

Digging deeper into the Dynamics of Female Ownership of Firms and Access to Finance: An Empirical analysis of Indian Firms

Nabamita Dutta
Department of Economics
College of Business Administration
University of Wisconsin, La Crosse, USA
Email: ndutta@uwlax.edu

Sushanta Mallick
School of Business and Management
Queen Mary University of London
Mile End Road, London E1 4NS, UK
Email: s.k.mallick@qmul.ac.uk

Abstract

Access to finance for firms is a much explored topic in the development as well as entrepreneurship literature. Studies on these topics are relatively scant in the context of firms in emerging markets. Using World Bank Enterprise Survey (WBES) data for 9281 Indian firms during June 2013-December 2014, we explore the role of gender in explaining difficulty in accessing finance for start-up activity. Our baseline results show that female-owned firms actually face less obstacles in accessing finance compared to male owned firms. But on delving deeper, we find that the composition of firm ownership in terms of gender matters. Our results show that firms that are dominantly managed by females face greater difficulty in accessing finance compared to firms that have low levels of female leadership. This supports two strands of theoretical studies - ‘ownership signaling theory’ reflecting a venture’s viability and the entrepreneurs’ commitment to business, and ‘gender congruity theory’ suggesting stereotypical beliefs about the abilities of male and female entrepreneurs. Our results are robust to different identification strategies including propensity score matching. Further, we also explore possible channels explaining the negative impact of female dominated firms in accessing finance. These channels are greater government ownership of firms, funding investment through one’s own capital and higher level of sales at the national level, which lend support to our main result that women entrepreneurs, under certain circumstances, may not be as credit-constrained as male entrepreneurs.

Keywords: *access to finance; female ownership; Indian firms; percentage of female ownership*

1. INTRODUCTION

Access to finance is a critical driver for innovative start-up, firm growth and international expansion. It is well known that growth of small enterprises has significant potential to absorb surplus labor in a low-income country, but their growth is often constrained by lack of start-up capital, owing to lack of collateral and high transaction costs of serving small enterprises (see Ho and Mallick, 2017). Thus, it is now increasingly recognized that credit facilities to small borrowers can be crucial for small firm¹ growth. Most developing countries have liberalized their financial markets in the hope of improving borrowers' access to credit markets (King and Levine, 1993; Jaramillo et al., 1996; Demetriades and Luintel, 1996). Among small borrowers, female entrepreneurs' access to the loan market remains even more constrained. India provides a unique opportunity to investigate this question, as the country pursued its policy of liberalization and financial reforms (officially since 1991) in the last two decades and, in the process, has so far averted any serious threat of financial crisis. This gives us a sufficiently long and stable period to examine whether small and marginal firms' access to the loan market remain less constrained, considering a gender distinction with regard to ownership. Although innovation and entrepreneurship are increasingly becoming female-dominated in the recent decades in many emerging economies, there are still significant barriers to greater female participation in innovation in emerging economies like India (for an overview on the challenges to the participation of women in Indian innovation and entrepreneurship, see Chatterjee and Ramu (2018)).

It is well known that the start-ups play an important role in generating innovative entrepreneurship. The heterogeneous nature of such firms in driving innovation, employment and economic growth requires us to investigate the barriers including financial constraints faced by

¹ Cole, Cumming and LI (2016) show in this context that venture capital has a positive and statistically significant effect on small firm growth.

entrepreneurs in firm creation (see Lerner, 2010; Bertoni et al., 2011). To support the design of effective entrepreneurship policies, we separate firms along different dimensions including gender to understand the financial constraints in the development process of innovative entrepreneurship. Gender's role in terms of ownership² of firms and its implications in the context of access to finance have been well emphasized in the literature (see for example Marlow and Patton, 2005). Yet, in the development as well as entrepreneurship literature, studies on these questions are relatively scant in the context of developing country firms with women-led entrepreneurs in accessing finance for innovative start-up activity.

What has received relatively less attention in the literature is how composition of gender for firm ownership affects the difficulty in accessing capital. Are firms that are dominantly female owned have greater difficulty in accessing finance than the ones that are dominantly owned by males? Our research question draws support from a specific strand of existing studies, stating that ownership signaling can decide the amount of bank financing obtained by entrepreneurs as it reflects a venture's viability and the entrepreneurs' commitment to business (Ozmel et al., 2013; Busenitz, Fiet and Moesel, 2005; Reuber and Fischer, 2005; Prasad et. al., 2000). Additionally, on the other hand, the gender role congruity theory suggests that stereotypical beliefs can differ about the abilities of male and female entrepreneurs (see for example Wasti and Sikdar, 2009; Ahl, 2006; Eagly and Karau, 2002). Thus, firms that are dominantly owned by females need to negotiate harder for finance since women may fail to generate the positive signals when seeking bank financing.

