foreign investments significantly influenced the relationships between offering type and deal size. In both domestic offerings and international offerings, the presence of foreign investment reduced deal sizes, suggesting cross-border capital was more cautious. Domestic capital lost their significance when foreign investments were introduced indicating that these markets relied on foreign backing to sustain large transactions for credibility and liquidity. Such markets had lower deal valuations and lacked depth and appetite to sustain large PE transactions without foreign investments. While international offerings had a positive significance with foreign investments, mediation analysis indicated that foreign capital ultimately decreased investment size. Investors seemed more cautious and muted when creating value to scale market opportunities. Foreign investment did not mediate the relationship between global and domestic investment indicating that PE investors viewed these deals as too complex and perhaps exposed to systemic risks.

The non-significance of Regulation D indicated that structural and / or regulatory deal features were not bottlenecks in determining deal sizes. Rather foreign investment acted as a gatekeeper of deal size. PE firms seemed to target resilient industries and middle-income markets while de-prioritising structures that were high-risk and required purely domestic funding.

Table 3. Results of the mediation effect of foreign investment on type of offering towards size of investment

Model 1 - Domestic Offering			Model 2 - International Offering			Model 3 - Global and Domestic Offering		
Step 1: Testing the effect of domestic offering on size of investment			Step 1: Testing the effect of international offering on size of investment			Step 1: Testing the effect of global and domestic offering on size of investment		
Number of observations	12123		Number of observations	12123		Number of observations	12087	
Prob >F	0.002		Prob >F	0.0008		Prob >F	0.0000	
R square	0.0008		R square	0.0009		R square	0.0021	
Adjusted R square	0.0007		Adjusted R square	0.0008		Adjusted R square	0.0020	
Variable	Coefficient (Standard Error)		Variable	Coefficient (Standard Error)		Variable	Coefficient (Standard Error)	
DOMOFF	22.762 *** (7.370)		INTOFF	-29.691 *** (8.865)		GLODOMOFF	-20.954 *** (4.130)	
CONST	1.113 (1.141)		CONST	5.624 *** (0.344)		CONST	7.138 *** (0.524)	
Step 2: Testing the effect of domestic offering on foreign investment			Step 2: Testing the effect of international offering on foreign investment			Step 2: Testing the effect of global and domestic offering on foreign investment		
Number of observations	12123		Number of observations	12123		Number of observations	12087	
Prob >F	0.0000		Prob >F	0.0000		Prob >F	0.0000	
R square	0.6940		R square	0.4277		R square	0.8370	
Adjusted R square	0.6940		Adjusted R square	0.4277		Adjusted R square	0.8369	
Variable	Coefficient (Standard Error)		Variable	Coefficient (Standard Error)		Variable	Coefficient (Standard Error)	
DOMOFF	-4.06 *** (0.024)		INTOFF	3.832 *** (0.040)		GLODOMOFF	2.488 *** (0.010)	
CONST	1.115 *** (0.004)		CONST	0.361 *** (0.002)		CONST	0.191 *** (0.001)	
Step 3: Testing the effect of domestic offering and foreign investment on size of investment			Step 3: Testing the effect of international offering and foreign investment on size of investment			Step 3: Testing the effect of global and domestic offering and foreign investment on size of investment		
Number of observations	12123	12123	Number of observations	12123	12123	Number of Observations	12087	12087
Prob >F	0.0002	0.0000	Prob >F	0.0002	0.0000	Prob >F	0.0000	0.0000
R square	0.0014	0.0145	R square	0.0014	0.0145	R square	0.0023	0.0153
Adjusted R square	0.0012	0.0124	Adjusted R square	0.0013	0.0124	Adjusted R square	0.0021	0.0132

Model 1 - Domestic Offering			Model 2 - International Offering			Model 3 - Global and Domestic Offering		
FOREIGN	-7.505 *** (2.735)	-5.249 * (3.068)	FOREIGN	-5.024 ** (2.000)	-3.248 (2.623)	FOREIGN	5.345 (3.761)	7.265 * (4.349)
DOMOFF	-7.692 (13.320)	-6.642 (13.362)	DOMOFF			DOMOFF		
INTOFF			INTOFF	-10.441 (11.715)	-7.149 (11.803)	INTOFF		
GLODOMOFF			GLODOMOFF			GLODOMOFF	-34.254*** (10.227)	-31.615*** (10.460)
AFRICA		2.108 (1.870)	AFRICA		2.084 (1.868)	AFRICA		2.447 (1.876)
ASIA		2.310* (1.278)	ASIA		2.311* (1.278)	ASIA		2.473* (1.283)
CARIBBEAN		2.736 (4.009)	CARIBBEAN		2.726 (4.009)	CARIBBEAN		2.596 (4.014)
EUROPE		0.558 (1.242)	EUROPE		0.555 (1.242)	EUROPE		0.619 (1.247)
MIDEAS		1.891 (2.072)	MIDEAS		1.872 (2.071)	MIDEAS		2.180 (2.077)
NORTHAMER		0.970 (1.232)	NORTHAMER		0.959 (1.233)	NORTHAMER		0.986 (1.237)
SOUTHAMER		8.088*** (1.827)	SOUTHAMER		8.069*** (1.826)	SOUTHAMER		8.219*** (1.834)
LOWINCOME		-2.268*** (0.646)	LOWINCOME		-2.253*** (0.645)	LOWINCOME		-2.338*** (0.648)
AGRI		-0.122 (2.501)	AGRI		-0.125 (2.500)	AGRI		-0.195 (2.503)
BIOTECH		2.944** (1.045)	BIOTECH		2.951** (1.045)	BIOTECH		2.850** (1.048)
FINAN		2.724** (1.074)	FINAN		2.722** (1.073)	FINAN		2.709** (1.076)
FOOD		-0.351 (1.206)	FOOD		-0.352 (1.206)	FOOD		-0.342 (1.207)
HEALTH		0.375 (0.932)	HEALTH		0.380 (0.932)	HEALTH		0.305 (0.934)

