THE GENDER FUNDING GAP WITHIN THE ENTREPRENUERIAL ECOSYSTEM IN THE UNITED STATES: DOES A CORRELATION EXIST AMONG GENDER, INDUSTRY, AND FUNDING?

Abigail A. Staker

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Approved by _____

(Maryann Feldman)

ABSTRACT

Abigail A. Staker
The Gender Funding Gap Within the Entrepreneurial Ecosystem in the United States: Does a
Correlation Exist Among Gender, Industry, and Funding?
(Under the Direction of Maryann Feldman)

Recent studies highlight females' positive impact within the business world and entrepreneurial ecosystem. Within the entrepreneurial ecosystem, however, females lag behind their male counterparts in funding accumulation. Previous research identified three primary causes to this discrepancy: (1) lack of females in the financial capital industry, (2) implicit bias, and (3) female- versus male-owned company characteristics and owner attitudes. What isn't addressed, however, is an analysis of the industries pursued by females versus males. My study identifies and attempts to understand underlying causes in gender funding differences based on industry. I use a mixed-method approach of quantitative and qualitative analysis. My findings suggest (1) industry does not exhibit a significant role in gender funding differences, (2) implicit bias continues to plague females, and (3) females are underrepresented across all industry lines. Females receive fewer investment dollars than their male counterparts, appearing to directly correlate to the limited number of females entering the entrepreneurial ecosystem.

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INTRODUCTION

Within the workplace and business world, females continue to make advancements both as leaders in established companies and founders of new ventures. As of 2019, females accounted for 6.6% of Fortune 500 CEOs in the United States, increasing from 4.8% in 2018 (Connley, 2019). In 2019, venture capital[1] (VC) investments in all-female founded startups hit a record-setting $3.3 billion, representing 2.8% of funds invested across the entire United States startup ecosystem (Clark, 2019). While popular press considers these statistics encouraging for females within the business world, are they true triumphs? Currently, among Fortune 500 companies, more CEOs named John exist than all female CEOs combined (Miller, Quealy, & Sanger-Katz, 2018). All-male founded startups received 88% of venture capital financing in 2019 (Clark, 2019). These percentages speak volumes to the distinct differences between males and females within the business world.

Further, the gender inequality remains perplexing as recent studies highlight females' positive impact within the business world and entrepreneurial ecosystem. Research conducted by Boston Consulting Group and MassChallenge[2] found females impacted revenue generated by startups more positively than males. The study indicated female-led ventures generated 10% more revenue over a five-year period compared to their male counterparts. However, while females delivered higher revenues, a gender gap persisted in new-business funding (Abouzahr, Taplett, Krentz, & Harthorne, 2018).

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[1] Venture capital is a form of private equity and a type of financing that investors provide to startup companies and small businesses that are believed to have long-term growth potential. (https://www.investopedia.com/terms/v/venturecapital.asp)
[2] MassChallenge strengthens the global innovation ecosystem by accelerating high potential startups across all industries, from anywhere in the world for zero-equity taken. (https://masschallenge.org/)

So, the question becomes, why do these distinct gender differences exist? At first glance, gender bias appears at play. However, when female entrepreneurs like Elizabeth Holmes succeed in obtaining significant funding for their business ventures, gender bias appears irrelevant. Thus, new questions and ideas regarding the entrepreneurial gender funding gap surface. Elizabeth Holmes, the founder of Theranos, provides the best, although most sensationalized, example to date of a female's ability to raise investment capital. Theranos, a blood-testing startup touting proprietary technology, reached unicorn status with a $9 billion valuation. Ultimately, the technology and Theranos proved worthless. However, before the exposure of Theranos' technology as fraudulent, Elizabeth Holmes raised $700 million from outside funding sources (Hartmans & Leskin, 2020). Obviously, her gender did not deter investors. Her ability to achieve such noteworthy capital accumulation, with an unproven technology, brings into question current research explanations for the funding gap, especially in regard to gender bias. Does funding really hinge on the gender of the founder or does funding occur as a function of industry?

While research to date examines many reasons for the existence of a gender funding gap, the anomaly witnessed with Elizabeth Holmes' unprecedented capital accumulation inspired me to assess the gender funding gap from a different approach. Specifically, my research will examine the following question:

Does a discrepancy between entrepreneur funding and gender exist within different industry sectors or does the discrepancy in funding exist as a function of the type of businesses pursued by females versus males?

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This research thesis intends to provide additional clarity as to why the gender funding gap persists in the entrepreneurial ecosystem. The literature review examines the formal research done to date on the gender funding gap, including (1) the lack of female presence in the financial capital industry, (2) gender bias, and (3) female- versus male-owned company characteristics and owner attributes. The research methodology section defines my hypothesis, explains my quantitative and qualitative data collection, and highlights any limitations to my research approach. The research analysis and discussion sections provide research findings and discussions of possible reasons for the gender funding gap based on my results. Lastly, the thesis provides a conclusion to my study and suggests additional future research which could improve or build upon this topic.

LITERATURE REVIEW

The initial step to my literature review involved reviewing current research to develop the overarching reasons for the entrepreneurial gender funding gap. From this initial analysis, I developed generalized categories focused on the possible causes for the gender funding gap. The primary explanations researched to date fall into three main groups: (1) lack of female presence in the financial capital industry, (2) implicit bias in entrepreneurial financing, and (3) female- versus male-owned company characteristics and owner attitudes. Within each category, I examined research studies which supported these three alternative conclusions. Based upon this review, I determined further research needs to be conducted on the direct correlations between gender, industry, and funding amount, specifically with a focus on gender and industry space.

The Gender Funding Gap in the Entrepreneurial Space

A growing body of literature exists that examines discrepancies in funding between females and males within the entrepreneurial space. Coleman and Robb (2009) used data from the Kauffman Firm Survey[3] to establish an inequality in gender funding. Their results indicated females start their ventures with significantly lower financial funding than males. Males incurred twice as much business debt to establish their ventures as compared to females (p. 402). Further, Coleman and Robb (2009) findings suggested females raise significantly lower amounts of incremental debt and equity in the first years of startup businesses. These results held true no matter the type of firm or owner characteristics (p. 403).

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[3] The Kauffman Firm Survey (KFS) is a panel study of 4,928 businesses founded in 2004 and tracked over their early years of operation, through 2011. The survey focuses on the nature of new business formation activity; characteristics of the strategy, offerings, and employment patterns of new businesses; the nature of the financial and organizational arrangements of these businesses; and the characteristics of their founders. (https://www.kauffman.org/what-we-do/entrepreneurship/research/kauffman-firm-survey)

A more recent study by Poczter and Shapsis (2018) builds on the research of Coleman and Robb (2009). Using data collected during a televised entrepreneurial pitch competition, these researchers analyzed funding obtained by entrepreneurs from angel investors. Consistent with findings from Coleman and Robb (2009), female teams received less capital and provided more of their own equity relative to their male counterparts (p. 32). Further, the study revealed females received lower valuations, resulting in smaller investments than male-owned ventures. Interestingly enough, the study revealed yield rates between males and females did not vary (p. 33).

While a gender funding gap clearly persists, the primary reason for the funding discrepancy between females and males varies by research. Research to date primarily studies the following explanations: (1) lack of female presence in the financial capital industry, (2) implicit bias in entrepreneurial financing, and (3) female- versus male-owned company characteristics and owner attitudes.

Lack of Female Presence in the Financial Capital Industry

One explanation for the gender funding gap relates to the underrepresentation of females in the financial capital industry. The authors of the Diana Project[4] found between 1953 and 1998, less than 5% of total venture capital funding went to female-owned firms (Gatewood, Brush, Carter, Greene, & Hart, 2009). They concluded this low level of funding correlated to the relatively small number of females employed in the venture capital industry (p. 131). A later study by Blum (2015) researched why gender disparities exist among directors and partners at venture capital firms. As of 2015, females comprised approximately 10% of independent venture

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[4] A multi-university research program aimed at identifying factors that support and enable high growth in female-led ventures. (Gatewood, Brush, Carter, Greene, & Hart, 2009).

capitalists (p. 33). The 2013 Bureau of Labor Statistics[5] highlighted from 2001 to 2011, 2.6% of

female workers left the financial industry while males increased by 9.6% during the same

timeframe. Further, the number of females aged 20 to 35 working in finance dropped by 16.5%

while males increased by 7.3% (p. 37). According to Blum (2015), this disparity resulted in part

from limited mentoring opportunities, few female role models, lack of executive management

experience, and female exclusion from primary niche networks (p. 38). Such disparity negatively

affects entrepreneurism and economic activity for females in their quest for capital in a male-

dominated industry (p. 38). With male dominance in the venture capital space, females lack the

networking relationships to connect them with venture capitalists, thereby limiting their

probability of obtaining venture financing.

Implicit Bias in Entrepreneurial Financing

In addition to the lack of female representation in the financial capital industry, gender

bias also affects investors' financing decisions. Muntean and Özkazanç-Pan (2015) studied the

gender gap in entrepreneurship from a lens of a feminist framework. Liberal feminism assumes

equality for males and females; however, an unspoken bias continues to view males as the norm

in the entrepreneurial space (p. 28). Edelman, Róisín, Tatiana, and Brush (2018) explored the

role of gender bias in the financial decision-making process. They examined the disparity in

funding between male- and female-owned companies using social identity theory[6] (p. 135). The

researchers argued in male-dominated angel investment groups, gender stereotypes biased angel

investors' interpretation of signals sent by entrepreneurs. These signals included male dominance

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[5] The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor is the principal federal agency responsible for measuring labor market activity, working conditions, and price changes in the economy. Its mission is to collect, analyze, and disseminate essential economic information to support public and private decision making. (https://www.bls.gov/bls/infohome.htm)

[6] A The study of the interplay between personal and social identities. Social identity theory aims to specify and predict the circumstances under which individuals think of themselves as individuals or as group members. (https://www.britannica.com/topic/social-identity-theory)

in business and the perceived difference between entrepreneurship and femininity (p. 141). Their findings suggested angel investors viewed female-led entrepreneurial ventures as having less legitimacy, even though no differences in actual legitimacy existed across businesses (p. 136). The researchers contended within angel groups composed of predominantly males, the expectation of entrepreneurs as masculine engendered biases against females (p. 140). This attitude resulted in ventures led by males being more favorably evaluated, thus privileging male entrepreneurs for funding. This study correlates to the results found by Fiske, Cuddy, Glick, and Xu (2002), which indicated the United States cultural beliefs system viewed males as being more competent than females in business transactions and personal interactions (p. 899).

