



FINAL REPORT

**Research on Undercapitalization as a Contributor to Business Failure for
Women Entrepreneurs**

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Executive Summary

Undercapitalization refers to a lack of sufficient capital to conduct normal business operations and to service debts, and undercapitalized firms typically have lower sales and lower profit margins than their fully capitalized counterparts. Further, undercapitalized businesses may experience cash flow deficiencies or other capital issues, such as the usage of short-term, high-cost credit as a funding source. Differences in undercapitalization exist between men-owned and women-owned firms. Babson College concluded that if capital differences facing women entrepreneurs at startup did not exist, the economy would create an additional 6 million jobs over the next five years.¹ Undercapitalization limits enterprise growth by inhibiting business investments and capital injections,² and is a critical issue for women business owners.

Women entrepreneurs in 2015 are still held back by limited access to capital.³ Fostering a greater understanding of how and why women-owned and women-led firms are undercapitalized is a key policy concern, as reducing the incidence of undercapitalization in nascent firms benefits individual businesses and promotes overall economic growth. Understanding how capitalization decisions and funding mix affect business outcomes including survival, employment, and profitability will inform policy makers, key stakeholders, and entrepreneurs alike in developing, promoting, and applying sound capital strategies.

This study evaluates the factors that contribute to undercapitalization of nascent women-owned and women-led firms as well as the effects of undercapitalization on these firms. We focus on a large sample of U.S. companies that began operations in 2004 using annual time-series Kauffman Firm Survey confidential microdata through 2011. As part of our research design, we implemented both univariate and multivariate analysis to address three research hypotheses designed to elucidate the causes and effects of undercapitalization on women-owned and women-led nascent firms. We quantitatively tested three research hypotheses exploring the causes and effects of undercapitalization on critical business issues including survival, profitability, and employment. Key findings include:

- Both owner and firm organizational characteristics affect undercapitalization. Using three different logistic models and undercapitalization definitions, we conclude that increased owner industry experience negatively affects the propensity to be undercapitalized. Further, team ownership and having owner employees negatively affects the propensity to be undercapitalized. Finally, we find no statistical causal relationship between owner startup experience and undercapitalization. This is an interesting finding given anecdotal evidence that investors prefer seasoned and experienced entrepreneurs in assuming that entrepreneurs have learned from past endeavors. However, our quantitative results indicate that previous startup experience

¹ Geri Stengel. *Money's There if Small Businesses Know Where to Look*. Forbes. March 5, 2014.

<http://www.forbes.com/sites/geristengel/2014/03/05/moneys-there-if-small-businesses-know-where-to-look/>

² Undercapitalization. Inc.com. <http://www.inc.com/encyclopedia/undercapitalization.html>

³ Eileen Zimmerman. *Women Entrepreneurs Worldwide Still Face Big Hurdles*. Forbes. July 1, 2015.

<http://www.forbes.com/sites/eilenezimmerman/2015/07/01/women-entrepreneurs-worldwide-still-face-big-hurdles/>

does not decrease the likelihood of being undercapitalized and as such, is potentially overvalued.

- The use of high cost capital negatively affects firm survival, as hypothesized. Further, a debt-heavy capital structure (i.e., undercapitalization via the equity to liabilities definition) negatively affects survival. Other factors include owner industry experience and education, which positively affect survival, the ratio of outsider capital to total capital, which positively affects survival, and credit rating, where a risky rating negatively affects survival. As anticipated, undercapitalization negatively affects firm survival and the use of excessive high-cost capital is counterproductive. However, this work also recognizes that firm success is complex and is the result of multiple firm factors.
- Multiple factors influence profitability and employment. We found that an increased number of owner employees positively affects profitability. However, both risky credit and undercapitalization via the current ratio and equity to liabilities ratio negatively affect profitability, consistent with our research hypothesis. In terms of employment, undercapitalization via the high cost capital ratio and the current ratio negatively affects the number of firm employees. Additionally, owner industry experience, owner education, and intellectual property ownership all positively affect employment. Finally, a high outsider capital to total capital ratio negatively affects firm employment.

Reducing the incidence of undercapitalization among women entrepreneurs will require action on a variety of fronts. In this study, we demonstrate that both the capital and asset structures of a firm are critically important to remaining in business and thriving. Given the importance of owner industry experience in predicting undercapitalization, encouraging women to mine their social networks and align with experienced individuals is a potential strategy.

Not all nascent entrepreneurs are finance experts, but due to limited startup resources, these entrepreneurs must make important capital decisions for their businesses that have potential long term ramifications. While the overall amount of capital is important to business operations, the composition and use of that capital is also important. The results of this study demonstrate the damaging effects of excessive high cost capital usage among nascent entrepreneurs. Specifically, using high cost capital has negative effects on profitability, employment, and firm survival. Educating women entrepreneurs about the importance of their capital structure and sources, regardless of total amount, will decrease barriers to capital and decrease the incidence of undercapitalization.

Table of Contents

Executive Summary	i
Table of Contents.....	iii
List of Figures	iv
List of Tables	v
Acknowledgements.....	vi
1. Introduction and Background	1
2. Previous Research.....	4
3. Research Design and Methodology	7
4. Results	15
5. Conclusions	32

List of Figures

Figure 4-1 Undercapitalization of all KFS Firms – Current Ratio Definition	18
Figure 4-2 Undercapitalization of all KFS Firms – High Cost Capital Ratio Definition	19
Figure 4-3 Undercapitalization of all KFS Firms –Equity to Liabilities Ratio Definition	19
Figure 4-4 Revenue Class Distribution	21
Figure 4-5 Average Employee Count by Firm Ownership/Leadership Gender	22
Figure 4-6 Survival Statistics by Gender and Industry	23

List of Tables

Table 2-1 Start-up Capital Sources for Men and Women-owned Businesses	2
Table 3-1 Year-End Balance Sheet: Hypothetical Example	9
Table 4-1 Average Balance Sheet – Women-Owned and Women-Led Firms	15
Table 4-2 Average Balance Sheet – Non-Women-Owned and Non-Women-Led Firms	16
Table 4-3 Average Ratio Analysis by Ownership and Leadership Gender	17
Table 4-4 Revenue and Profit by Ownership and Leadership Gender, 2004 – 2011	20
Table 4-5 Logistic Regression Results – Current Ratio Undercapitalization	24
Table 4-6 Logistic Regression Results – High Cost Capital Ratio Undercapitalization	25
Table 4-7 Logistic Regression Results – Equity to Liabilities Ratio Undercapitalization	26
Table 4-8 Logistic Regression Results – Undercapitalization and Firm Survival	27
Table 4-9 Logistic Regression Results – Undercapitalization and Profitability	29
Table 4-10 Ordinary Least Squares Regression Results – Undercapitalization and Employment	30

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1. Introduction and Background

Access to capital is among women business owners' greatest challenges in growing and sustaining their businesses.⁴ Empirical research confirms that inadequate financial resources, whether through a failure to seek capital or resulting undercapitalization, increase the chance of firm failure and lost economic opportunities.⁵ Undercapitalization refers to a lack of sufficient capital to conduct normal business operations and to service debts, and undercapitalized firms have lower sales and lower profit margins than their fully capitalized counterparts. Further, undercapitalized businesses may experience cash flow deficiencies or other capital issues, such as the usage of short-term, high-cost credit as a funding source. Pervasive differences in undercapitalization exist between men-owned and women-owned firms. Babson College concluded that if capital differences facing women entrepreneurs at startup did not exist, the economy would create an additional 6 million jobs over the next five years.⁶ Undercapitalization limits enterprise growth by inhibiting business investments and capital injections,⁷ and is a critical issue for women business owners.

The 9.9 million women-owned American businesses are an engine of the recovering economy, boasting \$1.6 trillion in sales and 10 million employees.⁸ Yet, data from the 2012 Survey of Business Owners (SBO) indicate that approximately 36 percent of total firms are women-owned, and these firms account for only 4.8 percent of total revenues. One reason for the revenue disparity is that WOBs face higher barriers than non-WOBs to obtaining capital and less success in fulfilling capital needs, leading to a greater incidence of undercapitalization. Since startup and expansion capital are integral determinants of firm growth and success, one key to improving women-owned firm performance is reducing the incidence of undercapitalization.⁹ In order for women business owners to achieve higher levels of startup capital and decrease their chances of perpetual undercapitalization, researchers, policy makers, and interested stakeholders need to continue to research and understand the factors that contribute to the apparent disparities in undercapitalization for WOBs compared to non-WOBs.

The U.S. Small Business Administration (SBA) notes that the greatest challenge facing women-owned businesses is access to credit, equity, and capital.¹⁰ Both the sources and amounts of capital procured by women-owned firms differ from those of men-owned firms. Among firms that do access capital at startup, women entrepreneurs tend to rely more heavily on personal sources of capital, such as savings accounts or loans from family members, and less on external

⁴ *Women-owned Firms in the US*. NWBC. January 2012.

<http://www.nwbc.gov/sites/default/files/NWBC%20Final%20Nattative%20Report.pdf>

⁵ Susan Coleman. Alicia M. Robb. *A Rising Tide*. 2012. Stanford University Press. Stanford, California. p. 139

⁶ Geri Stengel. *Money's There if Small Businesses Know Where to Look*. Forbes. March 5, 2014.

<http://www.forbes.com/sites/geristengel/2014/03/05/moneys-there-if-small-businesses-know-where-to-look/>

⁷ *Undercapitalization*. Inc.com. <http://www.inc.com/encyclopedia/undercapitalization.html>

⁸ United States Census Bureau, 2012 Survey of Business Owners (SBO)

⁹ Margot Dorfman. *What Women-owned Firms Need Most: Access to Capital*. American Banker Magazine. October 1, 2010. http://www.americanbanker.com/magazine/120_10/what-women-owned-firms-need-most-access-to-capital-1026090-1.html

¹⁰ *Women-owned Firms in the US*. NWBC. January 2012.

<http://www.nwbc.gov/sites/default/files/NWBC%20Final%20Nattative%20Report.pdf>

capital sources, such as business loans from banks; this reflects a disparity between MOBs (men-owned businesses) and WOBs.¹¹ Research shows that women tend to fund other women, where a relationship exists between the number of women investors and the number of women entrepreneurs funded by those investors.¹² These disparities in capital access as well as investor relationships may lead to undercapitalization and reliance on more costly capital sources, such as short-term credit.

Table 2-1 shows the various capital sources that women and men use as a percentage of total business owners. Owners can select more than one category such that the totals in the men-owned and women-owned columns do not add to 100 percent. For example, Business A may use both personal/family savings and grants to fund its business and as such, is included in both totals. Interestingly, women-owned businesses were more likely to use credit cards than men-owned businesses in financing their business. In addition, over 30 percent of WOBs indicated “none needed” on the Survey of Business Owners which raises questions about whether these businesses encountered a lack of access to capital, underestimated the level of capital required to launch and sustain a business, or alternatively, started a business with adequate capital or one that did not require any capital.

Table 2-1
Start-up Capital Sources for Men and Women-owned Businesses

Start-up Capital Source	Men-Owned	Women-Owned
Personal/Family Savings	62.1%	55.5%
Personal/Family Home Equity Loan	5.1%	4.0%
Personal/Business Credit Cards	9.8%	10.9%
Business Loan from Federal, State, or Local Government	0.6%	0.4%
Government-Guaranteed Loan from Bank or Financial Institution	0.6%	0.5%
Business Loan from Bank or Financial Institution	11.4%	5.5%
Business Loan/Investment from Family/Friends	2.7%	1.8%
Investment by Venture Capitalist	0.4%	0.1%
Grants	0.1%	0.3%
None Needed	19.5%	30.3%

Source: 2007 US Census Survey of Business Owners, American FactFinder

Overall, women entrepreneurs’ access to capital is limited in whether or not it is used and the amount used.¹³ Reducing undercapitalization of women-owned firms by increasing women’s access to capital for the purposes of both starting and expanding their businesses is an important factor for social welfare, increasing diversity,¹⁴ and diversifying the recovering economy.

¹¹ NWBC (2012), op. cit.

¹² Vivian Giang. *Why the Few Women Venture Capitalists Often Give Up*. Fast Company. <http://www.fastcompany.com/3041862/strong-female-lead/why-the-few-women-venture-capitalists-often-give-up>; Davey Alba. *Woman-led VC Firms are on the Rise – and Raising Lots of Cash*. Wired. May 14, 2015. <http://www.wired.com/2015/05/aspect-ventures-150m-fund/>

¹³ Salzman et al. (2006), op. cit.

