参赛队员姓名： Yiming Song, Victoria Yunlin Fang

中学： Dulwich College Beijing

省份： Beijing

国家/地区： China

指导教师姓名： 游杨

指导教师单位： 香港大学

论文题目 : Resilience and Female Entrepreneurship: Evidence from New Survey Data

Resilience and Female Entrepreneurship:

Evidence from New Survey Data

Yiming Song, Victoria Yunlin Fang[1]

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Abstract: Due to the COVID-19 pandemic, many female entrepreneurs have experienced unprecedented crises. This paper explores this phenomenon by using both qualitative and quantitative studies on female entrepreneurs' resilience and their work-life balance. This paper first summarizes relevant literature on resilience, work-life balance, and performance. Then, typical case studies were conducted to develop our main storyline: female entrepreneurs' resilience can affect how they handle their work-life balance dilemma. We also develop a theoretical framework and solve the optimal time allocation for the female entrepreneurs under a time constraint. Motivated by the case study, we employ survey data from a cooperative project between Tsinghua University School of Economics and Management and Goldman Sachs with a total of 173 valid questionnaires. Our data show that one unit change in resilience corresponds to an increase of 0.2 units in relative performance. The work-life balance dilemma serves as an important channel --- female entrepreneurs face challenges in balancing family responsibility and their startup. We use an instrumental variable approach to identify the causal relationship: one s.d. alleviation of dilemma pressure elicits at least a 1.5 s.d. increase in startup performance.

Keywords: Entrepreneurship, Resilience, Firm Performance, Family Responsibility

JEL Code: J12, J13, L25, L26

[1] Dulwich College Beijing.

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1. Introduction

1.1 Research Background

Of all components that drive the economy, entrepreneurship is one of the most interesting in terms of the amount of innovation it cultivates and the possibilities to be explored (Baumol, 1996). Investopedia defines an entrepreneur to be "an individual who creates a new business, bearing most of the risks and enjoying most of the rewards[1]." Entrepreneurship encourages creativity in its effort to create new services and products and stimulate new employment and, consequently, economic growth. However, despite the increasing significance of entrepreneurship, a crucial group is often underestimated and overlooked, facing obstacles in achieving their full potential: women.

Women are a pivotal part of the economy and are a force in entrepreneurship; they lead as the most important consumer in China. A term to accentuate this idea, "Womenomics," was coined in 2009 by journalists Claire Shipman and Katty Kay (Shipman & Kay, 2009) in their book *Womenomics: Write Your Own Rules for Success,* referring to a change in the way companies and people approach work due to the increasing participation of women in the workforce and changes in the attitude of women towards balancing personal and work life. While the participation of women in the workplace has increased over the past few decades, significant gender inequality still presents challenges toward women in business, especially in entrepreneurship, where factors like societal perceptions towards women, government support in the form of policies, and access to education can all have significant effects on the progress of female entrepreneurs.

[1] Source: https://www.investopedia.com/search?q=entrepreneurship

Under the COVID-19 pandemic, it is even more critical to narrow the gender disparity and recognize the ability of female entrepreneurs as a step towards a more equitable and strong economy. Despite decreases in revenue and changes in business models, many female entrepreneurs have chosen to keep their businesses running during the pandemic. According to a report launched by Goldman Sachs in 2020[1], 78% of their women alumni remained optimistic in their future business prospects, with a majority feeling that the pandemic did not "meaningfully alter their business outlooks, neither in performance nor in their abilities to lead," exhibiting resilience in the face of hardship. In the 2020 Mastercard Index of Women Entrepreneurs Report[2], utilizing data gathered from 40 different economies, it was found that 42% of women adapted to the circumstances by shifting to a digital business model, 37% of women began developing services and products that would accommodate pandemic-related local or global needs, and 34% identified new business opportunities during the pandemic itself. These alterations in strategy and behavior depict the flexibility of businesswomen in adapting to pandemic circumstances and again show evidence of resilience in the face of hardship, prompting us further to research deeper.

Our interest in this topic onsets from preliminary interviews with some female entrepreneurs. Many female entrepreneurs show impressive resilience in both their startups and their family, and we also see that their startups succeeded under COVID-19. Our takeaways supported the reported statistics as many of them did not quit their

[1] Source: https://www.goldmansachs.com/citizenship/10000women/womenomics-covid-19s-impact-on-women/index.html
[2] Source: https://www.mastercard.com/news/research-reports/2020/mastercard-index-of-women-entrepreneurs-2020/

businesses during the pandemic. Meanwhile, we conducted pre-interviews with some target female entrepreneurs who have just recovered from COVID-19. One target interviewee working in tourism even claimed that her business did better and that she considered COVID-19 to be the catalyst of her persistence in the business. Another young mother claimed the whole pregnancy encouraged her to do better in entrepreneurship. These real-life engagements highlight the importance of resilience behind their entrepreneurial success.

1.2 Literature Review and Research Contribution

Expansive economic literature has documented that women are in disadvantageous positions relative to men. Munasinghe et al. (2008) present the gender gap in wage returns relative to job experiences; Goldin et al. (2017) document how the gender earnings gap has been widening on average. Ahlstrom and Asarta (2019) show the gender difference in the field of economics and its persistent effects in the long run.

However, we have seen many positive developments in women's empowerment. Goldin (2014) documents that women's and men's roles are converging, mostly in technology, science, and health sectors. Goldin et al. (2017) documents that the number of women in top-paid jobs and women leaders has increased in the recent decade. Van et al. (2018) show the recent rise in prevalence of female education, and how girls start to outperform boys in education.

Our research also contributes to the household and marriage domain of economics initiated by Gary Becker (1973, 1974, 1985). Beaman et al. (2009) and Beaman et al. (2012) document the increasing aspiration of women in developing countries. Our paper

adds to this literature by showing that resilience empowers female entrepreneurs in China.

The concept of entrepreneurial resilience refers to the psychological term “resilience”, which is widely regarded as a necessary psychological quality for successful entrepreneurs. The term resilience initially emerged in psychological research in the 1940s and characterized people’s ability to cope with misfortune and tribulation. In the following decades, the definition of the term began to expand, capturing the sense of regenerative capacity and survivability. Studies have shown that the three dimensions of entrepreneurial resilience (tenacity, resourcefulness, and optimism) help predict entrepreneurial orientation and success. Resourcefulness is a key factor in predicting the success of entrepreneurs; surprisingly, there is no significant difference in the performance of successful male and female entrepreneurs in this dimension (Ayala & Manzano, 2014). Thus, it is meaningful to investigate topics about gender and resilience.

In recent years, Hanisch (2016) pointed out that the term “resilience” had been looked at in disaster and crisis management. Coincidentally, it has been proved in the literature that entrepreneurs who have experienced business failures show more lasting entrepreneurial resilience, which is important for entrepreneurs during challenging times (Bullough & Renko, 2013). It is particularly necessary to examine resilience to cover the turbulence one endures during a global pandemic such as COVID-19.

According to a paper published online (Garrett & Zettel, 2021), this concept is extended to the idea of entrepreneurial resilience. Zettel and Garrett characterized the concept to

include “the processes entrepreneurs utilize to develop and deploy their capabilities in order to adapt and respond to adversity encountered in their role as an entrepreneur. Entrepreneurial resilience may be conceptualized as a set of capabilities, as a process, and as an outcome.” Throughout this paper, entrepreneurial resilience will be continuously referenced in relation to women during the COVID-19 pandemic.

Of all the components highly related to entrepreneurship and gender, work-life balance (or work-life conflict) has been regarded as one of the typical problems female entrepreneurs face (Agarwal & Lenka, 2015). Therefore, we consider linking resilience and work-life balance by a certain clue of relationship.

Aldrich and Cliff (2003) discussed the significant positive relationship between entrepreneurship and family harmony; this paper points out that female entrepreneurs deal with work-life balance differently at different stages of their business. Jean and Ling (2001) claimed that the more mature female entrepreneurs are, the more comfortable they are with their work-life balance in terms of emotional support.

1.3 Research Importance

Encouraging female entrepreneurship and highlighting female voices in the business allows for women's lived experiences and distinctive perspectives to be recognized, decreasing the size of the gender perspective gap, as women know women best. The World Economic Forum defines the gender gap to be “the difference between women and men as reflected in social, political, intellectual, cultural, or economic attainments and attitudes.” This omnipresent gap permeates almost every aspect of our lives unrealized.

Female entrepreneurship allows for the female point of view and the female need to be represented in economics, offering important insight as workers, leaders, and, most importantly, consumers. As found in 2009 by the Harvard Business Review[1], women control over 20 trillion US dollars in worldwide spending. Further, an increasingly equally distributed workforce in terms of gender is also a form of diversity, which ultimately leads to increased innovation and creativity, as more nuanced perspectives are integrated into creating a particular service or product in order to push organizations forward. Our research aims to understand female entrepreneurial resilience and their work-life balance to highlight female efforts in business. This paper sheds light on previously unrecognized obstacles and efforts to overcome them, empowering women to continue to strive for excellence in entrepreneurship and increasing the engagement of the female consumer.

[1] Source: https://hbr.org/2009/09/the-female-economy#:~:text=Women%20now%20drive%20the%20world,trillion%20in%20the%20same%20period.

2. Case study, interview, and data coding

We started from a set of interviews to derive the logical framework of our paper. In this section, firstly, we read relevant literature to establish the overarching process of the case study. Then, we designed an interview outline to interview our guests. After that, we collected archive data, developed data coding, and triangulated it with secondary data.

Interview

An essential element to consider in case selection is the avoidance of selection bias. Therefore, we chose three typical female entrepreneurs of different ages, education levels, and industries. Also, we ensured that their firms were less than ten years old. Because we conducted most of our interviews when another wave of new local cases of COVID-19 arose in Beijing, we conducted the interviews online via Tencent meeting. Finally, every time we interviewed an entrepreneur, we would ask for permission to record. Table 2.1 displays the basic information of our interview target.