² The literature has also talked about the importance of a gender-diverse board of directors with respect to securities fraud (Cumming, Leung and Rui, 2015)

Using World Bank Enterprise Survey (WBES) data for 9281 Indian firms during June 2013-December 2014, we explore the role of gender in explaining difficulty in accessing finance, in the sense that whether enterprises owned/led by female entrepreneurs are likely to be more credit constrained compared to their male counterpart firms. Our overall results show that female-owned firms actually face less obstacles in accessing finance compared to male owned firms. But the more interesting question that we explore is whether the composition of firm ownership in terms of gender matters. Our results show that firms that are dominantly managed by females face greater difficulty in accessing finance compared to firms that have low levels of female leadership. Our results are robust to a wide set of identification strategies that we undertake – propensity score matching and instrumental variable regression. Further, our results also explore possible channels that can alleviate the negative impact of female dominated firms in accessing finance. These channels are greater government ownership of firms, funding investment through one's own capital and higher level of sales at the national level. These potential channels can make it easier for females to acquire funds and, thus, in spite of signaling effect and gender bias, firms with greater percent of female ownership are alleviated of the difficulties in accessing finance to some extent. Thus, this provides some support to our baseline results and also to a growing existing strand of studies that show that under certain circumstances, women entrepreneurs are not necessarily more credit-constrained compared to males.

As part of robustness analysis, the final channel that we explore is that of innovation. If firms are undertaking innovative activities on a regular basis whether it be with regard to launching new products or improving organizational structures, it shows promise of being a successful entrepreneurial firm. As Schumpeter (1934) points out, creative destruction is an integral part of entrepreneurial process and innovation endeavors, which imply that firms are keeping up with the

creative destruction process – replacing the old with the effective new. Thus, such firms should have better access to finance as lenders will have more hope about future success of such firms. Thus, in spite of greater percent of female ownership, such firms should have less constraints in accessing finance.

Section 2 presents our theoretical framework where we talk about the existing strands of literature and further build on our hypothesis. In Section 3, we describe our data along with their sources. Section 4 describes our empirical methodology. In Section 5, we present our benchmark results. Results from our secondary hypothesis are described in Section 6. Section 7 focuses on our robustness analysis and Section 8 concludes.

2. THEORETICAL FRAMEWORK

The literature on firm-level financing constraints has paid limited attention to gender as a determinant of access to finance. Building on this literature on financial access, firm-level heterogeneity along gender dimension, the puzzle still remains as to whether there is gender-based discrimination in financial access or not. While the finance and growth research has convincingly documented a positive and close long-run relationship between financial development and economic growth (see Levine, 1997; and Ang, 2008 for surveys on this issue), the empirical evidence at the firm level with regard to financial access remains mixed as credit access for different types of entrepreneurs has not changed uniformly across heterogeneous borrowers. In order to contribute a plausible explanation for this relationship (or lack of) between ownership by gender and financial access, we intend to examine whether female-owned firms are financially constrained and what explains such constraints, as countries with weaker institutions also lack a conducive environment for women empowerment (see Cooray, Dutta and Mallick, 2017).

Pham and Talavera (2018) find that there is little evidence for discrimination against female-owned enterprises in the formal lending market, using data from Vietnam. They show that female entrepreneurs have a higher probability of getting a loan and they pay lower interest rates in comparison with male entrepreneurs. The dataset however focuses on very small entrepreneurs who tend to borrow informal loans before applying for formal ones, indicating the role of social capital in facilitating loan applications. Aristei and Gallo (2016) on the other hand provide evidence of gender-based discrimination in firms' access to finance, using firm-level data for 28 transitional European countries, in the sense that financial constraints significantly depend on the way in which female participation in ownership and management is measured. Asiedu et al. (2013) assess whether female-owned firms are more financially constrained than male-owned businesses using data from 90 developing countries. They show that female-owned firms in sub-Saharan Africa are more likely to be financially constrained than male-owned firms, with no such gender gap in other developing regions. Hansen and Rand (2014) show different levels of gender differences in manufacturing firms' credit access, using data from 16 Sub-Saharan African countries. With a perception based credit constraint measure, they find female owned firms being relatively more constrained than male owned firms, while using formal financial access data they find no gender effect, and with actual data on credit constraints, male owned small firms appear to be disadvantaged. Such mixed evidence in the literature on access to credit by women-led businesses requires a fresh look at this hypothesis of gender-based discrimination, considering firm-level survey data from a large emerging market economy, India.

A firm being female-led or owned can have a differential access compared to a firm with majority female representation in ownership. More female representation (or female-majority firms) can make a firm financially constrained. Faccio et al. (2016) find that firms run by female

CEOs have lower leverage, less volatile earnings, and a higher chance of survival than otherwise similar firms run by male CEOs. Mascia and Rossi (2017) find that the gender of a firm's leader does affect the cost of bank funding faced by small and medium enterprises in Europe, using a large sample of SMEs from 11 countries during 2009-2013. They also find that leadership changes from female to male are more likely to benefit from an improvement in interest rate levels. Such bias in credit markets can be more prominent in less developed financial markets in emerging economies and thus requires further investigation. In the absence of information on cost of capital, in this paper we therefore empirically test for the presence of discrimination, comparing female-led and male-led firms to validate whether women managers are discriminated by banks in terms of limited or lack of access.