A different study conducted by Kanze, Huang, Conley, and Higgins (2018) pairs well with this observation. Kanze et al. (2018) proposed the funding gap originates with a gender bias, as evidenced by the questions posed by investors to entrepreneurs during funding rounds. They used data collected from question-and-answer sessions at the TechCrunch Disrupt New York City[7] in 2010 and 2016 (p. 587). In analyzing the question-and-answer sessions between entrepreneurs and venture capitalists, the researchers found the gender funding gap not likely to narrow with more females entering into venture capital. Both female and male venture capitalists demonstrated the same biases, especially in regard to the type of questions asked to each gender during funding sessions (p. 598). The questions posed to females highlighted prevention,[8]

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[7] TechCrunch Disrupt is the world's leading authority in debuting revolutionary startups, introducing game-changing technologies and discussing what's top of mind for the tech industry's key innovators. Disrupt gathers the best and brightest entrepreneurs, investors, hackers, and tech fans for on-stage interviews, the Startup Battlefield competition, a 24-hour Hackathon, Startup Alley, Hardware Alley, and After Parties. (https://www.techstars.com/event/techcrunch-disrupt-new-york-city/)

[8] Prevention focused questions emphasize maintaining non-losses and not losing capital (e.g. What does customer retention look like? Are you operating at breakeven?) (Kanze, Huang, Conley, & Higgins, 2018)

whereas the questions asked to males focused on promotion[9] (p. 588). A review of these sessions revealed discrepancies in questions asked to different genders, highlighting the effect of bias on financing decisions. Promotion focused questions directly correlated with greater funding amounts (p. 599).

Brush, Greene, Balachandra, and Davis (2018) substantiated the findings of Kanze et al. (2018) by examining recent developments in capital accumulation within the venture capital space. In an effort to update the initial Diana Project[2] study, the researchers analyzed funding in the venture capital space by industry, stage of investment, physical location, and performance outcomes (p. 118). Brush et al. (2018) concluded females made progress in obtaining funding; however, "there is still a significant funding gap in that all-male teams are four times more likely to receive funding from venture capital investors than companies with even one female on the team" (p. 132). Further, the researchers suggested this result may occur due to gender homophily theory.[10] Based on this theory, Brush et al. (2018) concluded in the venture capital space, with trust being the central component in financing relationships, the male-dominated venture capital industry prefers investing in relationships with male CEOs or all-male teams as compared to female CEOs and teams: a direct reflection of gender bias in funding decisions (p. 131).

Female- Versus Male-Owned Company Characteristics and Owner Attitudes

Females also appear to exhibit different owner attitudes and business characteristics than their male counterparts, which in turn affects financing decisions. The majority of research to date focuses on the gender funding gap in the early-stage obtainment of capital. Becker-Blease

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[9] Promotion focused questions emphasize attaining growth-oriented gains that are facilitated by capital (e.g. How do you intend to acquire customers? What does your revenue forecast look like?) (Kanze, Huang, Conley, & Higgins, 2018)

[10] Gender homophily theory suggests that people have a tendency to associate with people who are demographically similar as this leads to positive perceptions and trust (Brush, Greene, Balachandra, & Davis, 2018)

and Sohl (2007) observed females sought angel financing at a rate much lower than their male counterparts, even though the females' chance in obtaining financing from angel investors equaled males (p. 517). The researchers surveyed angel investor portals and found 9% of proposals originated from female entrepreneurs, the remaining 91% male. These findings indicated female entrepreneurs lack confidence when seeking external funding (p. 517). Cole and Mehran (2009) analyzed data from the 2003 Survey of Business Finances (SSBF)[11] and discerned the same finding as Becker-Blease and Sohl (2007). While the probability of a female and male receiving a loan equated, females applied for significantly lower amounts of debt compared to males (Cole and Mehran, 2009).

This trend continued into later stage funding. In 2005 and 2006, females raised roughly half the amount of incremental financing than their male counterparts (Coleman and Robb, 2009). Further, Gatewood et al. (2009) examined male and female entrepreneurs' networks and how these networks correlated to financing. Consistent with Coleman and Robb (2009), they determined females received early-stage funding. However, either for lack of aggressively growing their business or because they dropped out of their business early, later rounds of funding for female entrepreneurs consistently underperformed in comparison to males (p. 134). The discrepancy in external funding requests directly correlates to the gender funding gap.

So, why do females consistently underperform males in requesting debt when results in obtaining financing prove equal? Research confirmed females shy away from external sources of financing to avoid giving up control and taking on greater risk (Constantinidis, Cornet, & Asandei, 2006). After conducting interviews with entrepreneurs, Constantinidis et at. (2006)

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[11] The Survey of Small Business Finances (SSBF) collects information on small businesses (fewer than 500 employees) in the United States. Owner characteristics, firm size, use of financial services, and the income and balance sheets of the firm are just some examples of the types of information collected. (https://www.federalreserve.gov/pubs/oss/oss3/nssbftoc.htm)

also concluded females choose to pursue businesses in industries that do not rely heavily on external funding sources to maintain business viability (p. 135). Further, Brush, Edelman, Manolova, and Welter (2018) conducted research on the importance of gender in ecosystems at the institutional, organizational, and individual levels. This study found females tend to align themselves with female only networks, thereby, restricting access to economic and social capital and limiting their credibility as a field player in the entrepreneurial space (p. 402).

In addition to requesting smaller investment amounts at initial and later stage funding rounds, females also prefer to use different forms of capital accumulation than males. In analyzing the Kauffman Firm Survey[1], Coleman and Robb (2009) observed females preferred and relied more heavily on obtaining capital through internal rather than external sources to finance their ventures (p. 400). Personal debt for female entrepreneurs included personal credit card balances, personal bank loans, business credit card balances in the owner's name, and family loans. Only a small percentage of females used outside equity investors or venture capital financing, 1.5% and 0.2%, respectively (p. 401). Sullivan and Meek (2012) also noted female engagement in financing networking focused on family and friends (p. 428). A later study by Kanze et al. (2018) observed the continued trend of females using personal financing rather than external sources to fund their ventures. The researchers corelated the attraction to personal rather than external financing with the "lifestyle" and "female friendly" industries pursed by females, driven by a perceived need to balance work and life (p. 590).

Coleman and Robb (2009) analyze the growth in female-owned firms in the early 2000s which provided much insight to female attitudes toward business. According to data from the

United States Census Bureau[12] from 1997 to 2002, female-owned firms increased by 19.8%

compared to the growth rate of 10.3% for United States firms overall. However, during this same

timeframe, the revenues, business growth, and payroll of these female-owned firms grew at a

lagging pace compared to overall United States firms. Revenues, business growth, and payroll

grew at 15%, 1%, and 17%, respectively, compared to overall firm growth of 22%, 7.2%, and

30% (p. 398).

These United States Census Bureau[10] statistics indicated while the number of female-

owned firms grew faster than those owned by males, their relative importance in the marketplace

did not follow the same trend (p. 397). Between 2007 and 2016, the number of United States

female-owned companies continued to trend upward, increasing by 45%: a rate five times faster

than the national average for all businesses (Edelman et al., 2018). However, again, despite the

continued growth of female-owned ventures, the researchers found female entrepreneurs

continued to face challenges in obtaining financial capital and growing at the same rate as their

male counterparts (p. 135).

A key reason male- and female-owned businesses grow at differing rates and receive

different funding amounts links to the different motivations and anticipated rewards of business

ownership, a trend which remains constant over the past decade. Firm growth and profits

motivated males while females sought personal fulfillment, flexibility, and a sense of control

(Morris, Miyasaki, Watters, & Coombes, 2006). Further, the desire for control and risk aversion

led females to keep their businesses small and manageable (p. 236). A more recent evaluation

performed by Sullivan and Meek (2012), related to females and entrepreneurship, also concluded

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[12] The Census Bureau is the federal government's largest statistical agency. They are dedicated to providing current facts and figures about America's people, places, and economy. Federal law protects the confidentiality of all the information the Census Bureau collects. (https://www.census.gov/about/what/census-at-a-glance.html)

differences in motivation, opportunity recognition, acquisition of resources, and entrepreneurial

performance/ business success existed between females and males (p. 453). The authors noted

females pursue different industry lines compared to males (p. 447). Swartz and Amatucci (2018)

also found female confidence to be a cause. The authors concluded females give up greater

ownership percentage when negotiating funding than their male counterparts (p. 13). Further,

Ladge, Eddelston and Sugiyama (2019) focused on female entrepreneurs' imposter fears[13] and its

effect on female entrepreneurial identity. The researchers concluded these fears directly correlate

to the success and growth of female ventures, resulting in a gender performance gap which

directly relates to the gender funding gap (p. 619). Consistent with Ladge et al. (2019), Simmons,

Wiklund, Levie, Bradley and Sunny (2019) further assessed the cultural attributes of

entrepreneurship ecosystems by evaluating how public stigma and personal fear of business

failure affects the likelihood of reentry into the entrepreneurial space by males and females. The

authors found public stigma of business failure deterred females from trying again to a larger

degree than males. Conversely, males feared personal failure more than females (p. 10).