Table 2.1 Basic information of target interviewee*

ID	Industry	Age	Entrepreneurial Basic information	Interview duration	Marital situation
A	tourist	30	Full-time entrepreneurship, co-founder, spouses entrepreneurship	45min	Married, no kids
B	online education	43	Full-time entrepreneurship, CEO	2hours	Married, 2 kids
C	skin care	27	Part-time entrepreneurship, partner	1.5hours	Married, 1 kid
D	Artificial Intelligence	53	Full-time entrepreneurship, co-founder, spouses entrepreneurship	1hour	Married, 2 kids

*We use A-D to represent our interviewees.

According to the case selection criteria, as shown above, we selected three typical female entrepreneurs. We collected primary data through:

1. Dictation of the interviews
2. A semi-structured interview outline
3. Backtrack and secondary interviews

For triangulation, our secondary data includes (1) materials from these entrepreneurs' firms; (2) materials from the news and social networks such as TikTok and WeChat. Typical data collecting materials will be displayed in the appendix

After the interview was conducted, we created a transcript of the subject's data and proceeded with data coding. According to the standard research method of Eisenhardt (1989) and Gioia (2006), we conduct three stages of interview data coding. First-level open coding refers to the extraction of related concepts from original text data and the aggregation of similar concepts into the same category. Second-level axial coding refers to the aggregation of the initial category and concurrent expansion of the logical relations of the main category. Third level selective coding is mainly used to discover stories between main categories. We put the coding details in Appendix A.

(1) Open Coding

The first stage of coding is also known as open coding, which breaks up the original interview data and labels them with conceptualization. All open coding material will be displayed in the appendix.

(2) Axial Coding

We then conducted second stage-axial coding. Past first-order open coding, consisting of the compartmentalizing of textual material into labels, concepts, and categories, fourteen primary categories were formed. The core categories are as follows:

Resilience: Included in resilience were the primary categories of resilient character, including persistence, patience, and cognition on COVID-19.

Firm Performance: The umbrella term of performance includes innovative performance and financial performance.

Work-life balance: Including its cognition, action, and outcome.

(3) Selective Coding and Storyline

Finally, we conducted selective data coding and developed our storyline: Under the pandemic of COVID-19, many female entrepreneurs suffered, they did not quit their business, showing significant resilience. Meanwhile, their resilience can help them handle work-life balance dilemmas. Resilient women do well in firm performance and can handle dilemmas well when facing conflicts. Therefore, we derived our storyline below and made it into a relationship diagram, which will be discussed next. Figure 2.1 shows the storyline of three stages of case data coding.

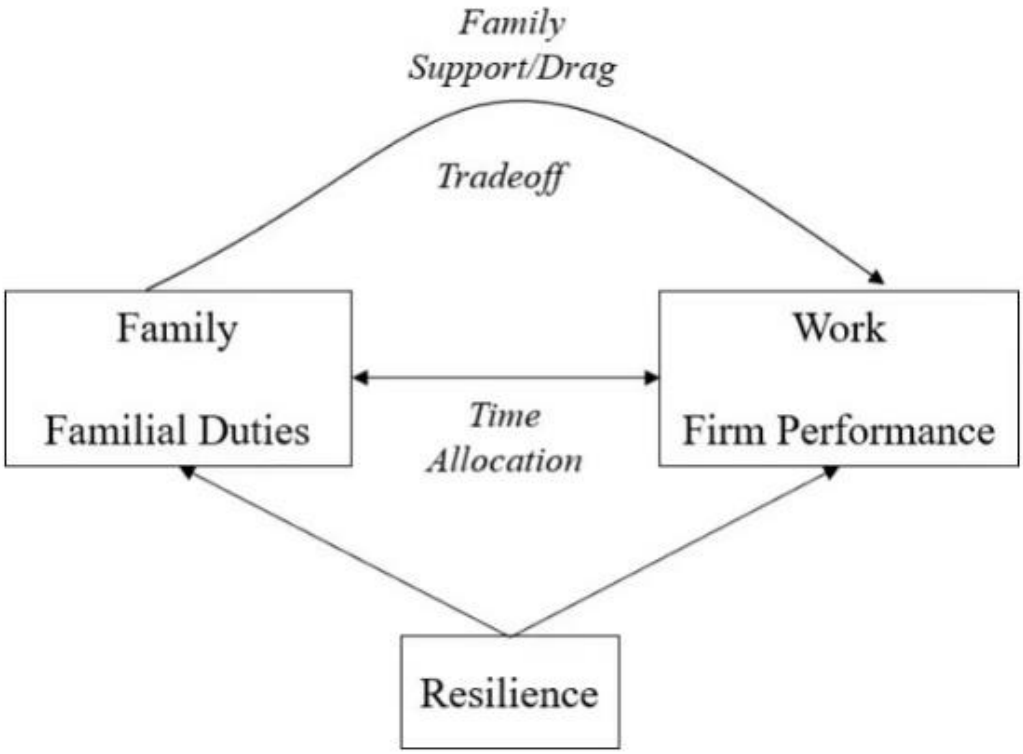

Figure 2.1 storyline and relationship diagram

3. Theoretical Framework

3.1 Environment and Resilience

A female entrepreneur would experience unexpected shock when she starts her own business. The shock would occur with probability p, and the female entrepreneur would always need to address the shock so that the business can remain in routine operation. In reality, the shock can be communication with investors, employees' protest, or unreliable business partners. There are many unproductive troubleshooting methods for entrepreneurs, particularly small business owners, to handle.

We model resilience as the productive discount when the shock happens. A resilient female entrepreneur is less likely to give up under unfavorable conditions. We use an index $\theta \in (0, 1)$ to capture resilience. The female entrepreneur only enjoys θ portion of her economic output when the shock arrives.

3.2 Female Entrepreneur's Time Allocation and Utility

A female entrepreneur optimally splits time between her startup T_S, family T_F, and leisure T_L. Every entrepreneur faces the time constraint ($T = 24$ hours a day, for example):

$$T_S + T_F + T_L = T$$

The family responsibility requires T_R hours per day. A female entrepreneur experiences negative utility if she cannot fulfill the responsibility. We can use an indicator function to represent the utility loss, as shown below.

On the firm performance, we use a square-root term $\sqrt{T_S}$ to model economic output from female entrepreneurship. We use a non-linear payoff to capture the diminishing returns to the entrepreneur's effort. When the shock happens, an entrepreneur can only get a portion of the total payment $\theta\sqrt{T_S}$.

We can write down the female entrepreneur's utility as the following:

$$U(T_S, T_F, T_L) = [p\theta + (1-p)]\sqrt{T_S} - \lambda(T_R - T_F)1_{\{T_R > T_F\}} + T_L$$

The first term $[p\theta + (1-p)]$ is the expected payoff from entrepreneurship engagement. The second term $1_{\{T_R > T_F\}}$ is an indicator function where it equals to 1 if the required time for the family is larger than the time devoted to the family T_F; otherwise, it is zero. λ captures how much a female entrepreneur cares about her family. The larger λ is, the more the female values her family. The third term T_L is the linear benchmark utility where the female gains from leisure. We assume that $\lambda > 1$: the female entrepreneur is altruistic and she values family responsibility more than her leisure. In the empirical section, we show that more than 85% of female entrepreneurs still take the majority of family responsibility. This fact supports our assumption on $\lambda > 1$, where most married females still prioritize family responsibility.

3.3 Optimal Time Allocation and Three Equilibria

First-best Optimal Choice: Non-binding Time Constraint

The first-order condition helps us to find the optimal time spent for her startup, using the above constraints with the method of Lagrange multipliers, where L is the Lagrangian, μ is the Lagrange multiplier, and $T - T_S - T_F - T_R = 0$ is the equality constraint. We set up the following equation:

$$L(T_S, \mu) = [p\theta + (1-p)]\sqrt{T_S} - \lambda(T_R - T_F)1_{\{T_R > T_F\}} + T_L - \mu(T - T_S - T_F - T_R)$$

Substituting in the constraint $T_F = T_R$:

$$L(T_S, \mu) = [p\theta + (1-p)]\sqrt{T_S} + T_L - \mu(T - T_S - T_F - T_R)$$

and setting the partial derivatives equal to zero:

$$\frac{\partial L}{\partial T_S} = \frac{1}{2}[p\theta + (1-p)]{T_S}^{-\frac{1}{2}} + \mu = 0$$

$$\frac{\partial L}{\partial T_l} = 1 + \mu = 0$$

We obtain $\mu = -1$ which can be substituted into equation (5) to obtain the optimal time spent in the startup for the first-best time constraint:

$$T_S = (\frac{[p\theta + (1-p)]}{2})^2$$

Second-best Optimal Choice: Binding Time Constraint

In this case, female entrepreneurs face difficulties in balancing their family responsibility and startup. First of all, entrepreneurs give up their leisure and $T_L = 0$ and experience mental challenges. Then, the female entrepreneur can only take partial responsibility: $T_F = T - T_S$. Using the same method outlined above, the first-order condition implies that the optimal time spent in the startup is:

$$T_S = (\frac{[p\theta + (1-p)]}{2\lambda})^2$$

Worst Choice: Lost Wife and Mom

In this equilibrium, female entrepreneurs further lose their flexibility as they fully give up their personal leisure and their engagement with family issues, that is, $T_L = T_F = 0$ and $T_S = T$. Their startup is the only project that the female is willing to work on. This case can only happen when the marginal productivity in the startup is higher than their contribution in the household, that is:

$$\frac{1}{2\sqrt{T_S}} > \lambda$$

We further illustrate our solutions with graphic representations. The figure 3.1 below plots the marginal utilities of the three types of time spending. The first cross at T_1 represents the transition from the worst equilibrium to the second-best as entrepreneurs start to take family responsibilities. The second cross T_1 represents the transition from the second-best to the first-best. Entrepreneurs can start to enjoy leisure while fulfilling family duties.

