

The effect of founder CEOs' technical and business education on the amount of entrepreneurial financing in the global fintech industry*

R. Isil Yavuz

*Bryant University, 1150 Douglas Pike, Smithfield
e-mail: ryavuz@bryant.edu
ORCID: 0000-0002-7662-5088*

Alexandria Iacoviello

*IBM, 75 Binney Street, Cambridge
e-mail: aiacoviello@ibm.com*

Abstract

This paper explores whether and how a founder CEO's technical and business education affects the amount of entrepreneurial financing in the fintech industry. Using signaling and human capital theories, this study examines 185 startups from Bangalore, Beijing, Berlin, and Boston and finds that founder CEOs with technical education are positively associated with the total amount of entrepreneurial financing. In contrast, founder CEOs with business education are surprisingly negatively associated with it. Moreover, there is an interaction effect between technical and business education. The negative association between business education and the amount of financing weakens when CEOs also have technical education. This paper contributes to entrepreneurship literature by emphasizing the role of founder CEOs' technical and business education as important signals in accessing financial capital in the fintech industry.

Key words: Entrepreneurial financing, founder CEO, technical education, business education.

1. Introduction

The growth of financial technology, or *fintech*, companies has been trending in news headlines, in college classrooms, and on social media, but our understanding of these companies' formation, operation, and performance has been very limited (Lee and Shin, 2018). The term *fintech* is newly developed but represents a broad section of electronic payments that have existed since the 1960s. It refers to "*the broad subset of financial innovations that apply new technologies to a financial service or product*" (Scott, 2020: 1). Digital transformation of financial transactions and records led to the development of four areas - digital lending, payments, blockchain, and digital wealth management - considered fintech today (Mayor, 2021).

As the technology field is constantly innovating, Market Data Forecast suggests that "*the global financial technology market is projected to reach a market value of \$324 billion by 2025 and grow at a compound annual rate of about 25.18% over 2022-2027*" (Market Data Forecast, 2022). With high growth projections, the fintech market is attracting entrepreneurs to take advantage of the growing market opportunities around the world (Scott, 2020). However, the creation of innovative ventures like fintech companies requires sufficient capital to finance the product development process and its marketing (Patzelt, 2010). Nevertheless, while many studies examine the factors that influence new ventures' access to financing, our knowledge of entrepreneurial financing within the context of fintech companies has been very limited (Lee and Shin, 2018).

This paper contributes to this newly emerging literature by exploring the influence of the founder CEOs' technical and business education on entrepreneurial financing in the fintech industry. Prior research comprehensively documented that CEO characteristics affect strategic decisions and company performance (Hambrick and Mason, 1984; Wang *et al.*, 2016). Extending these arguments to startup companies, studies in the entrepreneurship literature indicated that individual characteristics of founders lead different founders to pursue different entrepreneurial opportunities, form new ventures with different characteristics, and achieve different performance outcomes (Shane and Venkataraman, 2000; Shane, 2000).

Existing studies also suggested that founder characteristics, particularly their skills, education, and experience, are crucial for investors in making financial commitments to startup companies because these characteristics reflect the promise of the venture and signal the quality of the company to the investors (Eckhardt, Shane and Delmar, 2006). Accordingly, several studies examined the influence of the *level* of education on entrepreneurial outcomes (Jensen and Zajac, 2004; Nosella *et al.*, 2006). However, so far, existing literature has paid little attention to the *field*

of education, although the field of formal education might have important implications regarding how founders perceive, think, and act and what type of signals they send to outside investors (Patzelt, 2010). To address this gap, we explore whether and how the founder CEOs' technical and business education influence the amount of entrepreneurial financing. This question is particularly relevant to ask in the context of the fintech industry, which is at the intersection of technology and business, and it is not so clear whether a technical or a business education of founder CEOs might produce more favorable outcomes in terms of access to entrepreneurial financing.

We test our hypotheses by utilizing a unique data set from the online platform Growth Enabler, which gives detailed profiles of technology companies around the world. Our final sample includes 185 fintech startups from four cities - Bangalore, Beijing, Berlin, and Boston. Our results show that a founder CEO with technical education is positively associated with the amount of entrepreneurial financing, while a founder CEO with business education is negatively associated with it. Moreover, our results show a positive moderation effect of technical education such that the negative effect of business education on the amount of entrepreneurial financing weakens when the founder CEO also has technical education.

These results contribute to the human capital and signaling literature by indicating that the founders' education is not a simple human capital dimension measured by the number of years of formal education as in many prior studies. Instead, it is a more complex phenomenon where the field of education and its interactions should also be considered to fully understand its influence on entrepreneurial outcomes. As such, this research highlights not only the positive influence of founder CEOs' technical education and the negative influence of business education in accessing financial capital but also the role of technical education in lessening the negative influence of business education on the amount of entrepreneurial financing.

The results also have practical implications for policymakers and fintech startup founders. New ventures are considered the engine of economic growth in many countries, and fintech is a growing global industry with new startups contributing to the growth and competitiveness of their countries (Scott, 2020). Therefore, to facilitate the emergence and growth of new fintech startups, policymakers need to recognize the importance of formal education in technical areas and invest resources in the educational system accordingly. They may also implement educational programs/courses/certificate programs in technology-related fields for entrepreneurs. Aspiring entrepreneurs should also consider the value of technical education for access to financing in choosing their field of study if they want to operate in the fintech industry.

2. Theory development and hypotheses

Prior research shows that access to financing is one of the most fundamental issues for new ventures, affecting their emergence, survival, and growth prospects (Hogan, Hutson, and Drnevich, 2017). Researchers examining new venture financing primarily use the signaling (Spence, 1973) and human capital (Becker, 1975) theories. From the signaling theory perspective, new ventures face special difficulties in accessing financial resources because no track record exists to indicate the true potential of a new venture. Therefore, to decrease the uncertainty associated with their investments, resource providers, including venture capitalists (VCs), banks, angels, and governmental institutions look for observable attributes of the venture (Shane and Cable, 2002), such as patented technology, partnerships with prominent companies, and the individual qualities of the founders, particularly those of founder CEOs (Patzelt, 2010).

From the human capital theory perspective, the human capital - the education, knowledge, skills, and experiences of the founders - influence venture performance by affecting the strategic direction and the future development of the venture as they are the primary decision-makers in new ventures (Behrens *et al.*, 2012). Therefore, signaling theory and human capital theory coalesce in the sense that investors consider the individual attributes of founders as critical indicators signaling the promise of a new venture and base their financing decisions on these attributes (Baum and Silverman, 2004; Packalen, 2007).

Accordingly, existing research has examined the influence of various founder characteristics on new venture financing. For example, these studies explored the influence of the founders' gender (Coleman and Robb, 2009; Eddleston *et al.*, 2016); race (Frid, 2015; Bates and Robb, 2016); education (Bates 1990, Coleman and Cohn, 2000, Neeley and Auken 2009); degree from an elite educational institution (Nigam, Benetti and Johan, 2020); startup experience and industry experience (Delmar and Shane, 2006; Kotha and George, 2012), net worth (Frid *et al.*, 2016), media coverage (Mahto and Khanin, 2013), and social networks (Dudley, 2021), and found that all these factors are significantly related to access to entrepreneurial financing.

