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The Paradox of Plenty: Investors, Startups, and Accelerators in a Digital World

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## Abstract

Early-stage investing relationships have been predicated on face-to-face interaction, in part to mitigate inherent information asymmetries. However, the global onset of the COVID-19 pandemic forced a sudden, large-scale move to digital operations, thus questioning previous assumptions about physical location. We exploit the unprecedented move to digital delivery of accelerator cohorts, where investors are exposed to large numbers of startups for potential deals. We leverage a novel, deal-level dataset of 63,660 deals spanning 5,691 financing rounds, 1,630 startups and 8326 investors. The data comprises 30 accelerator programs focused on 'green shift' innovation and sustainability from 2018-2023. Results point to the digital shift paradoxically broadening the investor and startup base while also increasing agency concerns. We find evidence that these changes persist after the pandemic disruptions ended.

# THE PARADOX OF PLENTY: INVESTORS, STARTUPS, AND ACCELERATORS IN A DIGITAL WORLD

## ABSTRACT

Early-stage investing relationships have been predicated on face-to-face interaction, in part to mitigate inherent information asymmetries. However, the global onset of the COVID-19 pandemic forced a sudden, large-scale move to digital operations, thus questioning previous assumptions about physical location. We exploit the unprecedented move to digital delivery of accelerator cohorts, where investors are exposed to large numbers of startups for potential deals. We leverage a novel, deal-level dataset of 49,897 deals spanning 5,054 financing rounds, 1,442 startups and 4,817 investors. The data is comprised of 30 accelerator programs focused on ‘green shift’ innovation and sustainability from 2018-2023. Results point to the digital shift paradoxically broadening the investor and startup base while also increasing agency concerns. We find evidence that these changes persist after the pandemic disruptions ended.

Keywords: Accelerators; Venture Capital; Corporate Innovation; Global Innovation; Sustainability; Green Shift; Innovation Search

*'I think [the transition to digital] has had a tremendous impact on the VC community .... For pretty much all the deals or opportunities that we're looking at these days, regardless of whether it's in Europe or the east coast of the U.S., we meet maybe ten, 15 other VCs that would never have been in the running in the past. " (P.J. Parson, General Partner at Northzone, quoted in Eisenberg (2021))*

## INTRODUCTION

To what extent does physical proximity undergird investor decisions to invest in startups? Many aspects of the investing relationship are predicated on face-to-face interaction, particularly pitching and reaching agreement on early-stage deals. The literature provides ample evidence that distance strongly shapes investment patterns between early-stage investors and startups (Chen et al., 2009; Lerner & Nanda, 2020; Sorenson & Stuart, 2001). This occurs for myriad reasons, including diminished time spent in transit, greater communication, formation of syndicates, and the ability to better oversee and monitor startup activities (Fehder, 2023; Glaeser et al., 2010). These factors largely relate to the defining facet of overcoming issues associated with information asymmetry and reducing uncertainty inherent to investing in startups.

The global scale and onslaught of the COVID pandemic necessitated immediate changes in how firms organize innovative activities (Wenzel et al., 2021). In particular, the need to implement digital solutions on a large scale, in a time-urgent fashion demanded new approaches to a hallmark of innovation efforts: investment in startups seeking to launch and scale. Importantly, previously physically-based activities related to investment in early-stage startups instead required digital implementation. In a sense, the COVID pandemic was a precipitating event that marshalled immediate and massive mobilization towards digitally sustainable investing (Gompers et al., 2021).

This digital impetus manifested strongly in venture capital (CB Insights, 2020; Gompers et al., 2021), forcing a sudden, large-scale move to digital operations and calling into question previous reliance on location. While the initial stimulus for incorporating digital technologies came from the urgent need to substitute for in-person interactions, many elements of these digital innovations

remain in place as investors and startups realized unanticipated benefits accompanied the change, such as expanding exposure and reach of investors. Importantly, while implementation of digital technologies may alleviate some components of the investment process, such as communication, the fundamental challenges related to information asymmetries and uncertainty remain. Thus, digitalization introduces a paradox of plenty: expanding access to a larger set of investors while simultaneously exacerbating uncertainty. In this paper, we ask: *How does digitalization impact the role of proximity between investors and startups?*

Crucially, trusted intermediaries play a significant role in reducing uncertainty. For example, syndicating with known partners facilitates new investments when uncertainty is high (Hochberg et al., 2007; Lerner, 1994; Zhang et al., 2017). Increasingly, accelerators also serve this function (Assenova & Amit, 2024). The literature on entrepreneurial finance shows a growing recognition of the role of accelerators as a form of entrepreneurial support and mentoring (Cohen et al., 2018) and as active partners in financing and launching new ventures (Hallen et al., 2020; Hallen et al., 2023; Miller et al., 2023; Winston Smith, 2018; Winston Smith & Hannigan, 2014b; Yu, 2020). Premised on interactive mentor sessions and investor Demo Days, accelerators were heavily impacted by the sudden switch to digital delivery.

In this paper, we focus on two specific questions: 1) *To what extent has adoption of digital technologies in accelerator programs reduced the reliance of investors on geographic proximity for investment decisions?* And, 2) *To what extent does accelerator organizational form mitigate uncertainty?* We address these questions using a novel, deal-level dataset consisting of 49,897 deals spanning 5,054 financing rounds, 1,442 startups and 4,817 investors. The data is comprised of 30 accelerator programs from the start of Q1 2018 through Q3 2023, allowing us to analyze the sample across periods prior to, during, and after COVID-related disruptions. Our sample focuses on accelerators in ‘green-shift’ industries where a combination of corporate, industry-wide, and

traditional standalone accelerators developed in response to the grand challenge posed by climate change (CB Insights, 2020; DNV, 2022). We exploit the prevalence of these distinct accelerator approaches to analyze the relationship between organizational form and proximity before and after the digital transition.

Our research presents a compelling exploration of how the shift to digital technology in accelerator programs, accelerated by the COVID-19 pandemic, impacts early-stage investing and the traditional reliance on geographic proximity. Results point to the digital shift paradoxically broadening the investor and startup base participating in accelerators while also increasing uncertainty. We find evidence that these changes persist after the pandemic disruptions ended.