¹⁴ Eileen Zimmerman. *Women Entrepreneurs Worldwide Still Face Big Hurdles*. Forbes. July 1, 2015. <http://www.forbes.com/sites/eileenzimmerman/2015/07/01/women-entrepreneurs-worldwide-still-face-big-hurdles/>

Understanding the disparities and effects of undercapitalization on women-owned firms is a key policy concern. Reducing the incidence of undercapitalization via greater access to capital will benefit women-owned businesses as well as foster greater economic growth overall.¹⁵

This study evaluates the factors that contribute to undercapitalization of nascent women-owned and women-led firms as well as the effects of undercapitalization on these firms. We use Kauffman Firm Survey confidential microdata to perform a series of univariate and multivariate analyses to explore how owner qualifications affect undercapitalization with an eye towards industry experience and team ownership. We also explore the effect of undercapitalization on firm employment, revenue, and survival for the 2004 to 2011 period. Section 2 reviews the literature and summarizes relevant prior research findings on access to capital and undercapitalization. Section 3 details our research design, dataset, and methodology and Section 4 contains our results. Section 5 outlines our conclusions and presents avenues for future research.

¹⁵ Ibid.

2. Previous Research

Dr. Susan Coleman and Dr. Alicia Robb¹⁶ found that in addition to raising less start-up capital than men, women raise substantially lower amounts of incremental debt and equity in the first three years of operation, perpetuating undercapitalization throughout the business lifecycle. Additionally, women were significantly more likely than men to rely on personal debt as opposed to external debt (i.e. bank loans) or equity for both start-up and expansion capital. Robb and Coleman noted that women-owned firms are overall more likely to fail and that those women-owned firms that do succeed are more likely to use both personal and external sources of capital. Access to business loans is a critical issue for women-owned businesses, particularly given that women entrepreneurs' fear of credit and loan denial often prevents them from applying for credit entirely. In an effort to increase access to business loans by streamlining the loan application process, in 2014, the Small Business Administration (SBA) announced an initiative to eliminate the cash flow and debt-service coverage of loans worth less than \$350,000. This initiative attempts to address undercapitalization and access to capital challenges facing American small business owners by incentivizing banks to underwrite more small business loans while substantially reducing the time required to do so.¹⁷ The program represents a positive step towards reducing the prevalence of undercapitalization among women-owned firms, or at least increasing flexibility to address undercapitalization and access to capital challenges.

Women-owned businesses differ from men-owned businesses in financial and operational measures: only 3 percent of WOBs had receipts over \$1 million, compared to 6 percent of MOBs.¹⁸ Further, women-owned businesses tend to be smaller and have slower growth than male-owned businesses,¹⁹ generating different returns on their initial and expansion capital investments.²⁰ Given past research on the topic, the level of start-up capital is a strong predictor of business success. Fairlie and Robb used US Census Bureau Characteristics of Business Owners (CBO) confidential microdata from 1992-1996 to examine gender differences in business performance. They found that women-owned firms had lower survival rates, profits, employment, and sales than their men-owned counterparts.²¹

Firms with limited to no access to external capital may be unable to execute an effective investment policy and as a result, may suffer depressed growth or fail. Rahaman found that

¹⁶ Susan Coleman, Alicia Robb. *A Comparison of New Firm Financing by Gender: Evidence from the Kauffman Firm Survey Data*. Small Business Economics. 2009.

¹⁷ *SBA to Ease Key Loan Requirements: Women Business Owners Stand to Gain*. <http://www.nwbc.gov/news/sba-ease-key-loan-requirements-women-business-owners-stand-gain>

¹⁸ *Helping Women Business Owners Access Capital*. US Small Business Administration. December 23, 2012.

<http://smallbiztrends.com/2012/12/helping-women-business-owners-access-capital-two-essential-resources.html>

¹⁹ Hal Salzman, et. al. *Capital Access for Women – Profile and Analysis of U.S. Best Practice Programs*. July 2006. Kauffman Foundation, The Urban Institute. <http://www.kauffman.org/uploadedfiles/CapAccessWomen110606.pdf>.

²⁰ Mary-Lane Kamberg. *Business Owners: Are You Getting Your Share of Investment Capital?* Women in Business. September/October 2002.

²¹ Robert W. Fairlie, Alicia M. Robb. *Gender Differences in Business Performance: Evidence from the Characteristics of Business Owners Survey*. Small Business Economics. May 2009.

financial structure and its connection to firm growth is statistically significant.²² Raising sufficient capital to start and grow a firm is critically important given that unsuccessful capital acquisition can slow growth and depress employment. In 2007, 54.5 percent of WOBs did not make a capital investment. Of those 45.5 percent that made an investment, 59 percent used personal/family savings and 25.4 percent used personal/business credit cards, a high-cost financing option. The trend towards personal sources of capital reinforces the pertinence and urgency of understanding why women-owned firms are undercapitalized as compared to their male-owned counterparts.²³

A January 2012 study terms women's reduced access to capital as the "second glass ceiling," specifically defining the barrier as a gender bias obstructing the flow of start-up and expansion capital to women-owned firms.²⁴ Bosse and Taylor hypothesize that the second glass ceiling prevents women-owned firms from reaching their full entrepreneurial potential through a systemic financing disadvantage. Specifically, the authors offer the hypothesis that the pervasive stereotype that women are incapable and ill-qualified to lead growing businesses leads to the allocation of greater capital resources to male entrepreneurs, as the perceived return on investment from male-led ventures is greater. Eliminating the second glass ceiling and its causes is important to women-owned businesses as well as the economy at large. Lack of access to capital and subsequent undercapitalization prevents women entrepreneurs from realizing the full potential of their businesses and delays expansion and growth.²⁵

In a 2014 report for the National Women's Business Council, Robb and Coleman found large gender gaps in capital access among nascent entrepreneurs. The research results indicate that high-growth potential firms founded by men use about twice as much capital, on average, as similar firms founded by women. Women entrepreneurs used significantly less outsider equity than their male counterparts, even when controlling for industry, owner education and experience, credit scores, and size. Further, women had more unmet capital needs due to a decreased propensity to apply for credit when needed due to fear of loan application denial. The research findings also contrasted high-growth women-owned firms with non-high-growth women-owned firms. High-growth entrepreneurs had more experience, more education, and secured significantly more capital than their non-high-growth counterparts, producing a funding gap and highlighting differences in firms at multiple growth levels within the American economy.²⁶

Women-owned businesses tend to use less start-up capital, delay expansion, and fail to foster business growth at a rate commensurate with that of male-owned businesses.²⁷ Although

²² Mohammad M. Rahaman. *Access to Financing and Firm Growth*. Journal of Banking & Finance. September 15, 2010.

²³ Ibid.

²⁴ Bosse and Taylor (2012), op. cit.

²⁵ Ibid.

²⁶ Susan Coleman. Alicia Robb. *Access to Capital by High-Growth Women-Owned Businesses*. NWBC under contract SBAHQ-13-A-0A63. April 2014.

[https://www.nwbc.gov/sites/default/files/Access%20to%20Capital%20by%20High%20Growth%20Women-Owned%20Businesses%20\(Robb\)%20-%20Final%20Draft.pdf](https://www.nwbc.gov/sites/default/files/Access%20to%20Capital%20by%20High%20Growth%20Women-Owned%20Businesses%20(Robb)%20-%20Final%20Draft.pdf)

²⁷ NWBC (2012), op. cit.

this may be due to a variety of factors requiring analysis and consideration, women entrepreneurs' conservatism in predicting the capital required to run their businesses may be at play. Insufficient capital can restrict hiring of key employees necessary for growth.²⁸ According to a 2012 NWBC study, the amount of capital required is related to the number of firm employees.²⁹ As such, depressed access to capital and subsequent undercapitalization can stunt a business' growth,³⁰ and have far-reaching effects on the American economy.

²⁸ Coleman and Robb (2012), op. cit. p. 147.

²⁹ NWBC (2012), op. cit.

³⁰ Ibid.

3. Research Design and Methodology

Data Source – Kauffman Firm Survey (KFS)

The Ewing Marion Kauffman Foundation sponsored a panel study of businesses formed in 2004 and tracked these same businesses over a series of seven annual follow-up surveys. As a result, the Kauffman Firm Survey confidential microdata encompass eight years (2004-2011) of data on the nature of business formation, the characteristics of strategy, offerings, and employment patterns, the financial and organizational arrangements of these businesses, and the characteristics of business owners and operators.³¹ As noted by the Kauffman Foundation’s Dr. Robb, the sample represents a cohort of firms that began in 2004 and the data are not representative of all startups or all businesses in the United States.³² Nonetheless, the KFS represents a robust and valuable source to analytically assess startup and time-series data on firm formation. The baseline (2004) sample included 4,928 businesses, and by the seventh follow-up, the survey included 2,966 eligible respondents and 2,007 “completes.”³³ This research report uses the KFS confidential microdata, which allow us to observe critical attributes at the firm level.

Key Data Definitions

Our research design involves analyzing both women-owned (WOBs) and women-led businesses (WLBs) and we created a series of variables designed to capture whether a business in the KFS was women-owned or women-led. With respect to the WOB classification, the KFS data contain information on the gender of firm owners, as well as the equity percentage held by each owner in the startup year (2004) and subsequent years (2005-2011). Using these data, we define a women-owned business as a business where women collectively owned more than fifty percent of the total equity of the business.³⁴ Businesses that are not more than 50 percent owned by women are non-women-owned businesses, including businesses that are 50-50 owned by men and women.

In addition to examining women-owned businesses, our research objectives include exploration of undercapitalization of women-led businesses. In theory, WLBs can be firms that are women-owned or non-women-owned, but include an element of female leadership. The inherent challenge is quantifying the level of female leadership within a firm sufficient to classify that firm as a WLB, particularly given limited information or data and varying

³¹ David DesRoches, et al. *Kauffman Firm Survey (KFS) Seventh Follow-Up Methodology Report*. June 28, 2013. Available at http://papers.ssrn.com/so13/papers.cfm?abstract_id=2286725

³² Robb (2013) p. 8

³³ DesRoches (2013) p. 20. The final sample size of 2,007 corresponds to obtaining complete information from eligible recipients. The authors describe in detail the process through which original KFS participants either went out of business or hand unknown eligibility, including quantitatively assessing weighted and unweighted response rates for the seventh follow-up survey.

³⁴ For instance, consider a firm with two female owners with equity shares of 30 percent each and 1 male owner with a 40 percent equity share. Although the male owner has the greatest single equity stake in the business, the female equity ownership totals 60 percent. As a result, since the female ownership total is greater than 50 percent, we classify the business as women-owned.

definitions in the literature. Although the KFS is a robust dataset, there are challenges in assessing the role that women owners play in the leadership of each company. The KFS does not provide a transparent view of which businesses have women in leadership positions and the extent to which those leaders might have primary responsibility for or significant influence in making business decisions. For this research, we defined women-led businesses (WLBs) as businesses in which women-owners worked more than 30 percent of the total hours worked by all owners.³⁵ We recognize the limitations inherent in our definition, given that the KFS does not provide information on owner job descriptions. Nevertheless, we believe the use of the 30 percent “hours worked” threshold provides an initial baseline for defining WLBs. In addition, we believe defining and examining the appropriate definition of a WLB is a relevant topic for future research.

In order to evaluate whether a firm was undercapitalized, we constructed a year-end balance sheet for each firm that reported to the KFS in a given survey year. This facilitated the construction of a rolling capital structure that illustrated the capital mix at annual points in time throughout the survey period. Developing a rolling capital structure and time-series year-end balance sheet for each firm was critical to this study, given that we investigate undercapitalization through several financial lenses. We combined different sources of capital into several categories to calculate annual capital balances for each surviving firm in the KFS. This allowed us to explore the different debt and equity investments employed by WOBs and WLBs.

We adopt the KFS equity definition as “money received in return for some portion of ownership.”³⁶ Sources of equity may include venture capital, family members, and other companies who gain an ownership share of a firm in exchange for financing. We define debt capital as funding that is required to be paid back and which the debtor does not earn or acquire an ownership share of the firm. Sources of debt include personal loans, credit cards, and government loans. We define high cost capital as credit card and personal loan debt not from family/friends or a bank. The total financial capital is the sum of different capital categories, drawn from analysis of the KFS data. Similar to previously published studies,³⁷ we split financial capital into the following categories:

- Owner equity: equity injected by either the primary or secondary owners.
- Owner debt: debt injected into the business that is secured by an owner, not the business.
- Insider equity: equity injected by friends, family, and acquaintances.
- Insider debt: debt obtained through friends, family, and acquaintances, such as a personal loan.