However, very few studies have explored the influence of lead founders or the founder CEOs' *field* of education on entrepreneurial financing. Among the few studies is Patzelt (2010), who has studied the biotechnology industry and documented that the business education of CEOs significantly and positively affects the amount of VC financing, particularly when the startup team size is large. Similarly, Behrens *et al.* (2012) have examined 138 VC financing rounds in the US and Europe and have shown the positive influence of founders' management, legal, and technical education on VC financing in young ventures in the

biopharmaceutical industry. On the other hand, Nigam, Benetti, and Johan (2020) analyzed a sample of high-tech companies in India from 2014 to 2017 and found no significant relationship between the founder's technical background and VC financing rounds.

While this research has increased our understanding of the influence of the founders' business or technical background in accessing entrepreneurial financing, these studies have not examined these relationships in the context of the fintech industry, where technical and business requirements of the industry are different from industries such as biotechnology and software (Eesley *et al.*, 2014). As a result, it is unclear whether founder CEOs' technical or business education might send a more credible signal to investors regarding the venture's viability, influencing access to entrepreneurial financing. In this study, we aim to fill this gap and contribute to the literature by exploring how founder CEOs' business and technical education and their interplay affect the acquisition of financial capital in the fintech industry. We focus on the lead founders or founder CEOs because they represent their companies in the eyes of investors. Souitaris *et al.* (2022: 11) state that:

"Investors have limited attention and often look for and are influenced by a single founder who personifies a venture's values and business proposition. The lead founder is salient in obtaining financing, attracting investors, and legitimizing the firm, and is portrayed in the firm's prospectus and the media as the "face of" the venture, the core of the founding team, and the mastermind of the firm."

2.1. Technical education and entrepreneurial financing

The fintech industry has rapidly developed by simplifying financial transactions, making them faster, more accessible, and affordable due to the developments in related technologies. Studies predict that emerging trends in modern technology, including artificial intelligence, machine learning, blockchain, cloud computing, internet of things (IoT), and robotics, will continue to shape the future of fintech (Fong *et al.*, 2021). In such an environment, fintech startups must take advantage of technological trends to innovate and bring even more benefits to consumers and businesses to be successful.

Therefore, we argue that the founder CEOs' technical background is important in order to have a detailed understanding of the technology in the industry and develop products suitable for the market. Fintech startups compete to bring new-to-the-world innovations to the markets, and the source of complexity in the venture resides in the technological aspect of the business, requiring a deep technical understanding (Leong and Sung, 2018). Thus, founder CEOs with technical

education would be in a better position to address the technological needs of the company, identify and recruit technical talent, communicate with the technical staff effectively, and build a technical advisory board and other strategic relationships at the highest level to bring new innovations to the market (Eesley *et al.*, 2014). By studying 2,067 companies founded by MIT alums, Eesley *et al.* (2014) empirically demonstrated that technically focused teams performed better when they tried to bring innovations to the market.

Because capital providers in general, and VCs and angels in particular, are attracted to funding innovative startups (Baum and Silverman, 2004; Hahn *et al.*, 2019; Hirukawa and Ueda, 2011), we argue that founder CEOs with technical education will attract more financial capital since the understanding of the technology at the top managerial position will send a strong signal to capital providers regarding the emphasis the company puts on technological innovation which, in turn, will increase these companies' access to higher amounts of capital. Thus, we expect that:

Hypothesis 1: Technical education of founder CEOs is positively associated with the total amount of entrepreneurial financing in fintech startups.

2.2. Business education and entrepreneurial financing

The fintech industry is characterized as having a competitive commercialization environment where it is common for fintech startups to compete head-to-head in the product market with traditional banks and other large and established financial institutions (Navaretti *et al.*, 2018; Stulz, 2019). In such an environment, fintech startups must make investments and build capabilities, not only in technological innovation but also in complementary assets, including marketing, sales, and operations, to successfully commercialize their technology and outperform existing competitors (Eesley *et al.*, 2014).

We argue that business education would provide founder CEOs with the knowledge and skills to oversee the entirety of the company better and locate the areas that need improvement. New ventures face many challenges, including a lack of employee commitment, knowledge of their environment, and working relationships with customers, suppliers, and alliance partners (Baum and Silverman, 2004). In addition, because new ventures have little operating experience, they frequently operate using immature and unrefined routines (Wennberg, Delmar, and McKelvie, 2016). We suggest that a founder with a business education would address these business issues and integrate technological, human, and financial resources to organize, produce, and market products and services that yield value for customers and employees (Patzel, 2010; Behrens *et al.*, 2012).

Although diverting focus to an area other than technology in the fintech industry - where new startups with technological innovation compete with traditional financial institutions and with each other - may send a negative signal to investors regarding the managerial focus on technical development, we argue that the business education of founder CEOs' signals the company's dedication to building capabilities in various parts of the organization, which is necessary to operate in a competitive commercialization environment (Eesley *et al.*, 2014). Thus, founder CEOs with a business education will serve as a positive signal that the new venture will succeed and attract a more significant amount of investment capital. Thus, we expect that:

Hypothesis 2: Business education of founder CEOs is positively associated with the total amount of entrepreneurial financing in fintech startups.

2.3. The moderating role of technical education

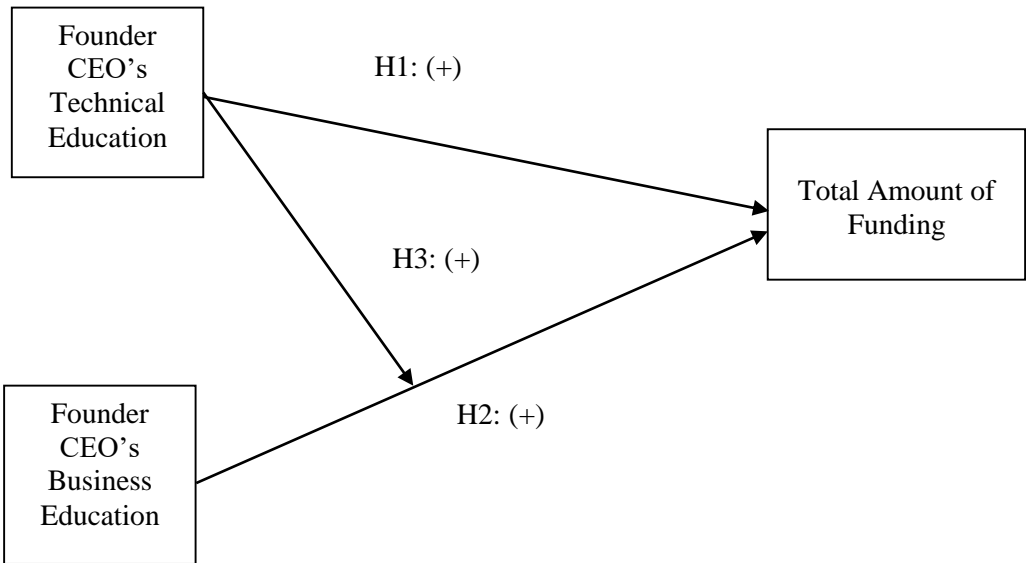
We propose that technical education will positively moderate the relationship between business education and the amount of entrepreneurial financing such that the positive influence of business education on entrepreneurial financing will be stronger for those founder CEOs who also have a technical education. This can stem from a variety of mechanisms. First, we argue that while a founder CEO with a business education may overemphasize the exploitation of existing technologies (Saemundsson and Candi, 2013), a founder CEO with both a technical and business education might be more likely to find a balance between the exploration of potential new technologies and exploitation of existing ones in all other areas of business needed for sustained performance.