We make three distinct contributions. First, we contribute to the growing literature surrounding the impact of digitalization by providing novel insights into impacts of transition to digital technology on venture investing. Second, we contribute to the literature on the early-stage investing by providing novel insights into the paradoxical tensions between the reduction of uncertainty associated with physical proximity and the expansion of opportunity associated with broader reach and greater geographical distance. Third, we contribute to the literature on accelerators, both traditional and corporate, by providing insight into their role as intermediaries between investors and startups, illuminating the role of organizational form in mitigating reliance on proximity in the investing relationship.

This paper also contributes societal and managerial implications. We add to the body of work that is beginning to unpack the long-term economic and social consequences of the unprecedented global pandemic. Finally, we contribute to scholarly and managerial understanding of the important role of startups, accelerators, and investors in solving grand challenges by providing a window into the role of the entrepreneurial ecosystem surrounding green shift solutions.

## LITERATURE REVIEW AND THEORETICAL DEVELOPMENT

### Accelerators and New Ventures

The literature on entrepreneurial finance shows a growing recognition of the role of accelerators as a form of entrepreneurial support and mentoring (Cohen et al., 2018) and as active partners in financing and launching new ventures (Winston Smith, 2018; Winston Smith & Hannigan, 2014b; Yu, 2020). Several components of accelerators make them a novel organizational form: their application and selection mechanisms; fixed cohorts with limited time duration (typically 3-4 months); and a distinct end, usually demarcated by “Demo Day” pitching events to investors and often the presence of an equity stake (Clarysse et al., 2015; Cohen et al., 2019; Dushnitsky & Sarkar, 2022; Hochberg, 2015). Accelerators facilitate entrepreneurial experimentation, helping them learn which ideas are promising and which are likely to fail, and leading to quicker exits through acquisition and through quitting (Hallen et al., 2020; Winston Smith & Hannigan, 2014a; Yu, 2020). Accelerator cohorts provide an intense experience that mimics the university experience, leading to cultural capital derived from social bonding (Bourdieu, 1986). Accelerators are thus characterized by intensive connections between the founders and their mentors (Cohen et al., 2018) and intensive peer learning through the cohorts (Assenova & Amit, 2024; Winston Smith et al., 2015).

### Uncertainty in Early-Stage Investing

Early-stage investing is rife with uncertainty due to the presence of information asymmetries between investors and young ventures. These include the inherent opacity of young, private companies, adverse selection, and moral hazard (Bitler et al., 2005; Hall & Lerner, 2010). For these reasons, venture capitalists and other early-stage investors devote substantial effort to screening ventures prior to investment and monitoring their performance post-investment (Ewens et al., 2022; Gompers, 1995).

Social and professional connections play an outsized role in mitigating some of these agency concerns. Entrepreneurs will pay a premium to be associated with high-status investors in order to build legitimacy (Hsu, 2004). The first round of funding can have a lasting impact on the future trajectory of new ventures. For example, at the outset, new ventures face significant challenges in overcoming their liability of newness to forge connections with investors. These challenges can be mitigated by existing ties and signals of achievement (Hallen, 2008) and by strategic efforts to build professional ties (Hallen & Eisenhardt, 2012). Access to prominent investors also confers reputational benefits on other investors. Being associated with high-status investors in their first round of investment positively impacts subsequent network positions for new venture capitalists (Milanov & Shepherd, 2013).

### **Geographic Proximity and Early-Stage Investing**

A large literature points to the enduring persistence of geographic constraints in early-stage investing. Investing in a local area provides multiple benefits for the investor, including decreased search costs, relative ease of communication, and greater ability to monitor portfolio companies (Chen et al., 2010). VC investors rely on ongoing connections with their portfolio companies to monitor performance (Gompers, 1995; Kaplan & Strömberg, 2001). Moreover, for startups in accelerators, VC investment generally occurs after Demo Day, when startups are more likely to be leaving the region. If startups come from a more distant region these ties may be harder to maintain after the cohort ends (Fehder, 2023). VCs recognize the need for monitoring benefits in the early stages (Hellmann & Thiele, 2015) and may rely on other, earlier stage investors more heavily for monitoring more distant startups. Typically, investors in angel groups have an incentive to provide some monitoring and oversight until an exit is achieved, such as in investment by a VC (Ibrahim, 2008). Accelerators provide intensive mentoring during the cohort but do not actively monitor startups post-graduation. However, many accelerators increasingly promote lifelong benefits and support.

## **Move to Digital: Early-Stage Investing and Digital Demo Days**

The onslaught of the COVID-19 global epidemic fundamentally impacted economic conditions and the nature of investing in early stage ventures (Baker et al., 2020; Bellavitis et al., 2022).

Traditionally, in-person events such as "demo day", where relatively large numbers of investors are selectively invited to participate, facilitate development of social capital (Takiff, 2015). COVID-19 forced accelerators into online demo day formats and startups into digital cohorts (Schubarth, 2020).

What happened when accelerators abruptly shifted to digital events? On one hand, introduction of a digital format alleviates space and travel constraints and thus potentially allows accelerators to include a larger and broader group of investors. However, these investors will share weaker ties with the accelerator. To the extent that the accelerator reduces agency problems by reducing information asymmetries, performing monitoring as well as mentoring duties, and providing certification for the ventures, then new investors with weaker ties to the accelerator might place lower value on the extent to which agency costs are reduced.

The transition to digital platforms potentially presents a mix of advantages and disadvantages for startups and investors. On the positive side, programs became globally accessible, cost-effective, and flexible in scheduling, allowing for diverse participation and easier networking (Becker et al., 2022). However, the shift to digital also reduced personal interaction, created technology barriers for some participants, and saturated startups and investors with online content, and increased engagement challenges (Becker et al., 2022). Networking, although more accessible, often lacked depth of in-person interactions, and coordinating across time zones posed difficulties, additionally, concerns regarding data security and privacy appeared (Becker et al., 2022). While the pandemic accelerated the adoption of digital accelerator programs, the trend has continued in post-COVID times, suggesting that this hybrid model of in-person and online interactions may become the norm in the future.