Model 1 - Domestic Offering			Model 2 - International Offering			Model 3 - Global and Domestic Offering		
INDUS		6.750*** (1.198)	INDUS		6.760*** (1.198)	INDUS		6.749*** (1.201)
INFRA		2.143* (1.295)	INFRA		2.149* (1.295)	INFRA		2.071 (1.300)
MANU		1.944* (1.104)	MANU		1.955* (1.104)	MANU		1.911* (1.107)
MEDIA		0.175 (0.893)	MEDIA		0.175 (0.893)	MEDIA		0.168 (0.895)
RETAI		0.898 (1.236)	RETAI		0.899 (1.236)	RETAI		0.884 (1.238)
SERVI		0.502 (0.973)	SERVI		0.503 (0.973)	SERVI		0.498 (0.975)
TECH		0.629 (0.803)	TECH		0.629 (0.803)	TECH		0.583 (0.804)
PEENTRY		0.504 (0.466)	PEENTRY		0.496 (0.466)	PEENTRY		0.564 (0.467)
INCSTAKE		0.312 (0.605)	INCSTAKE		0.317 (0.605)	INCSTAKE		0.506 (0.610)
NOINVEST		0.712*** (0.100)	NOINVEST		0.710*** (0.100)	NOINVEST		0.705*** (0.100)
REGULD		0.480 (0.562)	REGULD		0.479 (0.562)	REGULD		0.360 (0.565)
CONST	9.478 ** (3.255)	3.766 (3.601)	CONST	7.436 *** (0.799)	2.018 (1.868)	CONST	6.115 *** (0.890)	0.324 (1.948)
Sobel Test			Sobel Test			Sobel Test		
Test statistic	2.744		Test statistic	-2.512		Test statistic	34.161	
Std Error	11.098		Std Error	7.664		Std Error	0.389	
p-value	0.006		p-value	0.012		p-value	0.000	

*** significant at 99% CI, ** significant at 95% CI, * significant at 90% CI – A test of the statistical significance of the mediation effect was done using bootstrapping in R. Please contact the authors for more details on this analysis.

Source: own study.

CONCLUSIONS

This study examined PE investments in early-stage financing by analysing allocation of PE funds and PE investing strategies during the COVID-19 pandemic. We observed and analysed trends in global PE investments and the mediating effect of the foreign PE investor, influencing deal size in an effort to preserve and create value.

This study examined the allocation of PE resources among portfolio start-ups and the financial strategies used by PE firms during the COVID-19 pandemic when they held record volumes of dry powder. The pandemic constituted an exogenous shock that caused expected levels of divergence, including limiting physical movement of goods and services and disrupting startup financing. While early-stage financing is often constrained by capital and depends on close relationships between the entrepreneur and the investor, it was interesting to examine the allocation of investments and investing strategies, in terms of both value preservation and value creation.

After a temporary slowdown during the first two quarters of 2020, deal activity rebounded steadily in number, volume, and average size indicating that PE investors adapted quickly. PE investment activity was robust in mature ecosystems including North America, Asia, and Europe, and in tried and tested industries such as the technology sector. Such investments reflected strategies focused on preserving value. In terms of value creation, regions in the Caribbean (notable BVI) and Pre-series B financing witnessed larger average deal sizes suggesting selective PE participation and the ability to scale investments. Foreign PE investments played a mediating role influencing offering type and deal size. While structural and / or regulatory deal features did not emerge as bottlenecks in determining deal sizes, foreign investments significantly influenced domestic offerings and international offerings separately. Deals which were perceived too complex or exposed to systemic risk were avoided.

Thus, early-stage firms seeking PE investments during periods of crisis may benefit from demonstrating scalability and operational robustness. Policy makers aiming to attract PE capital should focus on reducing deal complexity and facilitating cross-border investment structures without regulatory frictions.

While this study examined trends of global PE investments early-stage financing, it was not free from challenges. While data was sourced from the S&P global database care was taken to verify the correctness of deals, this database may not capture all transactions. Further, this sample is limited to the extent of variables publicly available. Many deals had missing key variables and therefore, had to be dropped from the analysis. The availability of complete information and additional variables could certainly increase the insights that could be derived.

This study used data visualisation and the regression approach used by Baron and Kenny (1986) with mediation. The changing nature of R-square and Adjusted R-square values through Steps 1, 2, and 3 is acknowledged. The high R-square and adjusted R-square value in Step 2 indicates that offering type strongly predicts foreign investment, while mediation analysis prioritises causal pathways and may not prioritise on maximising R-square. Having additional variables could provide data for more complex regression techniques to increase insights.

While this study provided insights into the investing trends, techniques, and strategies of PE firms during the COVID-19 crisis, this paper does not discuss subsequent global inflation, and interest rate increases that arose immediately after the pandemic. Future research could investigate these studies and whether the results of investing strategies are indeed favourable. Gompers *et al.* (2022) noted that PE firms expected the performance of their existing funds to decline, future studies could examine the performance funds in the course of such strategic decision making.

While adding to the literature on the impact of crises in financial markets, notably PE and start-ups, this study opens avenues to contrast and compare the impact of COVID-19 crisis on PE investment activity.

While financing start-ups and entrepreneurship provides rich rewards and growth to various economies, a deeper examination of the nature of PE financing strategies will shed insights into successful, private, entrepreneurial targets.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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