Second, having a founder CEO who has both technical and business education is capable of not only crafting a vision for the company due to knowing the paths and opportunities for the development of the technology but also devising and implementing strategic decisions to achieve that vision, thanks to knowing how to manage a business concerning all financial, operational, and administrative issues.

Finally, having founder CEOs with a technical and business degree will likely lead to improved communication and coordination between technical and other business departments, such as marketing, finance, and operations, thereby decreasing the friction across departments in executing technological innovation. Therefore, business education in the presence of technical education represents the potency of the founder CEO's human capital and will send a strong signal to boost investors' confidence in the ability of the startup to achieve superior future performance. Thus, we expect that:

Hypothesis 3: Technical education of founder CEOs will strengthen the positive relationship between the business education of founder CEOs and the total amount of entrepreneurial financing in fintech startups.

Figure 1
Proposed Theoretical Framework



3. Methodology

3.1. Sample

To test the study's hypotheses, we analyzed data from the Growth Enabler Database, which uses AI and a data-driven matching algorithm to collect data on various firms and founders' characteristics from startups to provide various digital solutions that allow global enterprises to partner with, procure from and invest in emerging businesses (<https://growthenabler.com>). Because the fintech industry is a global industry where growth comes from developed and developing countries alike, we focus on a sample of fintech startups from four global fintech hubs: Bangalore, Beijing, Berlin, and Boston. From each city, we randomly selected an equal number of startups established in 2013 or later. The initial sample included a total of 300 startups.

For each of the selected startups, we gathered founder names from Growth Enabler, accessed the public LinkedIn profile of each founder to locate the founder

CEO, and recorded data about their background and experiences, including the fields they majored in during their undergraduate and graduate studies. The final sample without missing values for single variables included 185 startups that are used for econometric estimations in the main analyses. Of these 185 startups, 52 are in Bangalore, 47 in Beijing, 50 in Berlin, and 36 in Boston.

3.2. Measures

Dependent variable: The dependent variable is the total amount of funding, which measures the total amount of investment made in the firm. It includes both equity financing provided by angels and VCs and debt financing provided by banks or financial institutions. This variable is measured in US dollars and normalized by taking its logarithmic function.

Table 1
Variable Definitions

Variable Names	Variable Abbreviations	Variable Definitions
<i>Dependent Variable</i>		
Total Amount of Funding (ln)	Total Funding (ln)	Log of total amount of money (\$) invested in business in the form of equity or debt
<i>Independent Variables</i>		
Technical Background	Tech Education	Dummy =1 if the founder has a technical education.
Business Background	Buss Education	Dummy = 1 if the founder has a business education.
<i>Control Variables</i>		
Graduate Education	Graduate	Dummy =1 if founder has a graduate (Masters or PhD) degree.
Gender	Female	Dummy =1 if founder is female.
Immigrant Status	Immigrant	Dummy= 1 if the founder is an immigrant to the country the business headquarters is in.
Previous Start-Up Experience	Startup Exp	Dummy=1 if founder has prior start-up experience.
Number of Co-Founders	No of Co-founders	Number of Co-Founders
Firm Size	Firm Size (ln)	Log of number of employees
Firm Age	Firm Age	Total number of years operating.
Geographic Location	Bangalore, Beijing, Berlin, Boston	Four dummy variables created for Bangalore, Beijing, Berlin, Boston.

Independent variables: The study's independent variable is the founder CEOs' education. Two dummy variables were created to assess technical and business education. Technical education is coded "1" if the founder CEO has either an undergraduate or graduate degree from an engineering school, such as chemical engineering, financial engineering, computer science, and other STEM areas such as math or physics, and coded "0" otherwise. Business education is coded "1" if the founder CEO has an undergraduate or graduate degree from a business school in fields such as business administration, finance, marketing, or economics, and "0" otherwise. In the final sample, 33% of the founder CEOs have a technical education, 89% have a business education, and 23% have both a technical and business education. Table 2 shows the distribution of the sample in more detail.

Table 2
Sample, by Educational Background and Educational Level

	Educational Background			
	Business Background		Technical Background	
Educational Level	#	%	#	%
Undergraduate	105	0.36	72	0.25
Graduate	155	0.53	25	0.08
Total	260	0.89	97	0.33

Control variables: We include several control variables that might account for some variance in the dependent variable. At the individual level, we control for the founder CEOs' gender and immigrant status since prior literature shows that females and immigrants are disadvantaged in accessing entrepreneurial financing (Coleman and Robb, 2009; Collins and Low, 2010). Therefore, we create two dummy variables for gender (male = 0, female = 1) and immigrant status (native = 0, immigrant = 1), respectively. We also control the level of education (undergraduate degree = 0, graduate degree = 1) since prior research shows that the educational level of founders is an important variable in attracting financial capital (Neeley and Auken, 2009). In addition, prior research shows the positive influence of previous startup experience on entrepreneurial financing (Hsu, 2007; Nigam *et al.*, 2020). Thus, we control for prior startup experience using a dummy variable coded "1" if the founder CEO has any prior startup experience and "0" otherwise.

At the firm level, we control for firm size using the number of employees since prior research shows that firm size affects venture financing (Eddleston, *et al.*, 2016). Prior research also shows that the number of founders is related to the amount of entrepreneurial financing (Nigam *et al.*, 2020). Thus, we also control the

number of founders. Lastly, we control for firm age since investors prefer more established startups to invest in (Hsu, 2007). As mentioned, our sample consists of startups founded in 2013 or later.

Finally, as context controls, we create four dummy variables for Bangalore, Beijing, Berlin, and Boston to control for the geographic location of these startups since geographical proximity to VCs, angels, and other financial institutions influences access to entrepreneurial financing (Sorenson and Stuart, 2001). Our analyses include three dummy variables to control for Bangalore, Beijing, and Berlin, respectively. Table 1 presents the variable definitions and abbreviations.