³⁵ We arrived at the 30 percent hours worked leadership threshold after meetings with the NWBC in 2014. We felt that a woman who worked 30 percent of owner hours would have a substantial role in ongoing business operations conducive to leadership. We performed multiple sensitivity analyses at the 10, 20, 30, 40, 50, 60, 70, and 80 percent thresholds.

³⁶ For more information, please see http://www.mathematica-mpr.com/~media/publications/PDFs/labor/KFS_2ndfollowup_questionnaire.pdf

³⁷ Alicia Robb. David Robinson. *The Capital Structure Decisions of New Firms*. Review of Financial Studies, Vol. 1 No. 1. 2012.

- Outsider equity: equity obtained from third-party, unrelated sources such as venture capitalists and angel investors.
- Outsider debt: debt obtained from third-party, unrelated sources such as banks.

The sum of the equity and debt categories represents the total financial capital for a firm at a point in time.

After defining and categorizing capital sources, we constructed a year-end balance sheet for each firm. The balance sheet details firm liabilities and equities at the end of the year, as reported within the KFS. We classified different asset, liability, current, and long-term categories consistent with general accounting methods. Assets represent the total value of items the firm owns, such as inventory, buildings, or equipment. Liabilities include a company’s legal debts and obligations arising during the normal course of business and include business loans, long-term leases, and accounts payable. Further, we split assets and liabilities into current and long-term categories. Current assets are those expected to be converted to cash within one year and current liabilities are those due within one year. All other assets and liabilities are classified as long-term. Table 3-1 contains a hypothetical example of a year-end balance sheet for a single business.

**Table 3-1
Year-End Balance Sheet: Hypothetical Example**

	Year 1	Year 2	Year 3
Current Assets	\$100	\$110	\$75
Long-Term Assets	\$150	\$150	\$200
Total Assets	\$250	\$260	\$275
Current Liabilities	\$25	\$50	\$35
Long-Term Liabilities	\$130	\$100	\$95
Total Liabilities	\$155	\$150	\$130
Equity	\$95	\$110	\$145

We developed three definitions of undercapitalization for use in our proposed analytical models. Each definition represents a binary variable, where a value of 1 is assigned if the business is undercapitalized by the particular measure and equal to 0 if the business is not undercapitalized by the particular measure. The three different measures are:

- Current Ratio: firms are classified as undercapitalized in terms of their current ratio if the firm current ratio is less than 1 for a given year.³⁸ Generally, undercapitalized firms tend to have low current ratios. The current ratio examines liquidity and measures a firm’s ability to meet its short-term capital obligations. As such, a low current ratio indicates that a firm is in financial distress, a characteristic of undercapitalization.

³⁸ The current ratio is defined as current assets / current liabilities and is a measure of short-term liquidity.

- High Cost Capital Ratio: firms are classified as undercapitalized in terms of their high cost capital ratio if the ratio of high cost capital to total capital is greater than 20 percent for a given year.³⁹
- Equity to Liabilities Ratio: firms are classified as undercapitalized in terms of their equity/liabilities ratio if the ratio is less than one. This indicates that a firm's debt exceeds its equity.

In any given survey year, a particular firm in the KFS may be undercapitalized by zero, one, two, or all three measures described above depending on the capital structure and liquidity status at that given point in time. The research design employs multiple multivariate regression models to test three hypotheses discussed below. We created several indicator and continuous variables for use in hypothesis testing. Descriptions of each are included below:

- Number of owner employees: continuous variable equal to the number of owners who are also paid employees of the business. Used as a proxy for owner involvement.
- Average owner industry experience: continuous variable equal to the average owner industry experience in years.
- Previous startup experience: binary variable equal to one if the owners had previous startup experience and zero if the owners did not have previous startup experience.
- Average owner education: continuous variable equal to the average owner education level.
- Average owner age: continuous variable equal to the average age of the owners, in years.
- Risky credit: binary variable equal to one if the business had a risky D&B credit rating and equal to zero if the business did not have a risky D&B credit rating.
- WOB/WLB: binary variable equal to one if the business is women-owned or women-led and equal to zero if the business is not women-owned or women-led.
- Service: binary variable equal to one if the business provides a service and equal to zero if the business provides a product.
- High-tech: binary variable equal to one if the business operates in a high-tech industry and equal to zero if the business does not operate in a high-tech industry, as defined by the KFS.

³⁹ We selected 20 percent after performing several sensitivity analyses and consulting the literature. We found that ratios of 10-30 percent yielded approximately the same number of undercapitalized firms.

- Intellectual property (IP) ownership: binary variable that is equal to one if the firm owns trademarks, patents, or copyrights and zero if the firm owns no intellectual property.
- Outsider capital to total capital ratio: continuous variable equal to the ratio of outsider capital to total capital.
- Team-owned: binary variable equal to one if the business has more than one owner and equal to zero if the business has only one owner.

Hypotheses and Models

We propose three different hypotheses to test the relationship between undercapitalization, firm characteristics and firm failure for WOBs and WLBs. First, we examine the connection between undercapitalization and previous industry experience, startup experience, and owner involvement in business operations. Specifically, are firms whose owners lack industry and startup experience and whose owners are less involved in the business' everyday operations more likely to be undercapitalized? Second, we focus on the likelihood of failure among women-owned and women-led businesses that rely on large amounts of high-cost capital sources. Does a reliance on high-cost capital sources translate to high failure rates for women entrepreneurs? Third, we explore the connection between undercapitalization of women-owned firms and firm profitability and employment. That is, are undercapitalized firms less likely to be profitable and foster employment growth?

Our first hypothesis involves examining owner characteristics and involvement in firm operations as they contribute to undercapitalization. Given the networking connections and social capital gained through previous startup and industry experience, we anticipate that businesses whose owners are informed, experienced, and involved are less likely to be undercapitalized. Not only do multiple owners allow for multiple sources of internal equity, but they could also provide access to networks for outside financing (either equity or debt), which may only be accessible to those owners with industry experience. Further, businesses in which owners are also employees generally require less up-front capital than businesses that require many employees,⁴⁰ which may reduce the incidence of undercapitalization for these firms. We hypothesize that firms whose owners are first-time entrepreneurs are more likely to encounter difficulty in obtaining capital or to underestimate the capital needs of their businesses. Our first research hypothesis is:

H1: Women-owned and women-led firms whose owners have previous industry experience, previous startup experience, and are directly involved in the everyday operations of the business are less likely to be undercapitalized.

To test hypothesis 1, we use a logit model, where the dependent variable represents whether or not a firm is undercapitalized. This model allows us to empirically determine the contributing factors to firm undercapitalization with a focus on owner experience and

⁴⁰ Undercapitalization. Inc.com. <http://www.inc.com/encyclopedia/undercapitalization.html>

involvement. Specifically, are firms whose owners are serial entrepreneurs less likely to be undercapitalized? Does prior industry experience affect undercapitalization? We used the owner characteristic variables contained in the KFS confidential microdata to test this hypothesis. Supporting our multivariate analysis of hypothesis one, we performed a series of univariate analyses detailing the characteristics of firms that closed and were undercapitalized versus those that closed and were not undercapitalized. Further items include examining the frequency of closure of undercapitalized firms by owner gender, understanding the usage of outsider equity and outsider capital, changes in capital structure over time, and the use of high-cost capital, such as credit cards.

In our second hypothesis, we analyzed failure rates and the causal link to financing decisions, specifically increased reliance on high-cost capital sources by undercapitalized women-owned firms. When interpreting these results, it is important to note that a multitude of variables influence firm failure or success and that undercapitalization does not guarantee business failure. As shown in the literature review, women-owned firms tend to employ different financing mixes than their male-owned counterparts and are more likely to be undercapitalized at startup and during the subsequent operating years. Further, undercapitalized firms are less likely to be prepared for unexpected expenses as part of the normal business cycle.⁴¹ In the second hypothesis, we seek to understand whether women-owned business failure rates are attributable, at least in part, to the financing mix these firms employ, with a particular emphasis on high-cost capital sources and their contribution to failure of undercapitalized businesses. We propose the following hypothesis:

H2: Undercapitalized women-owned businesses that rely on a greater proportion of high-cost capital sources, such as credit cards, are more likely to fail.

To test our second hypothesis, we use a logit model, where we define our dependent variable as a binary variable indicating business operating status. We constructed a rolling capital structure and balance sheet to capture the possibility that undercapitalization or lack of additional capital lead to firm closure. Understanding the definition of “failure” in the context of the available data as well as the anticipated outcomes provides context to our empirical results. In the context of the KFS, we define a failed business as a one that indicated that it was no longer operating.

Testing the second hypothesis allows us to compare failure rates from women-owned and women-led versus non-women-owned and women-led businesses. In addition, testing this research hypothesis requires us to consider that there are a number of different reasons that might indicate firm failure. As a result, we are cognizant throughout this report of controlling for potential industry or external factors that might influence failure, besides undercapitalization and related capital financing decisions to the extent possible. To do so, we include a high-tech industry indicator variable in all models, recognizing that firms in high-tech industries often operate under different growth and financial circumstances than their non-tech counterparts. In addition, we ran our models on several industry subsets, where sample sizes allowed. In order to

⁴¹ Ibid.

understand the differences in undercapitalized and fully capitalized firms, we examined and compared the capital and financial composition of both firm types, including an analysis of debt and equity as well as the prevalence of outsider sources of capital.

The third research area includes analysis of the factors driving profitability and employment growth in women-owned and women-led firms with an emphasis on undercapitalization as a driving factor in low or no employment and profitability. As a component of exploring hypothesis three, we performed a series of univariate analyses designed to compare women-owned or women-led and non-women-owned and non-women-led undercapitalized firms. Specifically, we sought to explore what differences exist in undercapitalized firms that remained in business versus those that filed for bankruptcy or ceased operations via another mechanism. As such, the examination of the factors differentiating failed and operating undercapitalized firms in this study is germane. From a multivariate perspective, we explored the driving factors in women-owned and women-led firm employment and profitability, with a particular focus on the role of undercapitalization. We propose our third hypothesis:

H3: Undercapitalization of women-owned and women-led firms is a driving factor in firm profitability and employment. That is, firms that are undercapitalized are less likely to be profitable and foster employment growth.

We tested hypothesis three using both ordinary least squares and logit regressions. We created a dependent variable indicating whether or not a firm was profitable, which we used to test hypothesis three with a logistic regression. To test the employment component of hypothesis three, we created a dependent variable comprising the total number of paid employees, including paid owner employees.

Our analyses rely on firm-level data for those firms that reported data to the KFS in a given year.⁴² As a result, the undercapitalization status, annual balance sheet, and annual capitalization statistics reflect only those companies that have “survived” or “re-emerged” for a given year.⁴³ We tested our hypotheses using univariate analyses as well as multivariate logistic regression (logit) and ordinary least squares (OLS) regression modes, which follow the general form:

$$\text{Characteristic} = \alpha + \beta(\text{firm characteristics}) + \gamma(\text{owner characteristics}) + \text{industry controls} + \delta$$

The probability of a characteristic or outcome (such as failure) in year t is modeled as a function of financing sources, industry controls, firm size, and owner characteristics, such as startup experience and gender. In our multivariate models, each year is run separately to ascertain changes in parameters being tested on a yearly basis in a longitudinal manner, where applicable.

⁴² As part of our research design, we analyzed the distributions of different variables and limited extreme values in the statistical data to reduce the effect of outliers.

⁴³ We note that in some cases, a firm reports data throughout the survey time period, but not necessarily in consecutive years. These cases represent firms that are not necessarily “out of business,” but instead are non-responsive in certain years.

To control for industry effects to the best extent possible within the dataset, we include a high-tech industry indicator variable in all models, recognizing that firms in high-tech industries often operate under different growth and financial circumstances than their non-tech counterparts. In addition, we ran our models on several industry subsets, where sample sizes allowed.

4. Results

Univariate Results

Table 4-1 shows the year-end balance sheet for all women-owned and women-led surviving firms in the KFS. As shown, from 2004 to 2011, women more than doubled their total assets, indicating that either (a) those businesses that survived had greater asset levels at startup than their failed counterparts or (b) throughout the early part of the survey period, women increased the asset base for their businesses. We also note that women-owned and women-led businesses experienced low to no asset growth during the recession. An interesting trend is the decline from 2008 to 2009 in current assets, followed by a similar decline in 2009, 2010, and 2010 in long-term assets.