Taken together, the reasoning above points to the following hypotheses relating to time period

and mode of organization. Our first set of hypotheses relates to the expansion of access when programs become digital:

*H1a: Distance between investors and startups should increase during and after the pandemic relative to pre-pandemic periods.*

*H1b: The number of investors should increase during and after the pandemic relative to pre-pandemic periods.*

*H1c: The average age (size) of investors should be younger (smaller) during and after the pandemic relative to pre-pandemic periods.*

## **Uncertainty and Mode of Accelerator Organization**

Startups face tremendous market and technical uncertainty (Knight, 1921). Reducing this uncertainty is key to investor decision-making (Ewens et al., 2018; Lerner & Nanda, 2020).

The diversity of organizational modes of accelerators reflect varying degrees of domain specific knowledge (Beretta et al., 2025; Wesley Li et al., 2022) and mentoring and oversight (Santamaria & Breschi, 2025). Accelerators provide crucial business knowledge and skill development (Hallen et al., 2020; Miller et al., 2023; Santamaria & Breschi, 2025). However, corporate and industry accelerators will provide greater domain-specific knowledge than traditional standalone accelerators.

Corporate accelerators and industry-spanning accelerators are an increasingly common intersection between corporate innovation and the startup ecosystem (Giones et al., 2024). Similar to corporate venture capital, corporate accelerators are “outside-in” approaches to innovation (Weiblen & Chesbrough, 2015). Situated between startups and corporate strategic and innovation goals, corporate accelerators must balance venture launch and strategic fit with corporate innovation (Shankar & Shepherd, 2018). Moreover, corporate accelerators also exist in relation to existing, established forms of external knowledge seeking from startups, such as corporate venture capital

(Dizdarevic et al., 2023; Winston Smith, 2021). Industry-spanning accelerators apply more broadly across an industry without being specific to given corporate goals. As such, they comprise key actors in knowledge ecosystems (Clarysse et al., 2014).

We hypothesize that these distinct organizational types of accelerator programs differentially mitigate uncertainty. Specifically, we expect corporate accelerators to reduce uncertainty to the greatest extent given their domain-specific expertise and close collaboration with startups in their programs. Industry spanning accelerators aggregate domain-relevant knowledge as well, but in a broader fashion. Finally, traditional standalone programs provide general business knowledge but lack finely-tuned domain expertise. Our second set of hypotheses are:

*H2a: Distance between investors and startups should be greatest where uncertainty is*

*lowest, i.e. distance company-run > industry-specific > standalone*

*H2b: Average deal size should be largest when uncertainty is lowest, i.e., deal size*

*company-run > industry-specific > standalone*

Our final set of hypotheses pertain to the interaction between digitalization, i.e. during and after the pandemic time period, and organizational mode. Specifically:

*H3a: As organizational modes reduce uncertainty to a larger extent, they will*

*mitigate the relationship between digitalization and distance.*

*H3b: As organizational modes reduce uncertainty to a larger extent, they will*

*mitigate the relationship between digitalization and number of investors.*

*H3c: As organizational modes reduce uncertainty to a larger extent, they will*

*mitigate the relationship between digitalization average deal size.*

## METHODOLOGY

### Empirical Context: The Global Energy Industry and Green Shift Innovation

We concentrate on accelerators within the green shift industries, recognizing their pivotal role in addressing the grand challenges posed by climate change (CB Insights, 2020; DNV, 2022). Reliance on hydrocarbon resources underpinning global growth has led to acknowledgment of the need for sustainable energy sources and reusable resources (DNV, 2022). Addressing these grand challenges at scale is not only environmentally critical but also potentially profitable, attracting startups, investors, and corporates (Bradbury, 2023; McFarlane, 2021).

### Data and Sample

The sample was identified through the private capital markets database PitchBook and on accelerator websites for alumni cohorts. We cross-checked random data samples, using CB Insights, CrunchBase, and annual reports from company websites to confirm the accuracy of the PitchBook data. Identifying the most popular ‘green-shift’ accelerator programs globally through a longer search process and an inclusion-criteria (i.e., more than 10 previously accelerated startups and an industry focus on sustainable business) resulted in 30 programs.<sup>1</sup> We snowball-sampled alumni startup cohorts and identified investors in these startups.

Our unit of analysis is deal-level. In this study, the operational definition comprises all deals after startup inclusion in the accelerator programs in the period Q1 FY 2018 until Q3 FY 2023.

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<sup>1</sup>The accelerators in the sample are: Y Combinator (with programs related to the industries of Climate, ClimateTech, Energy, Electric Vehicles, Solar Power, Carbon Capture and Removal, Renewable Energy, Energy Storage, Hydrogen Energy, Bioplastic, Alternative Fuels, Sustainable Agriculture, and Fusion Energy), Austin Tech Inc, Cleantech Open, Venture for climate tech, Elemental Excelerator, LA Cleantech, Powerhouse, Urban future labs, Shell Gamechanger, TechStars (with programs named Techstars Farm to Fork, Stanley + Techstars, Equinor and Techstars Energy Accelerator, Techstars and The Heritage Group Hardtech Accelerator, Sustainability in Partnership with The Nature Conservancy, and Alabama EnergyTech Accelerator), BP Ventures, Halliburton Labs, TotalEnergies Ventures, Chevron Technology Ventures, Plug and play tech center (with programs related to the industries of Sustainability, Energy, New materials and packaging, and Agtech), Startupbootcamp Energy Australia accelerator, Telluride Venture Accelerator, Entrepreneur Roundtable, Impact Accelerator, 500 Global (with programs named Energy and Climate), Amazon Launchpad Sustainability Accelerator, and Google For Startups Accelerator (with programs related to the industries of Energy, Sustainability, and Cleantech).

We chose a cut-off between the pre- and pandemic data as Q1 FY 2020, pandemic and post data as Q4 2021, and post pandemic as Q1 2022 until Q3 2023. The final sample consists of 49,897 deals spanning 5,054 financing rounds, 1,442 startups and 4,817 investors from 2018-2023.

We analyze changes in pre- and post-pandemic data on new ventures, investor participation, and deal size, and geospatial distance between investor-startup dyads, startup-accelerator dyads, and investor-accelerator dyads. We also focus on accelerator program modes.

Summary statistics are provided in Table 1.

## **Dependent Variables**

Physical proximity.