Differing industry focuses by males and females further explains the gender funding

discrepancy. Coleman and Robb (2009) highlighted female-owned firms tend to concentrate in

the service and retail sectors: industries which are highly competitive and lack opportunities for

growth and profitability. As of 2006, 69% of female-owned firms resided in the service sector

and 14.4% in the retail industry space (p. 398). Only a small percentage of female-owned firms

existed in rapid growth or high technology lines of business (Morris et al., 2006). Further,

Manolova, Brush, Edelman, and Shaver (2012) researched the different expectations and growth

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[13] Imposter Syndrome is the overwhelming feeling that you don't deserve your success. It convinces you that you're not as intelligent, creative, or talented as you may seem. It is the suspicion that your achievements are down to luck, good timing or just being in the "right place at the right time." And it is accompanied by the fear that, one day, you'll be exposed as a fraud. (https://www.mindtools.com/pages/article/overcoming-impostor-syndrome.htm)

intentions of United States female and male entrepreneurs. These findings indicated females start more businesses to achieve a work-family balance, which usually relates to slower growth industries (p. 8). According to the study, male entrepreneurs' motivations focused on financial success much more than female objectives in entrepreneurship (p. 18). Manolova et al. (2012) research correlates with a study by Neumeyer, Santos, Caetano, and Kalbfleisch (2018) who investigated the effects of business typology, race, ethnicity, and past business experience on the social capital distribution of female entrepreneurs in entrepreneurial ecosystems (p. 475). Through studying two social network data from municipal ecosystems in Florida, USA (Gainesville and Jacksonville), the researchers determined network connectivity and the distribution of social capital significantly differ for male and female entrepreneurs (p. 476). This difference proved contingent on the business type. Male entrepreneurs highlighted higher social capital in aggressive- and managed-growth business networks, while female entrepreneurs exhibited higher social capital scores in lifestyle and survival business networks (p. 482).

Guzman and Kacperczyk (2019) examined the gender gap in entrepreneurship funding with a geographical focus of businesses located in California and Massachusetts between 1995 and 2011. The researchers used administrative business registration records to document six different startup attributes at founding (p. 1670). Guzman and Kacperczyk (2019) then used predictive analytics to summarize growth orientation of the different businesses. The results highlighted female-led ventures lagged by sixty-three percentage points behind male-led ventures in obtaining external funding (p. 1772). However, they attributed the most significant factor to the gender funding discrepancy related to initial startup orientation. The researchers found females start ventures with lower growth potential which does not appeal to investors. Specifically, females do not start companies with "differentiated technology" – an innovative technology product not currently available in the marketplace (p. 1677). This research found

females start firms associated with local business activities. However, when female- and male-led ventures focus on high growth, females and males achieved equal exit outcomes through IPOs or high-value acquisitions (p. 1671).

Conclusion

A review of the literature documents a funding gap between male and female entrepreneurs and provides much insight into why such gaps exist. Reasons for the funding gap include the lack of female angel investors and venture capitalists, implicit bias, and business characteristics and owner attitudes exhibited by female and male entrepreneurs. While some of the research touched upon the different industries male and female entrepreneurs pursue, a deeper dive with more current data could provide further explanation and narrow the causation of the gender funding discrepancy. Based upon this review, I determined further research needs to be conducted on the direct correlations between gender, industry, and funding amount, specifically with a focus on gender and industry space. Therefore, my research will focus on the following question: Does a discrepancy between entrepreneur funding and gender exist within different industry sectors or does the discrepancy in funding exist as a function of the type of businesses pursued by females versus males?

METHODOLOGY

Hypothesis

In response to my research question and review of studies related to the gender funding gap, I formulated the following hypothesis which I intend to prove or disprove through my research:

The gender funding gap more closely aligns with the type of industry and business growth pursued by females versus males with females pursing lower growth business industries. However, the continued lack of female investors (i.e. venture capitalists and angel investors) hinders female entrepreneurs' abilities to obtain outside funding, consistent with gender bias.

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In this section of the thesis, I explain the methodology used to address my research question and prove or disprove my hypothesis. I proposed a mixed-method study, including both quantitative and qualitative data collection. The goal of this approach to my research focused on (1) analyzing and determining the funding provided to startup businesses within certain industries and (2) determining any correlation between the amount of funding and the gender of the founder within these industries.

I conducted my quantitative analysis as follows: I collected a data sample of startups based on specific company characteristics using the financial website Crunchbase[14]. From this database sample, I performed data analytics to develop and analyze patterns within the entrepreneurial ecosystem by gender and industry. I also used the sample database to run a

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[14] Crunchbase is the leading platform for professionals to discover innovative companies, connect with the people behind them, and pursue new opportunities. Over 55 million professionals—including entrepreneurs, investors, market researchers, and salespeople—trust Crunchbase to inform their business decisions. And companies all over the world rely on Crunchbase to power their applications, making over a billion calls to Crunchbase's API each year. (https://about.crunchbase.com/about-us/)

regression analysis based on pre-determined independent and dependent variables. The regression analysis intended to determine if a correlation exists among gender of founder, industry, and funding amount.

My qualitative data collection consisted of one-on-one interviews with individuals in the entrepreneurial ecosystem, including angel investors, venture capitalists, and startup founders based upon an established set of questions.

Quantitative Analysis

Sample Selection and Criteria

To select the sample of startup companies, I used Crunchbase, an online database consisting of information on innovative ventures. While other databases exist, Crunchbase proved to be the most user-friendly with the capability to download datasets into Excel. Further, as an undergraduate Kenan-Flagler business student, Crunchbase was the only accessible financial database for use in my research study. Crunchbase data includes information about funding amounts, founding members, year founded, and specific company characteristics, including industry identification and location. Crunchbase sources its data in four ways: venture capitalists, machine learning, an in-house data team, and the Crunchbase community. Any individual can submit information to the Crunchbase database; however, a moderator reviews these submissions before being accepted for publication (About Crunchbase, n.d.). In order to validate Crunchbase as a reliable database, I cross-checked a random sample of the data with Pitchbook, a well-known, highly-respected private capital markets database. The datasets selected from Crunchbase matched Pitchbook, with a few exceptions. Overall, the Crunchbase data proved reliable.

In order to appropriately collect the dataset, I established certain criteria. These criteria related to founding dates and geographic landscape.

Founding Dates: The dataset consisted of companies founded between January 1, 2010 and December 31, 2019. This time frame provides history and current relevance for data analysis.

Geographic Landscape: The geographic landscape focused on startups headquartered in the United States, exclusively. I selected this landscape in order to better understand the entrepreneurial ecosystem in the United States.

<u>Data Collection</u>

Based on the above variables, the full dataset included the information shown in Table 1.1 for each company:

Table 1. 1: Data Collection Attributes

Company Characteristics	Funding Characteristics	Founders Characteristics
Organization Name	Number of Funding Rounds	Founders' Names
Company Group (Industry[15])	Total Funding Amount	Number of Founders
Date Founded		
Headquarters Location		

I selected these attributes because they most closely aligned with my research focus.

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[15] Crunchbase categorizes businesses based on groups, which equate to industry. Within the dataset, forty-one groups/industries exist.

In reviewing the initial dataset, I eliminated all companies missing information related to founders' names and total funding amount: two variables necessary to complete data analysis.

The next aspect of the dataset breakdown involved identifying the gender of the founders. Breaking down the dataset by gender proved crucial to identification and analysis of gender funding trends. To classify gender, I employed a version of Guzman and Kacperczyk's (2019) research method. Consistent with their research, I used the Social Security Administration[16] (SSA) list of names registered from 1880 to 2019. Through the use of Python,[17] an algorithm correlated each name within the SSA list to the number of times that name was recorded as a specific gender (See Appendix A). If a name from the SSA list associated with one gender more than 80%, the name identified with that gender. For a name falling below 80% correlation with one gender but above 20% with the other gender, the name identified as 'unknown' gender.

After identifying the gender of the names on the SSA list, a new Python algorithm correlated the gender identification from the SSA list with the first name of the founders within my dataset (See Appendix A). With gender identified, I then classified each company as all-male founded, all-female founded, or mixed gender founded. Following this procedure allowed for identification of 96% of companies within the dataset as all-male, all-female, or mixed gender founded ventures. I eliminated companies for my dataset with no gender identification. Funding associated with the excluded group accounted for less than 1% of total funding for the dataset.

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[16] The Social Security Administration (SSA) is a U.S. government agency that administers social programs covering disability, retirement, and survivors' benefits. (https://www.investopedia.com/terms/s/ssa.asp)

[17] Python is a high-level programming language designed to be easy to read and simple to implement. Python is considered a scripted language and is often used for creating Web applications and dynamic Web content. (https://techterms.com/definition/python)

Data Analytics

With a complete and consistent sample database, I performed quantitative analysis, including a breakdown of data by founding group, industry, number of ventures started by year, and funding amounts, to understand the dynamics occurring within each industry sector. With this analysis, I also compared the founding groups to each other based upon number of all-male, all-female, and mixed gender founded ventures with a focus on capital accumulation across the top industries for each gender group. By focusing my dataset on these characteristics, I analyzed 87% of total investment funding from 2010 to 2019.

Regression

To further understand and thoroughly analyze the relationship between funding, industry, and gender in the entrepreneurial space, I performed a multi-variable regression analysis using my sample dataset. The dependent variable in the regression equaled the total funding received by a startup. Gender of founder and industry group comprised the independent variables. The regression model examined the relationship between gender of founder, industry, and funding amount to determine relational patterns that potentially predict entrepreneurial funding decisions.