Our baseline hypothesis suggests that female owned firms in India face different probabilities than male owned firms. Our main hypothesis suggests that on top of female ownership, the extent of female ownership matters in determining the probability in accessing finance. In other words, firms that are dominantly female owned versus firms that are dominantly male owned can face different probabilities in terms of difficulty in accessing finance. Our paper adds clarification to the ambiguity in the literature as suggested above with regard to female ownership's impact on accessing finance. As suggested by studies like Connelly, Certo, Ireland and Reutzel (2011) and Spence (2002), signaling theory implies reducing information asymmetry while one party is evaluating quality of another party. In the case of entrepreneurship, signaling is applied in the case of viability of ventures as determined by the future prospects and stability of the venture (Jain et al., 2008; Reuber and Fischer, 2005). Additionally, as pointed out by Busenitz et al. (2005), signaling is also applied to judge the commitment of the entrepreneur. On the other hand, gender role congruity theory suggests that gender stereotypes can strengthen beliefs with

regard to males and females in terms of their behaviors and attributes (Eagly and Karau, 2002; Powell and Butterfield, 2003; Powell, Butterfield and Parent, 2002). These theories support our main hypothesis. Composition of ownership in terms of gender becomes one of the dominant factors for accessing finance. Firms sending healthy signals in terms of future commitment of entrepreneur and future prospects of venture are likely to be majority male owned since, along the lines of gender role congruity theory, the stereotypical beliefs about gender on the part of the lenders will result in such beliefs. Thus, such firms are likely to face less difficulty in accessing finance. But it can be just the reverse in the case of firms dominantly owned by females. Due to gender stereotypes, such firms might fail to successfully send positive signals and, thus, face increasing difficulty in accessing finance.

Hypothesis 1: Majority female owned or operated firms have lower probability of accessing finance.

Our next set of hypotheses proposes different channels that can potentially affect the percent of female ownership and access to finance relationship. The government-led banking policies play a key role in driving broader social development including women empowerment. Government-led credit market development is therefore critical for financial deepening. But it has been observed in the context of India that demand for credit is inelastic with regard to the cost of borrowing (Bell et al., 1997), implying the presence of credit rationing. Most theoretical and empirical studies assume that high lending costs and a high demand for credit result in high interest rates being charged to the rural small borrowers (see, for example, Banerji et al., 2014). The government regulation for the formal sector to lend at a subsidized rate can make the formal institutions ration credit supply to borrowers with limited collateral. Thus market failures in rural

credit markets combined with possible urban bias of financial sector policy reforms can justify the need for government-led financial development. At the same time, the demand for credit can still be driven by the sectoral growth and investment, which in turn can lead to the corresponding credit allocations.

In a related literature, Andrianova et al. (2008) have found that lower level of institutional quality continues to make state-owned banks dominating the banking sector in many countries, including India. In a cross-country context, Cooray (2011) also shows that the size of the government, proxied by the government ownership of banks, has a positive impact on financial sector development in the low income economies, although it has a negative effect on financial sector efficiency. This suggests that the lending behavior of these state-owned banks, which are the primary banking service providers in India, can incorporate the gender dimension in their loan allocation strategies in order to practice diversity. Although the reform process in India since the early 1990s has allowed the entry of new private banks, these minority banks mostly tend to cater to the credit demand of large corporations in the urban areas, due in part to fears over possible default risk in the rural areas (see Mallick et al., 2018). In this paper, we therefore explore a channel uncovering this government ownership of firms, as they tend to have better access to state-owned banks where gender balance can be a more important determinant for credit access. So, in general, the literature is in favour of the impact of state ownership on women entrepreneurship, leading us to the following hypothesis.

Hypothesis 2: State-owned female-led firms have greater financial access.

Besides, there have been significant efforts to liberalize the banking and financial sectors during the post-reform period in India, in order to promote credit market development, as institutional credit is the key source of finance for small and medium-sized enterprises, including women entrepreneurs. In the recent decades, improving access to finance for women entrepreneurs has been given priority, as over 30 percent of all small and medium-sized enterprises (SMEs) in emerging markets globally are women-owned/operated who can be financially constrained. Thus, there can be contrasting views on whether more innovative female-led enterprises/start-ups face less financial constraint or better access that can be reflected through an interaction effect of women entrepreneurship and innovation. The question is whether firms that are more innovation-focused tend to have varied levels of financial access, displaying differences in women entrepreneurship. In other words, whether female-led firms tend to have better access to quality financing if they are innovation-intensive. It is therefore natural to expect that expanding innovative firms could access better financing than less innovative constrained firms.