4. Results

Table 3 reports descriptive statistics and pair-wise correlations for all variables used to test our hypotheses. Descriptive statistics show that an average founder CEO is a native male with a graduate degree and prior startup experience. His company is about seven years old and employs three other people. Correlations in Table 3 show that firm size and firm age are strongly and positively correlated with the total amount of funding. Moreover, being in Beijing is positively correlated with the amount of funding, while being in Bangalore or Boston is negatively correlated with it.

Table 3 shows a significant and positive correlation between founder CEOs' technical education and the total amount of funding, providing the first positive sign supporting our first hypothesis. However, founder CEOs' business education is significantly and negatively correlated with the total amount of funding, which is not consistent with the second hypothesis.

Table 3
Descriptive Statistics and Pairwise Correlations

Variables	Mean	Sd	1	2	3	4	5	6
1 Total Funding	15.56	2.04	1					
2 Tech Education	0.33	0.47	.16*	1				
3 Buss Education	0.89	0.31	-.23**	-.45**	1			
4 Graduate	0.60	0.49	.12	-.34**	.16**	1		
5 Female	0.08	0.27	.04	-.07	.02	.06	1	
6 Immigrant	0.42	0.42	-.03	.09	.02	.05	-.01	1
7 Startup Exp	0.55	0.55	-.02	-.13	.11	.05	-.04	.06
8 No of Co-founders	1.63	0.67	-.02	.01	.10	-.01	-.08	.29**
9 Firm Size	2.66	1.32	.32**	-.06	-.04	-.01	-.05	-.04
10 Firm Age	6.79	1.55	.24**	-.03	-.06	.06	-.01	-.03
11 Bangalore	0.21	0.41	-.21**	.27**	.04	-.34	-.07	-.03
12 Beijing	0.30	0.46	.36*	.16**	-.26**	.13**	.06	-.03
13 Berlin	0.26	0.44	-.01	-.22**	.12**	.17**	-.11	.09
14 Boston	0.22	0.42	-.16**	-.18**	.06	.05	.14**	-.04

Table 3 (cont'd)

Variables	7	8	9	10	11	12	13	14
1 Total Funding								
2 Tech Education								
3 Buss Education								
4 Graduate								
5 Female								
6 Immigrant								
7 Startup Exp	1							
8 No of Co-founders	.13**	1						
9 Firm Size	.16**	.13**	1					
10 Firm Age	.02	.03	.17**	1				
11 Bangalore	-.17	.14**	.12**	-.17**	1			
12 Beijing	-.23**	-.23**	-.05	.22**	-.31**	1		
13 Berlin	.24**	.10	.06	-.06	-.39**	-.34**	1	
14 Boston	.12**	-.04	-.14**	.02	-.32**	-.28**	-.35**	1

Note: *p<0.10; **p<0.05; ***p<0.01

We estimate our models using STATA and OLS regression since our dependent variable is the total amount of funding, and OLS regression is the appropriate regression model when the dependent variable is continuous. Table 4 displays coefficients (β) and robust standard errors (s.e.). In Model 1 in Table 4, we introduce the control variables. In Model 2 in Table 4, we add technical education to the control variables to test our first hypothesis. The model is significant, and results show a significant positive relationship between technical education and total funding (ln) with $t=2.05$, $p<0.05$, supporting H1. The coefficient of technical education is 0.73, meaning that founder CEOs' having technical education increases the total amount of funding by 0.75 in logarithmic terms.

Table 4
Total Amount Funding as Function of Technical Education, Business Education,
and Their Interaction from OLS Regression

	Model 1	Model 2	Model 3	Model 4
Tech Education		0.73** (0.36)		-2.35** (0.59)
Buss Education			-0.87** (0.43)	-1.36** (0.65)
Tech Education * Buss Education				2.07** (0.82)
Graduate	-0.12 (0.37)	0.01 (0.37)	-0.02 (0.37)	0.11 (0.38)
Female	-0.29 (0.63)	-0.22 (0.61)	-0.26 (0.64)	-0.17 (0.61)
Immigrant	-0.00 (0.01)	-0.2 (0.01)	-0.01 (0.01)	-0.02 (0.01)
Startup Exp	0.07 (0.36)	0.08 (0.36)	0.07 (0.36)	0.09 (0.36)
No of Co-founders	0.26 (0.27)	0.23 (0.26)	0.28 (0.27)	0.25 (0.27)
Firm Size (ln)	0.62*** (0.12)	0.63*** (0.12)	0.59*** (0.12)	0.58*** (0.12)
Firm Age	0.13 (0.11)	0.14 (0.11)	0.13 (0.11)	0.14 (0.11)
Bangalore	-0.56 (0.50)	-0.76 (0.52)	-0.51 (0.50)	-0.72 (0.53)
Beijing	2.52*** (0.48)	2.26*** (0.49)	2.33*** (0.47)	2.15*** (0.49)
Berlin	0.17 (0.43)	0.19 (0.43)	0.20 (0.43)	0.21 (0.44)
Constant	11.98*** (0.91)	11.76*** (0.91)	12.79*** (0.91)	14.12*** (1.03)
F	10.04	9.04	9.37	21.01
R Squared	0.34	0.35	0.35	0.36
Sample Size	185	185	185	185