Qualitative Analysis

In addition to the quantitative analysis, I conducted one-on-one semi-structured interviews of investors, including venture capitalists and angel investors, as well as entrepreneurs. To identify research participants, I used chain referral sampling[18]. Further, I attended the 2020 Frontiers of Entrepreneurship Conference[19] in Palm Beach, Florida. During the

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[18] Chain referral sampling is a non-probability sampling technique that is used by researchers to identify potential subjects in studies where subjects are hard to locate. (https://explorable.com/snowball-sampling)

[19] The Frontiers of Entrepreneurship Conference is focused on exploring emerging issues to advance a new era of entrepreneurship: thought leaders from academics, industry and government debate the most challenging current issues in the field of entrepreneurship and set the agenda for future research and policy. (http://www.cvent.com/events/2020-frontiers-of-entrepreneurship-conference/event-summary-2f6a24f6867f4ecd94b651fbea323224.aspx)

conference, I connected with leaders throughout the country in the venture capital, angel

investing, and entrepreneurial space and conducted interviews. Lastly, I interviewed members of

an investment team at a local venture capital firm. Through these various networking

opportunities, I built a solid, well-rounded population of research participants to sample.

Table 1.2 lists the questions that I asked investors and startup founders:

Table 1. 2: Investors / Founders Questionnaire

Investors	Founders
(1) What is the gender of the founder for the majority of companies in which you invest?	(1) Do you think your gender players a roll in the way investors see you?
(2) What industries would you consider to be the most likely to receive large sums of money?	(2) Have you ever felt like your gender has been a disadvantage for you when trying to receive funding for your venture?
(3) Do you think gender of founder has ever affected your willingness to invest in a company?	(3) Within your industry, do you see a vast majority of either female or male founders?
(4) What role does gender play in the entrepreneurial ecosystem and how has it changed over the past 10 years?	(4) What is your general perception of male versus female founders?
(5) What are the key attributes you look for in individuals / companies to decide whether or not you will invest and how much to invest?	(5) What role does gender play in the entrepreneurial ecosystem and how has it changed over the past 10 years?
(6) Do you think females and males pursue different industries? If yes, what industries is each gender pursuing more heavily?	(6) Do you think females and males pursue different industries? If yes, what industries is each gender pursuing more heavily?

These questions were specifically developed based upon the research topic and approved

by IRB[20] (See Appendix B).

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[20] Federal regulations require that research projects involving human subjects be reviewed by an IRB. The IRB must approve or determine the project to be exempt prior to the start of any research activities. The IRB cannot provide approval or determinations for research that has already been concluded.
(https://www.bu.edu/researchsupport/compliance/human-subjects/determining-if-irb-approval-is-needed/)

Limitations

The process of collecting and analyzing data for my question presented limitations to my research as follows:

Quantitative Collection and Analysis: Crunchbase Database

Through using Crunchbase to create my dataset, a number of restrictions existed. As a relatively new database, created in 2007, Crunchbase's dataset for the early years of my research, which starts with 2010, may not be fully inclusive of businesses started during the early time period of my research. In addition, the data available for 2019 does not appear to be fully inclusive of all activity occurring in 2019. The numbers demonstrate funding for 2019 equating to less than 1% of total funding within my sample dataset. Given current published information, the 2019 funding amount in my dataset does not appear reasonable.

Further, Crunchbase provided limitations to my data based on available information for each company. The composition and data of companies on Crunchbase evolve from one of four data sources. While considered reliable by academia, these sources may be limited in scope. For example, a number of startup companies located in the geographical regions and industries of my research may not be on Crunchbase.

Additionally, Crunchbase does not allow for mass data accumulation. Therefore, I performed extensive data collection through hand-pulling the information from Crunchbase which approximated over one hundred Excel workbooks. These Excel workbooks then needed to be merged into one Excel worksheet to create a usable database. This combination created an output of approximately 99,000 companies. I then analyzed the 99,000 companies, realizing limitations associated with the data available in Crunchbase. For many companies, founders' names or total funding amount could not be discerned. Therefore, I eliminated these companies from my dataset, reducing the number of companies to 24,000. I also disregarded companies for

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which gender could not be identified for at least one founder, eliminating an additional 1,000 companies. I attempted to individually identify gender for common bisexual names, such as Taylor; however, the presentation of the data did not allow for this analysis. Through removing these companies, I chose to narrow the scope of my research, resulting in a sample dataset of approximately 23,000 companies. This narrowed scope may not allow for complete, unbiased analysis.

Qualitative Collection and Analysis: Interview Subjects

With regard to qualitative data collection, limitations exist by the nature of the interview process which cannot ensure unbiased answers. The composition of my interview subjects originated from successful entrepreneurial and investor ventures. Therefore, the predisposition of the interviewees focused on high-growth startup ventures rather than lower-growth companies founded by entrepreneurs seeking a work-life balance. By not having respondents that understand this aspect of the entrepreneurial ecosystem, the overall analysis as to why the gender funding gap exists could be skewed. Since Crunchbase appears to focus on companies with high-growth potential, the interviews will provide support to the quantitative analysis and findings.

Other

Limitations also exist outside of the quantitative and qualitative data collection and analysis. A further limitation involves the individuals who try to start a company, but never get their businesses off the ground. A pool of companies exists who likely apply for funding, but never receive investments and end their business ventures. Since I am unable to obtain company applications for investments, an unaccounted group of individuals may be missing from my analysis, potentially skewing the data centered around the types of businesses pursued by females and males and discrepancies in funding.

Conclusion

The combination of the mixed-method approach provides the necessary information needed to prove or disprove my hypothesis and identify underlying causes in gender funding differences. Further, the research methodology helps detect whether other factors, such as implicit bias, affect funding decisions in the entrepreneurial space.

RESEARCH FINDINGS

In this section, I provide high-level analysis of both my quantitative and qualitative findings in order to test my hypothesis. This analysis explores the gender funding gap within the scope of my observations.

Quantitative Analysis

Data Analysis

From my dataset sample, which includes the period January 1, 2010 to December 31, 2019, I confirmed the continued existence of a gender funding discrepancy. While not inclusive of every investment in the entrepreneurial ecosystem during this period, Figure 1.1 depicts males outpace females as a percentage of total funding amount received by year founded[21]. This finding is consistent with current published information. However, some interesting trends emerged from my analysis of the sample dataset comprising Figure 1.1. The decrease in percentage funding to all-male ventures from 89% in 2015 to 75% in 2016 indicates an increase in percent of total funding invested in all-female and mixed gender founded ventures. While all-female teams' percent of total funding received only increased 1% from 2015 to 2016, mixed gender ventures equated to 20% of all invested capital in companies founded in 2016, increasing from 8% in 2015. These findings indicate a trend towards improvement in the capital accumulation space for mixed gender ventures. Mixed gender ventures founded in 2018 equate to 23% of total funding, while all-male founded teams accumulated 70% of total funding. Interestingly, while not significant growth, all-female entrepreneurial ventures founded in 2018 received 6% of total funding, increasing from 4% in 2010. From 2015 to 2018, the trends towards increased capital investment in mixed gender and all-female teams continues, indicating

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[21] Note – funding amounts in my dataset correlate with the year founded, not the year funding is received.

an upward trend, not a one-time anomaly. The increase in mixed gender founded ventures as a percentage of capital accumulation highlights the increasing role of females in the entrepreneurial ecosystem.

*Figure 1. 1: Percent of Total Funding Received by Year Founded and Gender (2010 to 2018[22])*

Percent of Total Funding Received by Year Founded and Gender
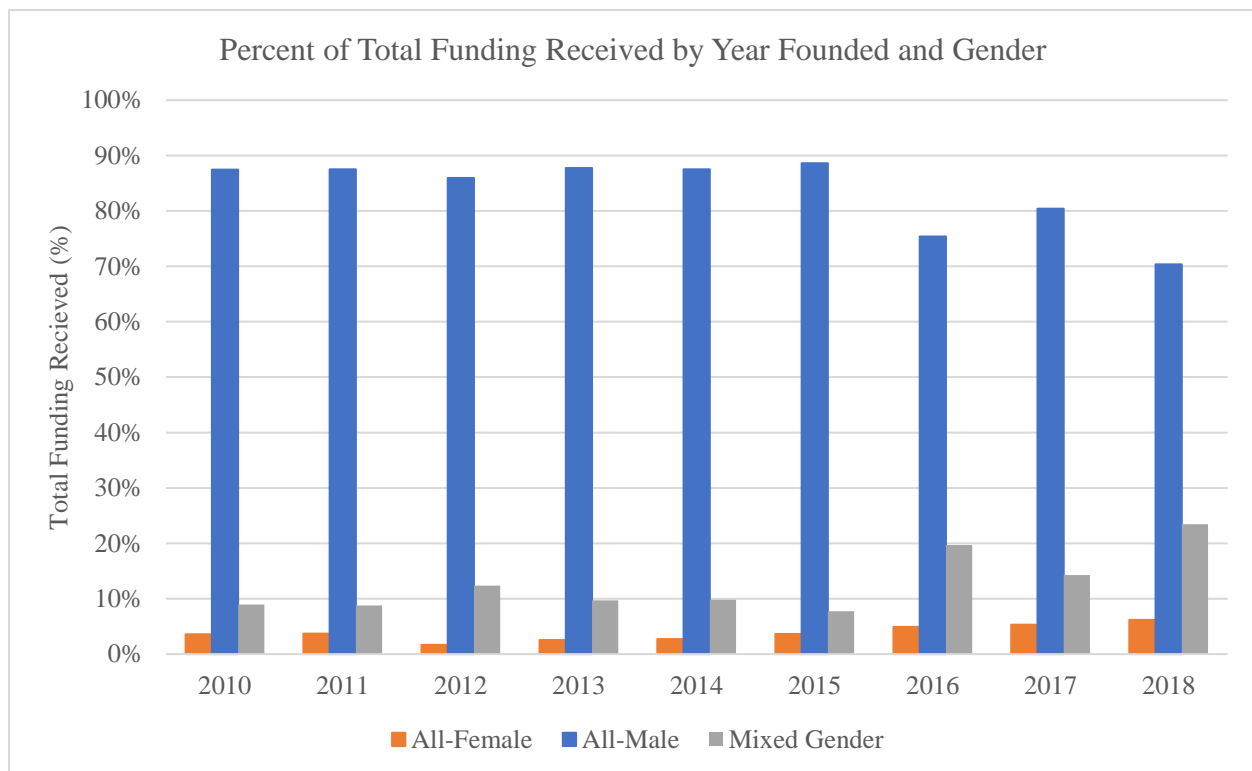
To further supplement the findings provided by Figure 1.1, Figure 1.2 examines the average funding ($\frac{Total\ Funding\ Recieved\ by\ Year\ Founded}{Total\ Number\ of\ Ventures\ by\ Year\ Founded}$) by gender within my sample dataset. Consistent with Figure 1.1, the graph indicates a decreasing trend for all-male founded ventures starting in 2016, as related to average funding received. However, when examining the average funding, Figure 1.2 does not highlight a significant gender funding disparity when accounting for the number of ventures founded relative to the amount of funding received. In fact, in 2016 and 2018, mixed gender founded ventures outpaced all-male teams by $5 million and $9 million,