Hypothesis 3: Innovation has a positive impact on financial access of Indian firms

3. DATA AND SOURCES

All data for the paper comes from World Bank Enterprise Survey database. Specifically, we consider firm-level data from the 2014 Enterprise Survey data set for India. As stated by World Bank, the firm-level data in India has been collected between June 2013 and December 2014. The Enterprise Survey collected data via interviews with firms in the manufacturing and service sectors. The collected data quantitatively assesses firm performance, firm structure and firms' perceptions to the obstacles in their growth process. A stratified random sampling method has been

employed for data collection, making sure that the collected sample provides unbiased estimates for the whole population and that the sample is representative of industries, sectors and regions (World Bank Enterprise Survey, 2014). Three levels of stratification have been used while collecting the sample. The 2014 dataset from India consists of 9281 firms from 23 major states of India. Firms, as represented in the sample, belong to 26 different industries like food, textiles, garments, leather, wood, paper, chemicals and so on. Among service industries, major services like hotels and restaurants are included.

Our main dependent variable is constructed based on the question “how much of an obstacle is access to finance”. As the survey report states, access to finance includes availability as well as cost, interest rates, fees and collateral requirements. The respondents’ answers categorize access to finance in five groups – no obstacle, minor obstacle, moderate obstacle, major obstacle and very severe obstacle. We construct an ordered dummy variable ranging from 0 to 4 with higher numbers indicating greater difficulty in accessing finance. We have 9244 observations for this question. All summary statistics are reported in Table 1. The mean is around 1.2. Almost

[Insert Table 1 about here]

50% of the firms in our sample have access to finance scores of 0 and 1 suggesting that almost half of our sample face relatively less difficulty in accessing finance. Very few firms have a score of 4 implying that the percent of firms in India facing extensive difficulty in accessing finance is very low.

As explained in our previous sections, while our starting analysis consists of exploring if female owned firms have difficulty accessing finance or not, our benchmark analysis explores if the percentage of female owners in a firm matters in terms of difficulty in accessing finance. We

start with a dummy suggesting female ownership as our baseline independent variable of interest. Out of 9224 observations, about 15 percent of firms have female ownership. Our main variable of interest is percent of female ownership within a firm. Percent of female ownership suggests how much of the firm is owned by females. The female ownership dummy does not distinguish between firms owned majorly by females or males. So, for example, firms with 90% female ownership versus 10% male ownership will be assigned a dummy 1 and so will be a firm majorly owned by males but has female ownership greater than 0. The mean of 'percent of female ownership' is around 38% with a relatively high standard deviation of 27. Less than 50% of the firms with female ownership in our sample have 33 percent female ownership. Females own about 8 percent of the firms for about 25% of the firms in our sample that are assigned female ownership dummy value of 1. So even among the 15 percent of the firms that have female ownership, there is huge variation in the extent of female ownership among the firms.

Delving deeper into our empirical analysis, we explore different channels that can potentially act in conjunction with percent of female ownership to affect the probability of accessing finance. One of the first channels we consider is the type of ownership of firms in terms of private, foreign and government ownership. The three variables we consider in this regard are percent of private ownership of firms, percent of foreign ownership of firms and percent of government ownership of firms. For our sample, we find that most firms have high percentages of private ownership. The extent of government ownership is relatively small across firms. The second channel that we consider is borrowing source of capital for firms. The borrowing source can be internal funds, banks, non-bank institutions and informal sources like money lenders, friends and relatives. The four variables considered indicate percentage of capital borrowed by firms from each of these sources. We find for our sample that the most common sources of funding

for firms are internal funds and banks. The percent of capital financed from non-bank financial institutions and informal sources is relatively small. The other channel we look into is the percent of national sales that were experienced by firms in the fiscal year 2012-13. The sample mean is as high as 92% suggesting that firms in our sample experienced a large amount of national sales.

Other than our main independent variables of interest and all our potential channels that we explore, we control for other variables that can potentially affect the probability of accessing finance. The controls considered for our benchmark analysis are firm size, whether the firm is located in the official capital city or not and whether the firm is located in the main business city or not. Being in the capital city or main business city can make it easier for firms to access finance because of greater availability of funding sources and better networking facilities. Firm size will also be indicative of a firm's probability to access finance. A small firm is likely to be more constrained than a medium or large firm in terms of accessing finance. We also control for industry and state fixed effects to take into account the time invariant characteristics across industry or state. We discuss more on this in Section 4.