*StartupInvestorDistance*. Geographical distance is a key metric in early-stage investing, reflecting place-based social connections (Hochberg et al., 2007; Sorenson & Stuart, 2001) and post-investment monitoring and oversight concerns (Chen et al., 2010; Gompers & Lerner, 2006). Distance captures geographical proximity, measured as absolute distance in kilometers between headquarters (HQ) of the investor and the startup applying the distance formula (Haversine) to compute a spherical straight-line accounting for the curvature of the Earth. None of the locations in our sample changed over the period, and thus distance is time-invariant.

*Number of investors*

*Number of Investors*. Number of investors participating in a round is also indicative of the reach of the accelerator. The variable measures unique investors in a round.

*Fund size*

*Assets Under Management (AUM)*. Assets under management (AUM) is a standard measure of fund size. More established and powerful firms have higher AUM than newcomers. AUM is measured in \$Million.

### *Deal size*

*Deal Size.* Deal size is measured in \$Million. A larger deal size indicates greater confidence on the part of the investors that the startup will succeed.

### **Focal Independent Variables**

We consider three organizational forms of accelerator modes and three time periods. This categorical segmentation allows us to capture the range of organizational forms of accelerators and the demarcation of periods before, during, and after the rapid digitalization during the pandemic. Details are provided below.

#### *Organizational form*

*Accelerator Modes.* Accelerator mode classifies the programs according to distinct operational mode. We group programs by three modes: corporate, industry-specific, and traditional standalone. *Company-Specific* accelerator programs are connected to a specific company, either in-house (e.g., Shell Gamechanger) or in partnership (e.g., Equinor-Techstars); *Industry Specific* accelerator programs are connected to a specific industry (e.g. electricity) but not a given company. *Standalone* accelerator programs are not connected to any specific industry or company (e.g. Y Combinator, Global 500) but frequently include green-shift startups.

#### *Time period*

*Time Periods.* We group our data using financial quarters and years. We compare a similar number of quarters before, during, and after the pandemic. The periods consist of *pre-pandemic* (Q1/2018 through Q1/2020), *during pandemic* (Q1/2020 through Q4/2021), and *post-pandemic* (Q1/2022 through Q3/2023).

### **Controls**

We include controls at the startup, investor, and deal level. We control for the age of the

startup at time of entry in the accelerator (*StartupAcceleratorEntryAge*) and the age of the investor at the time of the deal (*InvestorAgeAtDeal*). We also include the year of the deal and a dummy variable if the deal is international or not.

## METHODOLOGY

We employ ordinary least squares (OLS) regression for continuous dependent variables. The choice of OLS regression is predicated on its suitability for modeling the linear relationships between geographical distances and other continuous outcomes of interest.

We use negative binomial regressions for models with count data in the dependent variables. The negative binomial function accounts for overdispersion around the mean and is a better fit for our data than the Poisson specification (Greene, 2008).

## RESULTS

Descriptive snapshots of our sample by time period (pre, during, and post-pandemic) and by organizational mode (company, industry, and standalone) shown in Appendix Tables 1-4. Formal results from OLS and negative binomial regressions are presented in Tables 2-5 and discussed below.

### Descriptive Findings

These descriptive findings in Appendix Tables 1-4 point to notable differences across time period and organizational modes with respect to the various dependent variables of interest in line with our hypotheses. The mean distance for startup-investor dyads changed during the pandemic relative to the pre-pandemic period, with the largest difference in *Company* modes, followed by *Industry* and *Standalone*. Distance increased in the pandemic period, before falling back to pre-pandemic levels. Anecdotally, and according to current accounts, we note that a number of programs maintain a hybrid structure post-pandemic. Distance means are similar after

controlling for international investments and focusing on domestic investments only (i.e., startup and investor located in the same country).

Turning to startups, the means point to an increase in capital raised across the periods. The average amount raised nearly doubled during the pandemic for *Company* modes, before falling sharply afterward. The average age of the startups in the sample is also lower during the pandemic, pointing to increased entry of new entrepreneurs. This development accelerated again after the pandemic.

Looking at the investors, the average assets under management (AUM) increased sharply during the pandemic. This number drops post-pandemic, which potentially reflects re-pricing assets under tighter economic conditions in 2022 and forward. Furthermore, the average investor age decreases somewhat during the pandemic period with the entry of new venture firms, a trend we again see from the increase in average number of investors participating during that period.

## **Regression Analyses**

The findings in Tables 2-5 largely support our hypotheses, offering valuable insights into the evolving landscape of venture capital investment and startup acceleration during and after the pandemic and into the distinct differences across organizational modes.

Hypothesis 1a stated that the geographical distance between investors and startups would expand during the pandemic and contract in the post-pandemic era. This results in Table 2 provide support for this hypothesis. This shift indicates a move away from traditional investment models that heavily favored proximity and suggests that digital tools are effectively mitigating geographical constraints enabling VCs to seek opportunities across broader regions. As the world transitioned into the post-pandemic period, we observed a reversion to more traditional, proximity-based investment patterns, suggesting a blend of the enduring value of close

geographical ties and the newfound flexibility in remote engagements. Such a shift suggests that digital platforms are providing effective alternatives to physical interactions, allowing VCs to overcome barriers like information asymmetry and agency conflicts more efficiently. Our study provides evidence that digital interaction platforms enable VCs to better monitor and engage with startups, thus altering the traditional dynamics associated with these investments. Enhanced monitoring capabilities and more effective communication channels facilitated by digitalization could transform the VC-startup relationship dynamic.

Hypothesis 1b suggested an increase in the number of investors during the pandemic, followed by a decrease post-pandemic. The results in Table 2 provide support for this hypothesis. Our analysis validates this pattern, reflecting how the pandemic era, characterized by digital acceleration and heightened interest in sustainable and technology-driven startups, attracted a broader array of investors. The following decrease post-pandemic indicates a normalization of investment activity as markets stabilize and investors revert to pre-pandemic routines.

Hypothesis 1c predicted that investors would be younger and smaller during the pandemic, with a shift towards older and larger investors post-pandemic. The results in Table 3 do not support this hypothesis. While greater numbers of investors were observed during the digital transition, firms with larger AUM, not smaller, were more prevalent. The post-pandemic landscape has seen a re-emergence of established investors, possibly due to their greater resilience and strategic positioning to navigate the evolving market conditions.