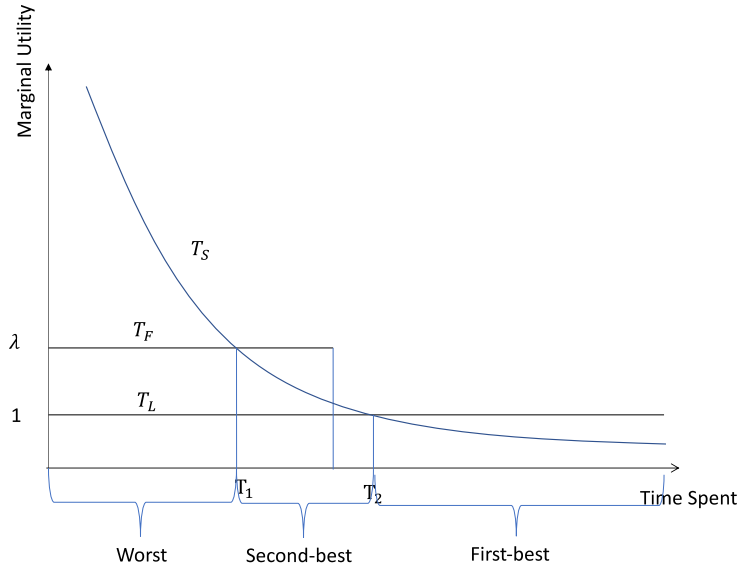

Figure 3.1 Marginal utilities from the three types of time spending

Then, we can show the time split among different tasks for different total time. When the total time is below T_1, the entrepreneur has to dedicate all her time to her startup. Then, the entrepreneur would shift to family duties until total time reaches $T_1 + T_R$. Between $T_1 + T_R$ and $T_2 + T_R$, entrepreneur would re-engage in her startup. Beyond $T_2 + T_R$, all time will be devoted to the leisure (green line).

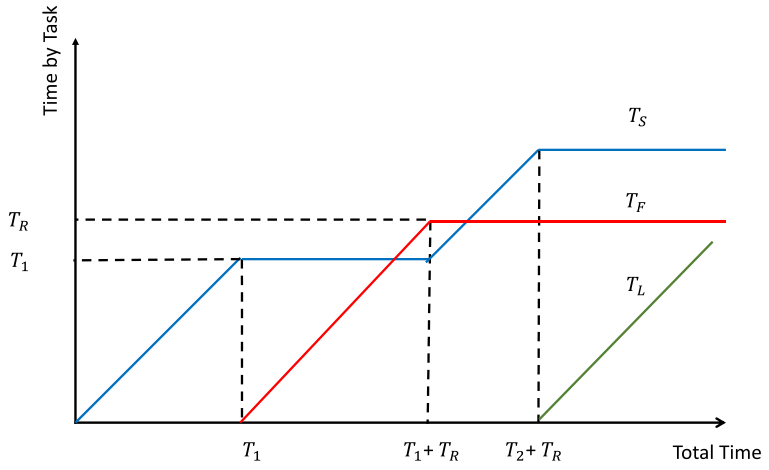

Figure 3.2 Time split among different tasks for different total time.

3.4 Firm Performance and Work-life Dilemma

Proposition 1: Firm performance is better in the first-best than in the second-best. Firm performance $\sqrt{T_S}$ is positively correlated with resilience in the first-best and second-best, but uncorrelated with resilience in the worst scenario.

Proof: First, $(\frac{[p\theta+(1-p)]}{2\lambda})^2 < (\frac{[p\theta+(1-p)]}{2})^2$ as $\lambda > 1$, where female entrepreneurs are willing to participate family activities. In the first-best case, $\frac{\partial\sqrt{T_S}}{\partial\theta} = 0.5\,p > 0$. In the second-best $\frac{\partial\sqrt{T_S}}{\partial\theta} = 0.5\,\frac{p}{\lambda} > 0$. In the worst scenario, $\frac{\partial\sqrt{T_S}}{\partial\theta} = 0$ firm performance does not change according to resilience as the female entrepreneur is fully committed to the startup.

Then, we define the work-life dilemma in the theoretical framework. The first-best under $\theta = 1$ is the global optimal that a female entrepreneur can achieve. We define family and career conflicts are deviations from the first-best.

Definitions: Career-family time conflict refers to the insufficient time spent in the startup

$$\Delta_C = (\frac{1}{2})^2 - T_S$$

$(\frac{1}{2})^2$ is the optimal time spending in the startup when the entrepreneur is perfectly resilient ($\theta = 1$). T_S is below the optimal level, and the career-family conflict measures the distance to the ideal time spending in her startup.

Proposition 2: Resilient entrepreneurs experience less career-family time conflict.

Proof: First, we can show that family time conflict would be negatively correlated with the resilience θ in both the first-best and the second-best, as we can show with the first-order derivative. In the first case scenario, by the optimal time constraint for T_S:

$$\Delta_C = (\frac{1}{2})^2 - T_S = \left(\frac{1}{2}\right)^2 - (\frac{[p\theta + (1-p)]}{2})^2$$

Taking the first order derivative with respect to θ:

$$\frac{\partial \Delta_C}{\partial \theta} = -\frac{1}{2}[p\theta + (1-p)]p < 0$$

Similarly, in the second-best scenario, the Δ_C is also negatively correlated θ:

$$\frac{\partial \Delta_C}{\partial \theta} = -\frac{1}{2\lambda}[p\theta + (1-p)]p < 0$$

The family-career time conflicts do not vary with the resilience in the worst equilibrium as the entrepreneurs cannot control their time entirely and have to spend all available time with their startups.

In the next section, we examine the survey data, quantify the resilience θ, measure the firm performance and career-family time conflict, and test the predictions in Propositions 1 and 2.

4. Survey and Quantitative Analysis

4.1 Survey Background

We use secondary data to verify our model. The original questionnaire was distributed and collected from the trainees of "Women Realizing Their Dreams," a cooperative project between Tsinghua University School of Economics and Management and Goldman Sachs. In order to provide more targeted guidance to female entrepreneurs, the project leaders designed and distributed this questionnaire. By March 2021, a total of 173 valid questionnaires in our sample, with a 73% response rate (173/222). As a whole, this questionnaire consists of 31 total questions (58 with sub-questions included). Survey respondents came from different regions in China. The survey intends to produce both subjective and objective measures for the variables seen in Figure 2.1 (resilience, family, work, firm performance, environment), and test our theoretical predictions. Data about marital status, past entrepreneurship experience, business history, and prevalence of firm digitalization were also collected. Empirical results from the survey provide quantitative analysis of female entrepreneurship and evaluate the statistical significance. We combine the statistical analysis and of case studies to provide both depth and breadth in the study of females' resilience.

4.2 Data Summary

Our survey occurred during the COVID-19 pandemic. Questions include the impact of the pandemic on their businesses. 94% of respondents reported that their businesses stayed running, with 5% temporarily closing and 1% permanently shutting down due to the pandemic. Regarding business income, 43% reported a decrease in income, 38% reported no significant difference, and 19% reported an increase. 40%, 43%, and 17% of

respondents reported cutting workers, no difference in employment numbers, and increases in hiring, respectively. Difficulty in obtaining financing was the most common obstacle (80/173, 46.3%) for female entrepreneurs, while familial responsibilities involving childcare were the second most common, indicating that family duties hindered their work. In reverse, however, most respondents did not believe that their work negatively affected their familial duties. These results would seem to suggest that the "family support/drag" link is more important than the "tradeoff" link between family and work in Figure 2.1. Most female entrepreneurs considered themselves adaptable, optimistic, and determined and believed that these were necessary qualities for entrepreneurs to have. Most respondents believed that their businesses outperformed competitors in terms of profit, market share, size. Finally, most participants agreed that the current entrepreneurial climate was conducive, accessible, and equal for women.

To avoid selection bias, this questionnaire considered cross-level issues. As for firm-level consideration, the selected enterprises had to meet three conditions: (1) officially established and normally operated for at least three months; (2) established for no more than ten years; (3) independent operating entity, not a branch or subsidiary of a company. As for individual-level consideration, respondents' marital statuses were collected. Because this questionnaire involved the private information of cooperative subjects, only part of the questionnaire can be accessed by classification variable rather than continuous variable.

In our survey, we use Likert's 5-point scale. Respondents were asked to specify their level of agreement to a statement according to five points: (1) Strongly disagree; (2)

Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree. We construct variables by combining these responses, which will be detailed in the next section.

We used Cronbach's α reliability coefficient to measure the reliability of this survey, especially internal consistency. Academically, If Cronbach's α of overall scale is larger than 0.8, the total scale can be regarded as operable. Cronbach's α between 0.7 and 0.8 is acceptable. The reliability coefficient of subscale should be above 0.7 preferably, and 0.6-0.7 is acceptable. If Cronbach's alpha coefficient is below 0.6, the survey should be rewritten. In this survey, the reliability coefficient of overall scale, resilience scale, work-on-life scale, life-on-work scale and original performance scale are 0.888, 0.763, 0.880, 0.883, 0.930. Therefore, we can conclude this survey has relatively operable internal consistency and can be applied with data analysis.

4.3 Data Encoding and Variable Construction

Six variables were constructed using the survey responses. The variables, along with the questions from which they are constructed are as follows:

Table 4.1. List of constructed variables and their accompanying questions from the survey.

Variable	**Question(s)**
Resilience	For the following statements, state how much you agree: a. I can handle any obstacle that I may face during entrepreneurship. b. When presented with a problem, I look on the bright side. c. I don't easily quit from the task at hand. d. I believe entrepreneurs need to be resilient.
Work influence on family	For the following statements, state how much you agree: a. My work affects my family life. b. My work takes a large chunk of my time, affecting my ability to fulfill my familial duties. c. Because of my work, I can never finish tasks at home.

	d. Mental stress from work affects my ability to fulfill my familial duties. e. Because of work, I often change family plans.
Family influence on work	For the following statements, state how much you agree: a. The needs of family members (partner/children) affect my work. b. I push my work aside due to the urgency of family tasks. c. Family members stop me from achieving my goals at work. d. My family life affects my daily work. e. Family relationships affect my ability to fulfill work duties.
Firm performance (subjective)	For the following statements, state how much you agree (all measures are compared to your competitors): a. Our volume of business is growing faster b. Our employment is growing faster c. Our market share is growing more d. Our gross profit is higher e. Our net profit is higher
Firm performance (objective)	How many employees does your business have?