4. Empirical Methodology

As stated in our hypothesis, we start with a simple baseline question – whether female ownership of firms affects the probability to access finance or not? In order to explore this question, we consider the following ordered logit specification

$$\text{Accessfinance}_{ijs} = \alpha_0 + \alpha_1 \text{femownership}_{ijs} + \sum_{k=1}^K \beta_k X_{kijt} + \alpha_2 \rho_i + \alpha_3 \theta_s + \epsilon_{it} \quad (1)$$

where $\text{Accessfinance}_{ijs}$ is the ordered dummy variable ranging from 0 to 4 for firm i in industry j in state s . $\text{femownership}_{ijs}$ represents a dummy suggesting if a firm has more than zero percent of female ownership or not in industry j in state s . X_{kijt} denotes the matrix of control variables. The benchmark controls as stated earlier are firm size, whether the firm is located in the official capital city or not and whether the firm is located in the main business city or not. These variables can potentially affect the probability of accessing finance. ρ_i represents the industry fixed effects and θ_s represent the state fixed effects. A positive coefficient of α_1 will suggest that firms that have more than zero percent of female ownership face greater difficulty in accessing finance. A negative coefficient will mean just the opposite.

The question that we are more interested in exploring can be answered by testing the following specification

$$\begin{aligned} \text{Accessfinance}_{ijs} &= \alpha_0 + \alpha_1 \% \text{offemownership}_{ijs} + \sum_{k=1}^K \beta_k X_{kijt} + \alpha_2 \rho_i + \alpha_3 \theta_s \\ &+ \epsilon_{it} \end{aligned} \quad (2)$$

$\% \text{ of femownership}_{ijs}$ represents the percentage of the firms owned by females. Thus, all these firms have assigned dummy values as 1 but they differ in terms of their diversity in ownership. As explained in our theoretical motivation and hypothesis, we consider $\% \text{offemownership}_{ijs}$ as our main variable of interest. This is because a firm dominantly owned by males differs inherently from one that is dominantly owned by females. Accordingly, we hypothesize that firms will face different probabilities in their accessing finance difficulties.

Our final set of hypothesis consists of exploring channels that can work in conjunction with percent of female ownership to affect the probability of difficulty in accessing finance. This is explored in the following specification:

$$\begin{aligned} \text{Accessfinance}_{ijs} &= \alpha_0 + \alpha_1 \% \text{offemownerhsip}_{ijs} + \alpha_2 (\% \text{offemownership} * \text{channel})_{ijs} \\ &+ \alpha_3 \text{channel}_{ijs} + \sum_{k=1}^K \beta_k X_{kijt} + \alpha_2 \rho_i + \alpha_3 \theta_s + \epsilon_{it} \end{aligned} \quad (3)$$

where channel_{ijs} denotes the specific channel that we explore. The channels, as described earlier, are type of firm ownership (private, government or foreign), source of capital for firms (internal, banks, non-banks and informal) and percent of national sales of firms. We are interested in the coefficients α_1 and α_3 . The overall impact of percent of female ownership is given by $\frac{\delta \text{Accessfinance}_{ijs}}{\delta \% \text{offemownerhsip}_{ijs}} = \alpha_1 + \alpha_2 \text{channel}_{ijs}$. Whether $\frac{\delta \text{Accessfinance}_{ijs}}{\delta \% \text{offemownerhsip}_{ijs}}$ is $>$ or $<$ 0 will depend on the sign and magnitude of α_1 and α_2 . Further, it will also depend on the magnitude of channel_{ijs} .

Ordered logit specifications are considered in which the coefficients describe the relationship between the lowest versus all higher categories of the response variable, which are the same as those that describe the relationship between the next lowest category and all higher categories, and so on. This is called the proportional odds assumption. Because the relationship between all pairs of groups is the same, there is only one set of coefficients, in the absence of which we would need different models to describe the relationship between each pair of outcome groups. We need to test the proportional odds assumption, and there are two tests that are used to do so.

5. Benchmark Results

We start by testing our baseline specification stated in equation (1). Table 2 presents the results. In column (1), we test the bivariate relationship between the access to finance measure and female

[Insert Table 2 about here]

ownership dummy. We add controls in subsequent columns along with industry and state fixed effects. The controls added are dummies indicating if the firm is small or medium, a dummy indicating if the firm is in the main capital city, and finally a dummy indicating if the firm is in the main business city. We control for industry fixed effects in column (4) specification and control for both industry and state fixed effects in column (5) specification. As we can see from Table 2 results, the coefficient of female ownership dummy is negative and significant for all the specifications. This suggests that the firms with female ownership faces a lower probability in terms of difficulty in accessing finance compared to firms with no female ownership. In other words, firms with female ownership are less constrained in terms of accessing finance relative to firms with no female ownership. Based on column (1) specification estimates, if a firm has female ownership, it faces the log-odds of being in a lower access to finance category by 0.24 units. More specifically, in terms of economic significance, if a firm has female ownership, the probability of the difficulty in accessing finance goes down by 14 percentage points. In the case of specification in column (5), the probability goes down by 7 percentage points. This implies that in specification (1), we are overestimating the impact since we do not include controls or industry or state fixed effect.