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[22] Given incomplete Crunchbase data for 2019, the graph does not reflect this year.

respectively. Females continue to struggle; however, the disparity does not appear as significant when considering the number of companies founded by all-female teams, which is significantly smaller than all-male teams. For example, in 2018, all-female founded ventures lagged behind their all-male counterparts by only an average of $3 million when considering the number of ventures started. While average funding in 2010 displays the largest average funding over the sample dataset time period for all-female teams, the discrepancy in average funding between all-female and all-male founded ventures approximated $11 million. Thus, the results of 2018 highlight a closing gap between average funding of all-male and all-female teams. The significant improvement related to mixed gender teams' average funding further highlights the narrowing of the gender funding gap.

Figure 1. 2: Average Funding Received by Year Founded and Gender (2010 to 2018[22])
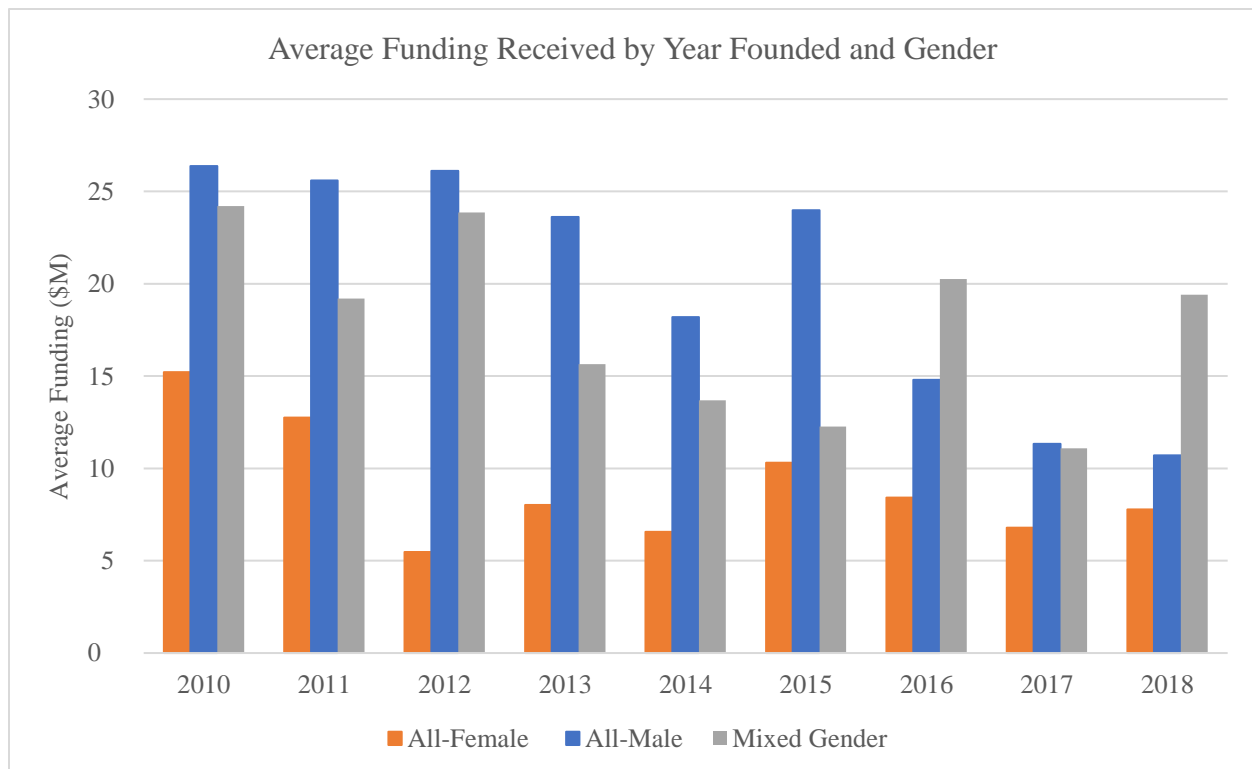
In addition to the overall analysis completed regarding gender and funding by year founded, I dissected my sample dataset further by examining funding by industry groups and gender. Within my sample dataset, forty-one different industry groups existed. Consistent with Figure 1.1, the dollar amounts invested in all-male ventures far exceeded the capital accumulation for all-female and mixed gender ventures in all forty-one industry groups. However, many of these industries comprised a small percentage of overall funding. Therefore, I analyzed the top-ten funded industries for each gender classification. This breakdown ultimately resulted in fifteen industry segments, comprising 87% of total funding from 2010 to 2019. Figure 1.3 highlights biotechnology startups received the largest funding for each gender. All-male, all-female, and mixed gender founded ventures received $47 billion, $3 billion, and $9 billion, respectively. Commerce and shopping also dominated the funding accumulation, placing in the top three for each gender category with all-male, all-female, and mixed gender teams receiving $42 billion, $1.3 billion, and $6.2 billion, respectively. In evaluating the top three industries by gender, clothing and apparel ranked second in funding for all-female teams, receiving $2.3 billion in funding. Interestingly enough, while all-male teams received $4.9 billion in investments for clothing and apparel, this industry category ranked nineteenth in overall funding received by males. Figure 1.3 also indicates the lack of dominance of the clothing and apparel sector in capital accumulation, but yet this sector places second for industry funding in all-female teams. Another curious finding relates to technology businesses outside of biotechnology, especially artificial intelligence (AI) and apps. For each gender category, AI and apps ranked in the top five for all-male and all-female founded teams for capital accumulation and top seven for mixed gender teams, indicating a strong presence of females in the technology sector outside of biotechnology. Financial services also topped the list for funding in all gender categories. A further breakdown of this category indicates companies focused on financial technology

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(fintech), banking, and blockchain comprise the majority of this classification. Once again, this finding indicates females occupy and receive funding in similar industry categories to all-male teams; however, a significant gender funding gap persists.

Figure 1. 3: Total Funding by Industry and Gender from Founding Years (2010 to 2019)

Total Funding by Industry and Gender from Founding Years 2010 to 2019
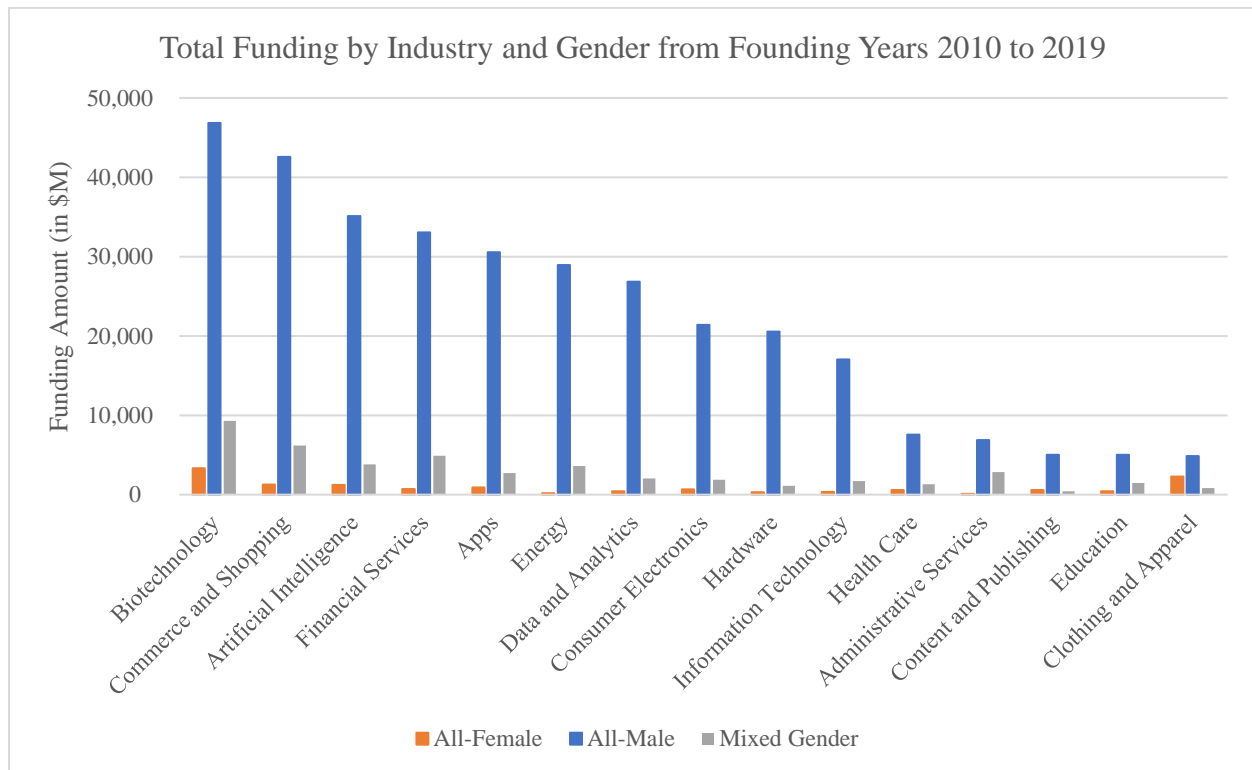
To fully understand the discrepancy between male and female entrepreneurs, Figure 1.4 examines the number of entrants by gender classification within each industry space receiving the highest capital investments. Consistent with the findings from Figure 1.3, which indicates funding amounts received by all-male teams dominate across industry space, Figure 1.4 highlights the number of startups founded by all-male teams far exceed the other gender classifications in all sectors. The discrepancies in funding directly correlate to the disparity in the number of startups by gender within industry category.