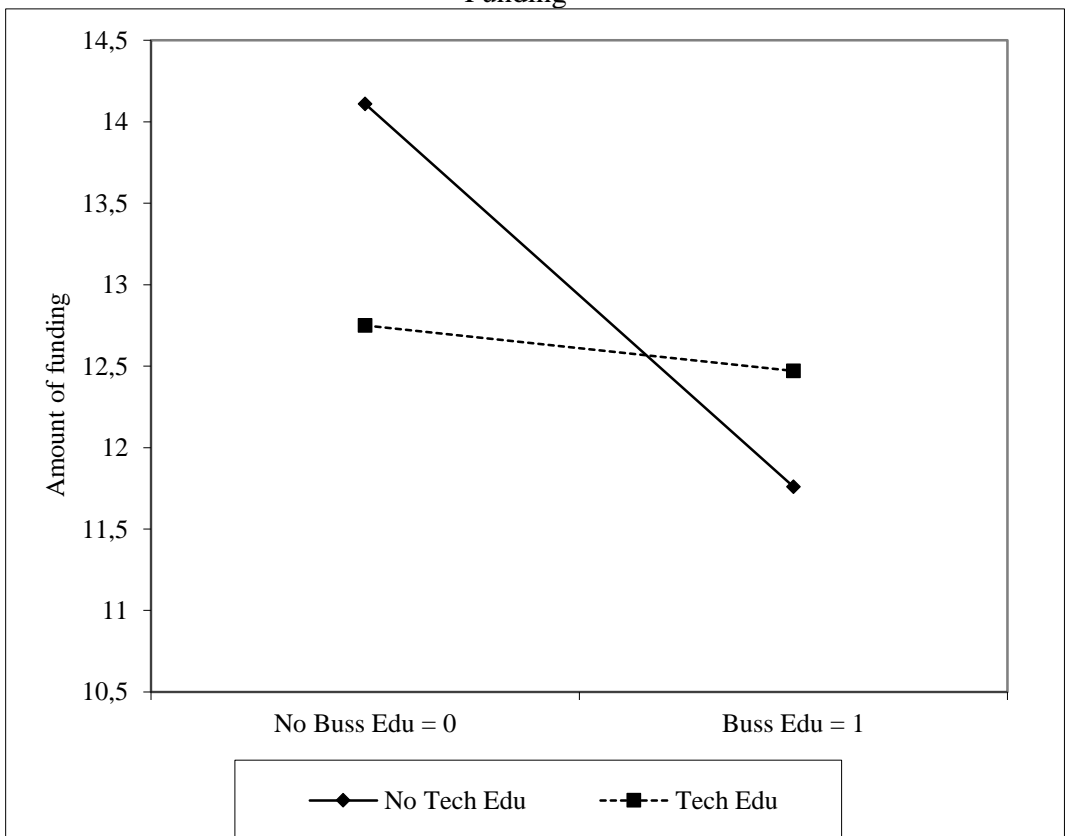
Note. *p<0.10; **p<0.05; ***p<0.01

Model 3 in Table 4 presents the results for our second hypothesis, the effect of business education on the total amount of funding. Contrary to H2, the results show that business education has a significant but negative main effect on the total amount of funding with $t=-2.02$, $p < 0.05$, failing to support H2. The coefficient of

business education is -0.87, meaning that founder CEOs with business education decrease total funding by 0.87 in logarithmic terms.

Model 4 in Table 4 indicates the results from our third hypothesis, the moderating role of technical education in the relationship between business education and the total amount of funding. Technical education has a positive and significant moderating effect on the relationship between technical education and the total amount of funding with $t=2.54$, $p<0.05$, supporting H3. Figure 2 displays the results graphically and shows that the slope of the relationship between business education and the total amount of funding is significantly less negative for founder CEOs with technical education.

Figure 2
Interaction Effect of Technical and Business Education on Total Amount of Funding



We also run robustness checks where we interact technical education and business education with the graduate variable to see whether to have technical or business education as an undergraduate or graduate degree makes a difference in terms of accessing external financing. The results show that the coefficients of both interaction variables are insignificant, meaning that having a technical or a business degree either at the undergraduate or at the graduate level does not make a significant difference in terms of the total amount of funding.

5. Discussion

This paper examines how founder CEOs' technical education, business education, and their interplay affect the amount of new venture financing in the fintech industry. While few prior studies investigate the effects of founders' business and technical education on new venture financing, the literature seldom considers their interplay. Also, these studies mainly examine industries other than the fintech industry. However, fintech is a growing global industry where technology and business intersect, and it is unclear whether founder CEOs' business or technical education or their interplay would result in better financing outcomes. We address this knowledge gap by integrating perspectives from human capital and signaling theories.

First, the results support our first hypothesis that technical education positively influences the total amount of financing. We provide arguments to explain the positive effect of technical education, including understanding technological trends, identifying the technological needs of the company, identifying and recruiting technical talent, and establishing effective alliances for technology development, all of which are required for the effective management of complexity associated with technological innovation (Eesley *et al.*, 2014; Saemundsson and Candi, 2014), and send a strong positive signal regarding the long-term viability of the company to the providers of financial capital.

Second, results show that business education has a significant but negative effect on the amount of entrepreneurial financing. Again, this is a finding contrary to our hypothesis. One possible explanation for this finding might be that diverting focus to an area other than technology in the fintech industry, where new startups with technological innovation compete with traditional financial institutions and with each other, may send a negative signal to investors regarding the managerial focus on technological innovation, and negatively influence financing outcomes. In line with this argument, Arvanitis and Stucki (2012) followed a cohort of 7122 Swiss startups in various industries over ten years and found that business education negatively influences their innovative activities.

Another alternative explanation might be that because business education leads to a tendency to establish formal structures and processes, possibly impacting the agility of the venture, it sends a negative signal to investors. As such, in his study of 84 biopharmaceutical ventures, Patzelt (2010) demonstrates that management education of CEOs is beneficial for ventures with large teams where conflict and communication problems are more likely to happen and require CEOs to have management skills to address them. However, additional research is needed to examine these alternative explanations.

Further, our findings show that technical education positively moderates the relationship between business education and the total financing amount, supporting our interaction hypothesis. We suggest that this is likely to result from a founder's ability to balance exploration and exploitation activities, improved communication and coordination, and more effective leadership of the technology and business side of the company. All of these are likely to send a strong signal to boost investors' confidence in the ability of the startup to achieve superior future performance. As such, our findings suggest that business education's value depends on entrepreneurs' technical education. Furthermore, capital providers tend to decrease their negative evaluation of founder CEOs' business education when these CEOs also have technical education.

5.1. Theoretical contributions

This study makes several theoretical contributions. First, while most research in entrepreneurship literature has tried to understand the antecedents of entrepreneurial financing by examining the personal characteristics of the founders, few studies focus on technical and business education as well as their interplay. This study contributes to literature by integrating human capital and signaling theory and illustrates the interactive role of technical and business education as they relate to access to financial capital.

Second, this study examines fintech startups, a nascent industry where new technological developments in machine learning, cloud computing, and AI causes frequent changes in domains of activity based on these new technologies, and uncertainty tends to be higher in such industries, particularly before a dominant design emerges (Anderson and Tushman, 1990). Our results suggest that in an environment where entrepreneurs face triple liabilities, including the firm's liability of newness, the industry's incohesive structure, and the technology's inherent uncertainty (Woolley, 2014), the technological background becomes more critical to address technological uncertainty and give greater confidence to capital providers. That is, the findings of this study refine our understanding of the role of *field* of education in nascent industries.

Third, this study contributes to the literature by examining startups in four global fintech hubs. The results show no significant differences between the four global fintech hubs regarding the influence of the type of education on entrepreneurial financing. The subsample analysis shows that one notable difference is female founder CEOs' significant and positive effect on the total amount of financing in Berlin. In other cities, gender has no significant effect on the amount of financing. These results support the global nature of the fintech industry, where cultural differences do not seem to matter much regarding factors influencing access to entrepreneurial financing (See Appendix 1).

5.2. Practical implications

Practically, this study has the potential to provide guidelines to entrepreneurs. The results suggest that young people aspiring to be successful fintech entrepreneurs pursue their education in a technical field. The results also suggest that entrepreneurs with business education achieve better results when they complement it with technical education. These results inform young aspiring entrepreneurs in choosing their co-founders and giving them CEO roles.

This study also has important implications for policymakers. New ventures are considered the engine of economic growth in many countries, and fintech startups are becoming an essential part of the entrepreneurial ecosystem in many countries (Koalewski and Pisany, 2020). Therefore, to facilitate the rise of fintech startups, policymakers need to recognize the importance of technical education and invest resources in the educational system. They may also implement business programs/courses for entrepreneurs with technical education to complement their technical education with business education.