To construct a composite variable, the question responses were encoded according to Likert's 5-point scale. Then, a mean of responses was taken. It was assumed that each question had an equal weighting towards the underlying variable. For example, as shown in Table 1, we constructed resilience using four survey questions. We added all points together to measure overall resilience (ranging from 4 to 20). The mean resilience value is 17.1 (s.d. 2.57), with 28% of entrepreneurs reading the full score of 20. We also normalize the data by demeaning and setting the standard deviation to one for a more straightforward interpretation.

We use principal component analysis (PCA) in order to reduce the dimensionality of the data. With multiple questions contributing to one composite variable and a limited number of observations, PCA provides a way to condense all the data from multiple

questions into one representative variable. For example, for the firm performance variable, data from six different conditions (six dimensions) can be compressed into a single variable, thus reducing the complexity and dimensionality of the data while persevering as much information as possible, increasing the ease of regression and interpretation of the data. PCA allows us to avoid the curse of dimensionality – where too many features in a multi-dimensional dataset can increase error and jeopardize the statistical significance of results. Because it is unnecessary to understand how the answers to each question affect our dependent variable, PCA allows for a far more summative and concise understanding of the relationships between the variables.

5. Empirical Findings

We study how resilience contributes to firm performance, family and career concerns, and effects of COVID-19. Then, we aim to estimate how the conflicts between family and career responsibilities impact the entrepreneurs' startup performance. This indicates that family responsibility relief can be a useful policy intervention to encourage female entrepreneurship.

Table 5.1 reports the summary statistics for key variables in Section 5. We construct measures of firm performance and resilience that follow mean zero and standard deviation one. To examine the channel, we study whether the female takes the main responsibility, and male partner's participation in the startup. Furthermore, we study their subjective and objective performance under COVID-19. Lastly, we measure the work-life balance dilemma using results from the survey.

Table 5.1 Summary Statistics

	Observation	Mean	Standard Deviation	Min	Max
Firm Performance	173	0	1	-2.967	2.434
Resilience	173	0	1	-4.333	1.124
Main Family Responsibility	173	0.855	0.352	0	1
Partner Participation	173	0.491	0.501	0	1
Difficulty (Covid)	173	0.827	0.379	0	1
Revenue(Covid)	173	1.786	0.766	1	3
# Employee (Covid)	173	1.786	0.727	1	3
Family Concern	173	0	1	-1.846	2.997
Career Concern	173	0	1	-1.542	3.317

5.1 Firm Performance

All subjective measures were demeaned, with the standard deviation being normalized to one. To perform a baseline analysis, firm performance (first principal

component) was regressed with the composite resilience variable as the only regressor, according to the following equation:

$$Perform_i = \beta\ Resilience_i + Prov_j + Industry_k + Size_i + \gamma + \varepsilon_{i,j,k} \qquad (1)$$

Table 5.2 Female enterprises' performance and resilience

	Firm Performance				
	(1)	(2)	(3)	(4)	(5)
resilience	0.288***	0.272***	0.204*	0.211*	0.208*
	[3.93]	[3.62]	[2.35]	[2.44]	[2.34]
Province FE	N	Y	Y	Y	Y
Industry FE	N	N	Y	Y	Y
Covid Impact	N	N	N	Y	Y
Firm Size	N	N	N	N	Y
N	173	173	173	173	173
R-sq	0.083	0.296	0.495	0.509	0.512

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

In Table 5.2, we show that female resilience in entrepreneurship positively correlates with firm performance. Under a naïve univariate regression, not considering the province, industry, and size, we obtain β=0.288 (t=3.93, p<0.001), suggesting that the result is statistically significant, with one s.d. increase in resilience resulting in an 0.288 s.d. increase in firm performance. The low r-squared value of 8.28% (7.74% adjusted) is due to the cross-sectional nature of the data, with many variables that affect performance being unaccounted for. However, the low p-value still proves the relationship to be statistically significant, at 0.0001. Including province into the regression, the coefficient decreases slightly to 0.272, while remaining statistically significant (t=3.62, p<0.001).

The R-squared value, however, does increase by almost four times to 29.58% (16.47% adjusted), indicating that while the addition of province as a variable does not affect the statistical power of resilience on firm performance much, it does explain much more variance in firm performance, shown by the increased goodness-of-fit. This result means that firm location likely has a large effect on firm performance. Further adding industry into the regression, we see the coefficient decrease to 0.204 while still remaining statistically significant ($t=2.35$, $p<0.05$). Similarly, adding industry fixed effect boosts the R-squared value to 49.49%, though the adjusted R-squared remains at 16.46%, indicating that this increase was just caused by the addition of new variables and not by the explanatory power of the variables. Finally, adding size as a variable, the coefficient increases slightly to 0.211 ($t=2.44$, $p<0.05$), with minimal changes in the R-squared values.

The stable coefficients and statistically significant results show that even controlling for COVID performance (size variable) and accounting for the province and industry; resilience remains an exogenous variable that can explain firm performance. The initial naïve estimate may have overestimated the power of resilience; however, even adjusting for all variables, we can confidently assume that at a lower bound, a one s.d. increase in resilience still leads to at least a 0.2 s.d. increase in firm performance, while remaining statistically significant.

5.2 Family Responsibility

We investigate whether resilience correlates with family roles and partners' contribution to their businesses. Chinese cultural norms conventionally expect women in

relationships to take care of familial duties, including childcare and eldercare, with 85.5% of participants responding that they take on the primary familial responsibilities, indicating that despite their successes, they still need to disproportionately take on the burden of household work. This high percentage suggests that resilient female entrepreneurs support their families better. To further understand the interaction between the entrepreneur's work and family lives, we also ask whether or not resilience affects the extent to which the partner helps in the business.

We conduct a regression with the following equation, where the role variable is a dummy for whether or not 1) the female entrepreneur takes on primary familial responsibilities 2) whether or not the partner helps in their businesses:

$$Role_i = \beta\ Resilience_i + Prov_j + Industry_k + \gamma + \varepsilon_{i,j,k} \quad (2)$$

Table 5.3 Resilience and the role of female

	Main Family Responsibility			Partner Participation		
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	Logit	OLS	OLS	Logit
Resilience	0.00655	0.0253	0.203	-0.0789*	-0.126**	-0.707**
	[0.24]	[0.71]	[0.59]	[2.08]	[2.63]	[2.76]
Province FE	N	Y	Y	N	Y	Y
Industry FE	N	Y	Y	N	Y	Y
Firm Size	N	Y	Y	N	Y	Y
N	173	173	112	173	173	129
R-sq	0	0.345		0.025	0.417	

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 5.3 presents the results of the regression in equation (2). Columns 1-3 explore the relationship between resilience and the entrepreneurs' family duty participation, with column 1 being the naïve regression; columns 4-6 explore the relationship between

resilience and the rates of partner participation and help in business, with column 4 being the naïve regression. We find no statistically significant relationship between resilience and the entrepreneurs' familial responsibilities, though a one s.d. increase in responsibility does lead to a 0.0789 s.d. decrease in the partners' likelihoods of assisting with business ($t=-2.08$, $p<0.05$). The relationship between resilience and partner help becomes more statistically significant after allowing for the province fixed effects, returning a coefficient of -0.126 ($t=-2.63$, $p<0.01$), and adjusting for industry ($\beta=-0.707$, $t=-2.76$, $p<0.01$). The results suggest that one s.d. increase in the resilience of a female leads to an ~8% decrease in the likelihood of their partners helping in their businesses. This result is intuitive; a more resilient entrepreneur would need less assistance in her work. Resilience does not, however, affect a female entrepreneur's role in the family, indicating that no matter the resilience and ability of a female entrepreneur, they are still tied heavily to traditional familial roles and responsibilities, casting doubt on the concept of a "career girl." We do not find that a resilient female entrepreneur gains more "bargaining power" to redistribute their family responsibilities with their partners. These results suggest that not only is a resilient entrepreneur able to complete their work responsibilities with less help from a partner, but they do so at no detriment to their familial responsibilities.

5.3 Resilience and COVID-19 Responses

It is expected that the COVID-19 pandemic has disproportionately increased the pressure on female entrepreneurs. With children staying at home and the results in the previous paragraph showing that the entrepreneurs are still bound to their roles as mothers,

these women would have had to deal with large changes in their life, potentially needing to cook meals and deal with other familial responsibilities throughout the day. Therefore, the effects of COVID-19 are important to consider in our analysis.

In the regression shown in equation (3), we explore whether resilience has an effect on the perceived amount of stress that the entrepreneurs feel during the pandemic, as well as changes in the performance of their businesses, both given by the 'Covid' variable:

$$Covid_i = \beta\ Resilience_i + Prov_j + Industry_k + \gamma + \varepsilon_{i,j,k} \quad (3)$$

Table 5.4 Perception and performance under covid-19

	Difficulty		Revenue		Employee	
	(1)	(2)	(3)	(4)	(5)	(6)
Resilience	-0.0556	-0.0722*	0.0120	-0.0625	0.00743	-0.0592
	[-1.94]	[-2.21]	[0.2]	[-1.06]	[0.13]	[-0.98]
Industry FE	N	Y	N	Y	N	Y
N	173	173	173	173	173	173
R-sq	0.021	0.233	0	0.392	0	0.293

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Shown in Table 5.4, resilient entrepreneurs are less likely to feel pressure as a result of the pandemic, with one s.d. increase in resilience leading to a 0.0722 s.d. decrease in pressure (t=-2.21, p<0.05). We control the regression for industries because COVID-19 has had widely different effects on different industries (for example, takeout compared to cinema), making sure that changes in stress are not due to these industry shocks. However, no statistically significant results were found to reinforce the relationship between business performance during the pandemic and resilience. Knowing that increases in stress of the entrepreneurs are not a result of worsened business during COVID, we can conclude from these regressions that resilient entrepreneurs are better equipped to deal

with stresses and pressures of the pandemic. These results also increase the reliability of the regressions in Table 2, showing that the effects of the pandemic would not have been a confounding variable in the relationship between resilience and performance.