*Figure 1. 4: Number of Startups Founded Per Industry Sector (2010 to 2019)*
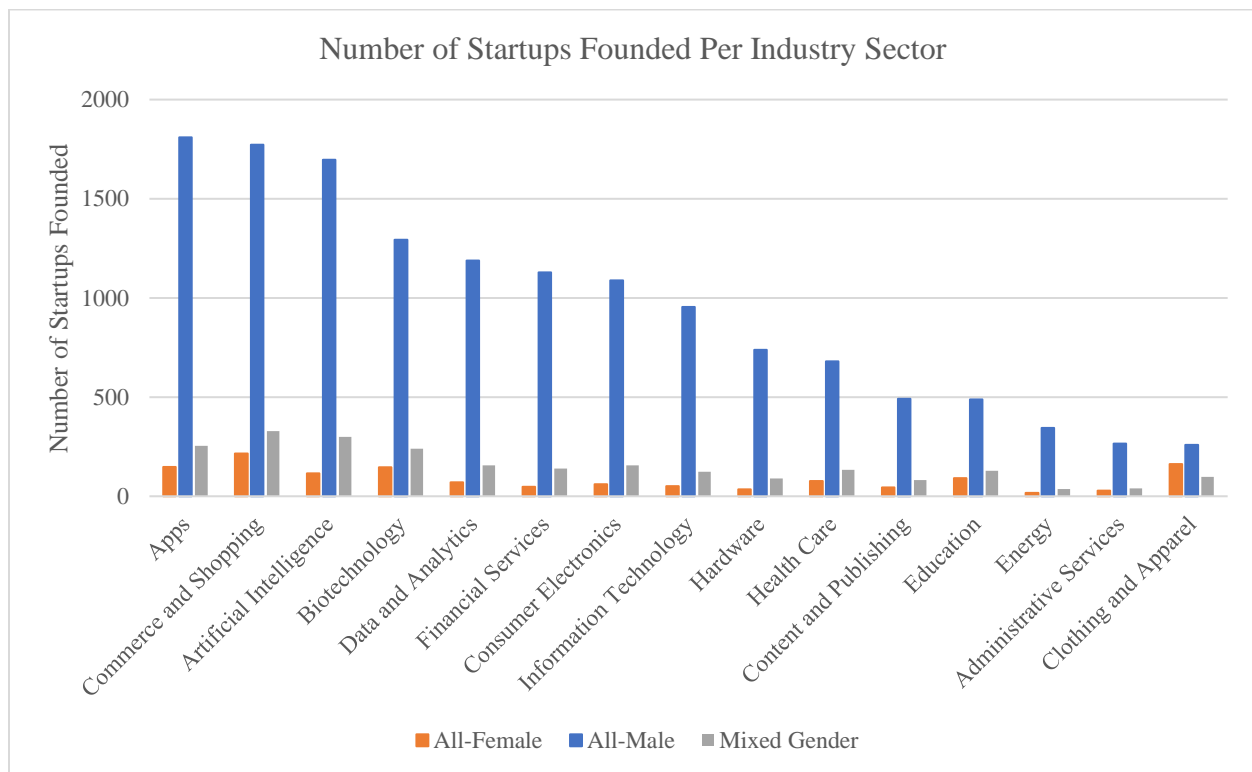
To further the understanding of the gender funding gap, I analyzed the average funding ($\frac{Total\ Funding\ Recieved\ by\ Industry}{Total\ Number\ of\ Ventures\ by\ Industry}$) provided to each gender by industry between 2010 and 2019. As with average overall funding by year (Figure 1.2), different trends emerge when considering the average funding provided to each gender by industry. Consistent with Figure 1.2, Figure 1.5 indicates average funding provided to each gender classification appears significantly different when assessing average funding provided to each industry. The energy sector immediately stands out in this analysis. In reviewing Figure 1.3, the overall funding provided to all-male teams in the energy space approximated $29 billion, with mixed gender teams receiving approximately $4 billion. However, with 334 all-male startup ventures in this industry space and only 37 mixed gender teams, the average investment provided to mixed gender teams surpassed all-male teams by $13 million. While not as large, this trend also exists in biotechnology, financial services, administrative services, and education. Further, while all-female teams lagged behind their

counterparts in average funding, all-female founded ventures exceeded all-male and mixed

gender teams in the content and publishing sector. With the exception of energy and

administrative services, which reflect average funding between $60-100 million and demonstrate

a large gap for all-female ventures and their counterparts, the average funding provided to all-

female teams does not appear as ominous as the discrepancies reflected in Figure 1.3. For

example, all-female startups in the biotechnology sector receive on average $22.7 million or

23%, whereas all-male teams receive $36.2 million or 37%. In comparison, when evaluating

total actual funding amount by industry (Figure 1.3), all-male startups received 80% of funding

as compared to all-females teams which received 6%. The smaller discrepancy related to average

funding by gender classifications within industry as compared to actual investment dollars seems

to indicate a narrower gender funding gap.

Figure 1. 5: Average Funding Provided to Each Gender by Industry (2010 to 2019)
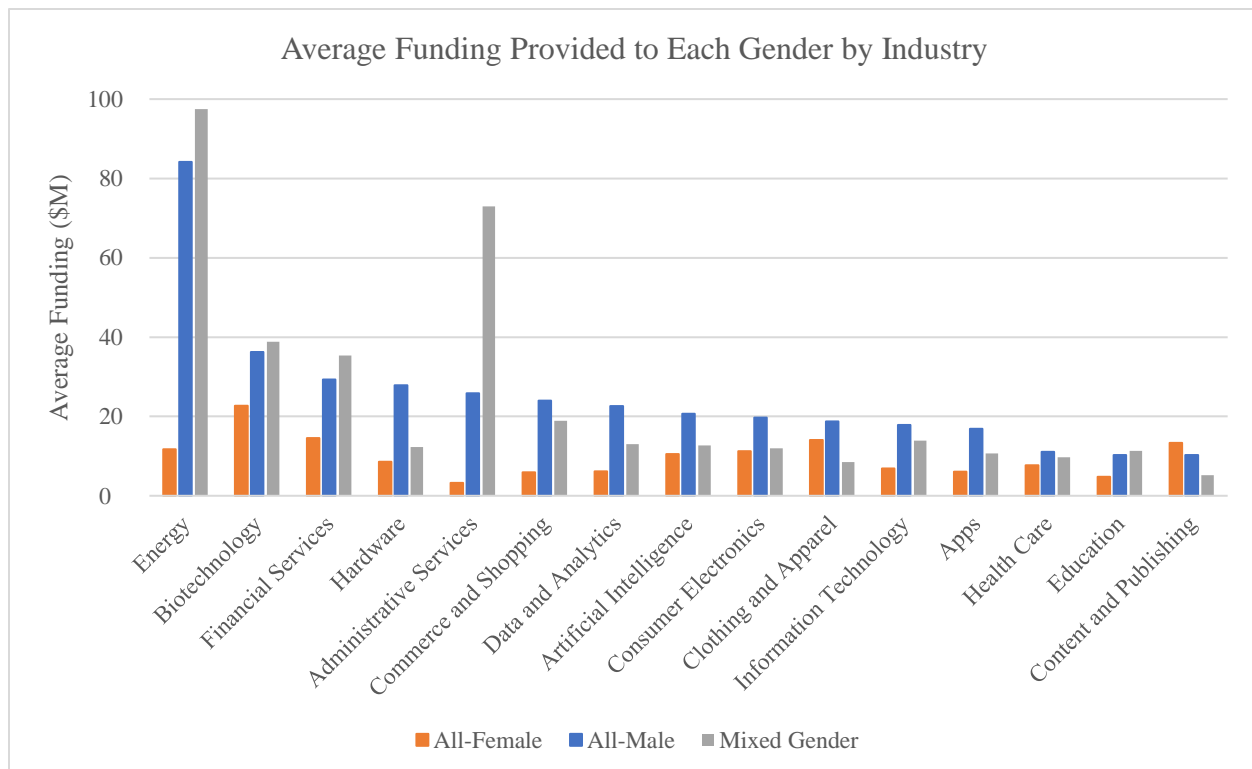
In order to determine whether or not a predictive relationship exists among industry, gender, and funding amount, I ran a multi-variable regression in which industry and gender acted as independent variables to determine potential investment amounts. Due to regression limitations, I selected eleven industries to analyze. These eleven industries comprised 80% of total capital accumulation in my sample dataset between the years 2010 and 2019. In order to analyze the effect of all-female and mixed gender teams by industry on investment amounts, I calculated an intercept which represented an all-male founded team in industries not included within the independent variables. Based upon this regression (See Appendix C), all-male teams will consistently outperform all-female and mixed gender ventures in capital accumulation. The predicted funding amount for an all-male founded venture exceeds all-female and mixed gender teams by $11.80 million and $3.75 million, respectively. At a significance level of 0.1%, the independent variables affecting the predictive funding amount include all-female founded ventures and the following industry sectors: administrative services, artificial intelligence, biotechnology, commerce and shopping, data and analytics, energy, and financial services. Due to mixed gender ventures being immaterial at a 0.1% significance level, this value indicates mixed gender teams do not meaningfully differ from their all-male counterparts in predictive investment funding amounts. This finding correlates with average investment funding amounts during the period of 2010 to 2019 which indicated mixed gendered team received greater amounts of average capital accumulation in certain industries than their all-male venture founded counterparts (Figure 1.5). While mixed gender teams appear to be immaterial in predicting future investment funding, the results differ for females. The regression analysis indicates all-female ventures to be disadvantaged in capital accumulation for startup ventures. The small number of all-female ventures included in my sample dataset limits the ability of the regression analysis to

be fully predictive of investment funding patterns. However, given the overall data analysis performed as part of my study, the prediction that females are disadvantaged in the entrepreneurial ecosystem related to funding appears valid.