Hypothesis 2a and 2b explored the impact of agency concerns on investment behavior, predicting that distances between investors and startups would be greatest, and average deal sizes would be largest, where agency concerns are lowest. Our findings support these hypotheses, revealing that company-run accelerators, presumed to have lower agency concerns due to their

more direct involvement and oversight, exhibit the greatest geographical distance and secure the largest deal sizes. This suggests that when agency concerns are mitigated, investors are more comfortable engaging across greater distances and allocating more substantial funds, likely due to increased trust and reduced perceived risk.

## **DISCUSSION AND CONCLUSION**

This study examines the effect of wide-scale implementation of digital technology accelerator programs to inform key tenets of our understanding of early-stage investing. The findings point towards a nuanced view of how the integration of digital platforms has reshaped the VC landscape, particularly in terms of geographic diversity, investment patterns, the significance of physical proximity, and the dynamics of early-stage investing. Our key findings are that digital tools facilitate investing over a wider range while seemingly enabling greater participation. These findings suggest that digital interaction in conjunction with trusted accelerators may help overcome some agency considerations but may also lead to disruption within existing entrepreneurial ecosystems.

VC investors and accelerator programs represent an increasingly important mode of organizing and coordinating efforts to address innovation needs at the company, industry, and societal levels. In many ways they are uniquely positioned to address complex societal problems, such as in the context of climate change and the green shift. By pooling global and regional resources, expertise, and innovative capacities, these firms and organizations can rapidly prototype solutions to urgent, critical issues at scale. This coordinated approach leverages the private market's strengths, such as agility, risk tolerance, and ability to mobilize substantial financial and human capital towards pioneering quality solutions. Accelerator programs, in particular, serve as catalysts for innovation, providing startups with the mentorship, resources, and network necessary to expedite their growth and impact. Accelerators organized to focus on the green shift might underscore the belief that market-driven solutions can potentially

outperform traditional government-led interventions in addressing environmental challenges by producing more rapid and scalable innovations in green technology and sustainable practices.

By exploring how digital platforms reshape traditional mechanisms of control, trust, and information asymmetry in VC-startup relationships, our study offers fresh insights into the agency conflicts inherent in these relationships. This advancement could lead to a more nuanced understanding of how digital communication and monitoring tools can mitigate agency problems, thus enriching the theoretical discourse on principal-agent relationships in modern investment settings. Further, our study is expected to expand existing theories that emphasize the centrality of geographical proximity in investor-startup relationships. By demonstrating how digitalization diminishes the traditional reliance on physical closeness, our research could redefine key aspects of these theories, particularly in the context of venture capital investments. This redefinition would lead to a broader understanding of geographical factors in investment decision-making, providing a new perspective in our field of finance and entrepreneurship.

As well, our study adds to our understanding of how startups and their associated novel innovations may be marshalled in support of creating breakthrough approaches to societal needs, such as the green transition and climate change. The indisputable demands towards sustainable energy solutions is a grand challenge that inherently involves global solutions (Bass & Grøgaard, 2021), requiring large-scale orchestration across startups, investors, and corporates to reach innovative technological solutions. The findings in this paper point to the potential of distinct organizational approaches to spurring and harnessing innovation efforts.

From a practical standpoint, our study offers valuable insights for venture capital funds and startups. Our findings could guide VC firms in refining their investment strategies and due diligence processes in a digital-first environment. Similarly, startups can leverage these insights

to better position themselves in attracting VC funding, understanding the importance of digital proficiency and online engagement in a competitive funding landscape. Further, the findings from our research are particularly beneficial for accelerator programs, highlighting the effectiveness of digital platforms in attracting venture capital attention and investment. This could inform accelerator programs on adding, keeping, or increasing a digital presence to stay central in the global innovation ecosystem. Finally, we add to the growing understanding of the impact of the pandemic on entrepreneurial finance, particularly the relationship between accelerators, early-stage startups and investors.

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**Table 1. Summary Statistics**

|                              | mean    | sd       | min  | max     |
|------------------------------|---------|----------|------|---------|
| StartupInvestorDistance (km) | 3162.7  | 3880.7   | 0    | 19600   |
| Number investors             | 4.2     | 5.2      | 1    | 41      |
| AUM (\$M)                    | 52906.3 | 474459.7 | 0    | 9430000 |
| Dealsize (\$M)               | 80.8    | 499.9    | 0    | 9609    |
| DealYear                     | 2020.2  | 1.6      | 2017 | 2024    |
| YearFounded_x (investor)     | 2002.3  | 26.1     | 1800 | 2023    |
| YearFounded_y (startup)      | 2015.8  | 2.8      | 2007 | 2023    |
| Timeperiodgroup              | 1.9     | 0.8      | 1    | 3       |
| Modesgroup                   | 2.0     | 0.7      | 1    | 3       |
| StartupAcceleratorEntryAge   | 4.4     | 2.7      | 0    | 10      |
| DummyInternational           | 0.3     | 0.5      | 0    | 1       |
| <i>N</i>                     | 67877   |          |      |         |