5.4 Work-Life Balance Dilemma

The next step of the analysis is to explore the effects of resilience on the work-life issues of female entrepreneurs. First, we document the work-life balance dilemma: from the survey results, family conflict and career conflict were 71.7% correlated, meaning that work and familial responsibilities mutually affect each other, with workload potentially leaving little time for family and family duties limiting work ability. This disproves the idea that work-life balance is a tradeoff.

We hypothesize that resilience entrepreneurs are better able to deal with both issues. The dilemma serves as a vital channel to explain why resilient entrepreneurs outperform. We analyze the regression as follows:

$$Career\ /\ Family_i = \beta\ Resilience_i + \alpha + \varepsilon_{i,j,k} \quad (4)$$

Table 5.5 Work-life dilemma and resilience

	Family Concern		Career Concern	
	(1)	(2)	(3)	(4)
resilience	-0.188*	-0.165	-0.163*	-0.0925
	[-2.51]	[-1.96]	[-2.16]	[-1.04]
Industry FE	N	Y	N	Y
N	173	173	173	173
R-sq	0.035	0.26	0.026	0.19

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

The results in Table 5.5 confirm the hypothesis. With one s.d. increase in resilience, we obtain a statistically significant 0.188 s.d. decrease in family concerns (t=-2.51, p<0.05) and a 0.163 s.d. decrease in work concerns (t=-2.16, p<0.05). A resilient woman

perceives fewer challenges in both her family and work life. Combined with results from Table 5.4, resilient women, despite needing less help from their partners, are better able to handle their work-life balance.

5.5 Dilemma and Firm Performance

The final step of the analysis is to estimate whether a better work-life balance leads to better business performance in order to inform policies. We are worried that OLS may provide biased estimates due to the reverse causality problem between the two variables of performance and family. Increases in business performance and revenue might indicate that the startup is undergoing rapid growth. Fast expansion requires more time from the entrepreneur, potentially leading to more stress and decreased time with her family. To avoid confounding variables in the regression, we use resilience as an instrumental variable for career/family balance in the following regression:

$$Performance = \beta\ Career/Family_i + \alpha + \varepsilon_{i,j,k} \quad (5)$$

Table 5.6 Causal estimation from dilemma to firm performance

	Firm Performance			
	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Family Concern	-0.130	-1.529*		
	[-1.71]	[-2.21]		
Career Concern			-0.0921	-1.769
			[-1.21]	(-1.94)
N	173	173	173	173

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

With the naïve OLS regression, we find that one s.d. change in family leads to a -0.13 s.d. change in business performance (t=-1.71, p<0.1). However, the relationship between the two factors is very likely to be underestimated. To avoid these issues, we use

resilience as an instrumental variable for an IV estimation. With the IV approach, we find a stronger and more statistically significant result, with a coefficient increasing tenfold to -1.53 (t=-2.21, p<0.05). This regression implies that the OLS regression underestimates the causal relationship and suggests that high-performing businesses induce higher stress at home within the female entrepreneurs. Similar to the family concerns, the correlation between career stress and performance also increases from -0.09 to -1.77 when we use the IV estimation. These results all imply that a massive firm performance gain can be obtained by relieving the stresses of female entrepreneurs, and policies that alleviate these stresses should be prioritized.

5.6 Endogeneity Problem of Resilience

Our fundamental assumption is that resilience is exogenous and given by nature. However, this assumption can be controversial as many factors can determine the resilience level. We explore a few determinants in an effort to understand whether they can significantly predict the resilience level or not.

First, we use self-reported variables from the survey as the $Survey\_factor_i$. Column (1) uses the number of prior startups run by the entrepreneur. Column (2) takes the dummy variable of whether the female entrepreneurs have a baby or not. Columns (3) to (5) use the self-reported local environment for female entrepreneurs: whether females are encouraged to start their business or not, whether business entry barriers for females are lower than before, and whether investors treat females and males equally in their investment decisions. We find only statistical significance in

$$Resilience_i = \beta\, Survey\_factor_i + \alpha + \varepsilon_i$$

Table 5.7: Predictability from Survey Factors

	(1)	(2)	(3)	(4)	(5)
	Prior Startups	Kid	Encourage	Entry	Equal Invest
β	0.0965	0.0976	0.302***	0.0654	0.109
s.e.	(0.61)	(0.59)	(4.21)	(0.91)	(1.41)
N	173	173	173	173	173

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Then, we further explore the historical factors of their place of residence. During the COVID-19 period, we trace their resident location using the IP address in the survey, since the possibility for business traveling is minimal due to the pandemic. If the female is born in a place with more gender discrimination, it might take more effort and resilience to pave the way for a startup.

We construct five historical variables to measure the gender inequality at the province level: Column (1) is the average of the male sterilization rates (how many males are sterilized during Birth Control for the One-child Policy). Column (2) is the gender ratio in 1970 constructed from China Gazetteers. Column (3) measures the ancestor worship with the average number of ancestor festivals in each county. Columns (4) and (5) are derived from China Family Panel Studies (CFPS): the average probability of clan existence (one surname accounts for more than 10% local population), and the average population percentage of the largest local clan. However, we find no variable is correlated with the resilience level.

$$Resilience_i = \beta\, History\_factor_i + \alpha + \varepsilon_i$$

Table 5.8: Predictability from Historical Factors

	(1)	(2)	(3)	(4)	(5)
	Male Sterilization	Gender Ratio	Ancestor Festival	Clan Dummy	Clan Ratio

β	0.512	1.376	-0.0894	-0.277	-0.00203
s.e.	(1.20)	(0.71)	(-1.13)	(-0.79)	(-0.31)
N	173	173	173	173	173

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Overall, we find little evidence that resilience is endogenous as only one out of ten variables have statistical power to predict the resilience level. We further experiment with the self-reported local environment for female entrepreneurs as the instrumental variables. In Table 5.9, Column (1) is our baseline estimation with OLS. Column (2) uses "Encourage" (Table 5.7 Column (3)) as the instrumental variable, and Column (3) uses all three variables in Table 5.7 Columns (3) – (5) as a set of instrumental variables. The partial F-statistics is 15.43 in Column (2), but only 4.91 in Column (3). The coefficient can be biased for the weak instrument concern. Our baseline estimation can potentially be under-estimated if we believe that self-reported local environments are valid instrumental variables.

Table 5.9: 2SLS Estimates with IV using Female-friendly Environments

	(1)	(2)	(3)
	OLS	2SLS	2SLS
Coef	0.288***	0.540**	0.496*
s.e.	(3.93)	(1.97)	(1.89)
Partial F-stats		15.43	4.91
R-square	0.083	0.019	0.039
N	173	173	173

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

5.7 Implications and Policy Advice

Because it may be relatively difficult to implement resilience training, especially considering there may be a lack of corporate framework with female entrepreneurs, other policies that ease the work-life pressures for these female entrepreneurs should be

considered. Increases in the flexibility of work arrangements with work-from-home and time-off policies could alleviate the pressures of these entrepreneurs, and COVID-19 has set a precedent for remote working. For workers who must still commute, governmental subsidies and stipends for meals, pickups, and childcare could be provided. Advocating for more equal familial duties between husband and wife, whether through advertising programs or increases in paternal leave times, could lead to men taking a greater role in the family, thus reducing the burden of the female entrepreneurs.

For example, Japanese policymakers enacted a law in June 2021 allowing fathers to gain more flexibility when taking paternal leave. Up to 80% of their salary will be guaranteed through the plan, and fathers will be allowed to give shorter prior notice to employers. The hope is to enable fathers to support their partners better, though the efficacy of the policy is yet to be seen. Finally, with policy changes, we hope to see shifts in the culture surrounding familial roles of female entrepreneurs to enable their voices and skills to be heard and put to best use.

6. Conclusion

Our paper provides a thorough understanding of the role of females' resilience in entrepreneurship, particularly under the context COVID-19. We estimate the causal impact with the IV approach and inform policies improving female participation in business. The case studies in Section 2 help us to gain confidence in our quantitative results.

This paper documents that resilience is crucial to the performance of female-owned startups and examines the underlying channels. From the qualitative data collected through the case studies, we find that resilience, as shown through the persistence, patience, and optimism of female entrepreneurs during COVID-19, is a defining characteristic of successful entrepreneurs, allowing them to better deal with obstacles and difficulties both in the workplace and at home. In the quantitative analysis, we find that resilient female entrepreneurs perform better by business performance metrics and work-life balance. Our estimates suggest that policies like remote working, subsidies and stipends for childcare, and promotion of equal familial duties should be enacted to alleviate the stress of female entrepreneurs and boost their performance.

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Appendix A: Secondary data source, open coding and axial coding

Our research roadmap is displayed in figure A1. We divided our research process into three stages as question posing-question analysis-question solving. First, in question posing, we conducted preliminary research to confirm whether it was worth investigating. We then, through a thorough process of literature review and visualization, attached definitions of the key term in our question, defining the theoretical background of "resilience." We also engaged with practical aspects, reading reports and carrying out pre-talks with participants who could give us relevant insight. This gave way to question analysis and subsequently model building through qualitative and quantitative means. In relation to qualitative data analysis, we created an interview outline design and interviewed our target subject, collecting txt data, carrying out triangulation and the three stages of data coding, ultimately creating a relationship diagram that organized our argumentative narrative. The three stages of data coding we utilized include first-order open coding, second-order axial coding, and third-order selective coding. The last step is the survey data analysis and provides quantitative evidence to support our theory.