5.3. Limitations and future directions

The study's limitations and findings suggest avenues for future research. First, it is interesting to find that business education harms access to financial capital, and while few studies are lending empirical support to some of the explanations for this finding, future research is needed in terms of theory development as to why that is the case. Thus, we suggest that future research develop and test theories using primary data sources in fintech and other rapidly growing global industries.

In this study, we use human capital and signaling theories to argue for accessing financial capital. However, different types of education may influence the nature of their social networks and increase or decrease founders' connectedness to different financing sources, influencing the total amount of funding. Thus, we suggest that future studies integrate a social network perspective in examining the relationship between different types of education and entrepreneurial financing.

Moreover, the reputations of schools that founder CEOs graduate from might also influence the perception of capital providers and their decisions. Therefore, future research could explore this direction further.

Moreover, this study uses the total amount of financing as its dependent variable. However, new venture financing tends to happen in stages, and consequent financing rounds often depend on the evidence of positive emergent trends in performance (Lichtenstein and Brush, 2001). While we control for firm size to account for this to some extent, we recommend that future research examine the influence of educational background on the initial financing.

Further, while this study employs many control variables, future research should investigate the role of other variables as either controls or moderators. For example, these variables might include the extent of industry and international experience, which may have important implications for access to financial capital for startups in the fintech industry.

Finally, while individually coding 300 companies and cross-referencing that data with LinkedIn is a time-consuming process, the final sample of 185 is still relatively small. Therefore, future research could explore a larger group of companies from more countries, not only to make further country comparisons but also to make the results more generalizable to the global fintech industry.

6. Conclusion

Fintech is the intersection of the business and technology fields, and there has been no previous research on whether having a technical or a business education affects the success of fintech startups in accessing financial capital. Using human capital and signaling theories, we argued for the positive influence of business and technical education of founder CEOs on the total amount of startup financing in fintech startups. The results of this study conclude technical education has a positive effect on the total amount of financing while business education has a negative effect on it. Moreover, technical education weakens the negative relationship between technical education and the total amount of financing. Our results suggest that not only the *level* of education but also the *field* of education matters in attracting entrepreneurial financing in the fintech industry.

Appendix 1

Table A1 presents country comparisons for the mean values of the variables used in the study. As for the independent variables, one big noticeable difference across countries is the higher percentage of startups with founder CEOs having technical education in Bangalore and Beijing at 53% and 49%, respectively, while this number is 17% for Berlin and 18% for Boston.

Table A1
Country Comparisons of Variables

Cities <i>Startup</i> <i>Characteristics</i> –	Bangalore, India	Beijing, China	Berlin, Germany	Boston, United States
Total Funding (ln)	14.70	16.95	15.51	14.80
Tech Education	53%	49%	17%	18%
Buss Education	91%	72%	95%	93%
Graduate	32%	74%	73%	68%
Female	5%	11%	3%	15%
Immigrant	18%	15%	1 %	9%
Startup Exp	41%	30%	72%	66%
No of Co-founders	1.7	1.3	1.7	1.6
Firm Size (ln)	2.93	2.5	2.77	2.31
Firm Age	6.3	7.46	6.66	6.85

For the control variables, Table A1 presents that Bangalore has the lowest percentages of startups, with founder CEOs with graduate degrees at 32%, while this number is similar for the other three cities at around 70%. Moreover, the percentage of founder CEOs who are female is highest in Boston at 15%, and lowest in Berlin at 3%. The percentage of founder CEOs who are immigrants is also lowest in Berlin at 1%, while this number is highest for Bangalore at 18%. Additionally, Table A1 shows that the percentage of founder CEOs with startup experience is highest in Berlin at 72%, and lowest in Beijing at 30%. Finally, Table A1 shows that there is not a notable difference between companies across countries in terms of their number of co-founders, firm size, or firm age.

Table A2
Total Amount Funding as Function of Technical Education, Business Education,
and Their Interaction from OLS Regression, Bangalore

	Controls	Model 1	Model 2	Model 3
Tech Education		1.10 (0.68)		-0.42 (1.47)
Buss Education			-1.17 (0.82)	-2.01* (0.96)
Tech Education * Buss Education				1.55 (1.71)
Graduate	0.67 (0.94)	0.82 (0.94)	0.78 (0.96)	0.91 (0.96)
Female	-0.72 (2.29)	-0.52 (2.18)	-0.72 (2.21)	-0.50 (2.16)
Immigrant	-0.52 (0.85)	-0.76 (0.78)	-0.43 (0.86)	-0.70 (0.81)
Startup Exp	-0.39 (0.71)	-0.28 (0.70)	-0.34 (0.72)	-0.17 (0.74)
No of Co-founders	0.12 (1.01)	-0.03 (1.04)	0.24 (1.10)	0.00 (1.15)
Firm Size (ln)	0.81*** (0.27)	0.82*** (0.28)	0.81*** (0.28)	0.76** (0.31)
Firm Age	0.37 (0.35)	0.43 (0.33)	0.41 (0.34)	0.46 (0.34)
Constant	9.64*** (2.49)	8.95*** (2.53)	10.24*** (2.43)	10.70*** (2.77)
F	2.42	2.07	2.08	
R Squared	0.18	0.23	0.20	0.24
Sample Size	52	52	52	52

Note. *p<0.10; **p<0.05; ***p<0.01

Table A3

Total Amount Funding as Function of Technical Education, Business Education, and Their Interaction from OLS Regression, Beijing

	Controls	Model 1	Model 2	Model 3
Tech Education		0.87 (0.57)		-2.46 (1.82)
Buss Education			-0.53 (0.69)	-3.23 (1.65)
Tech Education * Buss Education				3.57* (1.85)
Graduate	-0.47 (0.65)	0.53 (0.63)	-0.37 (0.65)	-0.31 (0.67)
Female	-0.56 (0.94)	-0.47 (1.06)	-0.44 (1.07)	-0.17 (1.00)
Immigrant	-1.50* (0.81)	-1.65 (0.85)	-1.59* (0.84)	-1.38 (0.94)
Startup Exp	0.55 (0.61)	0.56 (0.65)	0.54 (0.63)	0.38 (0.65)
No of Co-founders	0.63 (0.74)	0.53 (0.70)	0.63 (0.72)	0.83 (0.78)
Firm Size (ln)	0.37* (0.20)	0.44* (0.22)	0.36* (0.20)	0.29 (0.27)
Firm Age	0.23 (0.20)	0.19 (0.18)	0.22 (0.18)	0.17 (0.18)
Constant	14.28*** (1.91)	14.15*** (1.76)	14.71*** (1.79)	17.26 (2.34)
F	1.93	1.54	1.68	
R Squared	0.27	0.31	0.28	0.35
Sample Size	47	47	47	47

Note. *p<0.10; **p<0.05; ***p<0.01

Table A4

Total Amount Funding as Function of Technical Education, Business Education, and Their Interaction from OLS Regression, Berlin