Table 4-1⁴⁴
Average Balance Sheet – Women-Owned and Women-Led Firms

	WOB/WLB Only							
	2004	2005	2006	2007	2008	2009	2010	2011
Current Assets	\$37,197	\$ 58,531	\$ 63,566	\$ 76,920	\$ 86,433	\$ 80,927	\$ 84,968	\$ 88,656
Long-Term Assets	\$49,701	\$ 72,063	\$ 93,518	\$ 92,219	\$ 94,091	\$ 99,706	\$ 97,192	\$ 95,816
Total Assets	\$86,898	\$130,594	\$157,084	\$169,139	\$180,524	\$180,633	\$182,160	\$184,472
Current Liabilities	\$14,450	\$ 22,094	\$ 29,873	\$ 28,512	\$ 38,299	\$ 42,750	\$ 44,337	\$ 38,948
Long-Term Liabilities	\$37,510	\$ 23,493	\$ 22,380	\$ 26,344	\$ 21,514	\$ 14,393	\$ 19,338	\$ 13,201
Total Liabilities	\$51,960	\$ 45,587	\$ 52,253	\$ 54,856	\$ 59,813	\$ 57,143	\$ 63,675	\$ 52,149
Imputed Equity	\$34,938	\$ 85,007	\$104,831	\$114,283	\$120,711	\$123,490	\$118,485	\$132,323
Profit/Loss	\$(3,574)	\$ 10,361	\$ 24,438	\$ 20,339	\$ 16,901	\$ 21,455	\$ 29,782	\$ 42,711
Sample Size	1,513	1,273	1,083	921	813	737	658	624

In line with the literature discussing the risk-averse nature of women entrepreneurs, average total assets substantially exceeded total liabilities from 2004 to 2011. Further, surviving women-owned and women-led firms increased their equity by a factor of four from 2004 to 2011. Although the average WOB/WLB experienced a loss in 2004, profits steadily increased throughout the research period, indicating that those firms that were unprofitable did not remain in business or achieved profitability over time. Table 4-2 shows the balance sheet for all non-WOB/WLBs from 2004 to 2011, analogous to Table 4-1 for WOB/WLBs.

⁴⁴ Imputed equity is a mathematically-derived estimate of the equity, computed as total assets less total liabilities. It is not an exact dollar measure of the amount of equity contributed (either from inside or outside sources).

Table 4-2
Average Balance Sheet – Non-Women-Owned and Non-Women-Led Firms

	Non-WOB/WLB Only							
	2004	2005	2006	2007	2008	2009	2010	2011
Current Assets	\$ 55,014	\$ 94,844	\$122,805	\$122,456	\$115,469	\$106,145	\$107,192	\$126,759
Long-Term Assets	\$ 72,516	\$110,712	\$122,181	\$134,662	\$145,306	\$155,825	\$152,454	\$146,180
Total Assets	\$127,530	\$205,556	\$244,986	\$257,118	\$260,775	\$261,970	\$259,646	\$272,939
Current Liabilities	\$ 19,361	\$ 33,242	\$ 45,154	\$ 43,660	\$ 56,971	\$ 64,405	\$ 61,754	\$ 58,998
Long-Term Liabilities	\$ 47,241	\$ 37,381	\$ 31,913	\$ 31,203	\$ 26,499	\$ 23,042	\$ 25,659	\$ 20,020
Total Liabilities	\$ 66,602	\$ 70,623	\$ 77,067	\$ 74,863	\$ 83,470	\$ 87,447	\$ 87,413	\$ 79,018
Imputed Equity	\$ 60,928	\$134,933	\$167,919	\$182,255	\$177,305	\$174,523	\$172,233	\$193,921
Profit/Loss	\$ (3,934)	\$ 11,852	\$ 32,447	\$ 29,343	\$ 27,203	\$ 27,287	\$ 37,118	\$ 56,211
Sample Size	3,286	2,685	2,274	1,949	1,745	1,628	1,441	1,353

In general, WOB/WLBs started with lower total assets than non-WOB/WLBs. Additionally, non-women-owned or women-led firms had higher imputed equity balances than women's entrepreneurial endeavors at the conclusion of the first year. These results are consistent with our Access to Capital research and indicative of an asset-based gender gap at startup.⁴⁵ Tables 4-1 and 4-2 show that this gender gap persists and widens throughout the early business years. Non-WOB/WLBs tend to earn higher profits, on average, than WOB/WLBs. This could be due to the varying requirements and average returns of the different industries in which non-WOB/WLBs and WOB/WLBs are concentrated. However, the fact that non-WOB/WLBs earn higher profits than WOB/WLBs sheds light on the significance of the capitalization gender gap and its effect on business growth and success.

In addition to developing the average balance sheet measures for each type of business, we calculated a series of financial ratios designed to analyze the performance, capitalization, and financial viability of the firms. These ratios are shown in Table 4-3 for both WOB/WLBs and non-WOBs/WLBs. We calculated the ratios according to the following definitions:

- **Current Ratio: Current Assets / Current Liabilities**
 - The current ratio measures a company's ability to meet its short-term financial obligations.
- **Proprietary Ratio: Shareholders' Equity / Total Assets**
 - The proprietary ratio provides an estimate of the capitalization used to support a business. A high ratio indicates sufficient capital to support business operations.

⁴⁵ *Access to Capital by High-growth Women-owned and Women-led Businesses*. Premier Quantitative Consulting, Inc. Prepared for the NWBC under contract SBAHQ-12-M-0200. 2014.

- **Return on Equity: Profit / Shareholders' Equity**
 - The return on equity measures profitability by determining how much profit the company generates using the equity that shareholders have invested.
- **Return on Assets: Profit / Total Assets**
 - The return on assets estimates how efficiently a company employs its assets to generate profit.

Table 4-3
Average Ratio Analysis by Ownership and Leadership Gender

Ratio Analysis	WOB/WLB Only							
	2004	2005	2006	2007	2008	2009	2010	2011
Current Ratio	2.57	2.65	2.13	2.70	2.26	1.89	1.92	2.28
Proprietary Ratio	0.40	0.65	0.67	0.68	0.67	0.68	0.65	0.72
Return on Equity	-10.2%	12.2%	23.3%	17.8%	14.0%	17.4%	25.1%	32.3%
Return on Assets	-4.1%	7.9%	15.6%	12.0%	9.4%	11.9%	16.3%	23.2%
Sample Size	1,513	1,273	1,083	921	813	737	658	624

Ratio Analysis	Non-WOB/WLB Only							
	2004	2005	2006	2007	2008	2009	2010	2011
Current Ratio	2.84	2.85	2.72	2.80	2.03	1.65	1.74	2.15
Proprietary Ratio	0.48	0.66	0.69	0.71	0.68	0.67	0.66	0.71
Return on Equity	-6.5%	8.8%	19.3%	16.1%	15.3%	15.6%	21.6%	29.0%
Return on Assets	-3.1%	5.8%	13.2%	11.4%	10.4%	10.4%	14.3%	20.6%
Sample Size	3,286	2,685	2,274	1,949	1,745	1,628	1,441	1,353

As shown in Table 4-3, from 2004 to 2007, WOB/WLBs had lower current ratios than non-WOB/WLBs, indicating that women were less able than men to meet their short-term obligations, but only slightly so during that period. It is interesting to see that from 2007 to 2010, the period encompassing the Great Recession, the current ratios for both non-WOB/WLBs and WOB/WLBs decreased substantially. WOB/WLBs and non-WOB/WLBs have nearly identical proprietary ratios. This is an interesting observation as it hints that both WOB/WLBs and non-WOB/WLBs, despite the difference in their absolute capital levels, have nearly identical measures of sufficient capital for business operations. This is a point we explore in more detail using multivariate analysis as well as through our undercapitalization definition process.

WOB/WLBs and non-WOB/WLBs generated varying returns on equity, indicating that there is no gap in the ability of WOB/WLBs versus non-WOB/WLBs to effectively use available capital to generate returns for shareholders. Generally, from 2005 to 2011 WOB/WLBs generated slightly higher returns on assets than non-WOB/WLBs. This means that WOB/WLBs more effectively used their assets to generate value for shareholders. It is important to remember that despite similar ratios and returns among WOB/WLBs and non-WOB/WLBs, women suffer a substantial deficit as compared to men when examining absolute capital levels.

Figure 4-1 shows the percentage of firms considered undercapitalized by the current ratio for each year 2004 through 2011. At startup, women-owned or led firms are more likely than non-women-owned or women-led firms to face liquidity constraints, as measured by the current ratio. Over time, the share of WOB/WLB firms that are undercapitalized by the current ratio measure declines to approximately 39 percent, with a slightly smaller share of WOB/WLBs undercapitalized than non-WOB/WLBs. This phenomenon likely has numerous causes. Among them, WOB/WLBs may have optimized their funding mix as time went on or alternatively, that firms who did not face liquidity concerns at the outset were more likely to survive year after year, something we examine in testing hypothesis 2.

Figure 4-1
Undercapitalization of all KFS Firms – Current Ratio Definition

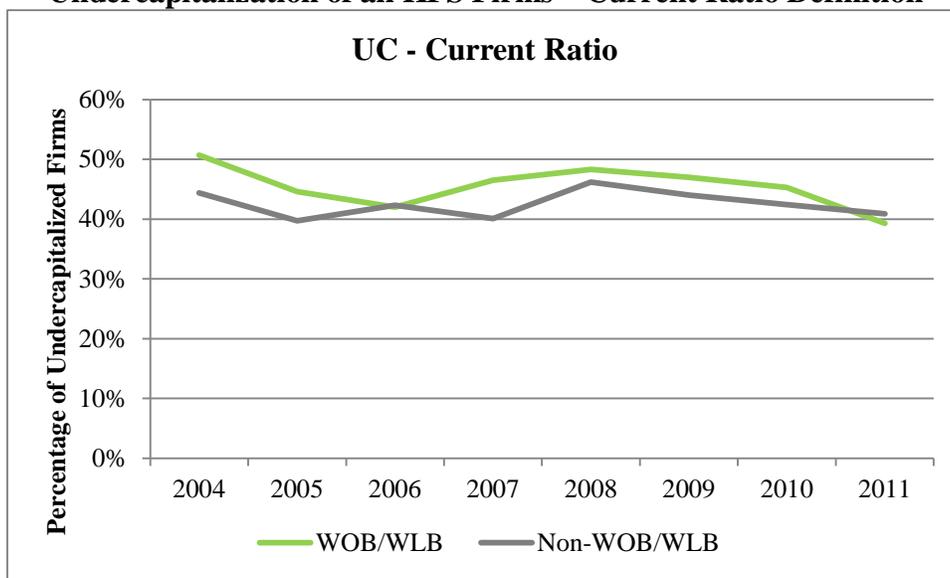


Figure 4-2 indicates that a smaller percentage of firms in the KFS are undercapitalized by the high cost capital ratio definition than the current ratio definition. In 2004, WOB/WLBs were more likely to use a high proportion of high cost capital. However, throughout the research period, the share of high cost capital ratio undercapitalized firms approximately equalizes among the gender groups. Overall, the proportion of KFS firms that are undercapitalized declined, indicating that firms shifted their capital mix away from high cost sources or alternatively, that surviving firms used lower levels of high cost capital throughout the survey period.

Figure 4-2
Undercapitalization of all KFS Firms – High Cost Capital Ratio Definition

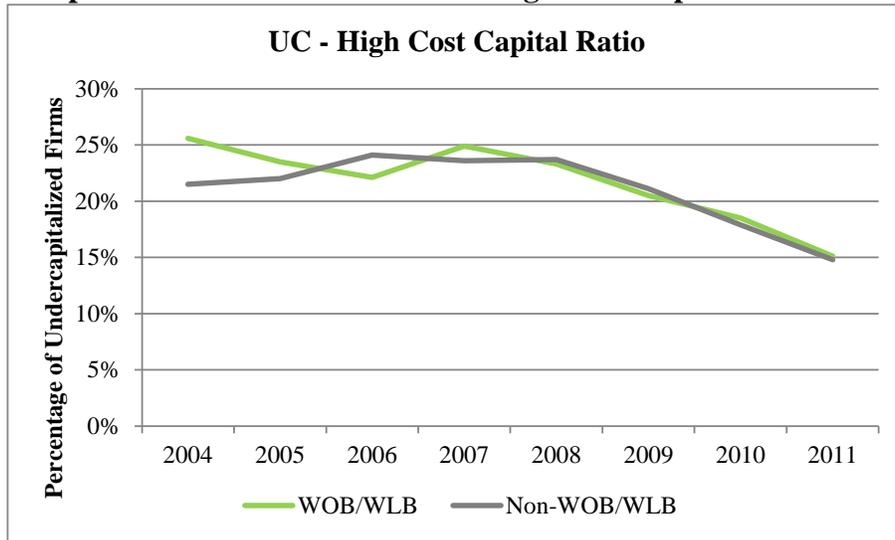


Figure 4-3 shows similar information to Figures 4-1 and 4-2 for the equity to liabilities ratio undercapitalization definition. In 2004, approximately 65 percent of WOB/WLB firms and approximately 57 percent of non-WOB/WLB firms had liabilities that exceeded the equity balance. The share of WOB/WLB firms whose liabilities exceeded equities declined in 2005 to approximately 49 percent. In each of the three figures, we note a decline in undercapitalization for WOBs compared to non-WOBs after 2004. This observation raises interesting questions about why we observe the decline, i.e., are WOBs disproportionately undercapitalized at the outset and then exhibit corrective behavior or are we observing a survivor bias? We investigate these issues in more detail in our multivariate analysis.