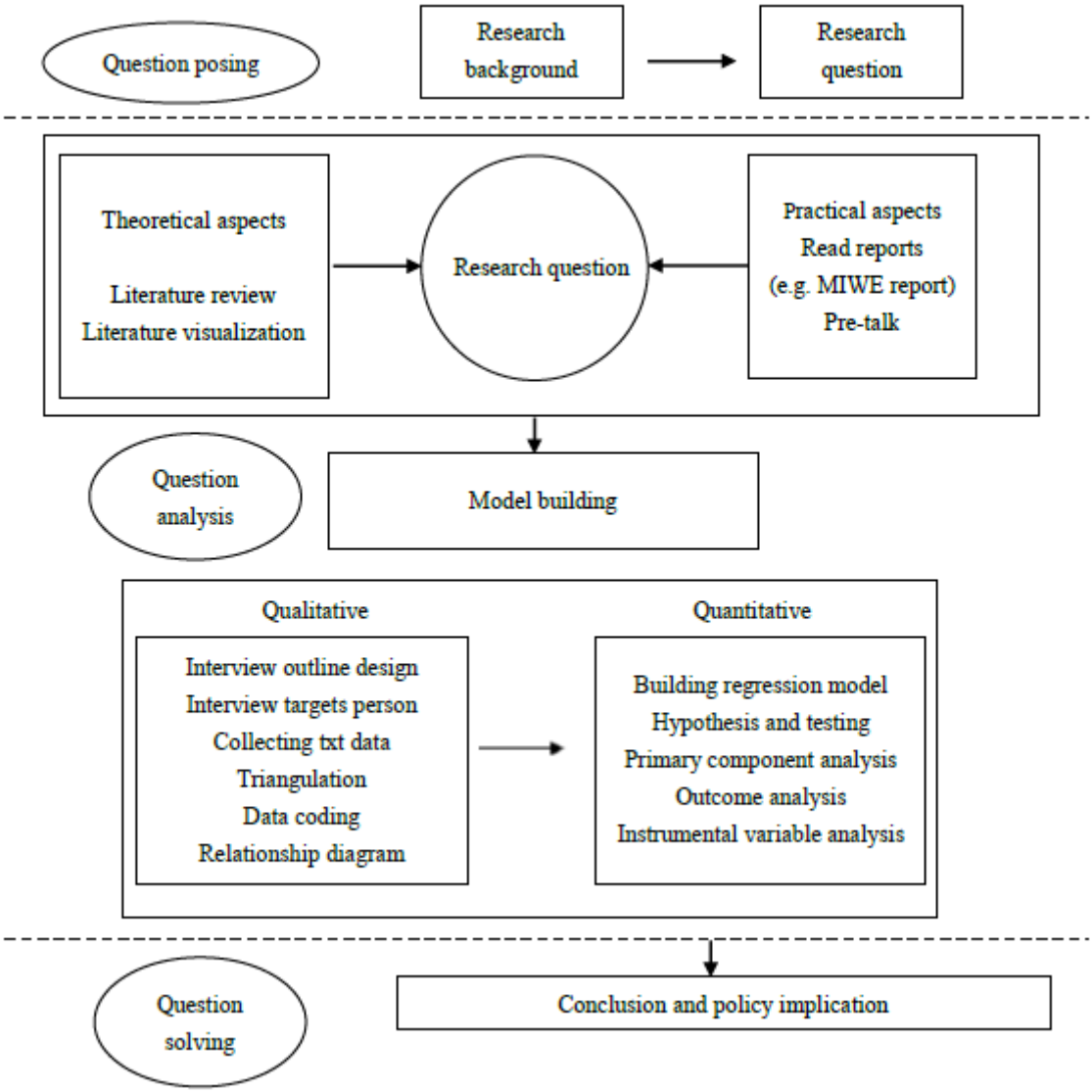

Figure A1 Research roadmap

Figure A2: Interviewee A’s material from Airbnb official WeChat page and red book

Figure A3: Interviewee B’s official Tiktok page

Figure A4: Interviewee C’s business plan

Table A: Examples of open coding

textual material	**label**	**concept**	**category**
I love to travel a lot with friends from all over the places(a1). I would like to have a place to have fun(a2) and to serve all the travelers from all over the world.	One reason for starting a business in tourist industry (friend-loving)	a1 love to travel, a2 a place for travelers	A1 friend-loving character
He is also a person who loves to travel, he loves music，playing guitars and making friends. That's why(a3) we came up with an idea to start to have a hotel.	It takes the same hobbies to start a business together	a3 spouses start business in tourist industry	A2 spouses entrepreneurship
I think conflict wouldn't be a big problem(a4) for us. They have some effect on our daily life.	The attitude toward work-life balance	a4 positive and optimistic	A3 cognition on work-life balance
whatever there's argument，there's conflict，we think about what our final goal I and then the problem can be solved (a5). Me and my husband agree that we should separate our family，work，family life and work life (a6).	How they handle work-life balance	a5, a6 agreement on work-life balance	A4 action on work-life balance
“ I think I recover faster than he does (a7). I’m quite emotional, but he is more rational and thinks about problems that are coming up (a8). I’m the person to get over it pretty fast.” We have no more discussion about work after working hours(a9).	The attitude toward their individual strengths in the partnership	a7 Appreciative and positive, a8 gender difference of conflict outcome, a9 work-life seperation	A5 outcome of work-life balance

Both parents have a something like a requirement for me that I should have a baby.			A6 entrepreneurial environment
When I was a kid parents that are always busy with their works. So my parents would like me to do my own decision。 Even when I was a teen and then I studied abroad and traveled by myself when I was 19 years old	cognition on gender stereotypes)		A7 growth environment (cognition on gender stereotypes)
“I don’t think the family and work-life conflict is a very big problem for us. We have different opinions on how to operate, but our goal with the business is the same (a10).” “We also agreed to separate our family life and work life; we have no more discussion about work after working hours (a11).”	They want the same outcome although they have different opinions in the process of reaching that outcome. They are both able to adjust her behavior and way of thinking based on the different circumstances.	A collaborative and synergistic relationship A collaborative relationship	A8 Flexible character
“If there’s a goal, you need to keep running. You can’t predict whatever tomorrow will be, so whatever bad happens, you need that persistence to get through it.”			A9 persistence
“Even if COVID-19 adds, a lot of pressure, I think that we can get through it.” (a13)	She has faith that her company will be able to survive through COVID-19	a13 Optimistic attitude	A10 cognition on covid-19 obstacles
“We came up with an idea to open a gift shop in our hotel … this shop is both online (a14)	She came up with a new digital idea for her business that	a14 Adaptation to	A11 Innovative performance

and offline, so the guests can buy products in our shop … Our hotel was closed for 3 months with no other income, so this was the only revenue we had.”	would work better in COVID-19 circumstances	COVID-19 circumstances	e.g. digitalization
“If we gave up last year, then we might not have had revenue growth.” (a15)	They had revenue growth because they persisted	a15 Business success	A12 Financial performance e.g. income/revenue
“Owners wanted to sell their hotels, but I wanted us to make our own decision independently.” (a16)	She did not want to be influenced too much by others	a16 Strong mentality	A13 Independence
“Patience is quite important in getting through COVID-19. The market got better after 2020; travelers can’t travel abroad, (a17) they can only travel domestically, and we benefitted from that.”	The existing benefits of the circumstance appeared after they were patient	a17 Faith in the business	A14 patience

Because artificial intelligence involves many secret-related materials such as patents, we did not display secondary data of D here.

Axial Coding

Resilience coding: Throughout the interview, when asked to comment on the circumstances of COVID-19, the subject always offered solutions or words of optimism after every description of struggle, revealing the lens of resilience through which A evaluates her surroundings. We never specifically asked her about her stance on resilience and persistence, two synonymous terms, and yet she offered those ideas to us without even realizing, indicating how deeply-seated the characteristic is, especially when discussing cognition on COVID-19 obstacles. Cognition on COVID-19 obstacles refers to the framework through which she evaluated said obstacles. That framework

proved to be linked to resilience as We also included patience in this category, as patience is a form of passive resilience; waiting is a form of having faith and enduring while

Performance coding: When asked about digitalization in the COVID-19 era, the participant offered examples of ideas that A adjusted to better accommodate the circumstances, showing innovative performance. They created an online gift shop where they sold local products, which not only generated revenue, but also allowed them to continue being active in the hotel space and making themselves known to customers. This innovation, for example, the online gift shop, then lead to better financial performance, providing them with a sustainable stream of revenue for the time being.

Work-life balance coding: Under the condition of being in a working relationship with her significant other, the subject gave us insight into some struggles A had, and also mentioning how she overcame it. A highlighted the strengths of herself and her partner, exhibiting resilience and optimism in resolve. The participant explained their agreement to keep family life separate from work life and other settlements in order to increase the efficacy of their work partnership and offered various examples of her ability to compromise in the face of work-life balance. As C mentioned, during the epidemic, many teachers who had been working in early childhood education were unemployed or their work was greatly affected, so they could do online education without being affected by the region. “Until now, I think what I am doing now is a new career that is more conducive to their balance of work and family.”

Appendix B: Literature Visualization

We then conducted literature statistic visualization in order to find out previous literature gaps. In gathering data on latest trend of female entrepreneurial resilience and resilience topic in COVID-19, we utilized Web of Science, a scientific citation information platform, to conduct our literature review. By searching for scholarly research articles with the key tags such as “female/women resilience”, “female/women entrepreneurs’ resilience”, “female/women entrepreneurial resilience” on the Web of Science Core Collection and filtering results to only include those published in the range of the last 5 years, we were able to create distribution diagrams on the already pre-existing data. This visualization allowed us to comprehend the different levels of concentration of research on female resilience in different areas and have an understanding of the research available for us to use.