**Table 2. Startup Investor Distance**

| VARIABLES                          | (1)<br>Dist_time<br>ln_startupinv<br>estordist | (2)<br>Dist_modes<br>ln_startupinvestor<br>dist | (3)<br>Dist_time_modes<br>ln_startupinvestor<br>dist | (4)<br>Dist_timeXmodes<br>ln_startupinvestor<br>dist |
|------------------------------------|--|---|--|--|
| <i>Time Period (Base:Pre)</i>      |  |   |  |  |
| 2.timegroup ( <i>During</i> )      | 0.0933***<br>(6.88)                            |   | 0.0510**<br>(2.70)                                   | 0.1584<br>(1.72)                                     |
| 3.timegroup ( <i>Post</i> )        | 0.2781***<br>(9.76)                            |   | 0.2312***<br>(6.58)                                  | 0.2661**<br>(3.18)                                   |
| <i>Org. Mode (Base:Company)</i>    |  |   |  |  |
| 2.modesgroup ( <i>Industry</i> )   |  | 0.3257***<br>(4.64)                             | 0.3263***<br>(4.60)                                  | 0.4009***<br>(4.29)                                  |
| 3.modesgroup ( <i>Standalone</i> ) |  | 0.3204***<br>(4.75)                             | 0.3251***<br>(4.86)                                  | 0.3937*<br>(2.44)                                    |
| 2o.timegroup#1b.modesgroup         |  |   |  | 0.0000<br>(.)  |
| 2.timegroup#2.modesgroup           |  |   |  | -0.1613<br>(-1.30)                                   |
| 2.timegroup#3.modesgroup           |  |   |  | -0.1438<br>(-0.90)                                   |
| 3o.timegroup#1b.modesgroup         |  |   |  | 0.0000<br>(.)  |
| 3.timegroup#2.modesgroup           |  |   |  | -0.0533<br>(-0.40)                                   |
| 3.timegroup#3.modesgroup           |  |   |  | -0.0543<br>(-0.35)                                   |
| startupacceleratoreentryage        | -0.0264*<br>(-2.28)                            | -0.0130<br>(-1.01)                              | -0.0132<br>(-1.03)                                   | -0.0132<br>(-1.06)                                   |
| InvestorAgeAtDeal                  | -0.0027**<br>(-2.84)                           | -0.0026**<br>(-2.82)                            | -0.0026**<br>(-2.85)                                 | -0.0026**<br>(-2.81)                                 |
| dummyinternational                 | 2.9303***<br>(70.83)                           | 2.9432***<br>(76.62)                            | 2.9449***<br>(76.36)                                 | 2.9454***<br>(77.99)                                 |
| dealyear                           | -0.0800***<br>(-8.87)                          | -0.0227**<br>(-2.51)                            | -0.0744***<br>(-7.43)                                | -0.0746***<br>(-7.26)                                |
| ln_AUM                             | 0.0767***<br>(8.31)                            | 0.0791***<br>(8.91)                             | 0.0796***<br>(8.81)                                  | 0.0796***<br>(8.89)                                  |
| 2.PostDemoDayDealNo                | 0.0176<br>(0.17)                               | 0.0167<br>(0.16)                                | 0.0210<br>(0.20)                                     | 0.0200<br>(0.19)                                     |
| 3.PostDemoDayDealNo                | 0.0766<br>(1.09)                               | 0.0668<br>(0.96)                                | 0.0710<br>(1.03)                                     | 0.0713<br>(1.04)                                     |
| 4.PostDemoDayDealNo                | 0.1987**<br>(3.06)                             | 0.1918**<br>(3.44)                              | 0.1937**<br>(3.49)                                   | 0.1958**<br>(3.44)                                   |
| Constant                           | 166.7797***<br>(9.17)                          | 50.7781**<br>(2.78)                             | 155.1107***<br>(7.68)                                | 155.5150***<br>(7.50)                                |
| Observations                       | 18,327   | 18,327  | 18,327   | 18,327   |
| R-squared                          | 0.249  | 0.252   | 0.252  | 0.252  |
| log pseudolikelihood               | -41803   | -41771  | -41768   | -41766   |

Robust t-statistics in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

**Table 3. Number of Investors**

| VARIABLES                       | (1)<br>NumInvest_time<br>investors | (2)<br>NumInvest_modes<br>investors | (3)<br>NumInvest_time_modes<br>investors | (4)<br>NumInvest_timeXmodes<br>investors |
|---------------------------------|------------------------------------|-------------------------------------|--|--|
| <i>Time (Base:Pre)</i>          |                                    |                                     |  |  |
| 2.timegroup ( <i>During</i> )   | 0.6752***<br>(31.65)               |                                     | 0.5474***<br>(23.44)                     | 0.4446***<br>(10.48)                     |
| 3.timegroup ( <i>Post</i> )     | 0.5129***<br>(14.26)               |                                     | 0.4089***<br>(12.39)                     | 0.3466***<br>(6.11)                      |
| <i>Org. Mode (Base:Company)</i> |                                    |                                     |  |  |
| 2.modesgroup                    |                                    | -0.2550***<br>(-8.20)               | -0.2550***<br>(-8.20)                    | -0.3330***<br>(-9.55)                    |
| 3.modesgroup                    |                                    | 0.1722***<br>(3.67)                 | 0.1722***<br>(3.67)                      | 0.1497***<br>(7.50)                      |
| 2o.timegroup#1b.modesgroup      |                                    |                                     |  | 0.0000<br>(.)                            |
| 2.timegroup#2.modesgroup        |                                    |                                     |  | 0.1120***<br>(3.13)                      |
| 2.timegroup#3.modesgroup        |                                    |                                     |  | 0.1223<br>(1.39)                         |
| 3o.timegroup#1b.modesgroup      |                                    |                                     |  | 0.0000<br>(.)                            |
| 3.timegroup#2.modesgroup        |                                    |                                     |  | 0.1397*<br>(1.92)                        |
| 3.timegroup#3.modesgroup        |                                    |                                     |  | -0.0767**<br>(-2.24)                     |
| startupacceleratoreentryage     | 0.0093<br>(0.38)                   | 0.0133<br>(0.64)                    | 0.0133<br>(0.64)                         | 0.0143<br>(0.69)                         |
| InvestorAgeAtDeal               | -0.0026***<br>(-5.60)              | -0.0022***<br>(-5.27)               | -0.0022***<br>(-5.27)                    | -0.0022***<br>(-5.17)                    |
| dummyinternational              | -0.0563***<br>(-4.38)              | -0.0570***<br>(-3.66)               | -0.0570***<br>(-3.66)                    | -0.0578***<br>(-3.85)                    |
| ln_AUM                          | 0.0374***<br>(5.15)                | 0.0324***<br>(4.34)                 | 0.0324***<br>(4.34)                      | 0.0322***<br>(4.33)                      |
| 2.PostDemoDayDealNo             | -0.0094<br>(-0.23)                 | 0.0251<br>(0.66)                    | 0.0251<br>(0.66)                         | 0.0268<br>(0.69)                         |
| 3.PostDemoDayDealNo             | -0.0415<br>(-0.20)                 | -0.0059<br>(-0.03)                  | -0.0059<br>(-0.03)                       | -0.0064<br>(-0.03)                       |
| 4.PostDemoDayDealNo             | -0.1009<br>(-0.64)                 | -0.0496<br>(-0.33)                  | -0.0496<br>(-0.33)                       | -0.0517<br>(-0.35)                       |
| Constant                        | 0.9368***<br>(15.50)               | 1.0632***<br>(12.85)                | 1.0632***<br>(12.85)                     | 1.1190***<br>(15.37)                     |
| lnalpha                         | -0.2866***<br>(-9.63)              | -0.3244***<br>(-10.37)              | -0.3244***<br>(-10.37)                   | -0.3271***<br>(-10.07)                   |
| YearDummies                     | Yes                                | Yes                                 | Yes                                      | Yes                                      |
| Observations                    | 17,488                             | 17,488                              | 17,488                                   | 17,488                                   |
| log pseudolikelihood            | -45586                             | -45298                              | -45298                                   | -45278                                   |