	Controls	Model 1	Model 2	Model 3
Tech Education		0.45 (1.14)		-0.75 (1.59)
Buss Education			-1.80 (1.10)	-2.54 (1.97)
Tech Education * Buss Education				Omitted
Graduate	-0.31 (0.72)	-0.23 (0.78)	-0.37 (0.74)	-0.51 (0.88)
Female	2.09** (0.69)	2.17** (0.74)	2.20** (0.73)	2.12** (0.72)
Immigrant	0.02 (0.02)	0.01 (0.03)	0.01 (0.02)	0.02 (0.03)
Startup Exp	0.93 (0.78)	0.93 (0.77)	1.04 (0.75)	1.08 (0.76)
No of Co-founders	-0.11 (0.42)	-0.04 (0.48)	-0.00 (0.45)	-0.08 (0.47)
Firm Size (ln)	1.04*** (0.20)	1.06*** (0.21)	1.01*** (0.21)	0.96*** (0.22)
Firm Age	-0.07 (0.23)	-0.08 (0.23)	-0.10 (0.24)	-0.11 (0.24)
Constant	12.19*** (1.59)	11.91*** (1.72)	13.98*** (1.98)	15.18*** (3.49)
F	8.49	7.33	8.78	8.07
R Squared	0.37	0.37	0.39	0.40
Sample Size	50	50	50	50

Note. *p<0.10; **p<0.05; ***p<0.01

Table A5

Total Amount Funding as Function of Technical Education, Business Education, and Their Interaction from OLS Regression, Boston

	Controls	Model 1	Model 2	Model 3
Tech Education		-0.86 (0.73)		0.57 (0.98)
Buss Education			-1.36 (1.02)	Omitted
Tech Education * Buss Education				-2.82** (1.19)
Graduate	-0.27 (0.53)	-0.54 (0.55)	-0.07 (0.56)	-0.53 (0.57)
Female	0.79 (1.28)	0.92 (1.34)	0.11 (1.08)	-0.28 (0.80)
Immigrant	-1.74 (0.88)	-1.30 (0.89)	-1.78* (0.83)	-0.69 (0.86)
Startup Exp	-0.26 (0.69)	-0.36 (0.68)	-0.36 (0.70)	-0.70 (0.68)
No of Co-founders	1.11** (0.40)	1.27** (0.39)	1.06** (0.37)	1.41** (0.37)
Firm Size (ln)	1.21*** (0.29)	1.27*** (0.39)	1.10*** (0.30)	1.15*** (0.28)
Firm Age	-0.19 (0.15)	-0.18 (0.15)	-0.18 (0.17)	-0.14 (0.17)
Constant	11.83*** (1.43)	11.71*** (1.45)	13.33*** (1.92)	11.78*** (1.41)
F	5.78	5.40	5.97	7.92
R Squared	0.53	0.54	0.55	0.60
Sample Size	36	36	36	36

Note. *p<0.10; **p<0.05; ***p<0.01

Next, we conduct subsample analysis for each country. Tables A2, A3, A4, and A5 show that these results are largely consistent with the results for a full sample. While in some cases regression coefficients turn out to be insignificant most likely due to the small sample size of subsamples, the direction of the coefficients is consistent with our main analysis. The only notable difference observed in our subsample analysis is Berlin where female founder CEOs are more likely to have access to a greater amount of financing with significant regression coefficients at $p < 0.01$ across all models.

References

- ANDERSON, P. & TUSHMAN, M.L. (1990), “Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change”, *Administrative Science Quarterly*, 35 (4), 604-663.
- ARVANITIS, S. & STUCKI, T. (2012), “What determines the innovation capability of firm founders?”, *Industrial and Corporate Change*, 21(4), 1049-1084.
- BATES, T. (1990), “Entrepreneur human capital inputs and small business longevity”, *The Review of Economics and Statistics*, 72(4), 551-559.
- BATES, T. & ROBB, A. (2016), “Impacts of owner race and geographic context on access to small-business financing”, *Economic Development Quarterly*, 30(2), 159-170.
- BAUM, J.A. & SILVERMAN, B.S. (2004), “Picking winners or building them? alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups”, *Journal of Business Venturing*, 19, 411-436.
- BECKER, G. S. (1975), *Human Capital: A Theoretical and Empirical Analysis*, with Special Reference to Education (2nd ed.). New York: National Bureau of Economic Research.
- BEHRENS, J., PATZELT, H., SCHWEIZER, L. & BURGER, R. (2012), “Specific managerial human capital, firm age, and venture capital financing of biopharmaceutical ventures: a contingency approach,” *The Journal of High Technology Management Research*, 23(2), 112-121.
- COLEMAN, S. & COHN, R. (2000), “Small firms’ use of financial leverage: evidence from the 1993 national survey of small business finances,” *Journal of Business and Entrepreneurship*, 12(3), 87-103.
- COLEMAN, S. & ROBB, A. (2009), “A comparison of new firm financing by gender: evidence from the Kauffman Firm Survey data”, *Small Business Economics*, 33, 397.
- COLLINS, J. & LOW, A. (2010), “Asian female immigrant entrepreneurs in small and medium-sized businesses in Australia”, *Entrepreneurship & Regional Development*, 22(1), 97-111.
- DELMAR, F. & SHANE, S. (2006), “Does experience matter? The effect of founding team experience on the survival and sales of newly founded ventures”, *Strategic Organization*, 4(3), 215-247.
- DUDLEY, E. (2021), “Social capital and entrepreneurial financing choice,” *Journal of Corporate Finance*, 70.
- EDDLESTON, K. A., LADGE, J. J., MITTENESS, C. & BALACHANDRA, L. (2016), “Do you see what I see? Signaling effects of gender and firm characteristics on financing entrepreneurial ventures”, *Entrepreneurship Theory & Practice*, 40(3), 489-514.
- ECKHARDT, J., SHANE, S., & DELMAR, F. (2006). “Multistage selection and the financing of new ventures” *Management Science*, 52 (2), 220-232.
- EESLEY, C., HSU, D. & ROBERTS, E.B. (2014), “The contingent effects of top management teams on venture performance: aligning founding team composition with innovation strategy and commercialization environment,” *Strategic Management Journal*, 35(12), 1798-1817.
- ENSLEY, M. D., CARLAND, J. W. & CARLAND, J. C. (2000), “Investigating the existence of the lead entrepreneur”, *Journal of Small Business Management*, 38(4), 59-77.
- FONG, D., HAN, F., LIU, L., QU, J. & SHEK, A. (2021), “Seven technologies shaping the future of fintech”, McKinsey & Company <https://www.mckinsey.com/cn/our-insights/our-insights/seven-technologies-shaping-the-future-of-fintech>