Figure 4-3
Undercapitalization of all KFS Firms –Equity to Liabilities Ratio Definition

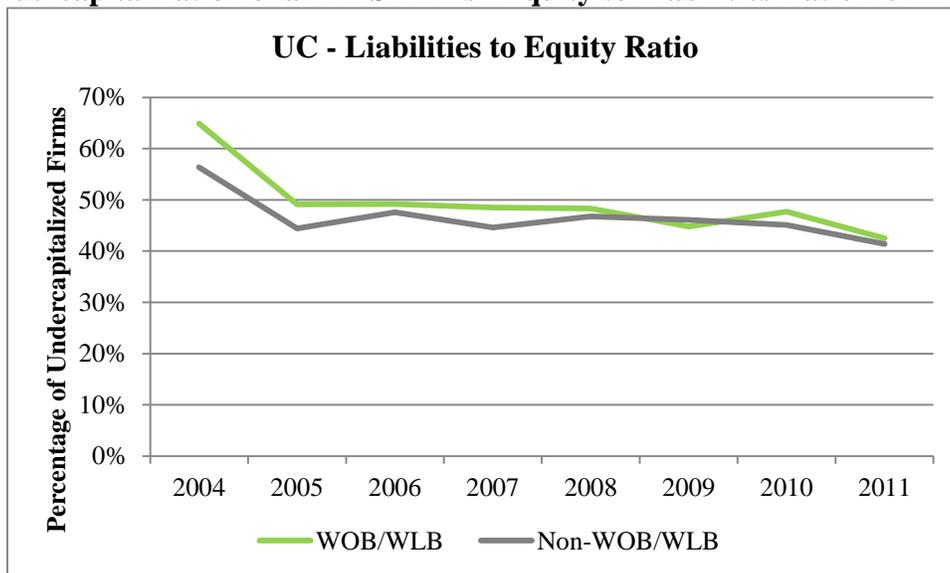


Table 4-4 provides average operating data based on firm ownership. As shown, WOB/WLBs have higher average operating margins than non-WOB/WLBs. Although the average WOB/WLB lost money in 2004, profit margins increased to levels above those of non-WOB/WLBs in 2005. Despite the fact that WOB/WLBs have higher operating margins in 2005 through 2011, on average, WOB/WLBs have substantially less revenue than non-WOB/WLBs, which indicates a difference in scale when comparing WOB/WLBs and non-WOB/WLBs. The revenue gap increases from approximately 32 percent in 2004 to 42 percent in 2011. We further explore the factors that contribute to firm profitability, particularly the effect of undercapitalization, in hypothesis 3.

Table 4-4
Revenue and Profit by Ownership and Leadership Gender, 2004 – 2011

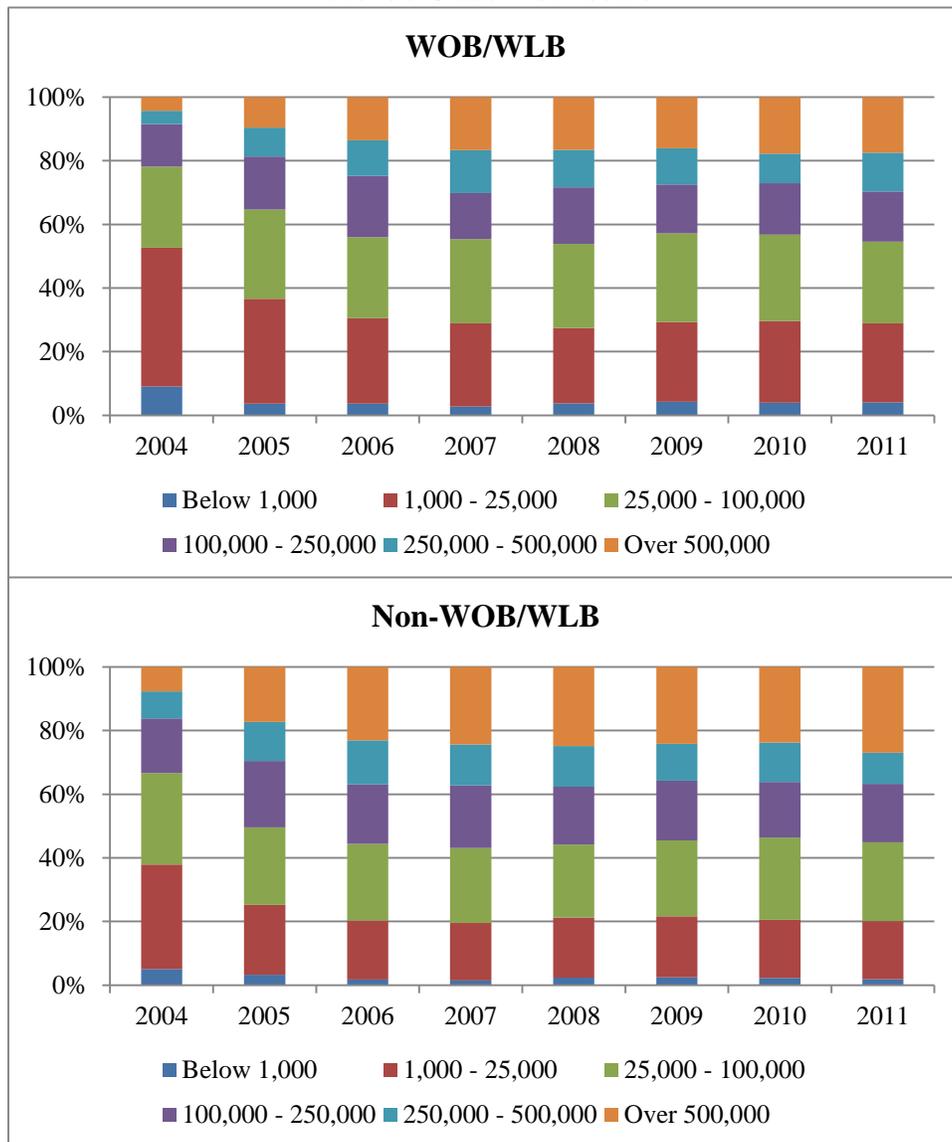
	2004	2005	2006	2007	2008	2009	2010	2011
Average Revenue								
WOB/WLB	\$117,998	\$229,741	\$308,052	\$420,388	\$407,079	\$512,453	\$540,967	\$ 555,456
Non-WOB/WLB	\$174,075	\$419,763	\$575,137	\$674,427	\$731,930	\$664,877	\$738,700	\$1,105,053
Average Profit/Loss								
WOB/WLB	\$ (3,574)	\$ 10,361	\$ 24,438	\$ 20,339	\$ 16,901	\$ 21,455	\$ 29,782	\$ 42,711
Non-WOB/WLB	\$ (3,934)	\$ 11,852	\$ 32,447	\$ 29,343	\$ 27,203	\$ 27,287	\$ 37,118	\$ 56,211
Average Operating Margin								
WOB/WLB	-3.0%	4.5%	7.9%	4.8%	4.2%	4.2%	5.5%	7.7%
Non-WOB/WLB	-2.3%	2.8%	5.6%	4.4%	3.7%	4.1%	5.0%	5.1%

Table 4-4 presents average data at an aggregate level. Analysis of the KFS microdata indicates a wide distribution of revenues based on firm ownership. As a result, we explored a disaggregated view of revenue and profitability based on six different revenue classes. Figure 4-4 illustrates the distribution of firms based on gender ownership on an annual basis, using revenue classes ranging from less than \$1,000 to in excess of \$500,000. Key observations from Figure 4-4 include:

- A larger share of WOB/WLBs is in the less than \$1,000 revenue class than non-WOB/WLBs throughout the research period. However, from 2004 to 2005, there is a significant decrease in the number of firms operating in the lowest revenue class for both gender entrepreneurs, reflecting either a firm survival bias in that revenue class or alternatively, reflecting revenue growth such that firms with less than \$1,000 in revenue during the first year were categorized in a higher revenue class in subsequent years. We anticipate that these are lifestyle businesses and are not a primary income source for the entrepreneur.
- The majority of firms in both gender categories had annual revenue between \$1,000 and \$250,000.

- As anticipated, the share of firms in the upper revenue classes generally increases over time for both genders, consistent with the theorized ramp-up in revenue of successful startup enterprises. However, the top revenue category, more than \$500,000, represented a greater share of non-WOB/WLB firms than WOB/WLB firms, consistent with lower women’s business receipts.

**Figure 4-4
Revenue Class Distribution**



A key component of this research is the exploration of the effect of undercapitalization on firm employment. Figure 4-5 shows the total employees, including owners that are also paid employees, for WOB/WLBs and non-WOB/WLBs for each year, 2004 through 2011. Generally, non-WOB/WLBs have more employees than do WOB/WLBs throughout the research period. This supports prior research findings that indicate that women’s entrepreneurial endeavors tend

to have fewer employees than their male-owned counterparts. However, there is little difference in average employment between firms that survived through 2011 and those that did not. Additionally, the gender gap in employment persists for those firms that survived through 2011.

Figure 4-5
Average Employee Count by Firm Ownership/Leadership Gender

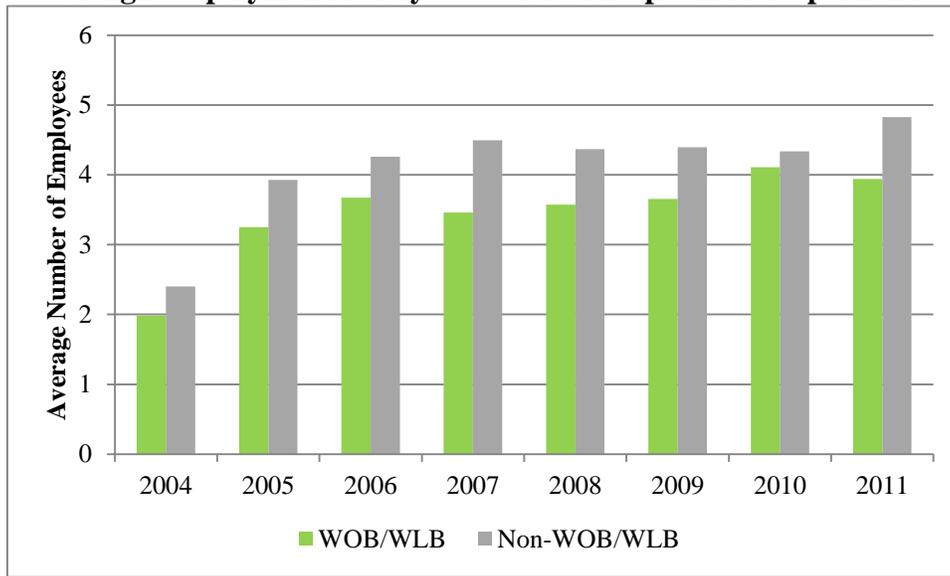
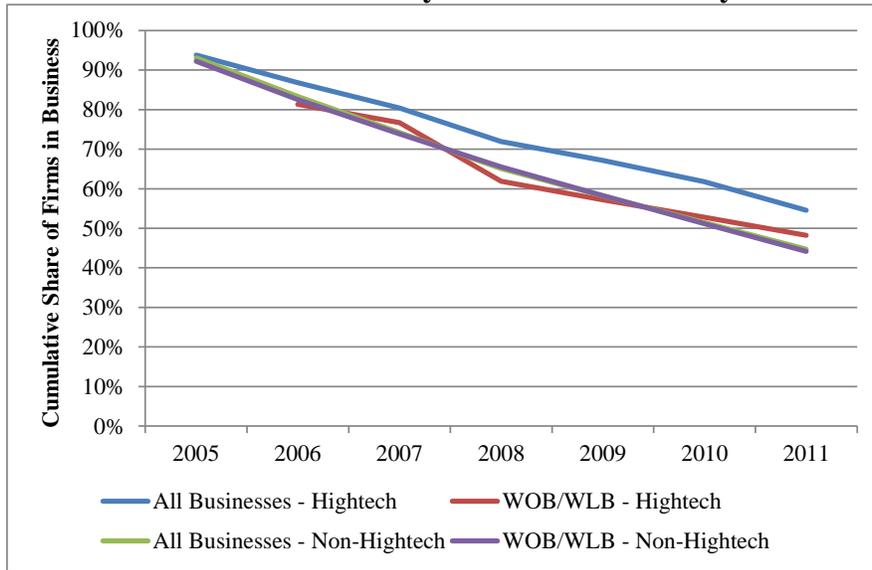


Figure 4-6 shows the survival rates for high-tech businesses and non-high-tech businesses by gender. The eight year survival rate was approximately 55 percent for businesses overall and 45 percent for WOB/WLBs, indicating a slight difference in survival by entrepreneur gender. High-tech non-WOB/WLBs had the highest survival rate of any group. For the WOB/WLB subsector, the difference in survival between high-tech and non-high-tech firms was negligible, suggesting that non-WOB/WLBs enjoy a survival advantage in high-tech industries that WOB/WLBs do not. We explore the factors contributing to firm survival with a focus on undercapitalization in hypothesis 2.