Robust z-statistics in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

**Table 4. Assets Under Management (AUM)**

| VARIABLES                       | (1)                    | (2)                    | (3)                        | (4)                        |
|---------------------------------|------------------------|------------------------|----------------------------|----------------------------|
|                                 | lnAUM_time<br>ln_AUM   | lnAUM_modes<br>ln_AUM  | lnAUM_time_modes<br>ln_AUM | lnAUM_timeXmodes<br>ln_AUM |
| <i>Time (Base:Pre)</i>          |                        |                        |                            |                            |
| 2.timegroup (During)            | 0.2521***<br>(12.27)   |                        | 0.2083***<br>(9.37)        | 0.2082***<br>(5.43)        |
| 3.timegroup (Post)              | 0.1851***<br>(8.52)    |                        | 0.1569***<br>(6.94)        | 0.0653<br>(1.61)           |
| <i>Org. Mode (Base:Company)</i> |                        |                        |                            |                            |
| 2.modesgroup (Industry)         |                        | -0.2634***<br>(-5.99)  | -0.2634***<br>(-5.99)      | -0.3012***<br>(-9.55)      |
| 3.modesgroup (Standalone)       |                        | 0.0846*<br>(2.39)      | 0.0846*<br>(2.39)          | 0.0555<br>(0.79)           |
| 2o.timegroup#1b.modesgroup      |                        |                        |                            | 0.0000<br>(.)              |
| 2.timegroup#2.modesgroup        |                        |                        |                            | -0.0081<br>(-0.18)         |
| 2.timegroup#3.modesgroup        |                        |                        |                            | 0.0147<br>(0.16)           |
| 3o.timegroup#1b.modesgroup      |                        |                        |                            | 0.0000<br>(.)              |
| 3.timegroup#2.modesgroup        |                        |                        |                            | 0.1588*<br>(2.19)          |
| 3.timegroup#3.modesgroup        |                        |                        |                            | 0.0878<br>(1.15)           |
| startupacceleratoreentryage     | 0.0454***<br>(5.87)    | 0.0431***<br>(7.08)    | 0.0431***<br>(7.08)        | 0.0430***<br>(7.22)        |
| dummyinternational              | 0.3509***<br>(9.64)    | 0.3450***<br>(10.01)   | 0.3450***<br>(10.01)       | 0.3445***<br>(9.86)        |
| yearfounded_x                   | -0.0489***<br>(-33.42) | -0.0490***<br>(-33.65) | -0.0490***<br>(-33.65)     | -0.0490***<br>(-33.70)     |
| 2.PostDemoDayDealNo_cat         | -0.0441<br>(-0.60)     | -0.0432<br>(-0.58)     | -0.0432<br>(-0.58)         | -0.0442<br>(-0.59)         |
| 3.PostDemoDayDealNo_cat         | -0.0770<br>(-1.27)     | -0.0633<br>(-1.17)     | -0.0633<br>(-1.17)         | -0.0650<br>(-1.23)         |
| 4.PostDemoDayDealNo_cat         | -0.1122<br>(-1.80)     | -0.0948<br>(-1.62)     | -0.0948<br>(-1.62)         | -0.0947<br>(-1.64)         |
| Constant                        | 103.3129***<br>(35.64) | 103.7927***<br>(35.85) | 103.7927***<br>(35.85)     | 103.8111***<br>(35.81)     |
| Year Dummies                    | Yes                    | Yes                    | Yes                        | Yes                        |
| Observations                    | 20,225                 | 20,225                 | 20,225                     | 20,225                     |
| R-squared                       | 0.254                  | 0.257                  | 0.257                      | 0.258                      |
| log pseudolikelihood            | -45085                 | -45038                 | -45038                     | -45036                     |