In terms of controls, we find that being a small or a medium firm increases the difficulty of accessing finance. The difficulty in accessing finance is higher in case of small firms compared to medium firms as evident from the magnitude of the coefficients. As expected, being in the official capital city reduces the difficulty in accessing finance. The capital city provides a firm with

expanded opportunities and sources of getting a loan and also provide better networking facilities. The impact is similar if the firm is located in the main business city. Our results also show that industries like food, tobacco, textiles, garments, plastics, chemicals and rubber, electronics, wholesale and retail face greater difficulty in accessing finance. Most state fixed effects are significant as well. Being in most states makes it difficult for firms in accessing finance as evident from the positive and significant coefficient of the state fixed effects. The magnitude of the state fixed effects shows that firms in states like Uttaranchal, Tamil Nadu, Jharkand and Bihar face the most difficulty in accessing finance. The only states where firms actually experience less difficulty in accessing finance are Chattisgarh, Gujarat, Orissa and Punjab.

In Table 3, we go on to explore the main question we are interested in. We present the results for equation (2) in Table 3. Here we consider percentage of female ownership among firms that have more than zero percent female ownership as our main independent variable. Considering percentage of female ownership as our main explanatory variable helps us to understand whether firms dominantly owned by females face higher difficulty in accessing finance relative to firms dominantly owned by males. The format of Table 3 is very similar to Table 2. Again, the only explanatory variable considered in Column (1) of Table 3 is the percentage of female ownership.

[Insert Table 3 about here]

We add controls in subsequent columns. The coefficient of percentage of female ownership is positive and significant for all the specifications in Table 3. The positive and significant coefficient suggests that with a rise in the proportion of female ownership, difficulty in accessing finance goes up. Based on column (1) specification estimates, if the percent of female ownership goes up by one unit, the log-odds of being in higher access to finance category go up by 0.013 units. A higher access to finance category, as stated earlier, implies greater difficulty in accessing finance. In

simple terms, a unit rise in percent of female ownership raises difficulty in assessing finance by 6 percentage points. The impact is almost similar in specifications in columns (2), (3) and (4) and slightly smaller in column (5) specification. Thus, our results suggest that for firms that are dominantly owned by females, the probability of difficulty in accessing finance rises.

As explained earlier in our introductory sections, signaling can explain why firms dominantly owned by males may differ in their abilities to access finance compared to firms dominantly owned by females. Amount of bank financing obtained by male and female entrepreneurs may differ based on signals that reflect a venture's viability and the entrepreneurs commitment to business (Prasad et al., 2000; Reuber and Fischer, 2005; Busenitz, Fiet and Moesel, 2005). Thus, firms dominantly owned by males but with some female ownership can successfully signal and, thus, might have lesser difficulty in accessing finance. On the other hand, firms that are dominantly owned by females need to negotiate harder for finance since women may fail to generate the positive signals when seeking bank financing.

Many of the controls loses their significance in Table 3. Among the industry fixed effects, the estimates suggest that for industries like chemicals, industries and rubber and publishing, the difficulties in accessing finance is relatively less. State fixed effects show that being a firm in states like Bihar, Assam, Jharkand, Madhya Pradesh, Rajasthan, Tamil Nadu is associated with greater difficulty in accessing finance.

To explore further and connect the findings in Tables 2 and 3, we present results in Table 4 based on split samples. So far our baseline results show that firms with female ownership experience less difficulty in accessing finance. But on exploring further, we find that percentage of female ownership matters within firms with female ownership and that firms dominantly owned by females face greater difficulty in accessing finance. In Table 4, we construct three dummies

based on percent of female ownership in firms. The firms are assigned dummies of 1 based on if female ownership is less than 50%, if female ownership is more than 60% and finally if female ownership is in between 50% and 60%. Ordered logit estimates are presented in Table 4. Column (1) considers female ownership dummy for firms with less than 50% female ownership as the main independent variable of interest. In column (2), the independent variable of interest is a dummy indicating firms with more than 60% female ownership. Finally, in column (3), firms with 50% to 60% female ownership are considered.

Table 4 presents us with some interesting findings. We find that in column (1), the dummy is negative and significant. Thus, when firms have less than 50% ownership by females, their difficulty in accessing finance goes down. But when firms have more than 60% ownership by females, they face greater difficulty in accessing finance as evident from column (2) estimates. For firms that have female ownership between 50% and 60%, the female ownership proportion is not a significant determinant of access to finance. This re-confirms the relevance of signaling and gender role in entrepreneurship domain as put forward by existing studies.