Figure 4-6⁴⁶
Survival Statistics by Gender and Industry



Multivariate Results

H1: Women-owned and women-led firms whose owners have previous industry experience, previous startup experience, and are directly involved in the everyday operations of the business are less likely to be undercapitalized.

Hypothesis 1 incorporates a social capital and team ownership and involvement angle into the undercapitalization puzzle. Specifically, what factors, both of the owners and of the business, affect the propensity to be undercapitalized? We performed separate logistic regressions on the individual measures used in this study for each year 2004 through 2011 using undercapitalization as the dependent variable. Because this study adopted three definitions, we present three separate regression results but combine insights in drawing hypothesis-based conclusions. First, we examined the causal factors contributing to liquidity constraints, i.e., undercapitalization via the current ratio measure. Table 4-5 contains our econometric results.

⁴⁶ The number of high-tech, women-owned or women-led firms that failed in 2005 is too few to report due to disclosure concerns.

Table 4-5
Logistic Regression Results – Current Ratio Undercapitalization

UC - Current Ratio	2004	2005	2006	2007	2008	2009	2010	2011
Team Owned	-0.3060 **	-0.5149 ***	-0.5473 ***	-0.2996	-0.2752 *	-0.2793 *	-0.3448 *	-0.4455 **
Owner Industry Experience	-0.0144 **	-0.0256 ***	-0.0066	-0.0245 ***	-0.0193 ***	-0.0099	-0.0175 **	-0.0064
Owner Startup Experience	0.0241	-0.1683	0.1477	0.0228	0.0495	0.3031 **	0.0403	0.2647
Owner Education	-0.0519 *	-0.0582 **	-0.0538 *	0.0144	-0.0085	-0.0198	0.0409	0.0459
Owner Age	0.0047	0.0174 ***	-0.0015	0.0030	0.0000	-0.0092	0.0113	-0.0063
Risky Credit	0.2690 **	0.0733	0.0950	0.1243	-0.0091	0.0862	-0.0133	0.0717
Women-owned/Women-led	0.1254	0.1414	0.0568	0.2082	-0.0053	0.0744	0.2231	0.0935
Service	0.3248 *	0.5231 ***	0.7482 ***	0.2777	0.6881 ***	0.2636	0.4255 *	0.7530 ***
Hightech	0.2931	-0.2921 *	-0.2359	0.0538	-0.1539	-0.1729	-0.1817	0.1724
Profit/Loss	-0.8042 ***	-0.8964 ***	-0.7495 ***	-1.1224 ***	-0.9618 ***	-0.9966 ***	-0.9344 ***	-0.7261 ***
Incorporated	-0.3318 **	-0.0884	0.0558	-0.2489	0.0214	-0.1634	-0.0416	0.1770
Constant	0.2074	-0.2318	-0.0072	0.2239	0.1550	0.8374	-0.4703	-0.6571
Sample Size	1,779	2,424	2,004	1,736	1,670	1,346	1,133	858
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0019

Note: *** indicates significance at the 0.01 level; ** indicates significance at the 0.05 level; * indicates significance at the 0.10 level

As shown, team ownership has a negative effect on current ratio undercapitalization, evidenced by the negative and statistically significant coefficients. Owner characteristics also play a role in undercapitalization. Increased industry experience and owner education are negatively associated with undercapitalization. Further, providing a service, as opposed to a product, positively affects undercapitalization such that service-based firms are more likely to be undercapitalized. Finally, profitability negatively affects undercapitalization, consistent with the notion that profitable firms have a more balanced asset structure and face fewer liquidity constraints. The women-owned/women-led variable is not significant in any of the years studied. This indicates that as a standalone factor, being women-owned or led does not cause undercapitalization.

This result does not necessarily imply that undercapitalization is not an issue for women-owned or –led firms. In fact, the data indicate that women-owned or –led firms are more likely to be undercapitalized at the outset in 2004. We also know that there are differences between women-owned and women-led firms in the causal variables that do affect undercapitalization. As a result, the observation that the gender dummy variable is not significant in the model is one reason to look at different cuts of data and also definitions for undercapitalization. In addition to the model below, we ran the same regression but on the subset of women-owned and women-led businesses. Our results were generally concurrent with those presented for the entire population in Table 4-5.

Table 4-6 shows the results of our logistic regression examining factors affecting undercapitalization according to the high cost capital ratio definition. In several years, team ownership negatively affected the propensity to be undercapitalized, consistent with hypothesis 1. Further, increased owner education was negatively associated with undercapitalization. In the startup year, 2004, being women-owned or women-led was a positive statistically significant factor in high cost capital undercapitalization. This is reasonable given women’s increased

propensity to use high cost capital sources, per the literature. In addition, we ran the model shown in Table 4-6 on the subset of women-owned and women-led businesses and obtained significant and similar results. An important note in this model is that the 2009 and 2011 models were not statistically significant. One potential reason for the modeling issues in 2009 and 2011 is the tightened lending that occurred during the recession and immediately after, such that high cost capital became harder to obtain. Another potential reason is that capital demands vary by industry, beyond the technology designation. This is an area poised for future work. Nevertheless, we can conclude that team dynamics and owner industry experience negatively influence undercapitalization, consistent with parts of hypothesis 1.

Table 4-6
Logistic Regression Results – High Cost Capital Ratio Undercapitalization

UC - High Cost Capital	2004	2005	2006	2007	2008	2009	2010	2011
Team Owned	-0.2883 **	-0.4245 ***	-0.1152	-0.3708 ***	-0.3864 ***	-0.2392	-0.4115 **	-0.5877 ***
Owner Industry Experience	-0.0084	-0.0121 **	-0.0091	-0.0049	-0.0190 ***	-0.0016	0.0010	0.0082
Owner Startup Experience	-0.1847 *	-0.1544	-0.0644	-0.0090	-0.1632	0.0354	-0.0315	0.2798
Owner Education	0.0010	-0.0175	-0.0379	-0.0933 ***	-0.0863 ***	-0.0338	-0.0937 **	-0.0360
Owner Age	-0.0074	-0.0095 *	-0.0063	-0.0096	-0.0035	-0.0089	-0.0025	-0.0169 *
Risky Credit	0.1314	-0.1195	-0.2045	-0.0740	-0.1564	-0.0526	-0.0769	-0.3033
Women-owned/Women-led	0.2661 **	0.0883	-0.1754	0.1153	0.0211	-0.0622	0.1484	0.1635
Service	-0.1139	0.0304	0.0913	-0.1527	0.4860 ***	0.3738 *	0.0885	0.0442
Hightech	-0.0383	-0.0461	-0.4931 **	0.2355	-0.5527 **	-0.2582	-0.3497	0.0708
Profit/Loss	0.0362	0.1154	-0.0491	-0.1932	-0.1242	0.0333	0.2170	0.1796
Incorporated	-0.1306	0.1710	-0.0696	-0.0300	0.2121	0.1476	0.0886	0.2270
Constant	-0.6660 **	-0.5397 *	-0.3168	0.2970	-0.4672	-0.9479 **	-0.9103 *	-1.0251 **
Sample Size	3,022	3,655	2,873	2,507	2,405	1,949	1,721	1,395
Prob > F	0.0001	0.0002	0.0079	0.0020	0.0000	0.4720	0.0450	0.1385

Note: *** indicates significance at the 0.01 level; ** indicates significance at the 0.05 level; * indicates significance at the 0.10 level

Finally, we explored what effect owner and business factors have on undercapitalization according to the equity to liabilities ratio definition. Table 4-7 contains logistic regression results for each year, 2004 through 2011. The results indicate that having owner employees makes firms less likely to be undercapitalized. Further, at firm founding (2004 and 2005), more owner industry experience decreases the propensity to be undercapitalized and in 2004, being women-owned or women-led positively affects the propensity to be undercapitalized. However, this gender bias disappears in subsequent years. This is consistent with the univariate results presented in Figure 4-3, which indicate that in the startup year, women are substantially more likely to be undercapitalized by the equity to liabilities measure. However, the difference in undercapitalization between men and women decreases after the startup year. Profitability consistently negatively affects the propensity to be undercapitalized in terms of excessive debt. This makes sense, as firms with profit are not forced to incur debt to sustain continued operations.

Table 4-7
Logistic Regression Results – Equity to Liabilities Ratio Undercapitalization

UC - Equity to Liabilities	2004	2005	2006	2007	2008	2009	2010	2011
Number of Owner Employees	-0.2110 ***	-0.1331 **	-0.1188 *	-0.0092	-0.1677 **	-0.0207	-0.1214	-0.0099
Owner Industry Experience	-0.0213 ***	-0.0123 **	-0.0073	-0.0080	-0.0049	-0.0077	-0.0090	-0.0124
Owner Startup Experience	-0.0368	0.0725	0.0025	-0.0699	-0.0460	0.1606	0.0380	-0.2249
Owner Education	0.0181	0.0692 ***	0.0549 *	0.0204	0.0553 *	0.0919 **	0.1018 ***	0.0637
Owner Age	0.0067	0.0125 **	0.0034	0.0088	-0.0045	-0.0043	-0.0020	0.0150
Risky Credit	0.1305	0.0524	0.2132	0.1852	0.0300	0.1203	0.1501	0.5054 **
Women-owned/Women-led	0.2853 **	0.0845	-0.0340	0.0456	-0.0783	-0.2111	0.1056	0.0934
Service	-0.0318	-0.2081	0.0366	-0.4504 **	-0.0660	-0.1729	-0.1244	0.3334
Hightech	-0.0954	-0.2317	-0.2293	-0.1040	-0.2057	0.2468	0.0765	0.3453
Profit/Loss	-0.7097 ***	-0.7666 ***	-0.6805 ***	-0.8286 ***	-0.6888 ***	-0.7645 ***	-0.7115 ***	-0.5736 ***
Incorporated	-0.0702	0.3161 ***	0.1327	-0.0170	0.0788	-0.0358	0.1506	0.2443
Constant	0.5845 *	-0.6087 *	-0.1348	0.2241	0.4170	-0.1196	-0.0976	-1.3807 **
Sample Size	2,127	2,622	2,110	1,824	1,756	1,393	1,187	904
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0009

Note: *** indicates significance at the 0.01 level; ** indicates significance at the 0.05 level; * indicates significance at the 0.10 level

We conditionally “accept” hypothesis 1, as we found that firms with industry experience, team ownership, and involved owners are less likely to be undercapitalized. However, owner startup experience was not a statistically significant factor in undercapitalization of women-owned and women-led businesses.

H2: Undercapitalized women-owned businesses that rely on a greater proportion of high-cost capital sources, such as credit cards, are more likely to fail.

To test hypothesis 2, we fit the data to a logistic regression where the dependent variable was whether or not the firm was in business in 2005 through 2011. The independent variables in this analysis are as of 2004. That is, we are testing the effect of startup conditions on eventual firm success with an eye towards undercapitalization. For example, how does the level of startup capital procured via high cost capital affect survival? This work has important implications for understanding how startup circumstances affect outcomes. Although we are testing the effect of undercapitalization on firm survival, previous research, including our own, indicates that multiple factors affect survival. Table 4-8 contains our regression results which show that as time goes on, some of the factors affecting firm survival change.