The data condensed into visual forms allow us to clearly see the disproportionate concentrations of research in different fields. For example, in Figure B1, we see that the distribution favors psychiatry with 669 pieces of literature, however, only 255 pieces on family studies and 223 on social work which related to our research topic. Figure B2 shows the bar chart of total published paper on female resilience in last 5 years with stable increasing trend. Figure B3 displays the research field distribution of female entrepreneurs’ resilience in detail. In Figure B4, we see that women and family studies, two elements of significance in our research of women who are business partners with

their significant others, fall in at fourth-to-last and fifth-to-last. Figure B.1 to Figure B.4 are displayed as follows.

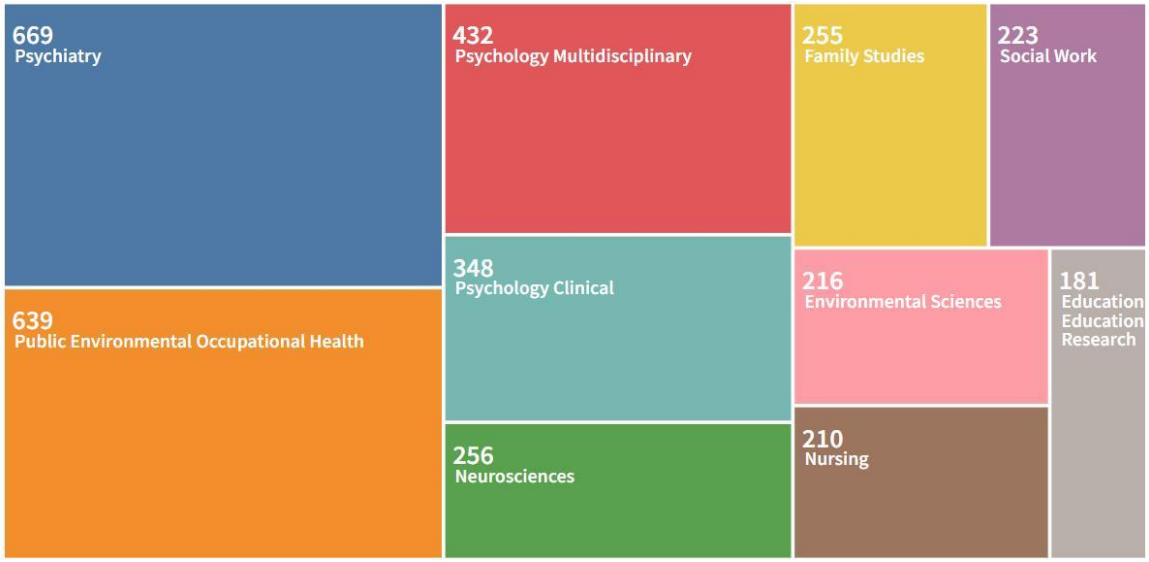

Figure B1 Research on female's resilience distribution diagram in last 5 years (topic=female resilience OR women resilience)

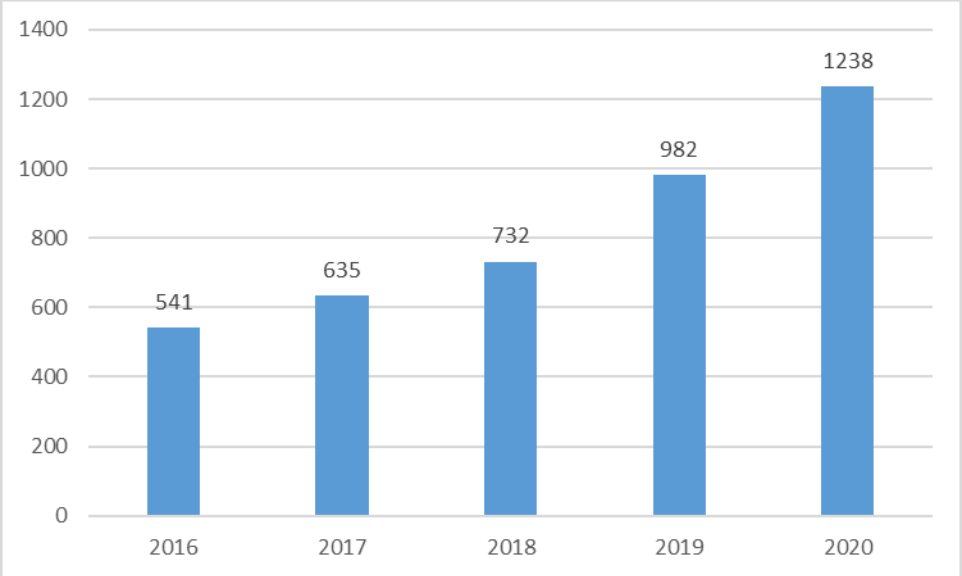

Figure B2 Bar chart of female's resilience publication in last 5 years

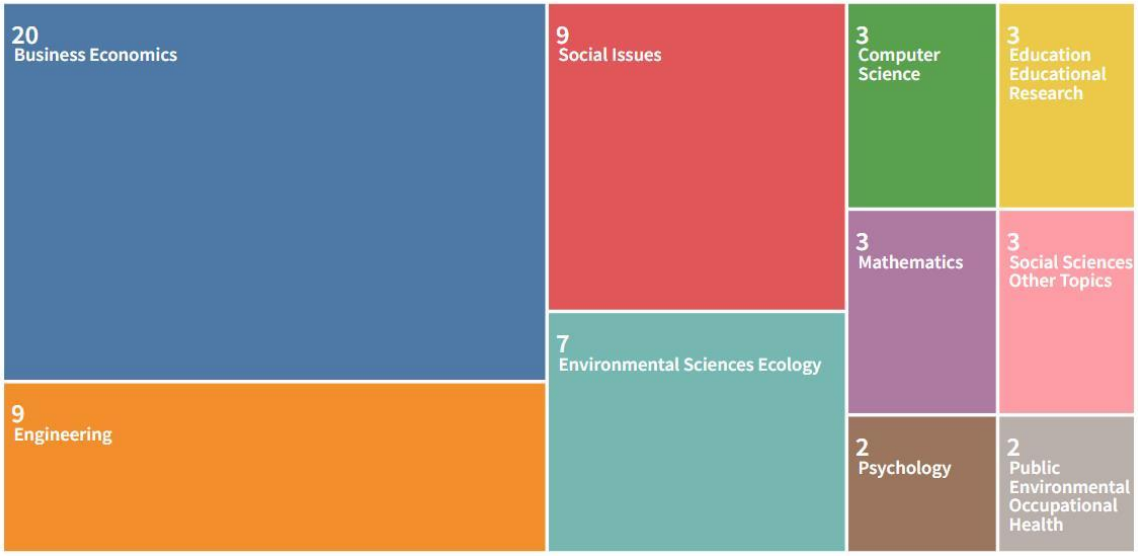

Figure B3 Research on female entrepreneurs' resilience distribution diagram in last 5 years
(topic= female entrepreneurs' resilience OR women entrepreneurs' resilience)

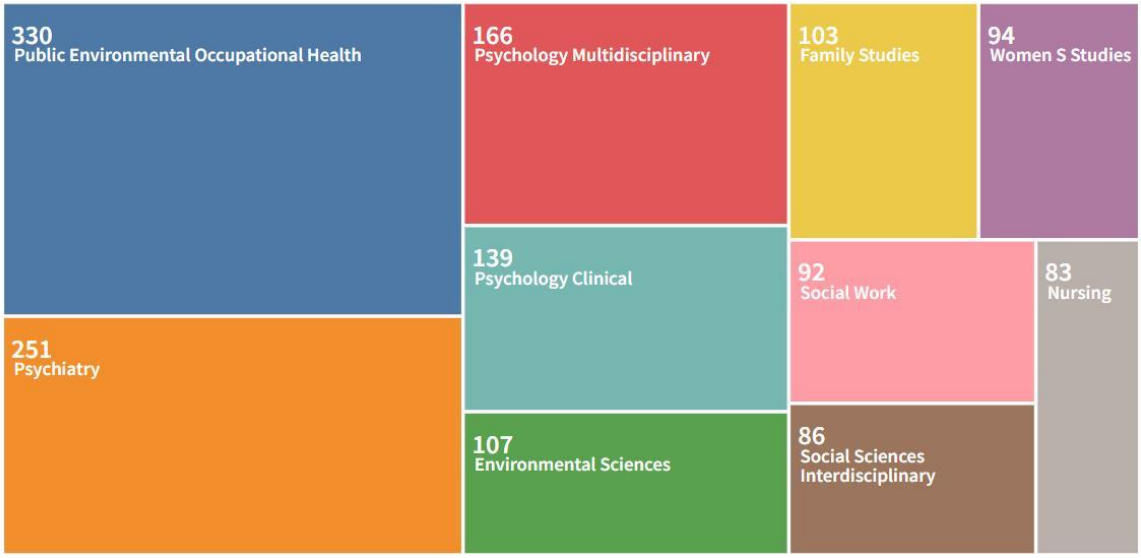

Figure B4 Research on resilience and COVID-19 distribution diagram
(topic= resilience AND COVID-19)

This gap in literary research covering female resilience in these various fields results in limitations in understanding how to strengthen the gender balance in these industries and identifying the gendered issues within them as well. And thus, these lacking numbers that depict this gap means that going forward, in order to achieve a more

thorough understanding of women in these industries and their capacity for resilience, there needs to be more research done.

Appendix C: Interview Outline

During the outbreak of covid-19, many female entrepreneurs have been suffering unprecedented crisis, some of them did not give up and changed their business strategy in order to face this pandemic. Meanwhile, they can also get rid of work-life balance dilemma during this time. Therefore, our project is aimed to investigate how and why female entrepreneurs handle this issue.

Before we conduct our interview, we will ask the permission of voice record. If this requirement is not convenient for you, feel free to let us know. After we collect our archive material, we may conduct a second interview in order to make this talk more persuasive.