[Insert Table 4 about here]

Signaling theory implies reducing information asymmetry while one party is evaluating quality of another party (Connelly, Certo, Ireland, & Reutzel, 2011; Spence, 2002). In the case of entrepreneurship, signaling is applied in the case of viability of ventures as determined by the future prospects and stability of the venture (Jain et al., 2008; Reuber & Fischer, 2005). Further, signaling is also applied to the commitment of the entrepreneur (Busenitz et al., 2005; Prasad et al., 2000). Gender role congruity theory suggests that gender stereotypes can strengthen beliefs with regard to males and females in terms of their behaviors and attributes (Eagly and Karau, 2002; Powell and Butterfield, 2003; Powell, Butterfield and Parent, 2002). These theories are aligned

with our findings. Firms that have less than 50% ownership by females still signal a healthy viability of projects as well as the commitment of the entrepreneur. For such firms with more than 50% male ownership, gender stereotypes as suggested by the gender congruity theory reassure financiers about the viability of future projects and, thus, such firms are successful in receiving funding. But it is opposite in the case of firms dominantly owned by females. Due to gender stereotypes, such firms fail to successfully send positive signals and, thus, face increasing difficulty in accessing finance.

6. Exploring channels

As explained in our hypothesis and in our empirical methodology section, the second hypothesis that we are interested in exploring is to investigate channels that potentially affect the relationship between percent of female ownership and access to finance. Specifically, we consider different variables that can potentially affect the relationship between percent of female ownership that captures the extent of gender diversity within firms and difficulty in accessing finance. In this section, we explore equation (3) as stated in the empirical methodology section. Further, as mentioned before we are interested in exploring how $\frac{\partial Access_{it}}{\partial \%femownership_{it}}$ changes with the different channels that we explore.

The first channel that we explore is the type of ownership of firms along the lines of public, private and foreign ownerships. The specific variables that we consider are percent of private ownership among firms, percent of foreign ownership in firms and percent of government ownership among firms. Three separate variables are considered that capture the extent of ownership by private, foreign and government agents. We interact the three variables with the

percent of female ownership variable as stated in equation (3). The results are presented in Table 5. In column (1), we interact percent of female ownership with percent of private ownership of

[Insert Table 5 about here]

firms. In column (2), percentage of female ownership is interacted with percent of foreign ownership of firms and finally in column (3), we interact the variable with percent of government ownership of firms. We find that private ownership or foreign ownership does not significantly alter the percent of female ownership-access to finance relationship. Yet, as evident from column (3) results, percent of government ownership does affect the relationship. While the coefficient of percent of female ownership is still positive and significant, the interaction term of percent of female ownership and percent of government ownership is negative and significant. This suggests that higher levels of government ownership of firms ameliorates the positive impact of female ownership on difficulty in accessing finance.

To delve deeper into the implications of the findings, we need to estimate $\frac{\partial Access_{it}}{\partial \% femownership_{it}}$.

A closer look at the percentage of government ownership variable shows that the variable ranges from 0 to 99 percent with 15 percent being the mean. For 0 percent of government ownership, $\frac{\partial Access_{it}}{\partial \% femownership_{it}}$ is positive and significant. A unit rise in female ownership raises difficulty in accessing finance by 1 percentage point. But even a little bit of rise in government ownership brings down the difficulty in accessing finance. Firms with 50% government ownership faces a 9 percentage point reduction in accessing finance for a unit rise in female ownership.

The next channel we explore is the source of capital obtained by firms. The capital source can be self-financed funds, loans from banks, from non-bank financial institutions or from informal sources like relatives, friends and acquaintances. The different variables represent percentage of

funding received from the mentioned sources. We interact each variable to percent of female ownership. Table 6 presents the results. The different sources of funding considered in columns (1) to (4) respectively are internal funding, banks, non-bank financial institutions and informal funding sources. We have some interesting findings from Table 6. We find that the proportion of female ownership hurts the least in terms of its impact on difficulty in accessing finance when the source of funding is internal.

[Insert Table 6 about here]

When majority of firm owners are females and they are funding future investments with their own capital, the need and efforts to acquire external funding go down. Thus, females do not need to send out positive signaling regarding viability of future projects and commitment as a successful entrepreneur to acquire funds. When the source of financing is bank, the interaction term is insignificant suggesting that the female ownership's impact on difficulty in accessing finance is not contingent on the source of funding. We find that when the sources of funding are non-bank financial institutions and informal sources, percent of female ownership has a worsening impact on difficulty in accessing finance. In the case of informal sources, gender stereotypes may make it harder for females to acquire funds and, thus, with higher female ownership, we see that firms have greater difficulty in accessing finance.

We estimate $\frac{\partial Access_{it}}{\partial \%femownership_{it}}$ when the source of funding is internal. When source of internal funding is 0, $\frac{\partial Access_{it}}{\partial \%femownership_{it}}$ is positive and significant. In terms of economic significance, a unit rise in percent of female ownership raises difficulty of accessing finance by 1 percentage point. As the percent of internal borrowing rises, we find that $\frac{\partial Access_{it}}{\partial \%femownership_{it}}$ becomes less in magnitude but still remains positive and significant for firms that have internal

borrowing at the 75th percentile level in terms of our sample. At the 90th percentile of internal borrowing, $\frac{\partial Access_{finance}_{it}}{\partial \% femownership_{it}}$ becomes insignificant suggesting that percent of female ownership does not remain a significant determinant of access to finance.