Robust t-statistics in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.10

**Table 5. Deal Size**

|                                    | (1)                            | (2)                             | (3)                                  | (4)                                  |
|------------------------------------|--------------------------------|---------------------------------|--------------------------------------|--------------------------------------|
| VARIABLES                          | lnDealSize_time<br>ln_DealSize | lnDealSize_modes<br>ln_DealSize | lnDealSize_time_modes<br>ln_DealSize | lnDealSize_timeXmodes<br>ln_DealSize |
| <i>Time (Base:Pre)</i>             |                                |                                 |                                      |                                      |
| 2.timegroup ( <i>During</i> )      | 0.6933***<br>(31.54)           |                                 | 0.6114***<br>(19.27)                 | 0.6103***<br>(14.00)                 |
| 3.timegroup ( <i>Post</i> )        | 0.8160***<br>(37.33)           |                                 | 0.7668***<br>(22.35)                 | 0.7714***<br>(21.28)                 |
| <i>Org. Modes (Base:Company)</i>   |                                |                                 |                                      |                                      |
| 2.modesgroup ( <i>Industry</i> )   |                                | -0.4585***<br>(-22.64)          | -0.4585***<br>(-22.64)               | -0.4487***<br>(-13.87)               |
| 3.modesgroup ( <i>Standalone</i> ) |                                | 0.0100<br>(0.10)                | 0.0100<br>(0.10)                     | -0.0352<br>(-0.84)                   |
| 2o.timegroup#1b.modesgroup         |                                |                                 |                                      | 0.0000<br>(.)                        |
| 2.timegroup#2.modesgroup           |                                |                                 |                                      | -0.0118<br>(-0.21)                   |
| 2.timegroup#3.modesgroup           |                                |                                 |                                      | 0.0722<br>(0.35)                     |
| 3o.timegroup#1b.modesgroup         |                                |                                 |                                      | 0.0000<br>(.)                        |
| 3.timegroup#2.modesgroup           |                                |                                 |                                      | -0.0140<br>(-0.43)                   |
| 3.timegroup#3.modesgroup           |                                |                                 |                                      | 0.0600<br>(1.01)                     |
| startupacceleratoreentryage        | 0.2018***<br>(8.27)            | 0.1965***<br>(8.21)             | 0.1965***<br>(8.21)                  | 0.1967***<br>(8.07)                  |
| dummyinternational                 | -0.0162<br>(-0.50)             | -0.0304<br>(-1.00)              | -0.0304<br>(-1.00)                   | -0.0312<br>(-1.02)                   |
| yearfounded_x                      | 0.0034***<br>(5.52)            | 0.0030***<br>(5.45)             | 0.0030***<br>(5.45)                  | 0.0030***<br>(5.48)                  |
| ln_AUM                             | 0.1147***<br>(8.34)            | 0.1091***<br>(8.70)             | 0.1091***<br>(8.70)                  | 0.1091***<br>(8.58)                  |
| ln_Investors                       | 0.9691***<br>(16.74)           | 0.9220***<br>(14.19)            | 0.9220***<br>(14.19)                 | 0.9222***<br>(13.95)                 |
| 2.PostDemoDayDealNo_cat            | 0.1897**<br>(2.68)             | 0.2069**<br>(2.67)              | 0.2069**<br>(2.67)                   | 0.2063**<br>(2.69)                   |
| 3.PostDemoDayDealNo_cat            | 0.1654<br>(1.32)               | 0.1982<br>(1.66)                | 0.1982<br>(1.66)                     | 0.1964<br>(1.65)                     |
| 4.PostDemoDayDealNo_cat            | 0.2501*<br>(2.42)              | 0.2902**<br>(2.70)              | 0.2902**<br>(2.70)                   | 0.2884**<br>(2.66)                   |
| Constant                           | -8.9821***<br>(-6.61)          | -7.8097***<br>(-6.41)           | -7.8097***<br>(-6.41)                | -7.8081***<br>(-6.40)                |
| Observations                       | 13,687                         | 13,687                          | 13,687                               | 13,687                               |
| R-squared                          | 0.428                          | 0.447                           | 0.447                                | 0.447                                |
| log pseudolikelihood               | -22341                         | -22112                          | -22112                               | -22111                               |

Robust t-statistics in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

**APPENDIX TABLE 1: Means across time periods and startup-investor dyad locations.**

| <i>Table 1: Means</i>               | <i>Industry</i> | <i>Standalone</i> | <i>Company</i> |
|-------------------------------------|-----------------|-------------------|----------------|
| <b><i>Startups</i></b>              |                 |                   |                |
| <i>YearFounded_y</i>                | 2015.242        | 2016.541          | 2013.02        |
| <i>Totalraised (\$Mill)</i>         | 62.01538        | 806.9081          | 1654.975       |
| <i>Investors (#)</i>                | 3.647887        | 5.069612          | 4.533063       |
| <b><i>Investors</i></b>             |                 |                   |                |
| <i>YearFounded_x</i>                | 2002.306        | 2008.451          | 1997.711       |
| <i>AUM (\$Mill)</i>                 | 46326.14        | 34731.31          | 104560.1       |
| <b><i>Distance</i></b>              |                 |                   |                |
| <i>Startupinvestordistance (km)</i> | 3094.812        | 3057.734          | 3474.715       |

**APPENDIX TABLE 2: Means across pre-period and startup-investor dyad locations**

| <i>Table 2: Means</i>               | <i>Industry</i> | <i>Standalone</i> | <i>Company</i> |
|-------------------------------------|-----------------|-------------------|----------------|
| <b><i>Startups</i></b>              |                 |                   |                |
| <i>YearFounded_y</i>                | 2014.722        | 2015.581          | 2012.706       |
| <i>Totalraised (\$Mill)</i>         | 55.47582        | 853.1524          | 1332.765       |
| <i>Investors (#)</i>                | 2.935919        | 3.94297           | 4.455407       |
| <b><i>Investors</i></b>             |                 |                   |                |
| <i>YearFounded_x</i>                | 2001.998        | 2007.283          | 1998.018       |
| <i>AUM (\$Mill)</i>                 | 43784.35        | 43653.78          | 90018.1        |
| <b><i>Distance</i></b>              |                 |                   |                |
| <i>Startupinvestordistance (km)</i> | 3119.777        | 2975.961          | 3379.462       |

**APPENDIX TABLE 3: Means across during-period and startup-investor dyad locations**

| <i>Table 3: Means</i>               | <i>Industry</i> | <i>Standalone</i> | <i>Company</i> |
|-------------------------------------|-----------------|-------------------|----------------|
| <b><i>Startups</i></b>              |                 |                   |                |
| <i>YearFounded_y</i>                | 2015.196        | 2016.804          | 2012.903       |
| <i>Totalraised (\$Mill)</i>         | 69.32473        | 906.9266          | 2834.024       |
| <i>Investors (#)</i>                | 3.907896        | 5.563122          | 4.57499        |
| <b><i>Investors</i></b>             |                 |                   |                |
| <i>YearFounded_x</i>                | 2002.39         | 2008.965          | 1997.321       |
| <i>AUM (\$Mill)</i>                 | 53087.92        | 33340.84          | 143664.4       |
| <b><i>Distance</i></b>              |                 |                   |                |
| <i>Startupinvestordistance (km)</i> | 3104.718        | 3122.303          | 3865.804       |

**APPENDIX TABLE 4: Means across post-period and startup-investor dyad locations**

| <i>Table 4: Means</i> | <i>Industry</i> | <i>Standalone</i> | <i>Company</i> |
|-----------------------|-----------------|-------------------|----------------|
|                       |                 |                   |                |

| <b>Startups</b>                     |          |          |
|-------------------------------------|----------|----------|
| <i>YearFounded_y</i>                | 2016.067 | 2017.406 |
| <i>Totalraised (\$Mill)</i>         | 59.42175 | 582.7747 |
| <i>Investors (#)</i>                | 4.313939 | 5.848813 |
| <b>Investors</b>                    |          |          |
| <i>YearFounded_x</i>                | 2002.602 | 2009.173 |
| <i>AUM (\$Mill)</i>                 | 38700.15 | 25395.79 |
| <b>Distance</b>                     |          |          |
| <i>Startupinvestordistance (km)</i> | 3042.841 | 3062.349 |
|                                     |          | 2986.703 |