Your personal information will not be used except for this academic research.

1. Please give us a brief introduction of your entrepreneurial activity.
2. Please recall your entrepreneurial process. What was your initial intention to start your business?
3. Please describe your feeling when you found you were pregnant/ got married.
4. Why you choose to start a business when you were pregnant? Did marriage/pregnancy affect your own business?
5. Do you and your husband's parents have the same expectations about your roles in the business? Does there exist gender bias?
6. What challenges did your business face during the outbreak? Have you ever thought

about giving up running your own business?

7. What traits/characters of you that have helped your entrepreneurial activity? Where do these qualities come from?
8. Do you think this trait helped you/affect you when you have to face work-life balance?
9. Do you think this trait helped you during the challenges? What are the specific aspects? (Especially entrepreneurial performance)
10. Other personal question depending on age, education, industry and so on.

Appendix D: Basic information of survey

Figure D1 to figure D6 display some other representative basic information of the survey. Among those variables, age, education level, marital situation and previous entrepreneurship experience are regarded as individual level; firm's employees and industry category are regarded as firm level.

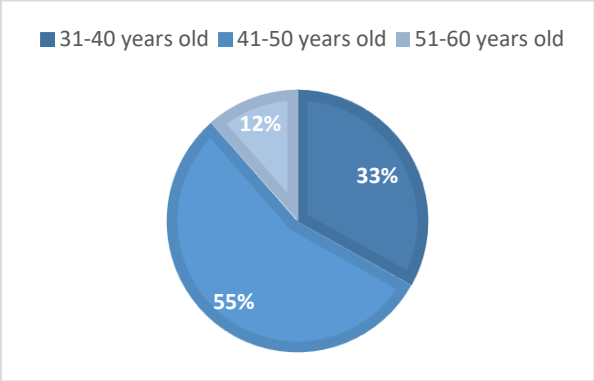

Figure D1 Age distribution of survey participants

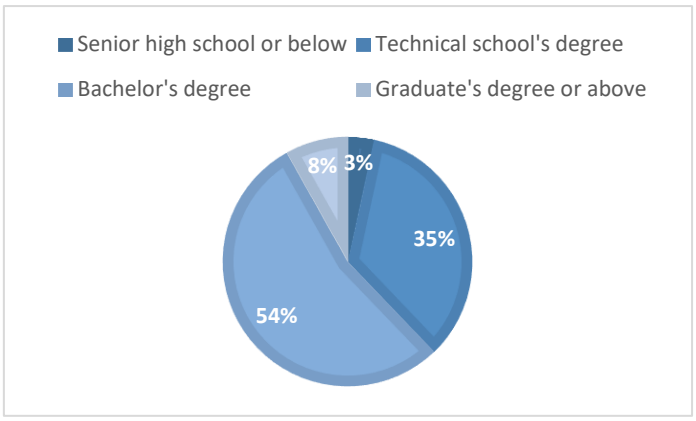

Figure D2 Education level distribution of survey participants

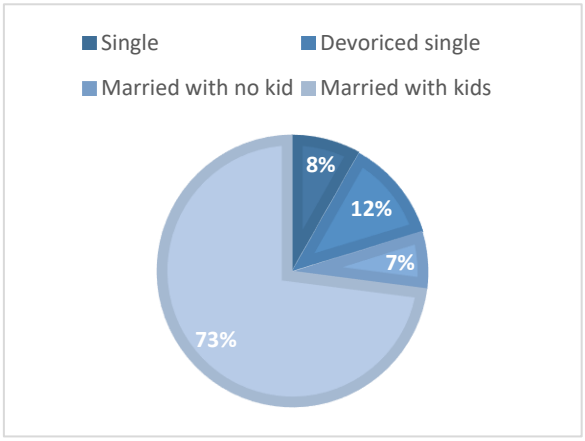

Figure D3 Marital situation distribution of survey participants

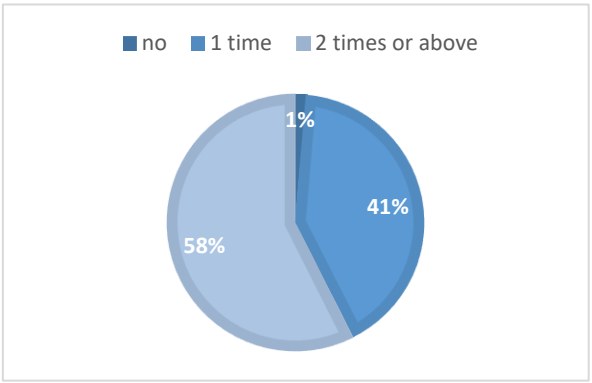

Figure D4 Previous entrepreneurship experience distribution of survey participants

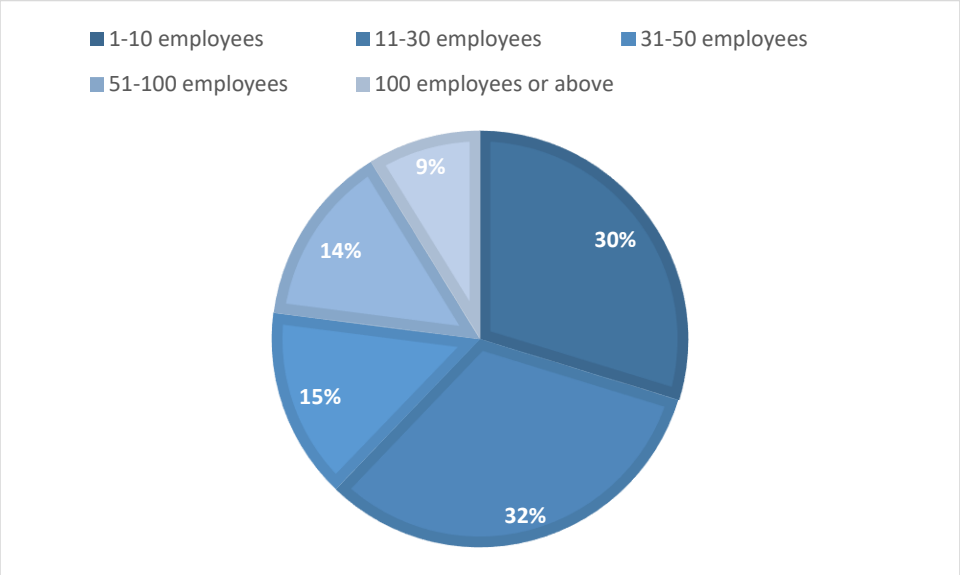

Figure D5 Employees' distribution of survey participants

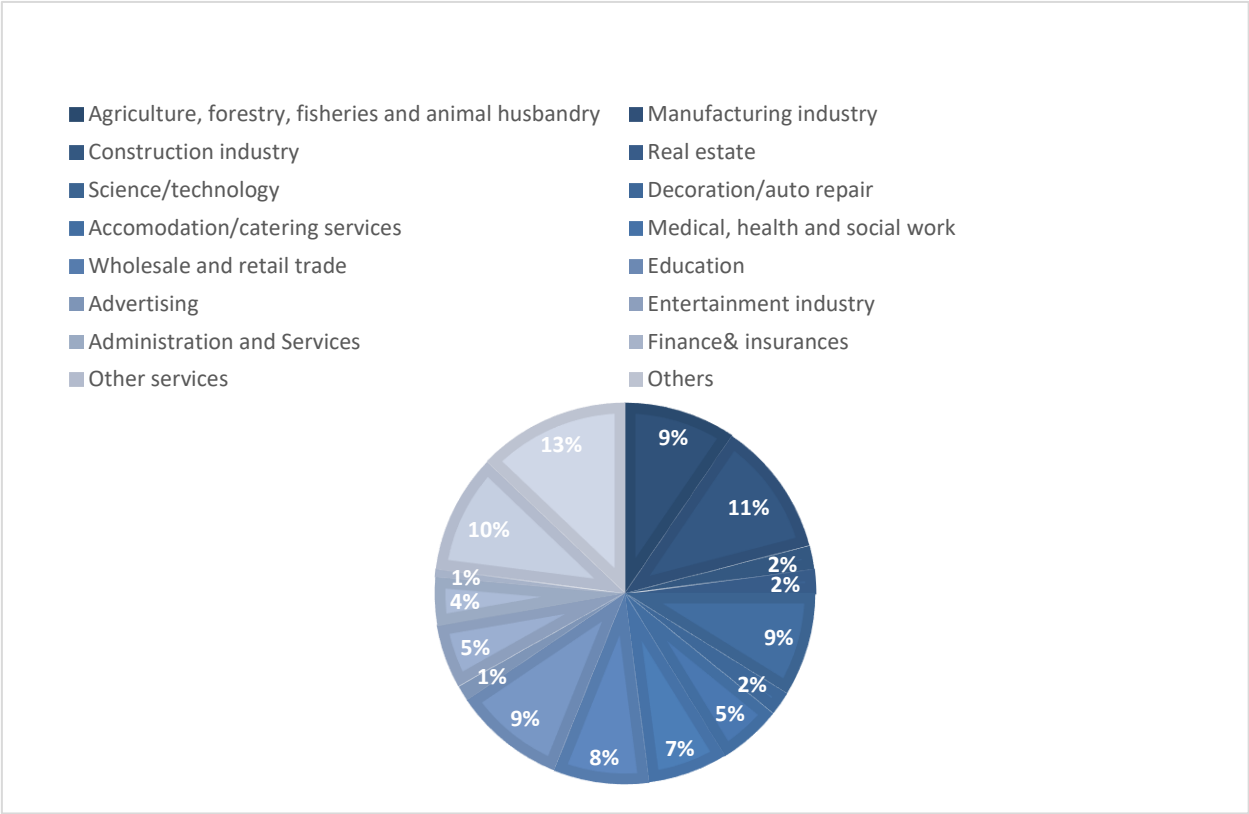

Figure D6 Firm's industry category of survey participants