Qualitative Analysis

To collect my qualitative data, I conducted seven interviews with entrepreneurs and investors, including angel investors and venture capitalists. The composition of this sample included six females and one male. Three of the females encompassed both the roles of angel investor and entrepreneur. One female represented only the entrepreneurial space. The other two females work within the venture capital industry. The sole male interviewed for my qualitative analysis founded a number of startups and currently pursues angel investing opportunities. While the sample size appears small, the interviewees encompassed a vast geographic area and various industry expertise. In discussions with my advisor, expanding the scope of this sample proved unnecessary due to the consistency of my findings.

The summary of findings for each question posed to interviewees as set forth in Table 1.2 follows:

Investors

What is the gender of the founder for the majority of companies in which you invest?

Two of the respondents focus on investing in underrepresented entrepreneurs which include females, the LGBTQ community, and minority ethnic groups. The remaining respondents confirmed male entrepreneurs receive the majority of funding from their companies.

What industries would you consider to be the most likely to receive large sums of money?

Each respondent agreed the technology industry comprised the majority of investment funds. Specifically, more than one respondent highlighted software, primarily related to business to business software as a service, and fintech as an emerging space that will accumulate

tremendous investment funding. One respondent did include artificial intelligence and blockchain, as well as healthcare to be likely industries to receive large investments. These findings correlate with the quantitative analysis performed by industry category (Figure 1.3). Further, an interviewee highlighted the massive funding needed to create a successful biotechnology company directly correlates to the biotechnology industry's dominance in investment funding for the period 2010 to 2019.

Do you think gender of founder has ever affected your willingness to invest in a company?

Two of the females make sole investments in minority entrepreneurs; therefore, this question did not apply. However, one of the female venture capitalists acknowledged the #MeToo movement[23] as a deterrent to males investing in female ventures. The interviewee believed the tension created between genders by this movement creates an unfavorable environment for females and males to transact business outside the confines of a business office: an area where much business occurs, such as coffee meetings or dinners. While the #MeToo movement correctly highlights needed reforms in the workplace for females, the pressure created by the movement limits the willingness of males to interact with females in the entrepreneurial ecosystem for fear of misinterpretation. This sentiment presented itself during my interview with the sole male interviewee who confirmed his comfortableness with females due to his personal circumstances. However, he acknowledged his male counterparts may not possess a similar attitude given existing biases in the workplace. For examples, males prefer to work with males because of familiarity.

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[23] The #MeToo movement was founded in 2006 to help survivors of sexual violence, particularly Black women and girls, and other young women of color from low wealth communities, find pathways to healing. Our vision from the beginning was to address both the dearth in resources for survivors of sexual violence and to build a community of advocates, driven by survivors, who will be at the forefront of creating solutions to interrupt sexual violence in their communities. (https://metoomvmt.org/about/)

What are the key attributes you look for in individuals / companies to decide whether or not you will invest and how much to invest?

All interviewees agreed the key attribute to decide where to invest lie with the potential growth of the company, no matter the gender of the founder. The scalability of the business highlighted the decision-making process of investors as well as the coachability of the founding team.

Founders

Do you believe your gender players a roll in the way investors see you? Have you ever felt like your gender has been a disadvantage for you when trying to receive funding for your venture?

Of the four female entrepreneurs interviewed, three believed their gender deterred investors. One female entrepreneur stated, "I had to be twice as good [compared to my male counterpart] to get anywhere." She further elaborated by stating that if investors did well with male founded companies, they will likely continue to invest in males over females, creating a pattern in the investment cycle. Interestingly enough, one of the female founders said she never experienced discrimination because she "was so used to being the only female that she thought it was normal." As we continued our conversation and discussed the increased awareness of gender bias, she reaffirmed her belief that her gender did not cause discrimination in investor funding decisions.

Within your industry, do you see a vast majority of either female or male founders?

Consistent with the interviewee responses as investors, the number of males in the entrepreneurial ecosystem, no matter the industry, far outweighs the number of females starting ventures. Specifically, each interviewee created a company within the various technology sectors. However, they believed a disproportionate number of males dominate the space. While they acknowledge the number of females within the various sectors of the technology industry

increasing, the discrepancy remains in the number of females starting ventures compared to their male counterparts.

What is your general perception of male versus female founders?

A general observation made by both investors and entrepreneurs highlights that females when entering an investment pitch appear more prepared than their male counterparts. Females tend to request capital accumulation later in the business development model. For example, females request money once they conduct in-depth market research and/or obtain revenue whereas males tend to request investments before the product/service proves viable.

Investors and Founders

What role does gender play in the entrepreneurial ecosystem and how has it changed over the past 10 years?

From both an investor and entrepreneur perspective, more than one respondent believes females incur a diminished role in the entrepreneurial ecosystem due to bias. For example, one female investor highlighted when an entrepreneur seeks funding, the potential investors ask more preventative questions to females while their male counterparts receive promotion questions. As my literature review indicated, promotion questions garnish more capital accumulation. Thus, females incur bias at the initial stage of investment. One of the female interviewees believes the expectation for female founders far exceeds their male counterparts. A female must "knock it out of the park" in order to obtain funding while the male benchmark during a pitch does not require the same expectation. One of the most interesting perspectives related to this question focused on how things transformed over the past ten years. Almost all respondents agreed that not much 'actually' changed over the time period, but the attention to the underrepresentation of females in the entrepreneurial ecosystem warranted much greater conversation and understanding.

Do you think females and males pursue different industries? If yes, what industries is each gender pursuing more heavily?

All interviewees believe little differences exist in the industries pursued by females and males. In the respondents' objective opinion, males just outnumber females in the entrepreneurial ecosystem, both as investors and entrepreneurs. However, three respondents, who invest at the seed stage, found females to pursue more social ventures[24] than their male counterparts. These social ventures focus more on community good than high-growth, financial outcomes, resulting in less investment dollars flowing to female founders who start social ventures.

Overall, the qualitative analysis consistently confirmed the lack of females in the entrepreneurial ecosystem creates some of the gender funding discrepancy. However, the reasons for this gap vary based upon the respondents' personal experiences.

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[24] A social entrepreneur is a person who pursues novel applications that have the potential to solve community-based problems. These individuals are willing to take on the risk and effort to create positive changes in society through their initiatives. (https://www.investopedia.com/terms/s/social-entrepreneur.asp)

DISCUSSION

In this section, I intend to analyze my quantitative and qualitative research findings in an attempt to understand factors contributing to the gender funding gap. I further plan to analyze these results in relation to previous studies performed, as outlined in my literature review.

Discussion of Findings

From my analysis, the gender funding gap continues to hinder females in the entrepreneurial ecosystem. The regression results, without question, clearly establish females as disadvantaged in capital accumulation. Certain industries, by nature of capital investment requirements, appear to receive greater sums of investment dollars during the period 2010 to 2019. However, no matter the industry or amount of seed money needed to launch/develop a startup, the regression indicates females predictively lag behind their male counterparts in obtaining investment funds.

Further, the quantitative data analytics of my dataset sample from 2010 to 2019 supports the regression as capital accumulation between females and males remains vastly different. The investment amounts provided to females, no matter team orientation, significantly lag behind all-male ventures. However, the data does suggest minor improvements in female entrepreneurs' quest for capital accumulation when considering the average funding received by year founded and gender (See Figure 1.2). The trend indicates average investment funding increasing, especially for mixed gender teams which outpaced all-male founded team in average funding for the years 2016 and 2018. This finding suggests females' acceptance increasing within the entrepreneurial ecosystem whether as an all-female or mixed gender team.

Expanding the quantitative analysis to include industry sectors reaffirms the basic conclusion that males receive significantly greater investment funding compared to females, no

matter the industry. However, as with the overall trend in average funding received by gender, the gap diminishes between males and females when considering average funding provided to each gender team within the different industries (Figure 1.5). This analysis indicates that within certain industry segments, such as energy, biotechnology, administrative services, education, and content and publishing, mixed gender teams and all-female teams acquired higher average capital accumulation than their all-male counterparts.

One interesting observation I noted during my quantitative analysis related to the female industries that received the greatest funding, both in overall and on average investment accumulation. Clothing and apparel ranked second in industries for overall capital accumulation for all-female ventures. This finding seems to indicate that females may be receiving more investment dollars in areas more aligned with their stereotypical gender roles. Further, support for this finding existed when analyzing average funding by industry (Figure 1.5). Content and publishing exhibited female dominance as the only industry females received more average funding than their counterparts. Again, this industry closely aligns with perceived stereotypical roles for females. These findings suggest the existence of gender bias in funding decisions within the entrepreneurial ecosystem.

In comparing the quantitative analysis with my qualitative findings, certain trends align. For example, all respondents agree females trail behind their male counterparts in regard to total investment dollars received. However, one interesting fact that emerged not only in my quantitative, but also my qualitative analysis, relates to the sparseness of females entering the entrepreneurial space. The limited number of female-founded ventures stands out throughout the period of 2010 to 2019. As Figure 1.4 highlights, the number of all-female and mixed gender teams significantly lag behind all-male teams entering the entrepreneurial ecosystem in every industry category. During the interviews, more than one respondent commented on the absence

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of female entrepreneurs and female investors as a reason for the funding gap. The interviewees consistently agreed that the high-growth industries pursued by females and males did not significantly differ. This finding directly disputes earlier research which found females' pursuit of a work-life balance as a reason for gender funding discrepancies.