Table 4-8
Logistic Regression Results – Undercapitalization and Firm Survival

Firm Survival	2005	2006	2007	2008	2009	2010	2011
High Cost Capital	-0.0097	-0.0290	-0.0301 *	-0.0376 ***	-0.0343 **	-0.0329 **	-0.0301 **
UC - Current Ratio	-0.1244	-0.0782	-0.1434	-0.0614	-0.0821	-0.0880	-0.1233
UC - Equity to Liabilities	-0.3395	-0.1559	-0.3881 ***	-0.3192 **	-0.2670 **	-0.2142 *	-0.2151 *
Team Owned	0.1190	-0.1956	-0.1584	-0.1676	-0.0960	-0.1065	-0.0666
Women-owned/Women-led	0.1183	0.0549	0.1542	0.1411	0.1559	0.1859	0.1776
Owner Industry Experience	0.0169	0.0116	0.0148 **	0.0110 *	0.0121 *	0.0163 ***	0.0200 ***
Owner Startup Experience	-0.1296	-0.0297	-0.0195	0.0853	0.0767	0.0893	0.0972
Owner Education	0.0250	0.1060 ***	0.0938 ***	0.0927 ***	0.1074 ***	0.1058 ***	0.1218 ***
Service	0.4165	0.5674 ***	0.2352	0.2890 *	0.1087	0.0723	0.0058
Owner Age	-0.0086	-0.0033	0.0013	-0.0032	-0.0064	-0.0082	-0.0114 **
Outsider Capital/Total Capital Ratio	-0.0736	0.2573	0.2340	0.3128 *	0.3281 *	0.3618 **	0.3494 **
Hightech	0.4251	0.1943	0.2776	0.2472	0.3455 *	0.3736 **	0.3661 **
Profit/Loss	0.1132	0.1604	0.1340	0.1022	0.1529	0.2668 **	0.2674 **
Incorporated	-0.0520	0.0321	-0.1707	-0.2576 *	-0.2245 *	-0.1636	-0.1982
Owner Employees Indicator	0.4350 **	0.3171 **	0.2301 *	0.1756	0.1749	0.1717	0.1504
Risky Credit	-0.5187 **	-0.6398 ***	-0.4197 ***	-0.4492 ***	-0.4310 ***	-0.4099 ***	-0.4281 ***
Constant	2.6872 ***	0.8753 *	0.6091	0.3266	0.1030	-0.2321	-0.4035
Sample Size	2,193	2,104	2,053	2,057	2,046	2,031	2,002
Prob > F	0.0107	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: *** indicates significance at the 0.01 level; ** indicates significance at the 0.05 level; * indicates significance at the 0.10 level

As shown, increased use of high cost capital negatively affects firm survival in 2007 through 2011. The current ratio undercapitalization variable does not have a statistically significant effect on survival, indicating that liquidity constraints are not a primary reason for firm failure. However, excessive debt and a capital structure weighted towards debt do affect survival. This result is indicated by the significance of the negative coefficient on the equity to liabilities ratio undercapitalization variable. This is an important finding demonstrating that not only does the total amount of capital injected matter, as the literature shows, but the sources of that capital and the balance between debt and equity has survival implications. This result ties into the coefficient on the ratio of outsider capital to total capital. The outsider capital ratio has a positive and statistically significant effect at the 1 percent level on firm survival. That is, firms that use more outsider capital sources, such as venture capital and bank loans, are more likely to remain in business. A related capital issue is the credit risk a firm faces, as defined by the D&B credit rating. Having a risky credit rating makes accessing capital difficult and also increases the interest rates paid on loans. Here, we see that a risky credit rating also negatively affects firm survival.

In addition to financial factors, owner and firm-specific characteristics also impact firm survival. Increased owner industry experience and owner education positively affect the propensity to remain in business. However, an interesting result is that prior owner startup experience has no effect on firm survival. On the firm side, it is not surprising that profitable firms are more likely to remain in business. The women-owned and women-led binary indicator was not statistically significant in any of the models. From a causal standpoint, this indicates that although women-owned and women-led businesses face additional access to capital and

undercapitalization challenges, those challenges are not caused by entrepreneur gender, but instead are the result of ancillary factors and differences in those factors along gender lines, such as lower industry experience. Additionally, we ran the survival model on the subset of women-owned and women-led businesses and found generally concurrent results. That is, the factors identified above, including the use of high cost capital and firm undercapitalization, affect firm survival for women. Finally, as anticipated based on the univariate survival statistics presented in Figure 4-6, operating in a high-tech industry positively influences firm survival.

We are unable to reject the null hypothesis as stated, and can therefore accept our hypothesis that undercapitalization and the use of high cost capital, in particular, negatively affect the propensity to remain in business. This is a critical action item for nascent entrepreneurs as it demonstrates a direct link and causal effect between not only the amount of capital, but also the source of capital. Given women's increased propensity to use high cost capital, such as credit cards, when starting a business, it is important as a policy concern to increase access to lower cost capital sources and educate women entrepreneurs about the implications of the capital they use.

H3: Undercapitalization of women-owned and women-led firms is a driving factor in firm profitability and employment growth. That is, firms that are undercapitalized are less likely to be profitable and foster employment growth.

We explored hypothesis three using two separate models: one examining profitability and one examining employment. The univariate statistics presented throughout this report indicate that in spite of the negative effect of undercapitalization on survival discussed above, women-owned and women-led firms survive. Table 4-9 presents a logistic model with profitability as the binary dependent variable for each year, 2004 through 2011 including a women-owned and women-led independent variable. We also tested the model on the women-owned and women-led subset and found consistent results with the model presented in Table 4-9.

Table 4-9
Logistic Regression Results – Undercapitalization and Profitability

Profitability Indicator	2004	2005	2006	2007	2008	2009	2010	2011
Number of Owner Employees	0.2405 ***	0.2748 ***	0.2791 ***	0.5444 ***	0.2219 ***	0.1584 *	0.1846 **	0.2941 ***
Women-owned/Women-led	-0.2519 *	-0.1089	-0.2836 **	-0.1052	-0.3897 ***	-0.3984 **	-0.1750	-0.3794 *
UC - Current Ratio	-0.5739 ***	-0.6951 ***	-0.4923 ***	-0.8422 ***	-0.8050 ***	-0.8841 ***	-0.9458 ***	-0.6133 **
Owner Industry Experience	0.0223 ***	0.0077	0.0176 **	0.0138 *	0.0176 ***	0.0153 *	-0.0026	-0.0052
Owner Startup Experience	0.1123	-0.1886 *	-0.1773	-0.2910 **	-0.2739 *	0.1055	0.1016	0.1487
Owner Education	-0.0150	-0.0109	0.0501	0.0574 *	0.0749 **	0.0051	0.0490	-0.0108
Risky Credit	0.0888	-0.1294	0.0716	-0.5073 ***	-0.2848	-0.7544 ***	-0.6989 ***	-0.6586 ***
Service	0.1897	0.3532 **	0.4532 **	-0.0796	0.4470 **	0.1675	0.3614	0.4151
Owns Intellectual Property	-0.5482 ***	-0.4555 ***	-0.1306	-0.3190 *	0.0469	0.0243	-0.0156	-0.0408
UC - High Cost	0.2464 *	0.5246 ***	0.1593	0.0753	0.1269	0.2411	0.3711 *	0.1553
UC - Equity to Liabilities	-0.6164 ***	-0.4872 ***	-0.4162 ***	-0.4134 **	-0.3222 *	-0.3008	-0.3580 *	-0.3722
Owner Age	-0.0022	-0.0052	-0.0088	-0.0124	0.0005	-0.0217 **	-0.1013	-0.0074
Outsider Capital/Total Capital Ratio	0.3212 *	-0.1514	0.3206	0.0972	0.2819	0.1662	0.7092 **	0.6096 *
Hightech	-0.0187	-0.0928	-0.1195	-0.4838 *	-0.5002 **	-0.3859	-0.5205 **	-0.6974 **
Incorporated	-0.5427 ***	-0.2943 **	-0.3804 ***	-0.3541 **	-0.3356 **	-0.4562 ***	-0.2767	-0.1376
Constant	-0.0982	0.6427 *	0.3866	1.0840 **	-0.1281	1.9145 ***	0.9956 *	1.2410 *
Sample Size	1,757	2,341	1,949	1,687	1,640	1,307	1,099	830
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: *** indicates significance at the 0.01 level; ** indicates significance at the 0.05 level; * indicates significance at the 0.10 level

Key findings for the profitability analysis of hypothesis 3 include:

- The number of owners who are also paid employees of the business positively affects firm profitability. That is, having more owners who are involved in the daily operations of the firm increases the chances of profitability. This variable was positive and statistically significant in all years.
- Being women-owned or women-led negatively affects firm profitability, evidenced by the negative and statistically significant coefficient on the women-owned and women-led variable in five of the eight years studied.
- Facing liquidity constraints for firms that remain in business negatively affects the propensity to be profitable. That is, undercapitalization as defined by a current ratio of less than 1 negatively affects profitability, as hypothesized.
- Having owners with industry experience positively affects firm profitability. The industry experience variable was positive and statistically significant in five years.
- Although unexpected, the owner startup experience variable had negative and statistically significant coefficients in three years, two of which were during the Great Recession. This is a surprising result, but indicates that prior business ownership is not a panacea for a successful and profitable firm.
- Post-recession, having a negative or risky credit rating negatively affected firm profitability. This is interesting in the context of the Great Recession and associated tightened lending standards, as well as the increased lending laws seen post-recession.
- Undercapitalization as defined by the equity to liabilities ratio negatively affects profitability, consistent with our research hypothesis. This indicates that capital structure has implications beyond the balance sheet and into the daily operations of nascent enterprises.

The second component of testing hypothesis three examined the role of undercapitalization on total firm employment. We define total firm employment as the number of paid employees, including paid owner employees. In this model, the dependent variable is the total number of firm employees. We also ran this model on the subset of women-owned and women-led firms and found compatible results. Table 4-10 contains our regression results.

Table 4-10
Ordinary Least Squares Regression Results – Undercapitalization and Employment

Total Employees	2004	2005	2006	2007	2008	2009	2010	2011
Number of Owners	0.9783 ***	1.0165 ***	1.7836 ***	2.0965 ***	2.1341 ***	2.4385 ***	2.7128 ***	3.3944 ***
Women-owned/Women-led	-0.5440 **	-0.4755	0.0636	-0.7248	0.2058	0.2215	0.4775	-1.3329
UC - Current Ratio	-0.6717 **	-0.3666	0.3143	-2.0697 ***	-2.7744 ***	-2.3687 ***	-2.8142 ***	-1.6722 **
Owner Industry Experience	0.0215 *	0.0632 ***	0.0960 ***	0.0874 ***	0.1097 ***	0.0927 **	0.1135 ***	0.1157 **
Owner Startup Experience	0.0366	0.8749 ***	0.6357	1.0713 *	0.8254	1.3093 *	1.0901	0.8935
Owner Education	0.1450 ***	0.1522 **	0.1493	0.2153	0.1664	0.1517	0.1560	0.2915 *
Risky Credit	-0.3026	-0.5657 *	0.1559	-1.4649 ***	-0.3834	0.1468	0.4403	0.1297
Service	0.7050 **	1.0252 **	-0.2279	-0.3540	1.6801 *	0.0735	-0.5697	-0.2408
Owns Intellectual Property	1.0881 ***	0.9327 *	0.8488 *	0.6507	2.0759 ***	0.9986	1.8809 *	3.0506 **
UC - High Cost	-0.8629 ***	-2.2583 ***	-2.8440 ***	-0.9688 *	-2.0712 ***	-2.6628 ***	-1.3615	-2.6545 ***
UC - Equity to Liabilities	0.2927	-0.4880	-0.7477	0.6916	0.8974	-0.0142	1.8722 *	-1.0965
Owner Age	-0.0023	-0.0063	-0.0565 ***	-0.0758 ***	-0.0791 ***	-0.0834 ***	-0.0849 ***	-0.1190 ***
Outsider Capital/Total Capital Ratio	1.4559 ***	2.6678 ***	2.8767 ***	0.9270	1.4519 *	3.7281 ***	0.6037	3.6840 **
Hightech	-1.1715 ***	-0.4786	-2.1761 ***	-1.4816 *	-2.1251 **	-1.4140	-1.5691	-2.1644
Profit/Loss Indicator	0.2302	-0.0912	0.8541 **	1.2246 **	-0.0030	0.9541	1.8649 **	2.1337 **
Incorporated	1.3615 ***	1.7074 ***	2.2996 ***	2.2129 ***	1.3572 **	1.4621 **	2.4355 ***	2.8643 ***
Constant	-0.9270	-0.2098	0.9566	2.1124	1.4526	2.1894	0.2822	0.6536
Sample Size	1,758	2,345	1,951	1,690	1,640	1,308	1,099	830
R-Squared	0.1657	0.1414	0.1888	0.1636	0.1764	0.1886	0.1858	0.2298

Note: *** indicates significance at the 0.01 level; ** indicates significance at the 0.05 level; * indicates significance at the 0.10 level

- The number of owners, regardless of owner employment status at the firm, positively affects the number of firm employees in all years studied.
- In the first year of operation (2004), being women-owned or women-led negatively affects firm employment.
- Undercapitalization as defined by the current ratio has a negative effect on firm employment. This is in line with hypothesis three, based on the idea that liquidity concerns, regardless of revenues and profit, inhibit firms' ability to hire employees and expand their payroll.
- Owner industry experience positively affects firm employment. Other owner characteristics affect employment as well. In 2004 and 2005, the first two years of operation, increased owner education positively influenced firm employment.
- Increased use of high-cost capital and related undercapitalization negatively affects firm employment.
- Increased use of outsider capital as a percentage of total capital positively affects firm employment.
- Incorporation status matters when starting a new firm with employees. Operating as an S or C corporation is positively associated with the number of employees.