- FRID, C.J. (2015), "Acquiring financial resources to form new ventures: the impact of personal characteristics on organizational emergence", *Journal of Small Business & Entrepreneurship*, 27(3), 323-341.
- FRID, C., WYMAN, D., GARTNER, W., GARTNER, W. & HECHAVARRIA, D. (2016), "Low-wealth entrepreneurs and access to external financing", *International Journal of Entrepreneurial Behavior & Research*, 22(4), 531-555.
- GROWTHENABLER, <https://growthenabler.com>
- HAHN, D., MINOLA, T., VISMARA, S. & DE STASIO, V. (2019), "Financing innovation: challenges, opportunities, and trends", *Foundations and Trends in Entrepreneurship*, 15 (3-4), 328-367.
- HAMBRICK, D.C. & MASON, P.A. (1984), "Upper echelons: the organization as a reflection of its top managers. *Academy of Management Review*, 9(2), 193–206.
- HSU, D. H. (2007), "Experienced entrepreneurial founders, organizational capital, and venture capital funding", *Research Policy*, 36, 722-741.
- JENSEN, M.C. & ZAJAC, E.J., (2004), "Corporate elites and corporate strategy: how demographic preferences and structural position shape the scope of the firm", *Strategic Management Journal*, 25, 507–524.
- KOTHA, R., & GEORGE, G., (2012), "Friends, family, or fools: entrepreneur experience and its implications for equity distribution and resource mobilization", *Journal of Business Venturing*, 27(5), 525-543.
- KOWALEWSKI, O. & PISANY, P. (2020), "The rise of fintech: a cross-country perspective," Working Papers, IESEG School of Management.
- LEE, I. & SHIN, Y.J. (2018), "Fintech: Ecosystem, business models, investment decisions, and challenges. *Business Horizons*, 61, 35-46.
- LEONG, K. & SUNG, A. (2018), "Fintech (Financial Technology): What is it and how to use technologies to create business value in fintech way?" *International Journal of Innovation, Management, and Technology*, 9(2), 74-78.
- LICHTENSTEIN, B.M. & BRUSH, C.G. (2001), "How do" resource bundles" develop and change in new ventures? A dynamic model and longitudinal exploration", *Entrepreneurship: Theory and Practice*, 25(3), 37.
- MAHTO, R.V. & KHANIN, D. M. (2013), "Speed of venture financing for emerging technology-based entrepreneurial firms as a function of founder reputation", *Creativity and Innovation Management*, 22(1), 84-95.
- MARKET DATA FORECAST. (2022) "Fintech market: size, share, growth: 2022 - 2027", <https://www.marketdataforecast.com/market-reports/fintech-market>.
- MAYOR, T. (2021). "Fintech explained", *MIT Sloan*, Massachusetts Institute of Technology, <https://mitsloan.mit.edu/ideas-made-to-matter/fintech-explained>.
- NAVARETTI, B., CALZOLARI, G., MANSILLA-FERNANDEZ, J. M., & POZZOLO, A. F., (2018), "Fintech and banking. Friends or foes?" SSRN: <https://ssrn.com/abstract=3099337>.
- NEELEY, L. & AUKEN, H. (2009), "The relationship between owner characteristics and use of bootstrap financing methods", *Journal of Small Business & Entrepreneurship*, 22(4), 399-412.
- NIGAM, N., BENETTI, C. & JOHAN, S., (2020), "Digital start-up access to venture capital financing: what signals quality?", *Emerging Markets Review*, 45(4), 1-38.
- NOSELLA, A., PETRONI, G. & VERBANO, C. (2006), "Innovation development in biopharmaceutical start-up firms: An Italian case study", *Journal of Engineering & Technology Management*, 23, 202–220.

- PACKALEN, K. A. (2007), "Complementing capital: the role of status, demographic features, and social capital in founding teams' abilities to obtain resources", *Entrepreneurship Theory and Practice*, 31(6), 873–891.
- PATZELT, H. (2010), "CEO human capital, top management teams, and the acquisition of venture capital in new technology ventures: An empirical analysis", *Journal of Engineering and Technology Management*, 27(3-4), 131-47.
- SCOTT, A. P. (2020). "Fintech: Overview of Financial Regulators and Recent Policy Approaches", *Congressional Research Service ISSN: R46333*. <https://crsreports.congress.gov>
- SEC, U.S. GOVERNMENT. (2018), "Strategic Hub for Innovation and Financial Technology (FinHub)", *United States Securities and Exchange Commission*, United States, <https://www.sec.gov/finhub> . F
- SHANE, S. & CABLE, D. (2002), "Network ties, reputation, and the financing of new ventures," *Management Science*, 48(3), 313-452.
- SPENCE, M. (1973), "Job Market Signaling", *Quarterly Journal of Economics*. 87 (3), 355–374.
- STULZ, R. (2019), "Fintech, big tech, and the future of banks," Working Paper Series.
- TALAIJA, M., PISONI, A. & ONETTI, A. (2016), "Factors Influencing the Fund-Raising Process for Innovative New Ventures: An Empirical Study", *Journal of Small Business and Enterprise Development*, 23 (2), 363–378.
- WANG, G., HOLMES, R.M., OH I.S. & ZHU, W. (2016), "Do CEOs matter to firm strategic actions and firm performance? A meta-analytic investigation based on upper echelons theory", *Personnel Psychology*, 69(4), 775–862.
- WASSERMAN, N. (2003), "Founder-CEO Succession Entrepreneurial Success", *Organization Science*, 14(2),149–172.
- WENNBERG, K., DELMAR, F., MCKELVIE, A. (2016). "Variable Risk Preferences in New Firm Growth and Survival", *Journal of Business Venturing*, 31(4), 408-427.
- WOOLLEY, J.L. (2014). "The Creation and Configuration of Infrastructure for Entrepreneurship in Emerging Domains of Activity", *Entrepreneurship Theory and Practice*, 38(4), 721-747.

Özet

Fintek endüstrisinde kurucu CEO'nun teknik ve işletme eğitiminin girişim sermayesi tutarına etkisi

Bu makale fintek (*fintech*) endüstrisinde kurucu CEO'nun teknik ve işletme eğitimi ile girişim sermayesi tutarı arasındaki ilişkiyi anlamayı amaçlamaktadır. Sinyal Teorisi ve Beşeri Sermaye Teorilerini kullanan bu çalışma, Bangalore, Pekin, Berlin ve Boston'da kurulmuş 185 yeni fintek girişimini incelemiştir. Analiz sonuçları kurucu CEO'nun teknik eğitimi ile girişim sermayesi tutarı arasında olumlu bir ilişki gösterirken, işletme eğitimi ile girişim sermayesi tutarı arasında olumsuz bir ilişki göstermektedir. Buna ek olarak, kurucu CEO'nun teknik eğitiminin, kurucu CEO'nun işletme eğitimi ve girişim sermayesi tutarı arasındaki olumsuz ilişkiyi ılımlaştırdığı gözlenmiştir. Bu çalışma fintek girişimlerinde kurucu CEO'nun öğrenim geçmişinin girişim sermayesine ulaşmada önemli bir rol oynadığını vurgulayarak girişimcilik literatürüne katkıda bulunmaktadır.

Anahtar kelimeler: Girişim finansmanı, girişimci CEO, teknik eğitim, işletme eğitimi.