The differing investment amounts verify the existence of a gender gap, but the ability to discern the reasons for this discrepancy proves difficult. While one can infer from the quantitative findings that implicit bias affects capital accumulation for startup ventures, the ability to confirm these findings based solely on the numbers proves infeasible. Therefore, the qualitative findings create the supplemental data required to fully understand all aspects of the gender funding discrepancy. While not explicitly stated, each interviewee believed gender bias plays a role in capital accumulation for startup ventures. This belief supports the many research studies to date which highlight implicit bias as a reason for the gender funding gap. One respondent discussed the different types of questions asked to females and males; another interviewee highlighted the need for females to be "twice as good" as their male counterparts. One individual deliberated the impact of the #MeToo movement on investor/entrepreneur relationships. These interviews confirm an obvious belief of gender bias within the investor world. This belief ultimately affects the interpersonal relationships between females and potential investors which potentially may impact funding decisions for entrepreneurs.

When considering industries pursued, number of companies being founded by gender, and implicit bias, one may conclude the gender funding gap inevitable. However, as the aspects of my quantitative findings highlight, minor improvements appear to exist for females in the entrepreneurial ecosystem related to capital accumulation when considering the *average* funding received by year founded and gender (Figure 1.2). While these gains reflect baby steps rather than systemic change, if the quantitative trends continue, the gender gap could narrow.

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<u>Conclusion</u>

My research and subsequent analysis tested the following hypothesis: *The gender funding gap more closely aligns with the type of industry and business growth pursued by females versus males with females pursing lower growth business industries. However, the continued lack of female investors (i.e. venture capitalists and angel investors) hinders female entrepreneur's abilities to obtain outside funding, consistent with gender bias.*

My findings suggest industry does not exhibit a significant role in the gender funding discrepancy within the entrepreneurial ecosystem, disputing a portion of my hypothesis. However, my study did confirm the lack of female investors and gender bias as potentially impacting females' ability to receive funding. The most significant results of my study highlight the underrepresentation in the number of female entrepreneurs across all industry lines for startup ventures. This underrepresentation results in females receiving fewer investment dollars than their male counterparts. No matter the industry pursued or the reasons for the lack of female presence in the entrepreneurial ecosystem, the fact remains – with significant underrepresentation of female entrepreneurs, the investment funding gap will remain insurmountable.

<u>Future Research</u>

While my research identified reasons for the persistent gender funding gap within the entrepreneurial ecosystem, my study highlights areas to consider for future research. As discussed within the limitation section of my research methodology, the quantitative data collection presented a number of shortcomings. By collecting and analyzing a more inclusive database, the trends identified in my study, especially related to an upward trend in average funding received by all-female and mixed gender founded ventures, need further investigation. This aspect of my study provides significant insight worth deeper analysis and understanding.

As with the quantitative analysis, a more extensive qualitative analysis, which includes more males and less investors focused on minority groups, may provide additional insight into the root cause of the gender funding disparity. The ability to fully analyze the impact of gender bias on the funding determinations within the entrepreneurial ecosystem could provide invaluable insight to reduce the gender funding gap.

Yet, another area of study that warrants further investigation relates to determining whether or not the lack of females in the entrepreneurial ecosystem relates to ventures that never progressed in the entrepreneurial lifecycle. A potential means to analyze this area would be an extensive review of patents issued by gender. This type of study could also provide insight into why female entrepreneurs continue to maintain minority status in the entrepreneurial ecosystem.

Further, because the underrepresentation of females, both as entrepreneurs and investors, appears correlated to the lack of investment funding provided to female entrepreneurs, future research should focus on barriers to entry for females in the entrepreneurial ecosystem. For example, a current study by the *Wall Street Journal* highlights the existence of an "invisible wall that deters women from roles seen as stepping stones to CEO" (Fuhrmans, 2020). This "invisible wall" may also exist in the entrepreneurial space, leading females to not pursue startups. Investigating the reasons for the lack of females receiving college/graduate degrees with a high entry into the entrepreneurial ecosystem, such as computer science and engineering, equates to an area worth further study. To rectify the gender funding discrepancy in the entrepreneurial ecosystem, understanding why the number of females entering the space remains low proves necessary.

APPENDICES

APPENDIX A.1
Python Script for Name Parse Using Social Security Administration (SSA)

```python
# -*- coding: utf-8 -*-
"""
Created on Tue Nov 26 10:48:57 2019

@author: fisherd
"""

#Standard Imports
import os

#Third-party imports
import pandas as pd

#Change this to your working directory (the one with all of the name files).
#Note the double backslashes needed here or the folder will be wrong
os.chdir("C:\\Users\\fisherd\\Desktop\\projects\\projects\\Kenan Scholars\\Abby_Staker")

DF_list = []

for i in range(1880, 2019):
    infile = "yob" + str(i) + ".txt"
    temp_names = pd.read_csv(infile, header=None, names=['name', 'gender', 'count'])
    temp_names2 = temp_names.pivot(index='name', columns='gender', values='count')
    temp_names2.fillna(value=0, inplace=True)
    temp_names2['year'] = i

    DF_list.append(temp_names2)

combined = pd.concat(DF_list)

subset = combined[(combined['year'] < 2005) & (combined['year'] > 1940)].copy()
subset.reset_index(inplace=True)
subset.drop('year', axis=1, inplace=True)
subset.groupby('name').sum().to_csv("output.csv")
print("Successfully completed Run")
```

Python Script to Correlate Gender Identification from SSA List with First Name of Founders

```python
14 #Change this to your working directory (the one with all of the name files).
15 #Note the double backslashes needed here or the folder will be wrong
16 os.chdir("C:\\Users\\fisherd\\Desktop\\projects\\Kenan Scholars\\Abby_Staker")
17
18 name_reference = pd.read_excel("name_counts.xlsx", sheet_name='name_counts')
19
20 founder_data = pd.read_excel("founder_data.xlsx")
21
22 bad_index = []
23
24 for index in range(founder_data.shape[0]):
25     try:
26         m_count = 0
27         f_count = 0
28         u_count = 0
29         row = founder_data.iloc[index]
30         founder_list = row['Founders']
31         founders = founder_list.split(",")
32         founders = [i for i in founders if i]
33         #print(founders)
34         for founder in founders:
35
36             names = founder.split(" ")
37             names = [i for i in names if i]
38             #print("\t-"+founder + "-")
39             first_name = names[0]
40             first_name = first_name.strip(" ")
41             #print("-"+first_name+"-")
42             name_row = name_reference[name_reference['name'] == first_name]
43             if name_row.shape[0] > 0:
44                 category = name_row.iloc[0][6]
45                 if str(category) == 'Male':
46                     m_count += 1
47                 if str(category) == 'Female':
48                     f_count += 1
49                 if str(category) == 'Unknown':
50                     u_count += 1
51             else:
52                 u_count += 1
53         #should have all names by now
54         #print(f'For {founder_list} we have {m_count}, {f_count}, and {u_count}')
55         founder_data.set_value(index, 'm_count', m_count)
56         founder_data.set_value(index, 'f_count', f_count)
57         founder_data.set_value(index, 'u_count', u_count)
58     except:
59         bad_index.append(index)
60
```

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APPENDIX B.1
IRB Application

APPENDIX B.2
IRB Exemption Approval

APPENDIX C.1
Regression Summary Output

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.077664369
R Square	0.006031754
Adjusted R Square	0.005466654
Standard Error	142.3762389
Observations	22880

ANOVA

	df	SS	MS	F	Significance F
Regression	13	2812783.854	216367.9888	10.67377333	4.45646E-23
Residual	22866	463516535.2	20270.99341		
Total	22879	466329319.1			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	14.27607888	1.650872981	8.647593751	5.59962E-18	11.04025601	17.51190175	11.04025601	17.51190175
Administrative Services	16.59691644	7.948583392	2.088034512	0.03680576	1.017154585	32.1766783	1.017154585	32.1766783
Apps	2.39476297	3.415112281	0.701225252	0.483169589	-4.299088429	9.088614369	-4.299088429	9.088614369
Artificial Intelligence	5.904321392	3.478297694	1.697474429	0.08962061	-0.913377696	12.72202048	-0.913377696	12.72202048
Biotechnology	22.71290169	3.816198633	5.951708459	2.6923E-09	15.23289387	30.1929095	15.23289387	30.1929095
Clothing and Apparel	5.506761009	6.507161499	0.846261616	0.397415671	-7.247716302	18.26123832	-7.247716302	18.26123832
Commerce and Shopping	8.954788815	3.353243978	2.670485319	0.00757953	2.38220348	15.52737415	2.38220348	15.52737415
Consumer Electronics	5.090155144	4.248271693	1.198170812	0.230862944	-3.236745138	13.41705543	-3.236745138	13.41705543
Data and Analytics	7.432812738	4.102183618	1.811916148	0.07001227	-0.607745021	15.4733705	-0.607745021	15.4733705
Energy	68.87704012	7.310890109	9.421156535	4.8711E-21	54.5472003	83.20687995	54.5472003	83.20687995
Financial Services	15.96688373	4.234643276	3.77053808	0.00016331	7.666696064	24.26707139	7.666696064	24.26707139
Information Technology	3.58246788	4.525160077	0.791677602	0.428556897	-5.287152389	12.45208815	-5.287152389	12.45208815
All Female Founders	-11.8013285	3.650551048	-3.23275263	0.00122777	-18.95665584	-4.646001174	-18.95665584	-4.646001174
Mixed Gender Founders	-3.747653658	2.849603984	-1.31514894	0.18847304	-9.333070488	1.837763173	-9.333070488	1.837763173

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