We can accept the employment prediction of hypothesis 3, noting that undercapitalization by both the current ratio and the high cost capital definitions negatively affects firm employment.

This result has implications for increasing the number of new jobs in the American economy as entrepreneurs can leverage capital and effectively manage their cash flows to enhance their likelihood of success and developing a firm with many employees.

5. Conclusions

Women entrepreneurs are an engine of the United States economy, creating \$1.6 trillion in sales and employing nearly 10 million Americans.⁴⁷ Despite the contributions to the national economy, women entrepreneurs face barriers to obtaining capital in starting and growing their new businesses. Overall, women entrepreneurs' access to capital is limited in both source and amount, as women are much more likely than men to fund their endeavors with high cost capital sources such as credit cards and on average, women start their firms with only 77 percent of the capital with which men start comparable firms. Fostering a greater understanding of how and why women-owned and women-led firms are undercapitalized is a key policy concern, as reducing the incidence of undercapitalization in nascent firms benefits individual businesses and promotes overall economic growth. Understanding how capitalization decisions and funding mix affect business outcomes including survival, employment, and profitability will inform policy makers, key stakeholders, and entrepreneurs alike in developing, promoting, and applying sound capital strategies.

As part of this research, we examined a multitude of firm characteristics that affect undercapitalization as well as the causal effects of firm undercapitalization on firm employment, profitability, and survival with an eye towards understanding how the capital mix and structure a firm employs affects success. Our study focuses on a large sample of U.S. companies that began operations in 2004 using annual time-series Kauffman Firm Survey data through 2011. As part of our research design, we implemented both univariate and multivariate analysis to address three research hypotheses designed to elucidate the causes and effects of undercapitalization on women-owned and women-led nascent firms. Before examining causal relationships, we explored what similarities and differences exist in terms of undercapitalization and firm finances along gender lines and found the following:

- Consistent with literature on the risk-averse nature of women entrepreneurs, on average, women's firms had total assets substantially exceeding liabilities. Additionally, those firms that survived increased their equity by a factor of four from 2004 to 2011.
- The average WOB/WLB recorded a loss in 2004, the first year of operations. However, profits steadily increased through 2011. Non-WOB/WLBs earned substantially higher profits, on average, than WOB/WLBs. Potential explanations include both scale and industry differences among firms. For example, we might expect different absolute levels of returns based on whether the firm is in manufacturing compared to retail. This also can influence the overall capital intensity. As part of our research process, we attempted to control for industry and geographic differences, but encountered issues with robustness at disaggregated levels (i.e., insufficient observations).
- Despite the fact that WOB/WLBs had higher average operating margins from 2005 through 2011, on average, WOB/WLBs had substantially less revenue than their non-

⁴⁷ United States Census Bureau, 2012 Survey of Business Owners

WOB/WLB counterparts. In 2004 the gender revenue gap was 32 percent, and increased to 42 percent in 2011 for surviving firms.

- Over time, the share of WOB/WLB firms undercapitalized by the current ratio definition declined to approximately 39 percent, with fewer WOB/WLBs undercapitalized than non-WOB/WLBs according to this measure, a reversal in the trend at startup.
- Throughout the research period, the proportion of firms using excessive amounts of high-cost capital approximately equalizes among the gender groups. Further, the total number of undercapitalized surviving firms decreased with each year, indicating that surviving firms shifted their capital mix away from high cost sources, such as credit cards or alternatively, that firms using high cost capital did not remain in business.
- At startup, approximately 65 percent of WOB/WLBs' and approximately 57 percent of non-WOB/WLBs' liabilities exceeded equities. In the startup year, women's firms were more highly leveraged than their male counterparts. This is an important distinction as it indicates that women entrepreneurs are more likely to access necessary capital as debt in the startup year.⁴⁸ By 2011, the rates of undercapitalization via the equity to liabilities ratio were approximately equal.

There is substantial variability in the revenue of firms reporting to the KFS, with some firms taking in less than \$1,000 per year and others earning well over \$1,000,000. To that end, we created a revenue class system to explore the distribution of revenue along gender lines. Critical observations included:

- Firms earning less than \$1,000 in revenue represent a greater proportion of WOB/WLBs than non-WOB/WLBs. However, given firm growth and survivorship bias, the number of firms operating in the less than \$1,000 revenue class decreased substantially from 2004 to 2005.
- The majority of firms in both gender categories brought in between \$1,000 and \$250,000 in revenue.
- The share of firms in the upper revenue classes generally increases over time, consistent with firm growth and the theorized ramp-up in revenue of successful startups. Despite growth by firms of both ownership and leadership genders, non-WOB/WLBs represented a greater share of the top revenue category, firms earning more than \$500,000 consistent with the incorrect assumption that women are not equipped nor do they desire to run growth-oriented, high revenue firms.

⁴⁸ We acknowledge that industry differences in capital structure and asset intensity exist. Further, capital needs typically vary by industry. We controlled for industry to the greatest extent possible, but recognize that industry remains a factor.

Given the role of small businesses in growing and providing new jobs to the recovering economy, understanding the role of capitalization and financing decisions of women entrepreneurs is of the utmost importance. Generally, non-WOB/WLBs have more employees than do WOB/WLBs throughout the nascent stage. We did not observe a gendered survival bias in employment as there is little difference in average employment between firms that survived through 2011 and those that ceased operations. However, WOB/WLBs that survived through 2011 had fewer employees, on average, than comparable non-WOB/WLB firms, an issue this research explored through the undercapitalization lens via multivariate analysis.

From 2004 to 2011, on average more than 50 percent of businesses studied in the KFS ceased operations, consistent with the overall business survival statistics presented in the Survey of Business Owners (SBO). The eight year survival rate was approximately 55 percent for businesses overall and 45 percent for women-owned and women-led firms. Overall, high-tech non-WOB/WLBs had the highest survival rate of any group, with approximately 55 percent of firms surviving through 2011. Given the univariate differences reported throughout this research, understanding how undercapitalization affects firm survival, particularly for the women entrepreneurial subset, is a critical concern.

As part of our multivariate analysis, we quantitatively tested three research hypotheses exploring the causes and effects of undercapitalization on critical business issues including survival, profitability, and employment. Key findings include:

- Both owner and firm organizational characteristics affect undercapitalization. Using three different logistic models and undercapitalization definitions, we conclude that increased owner industry experience and education negatively affect the propensity to be undercapitalized. Further, team ownership and having owner employees negatively affects the propensity to be undercapitalized. Finally, we find no statistical causal relationship between owner startup experience and undercapitalization. This is an interesting finding given anecdotal evidence that investors prefer seasoned and experienced entrepreneurs such that the entrepreneurs have learned from past endeavors. However, our quantitative results indicate that previous startup experience does not decrease the likelihood of being undercapitalized and as such, is overvalued.
- The use of high cost capital negatively affects firm survival, as hypothesized. Further, a debt-heavy capital structure (i.e., undercapitalization via the equity to liabilities definition) negatively affects survival. Other factors include owner industry experience and education, which positively affect survival, the ratio of outsider capital to total capital, which positively affects survival, and credit rating, where a risky rating negatively affects survival. As anticipated, undercapitalization negatively affects firm survival and the use of excessive high-cost capital is counterproductive. However, this work also recognizes that firm success is complex and is the result of multiple firm factors.
- Multiple factors influence profitability and employment. We found that an increased number of owner employees positively affects profitability. However, both risky credit

and undercapitalization via the current ratio and equity to liabilities ratio negatively affect profitability, consistent with our research hypothesis. In terms of employment, undercapitalization via the high cost capital ratio and the current ratio negatively affects the number of firm employees. Additionally, owner industry experience, owner education, and intellectual property ownership all positively affect employment. Finally, a high outsider capital to total capital ratio negatively affects firm employment.

Multiple factors contribute to and result from undercapitalization and, as such, reducing the incidence of undercapitalization among women and men entrepreneurs will require action on a variety of fronts. We demonstrated that both the capital and asset structures of a firm are critically important to remaining in business and thriving. Given the importance of owner industry experience in predicting undercapitalization, encouraging women to mine their social networks and align with experienced individuals is a potential strategy. Further, team ownership and owner involvement affect undercapitalization and therefore, policies designed to encourage women and men entrepreneurs to work in teams is a potential avenue by which to address undercapitalization. Even if women entrepreneurs elect to avoid team ownership, policy makers should consider and evaluate programs designed to create entrepreneurial social networks that support solo entrepreneurs with other network members, such as key advisors or mentors that can proxy team ownership.

The results of this study demonstrate the damaging effects of excessive high cost capital usage among nascent entrepreneurs. Specifically, using high cost capital has negative effects on profitability, employment, and firm survival. Previous research indicates that women are much more likely to use high cost capital sources, such as credit cards, to finance their entrepreneurial endeavors. As such, addressing the usage of high cost capital among women entrepreneurs is essential. Entrepreneurs use high cost capital when starting their firms when they lack more attractive options, such as bank loans or equity investments. Policy makers, program leaders, and key stakeholders should consider developing programs to increase women's access to traditional capital sources, such as bank loans. Further, fear of loan denial is an issue for women, as noted by Robb and Coleman (2014). As such, programs designed to offer lower cost capital to women entrepreneurs must do so in a method consistent with attitudes surrounding debt and business financing. Given the role of capital cost and firm survival, remedying the overuse of high cost capital among women entrepreneurs will promote more successful firms.

Not all nascent entrepreneurs are finance experts, but due to limited startup resources, these entrepreneurs must make important capital decisions for their businesses that have potential long term ramifications. While the amount of capital is important to business operations, the composition and use of that capital is equally important. Educating women entrepreneurs about the importance of their capital structure and sources, regardless of total amount, will decrease barriers to capital and decrease the incidence of undercapitalization. Key stakeholders, such as support organizations, could consider developing an interactive toolkit to assist women entrepreneurs in particular with analyzing the cost, structure, and sources of their capital on a regular basis. Examining financial structure is important for businesses at all stages of the lifecycle and assists with optimizing business. The primary goal of the toolkit would be to increase women entrepreneurs' ability to answer the question, how do your capital decisions

affect your bottom line? Further, education in this space acknowledges that rectifying undercapitalization is not a “one size fits all” phenomenon. Ideally, seminars would include gender-mixed groups and provide a forum for entrepreneurs to discuss what strategies are effective, which are not, and how to handle challenges. Opening this dialogue by creating a network of nascent entrepreneurs serves to increase the dissemination of information as well as increase cooperative entrepreneurship.

We explored the causes and effects of undercapitalization on nascent women entrepreneurs. No single definition exists for undercapitalization in the literature and as such, we propose three definitions designed to capture undercapitalization via capital structure and financing mix lenses. There are distinct differences in financing mix, revenue, and profitability among WOB/WLBs and non-WOB/WLBs. This research provides an empirical analysis of undercapitalization through a female entrepreneur lens designed to assist entrepreneurs in decoding their own capital choices and understanding the long-term effects of those choices. However, there remain a number of avenues for future research and policy considerations including:

- Analysis of the motivations behind women entrepreneurs’ funding decisions and their use of assets to generate revenue. Specifically, are women entrepreneurs optimizing their capital structure and capital sources to maximize profit? How do attitudes and strategies surrounding this issue differ by industry and entrepreneurial team dynamic?
- Given women’s lower use of outsider equity, such as venture capital, what role do women’s social networks play with respect to their undercapitalization and acquisition of external equity? How do relationships with industry professionals and investors influence capital decisions and mix?