The final channel that we explore is the percent of national sales that firms have. Higher percent of national sales is indicative of a well-established firm. Such a firm should have relatively less difficulty in accessing finance because of its credibility, signaling its abilities to creditors and being able to network successfully. We interact percent of national sales

[Insert Table 7 about here]

with percent of female ownership. Table 7 presents the results. We do find that interaction term is negative and significant suggesting that higher percent of national sales of firms ameliorates the worsening (positive) effect of percent of female ownership on difficulty in accessing finance.

7. Robustness Analysis

The two sets of results that constitute our robustness analysis are considering an alternate model specification that take into account multiple challenges that might be associated with our benchmark estimator exploring yet another channel that can affect the percent of female ownership and probability in accessing finance relationship. We describe here the adopted methodology in greater detail. The methodology undertaken aims to establish identification with respect to our variable of interest, i.e., percent of female ownership.

7.1. Propensity score matching

Our benchmark ordered logit specifications have limitations. One of the challenges we face is that logit or probit specification does not allow sufficiently for heterogeneity of firms (see Webster and Piesse, 2018). The implication of this is that the same behavioral model is imposed on all firms irrespective of the fact that the firms may not be similar to each other. In order to take care of this and to explore our hypothesis more robustly, we use matching techniques that ensure closer compatibility between firms that have higher percentage of female ownership versus firms that do not. As shown in Mallick and Yang (2013), sample selection bias can be reduced via propensity score matching (PSM), since PSM allows a carefully matched control group to be created. In our case, difficulty in accessing finance and high or low levels of female ownership or, in other words, gender diversity can be simultaneously determined. Thus, there is a fair chance of sample selection bias which can be minimized via PSM as suggested by Borin and Mancini (2016). In our case, we need to observe the similar firms in two different categories – with high level of female ownership or none. Likewise, the other possible scenario is to observe the same firm with low level of female ownership or none. While it is not possible to observe the same firm in two different scenarios, it is possible to create a counter-factual group of firms that are relatively similar in all respects except with respect to low or high female ownership. PSM techniques are particularly useful in such situations for analyzing the data.

For our study, the treatment variable is percentage of female ownership (defined by three different dummies). The outcome variable is whether a firm has difficulty in accessing finance or not. A simple approach to study the treatment effect is to test whether there is any statistical difference between firms' difficulty in accessing finance with high levels of female ownership to those who have no female ownership. But such an approach is likely to produce biased results since it is very unlikely that the control and treatment group will closely resemble each other in

everything except the treatment. A matching approach enables creating a control group that satisfies the above criteria. Thus, as mentioned by Webster and Piesse (2018), the matching process replicates the process of experimental random sampling using non-experimental observed data.

We face another challenge while trying to run propensity score matching as part of our robustness analysis. Our dependent variable is an ordered dummy and, thus, we need to create dummies for difficulty in accessing finance that are binary. We consider the dummy which takes value 1 if difficulty in accessing finance scores are 2, 3 or 4. It is to be noted that the difficulty in accessing finance variable is constructed on a range of 0 to 4 with higher numbers indicating greater difficulty in accessing finance. Keeping space constraints in mind, we do not report the results but they are available on request.

To apply the PSM technique, a probit model – where the dependent variable is financing access and the regressors are the firm characteristics – is estimated. The probability (propensity score) that each firm has majority female ownership is derived and used to determine the matched treated (majority female ownership) and untreated (no female ownership) samples. Instead of regressing financing on female ownership for the whole sample, the average effect of female ownership on financing access in the matched samples (also known as the average treatment on treated effect; hereafter ATT) is estimated. The magnitude of difference in financing pattern between the treatment group (firms with majority female ownership) and control groups (firms with no female ownership) is then derived. We derive results for both the average performance differences between unmatched firms and for the matched firms. The results show that there is a statistically significant difference between the two types of female ownership. Across all the different matching methods, the average financing access difference between firms with female ownership and firms without such ownership is statistically significant.

7.2. Exploring the innovation channel

Finally, as stated in our hypothesis, we explore the innovation channel and if that affects the percent of female ownership versus difficulty in accessing finance. We consider variables that are indicative of whether firms have adopted innovative strategies recently in terms of coming up with a new product, in terms of service or management or in terms of organizational structures or practices. Dummies take the value 1 if the firm has taken up any innovative activity with regard to the categories mentioned above in the last three years. We interact the dummies with percent of female ownership. Our results are not significant for any innovative activities except in the case of organizational structures or practices. We find that firms who have taken up innovative activities in terms of organizational structures or practices face relatively lesser credit constraints in spite of rise in female ownership.

8. Conclusion

The paper focused on the key link between women entrepreneurship and their financial access, emphasizing the role of state ownership of firms and innovative ability of firms, in an emerging economy. The idea here was to examine whether majority women-led firms have had better access to finance. This paper concludes that majority women-operated firms tend to be more financially constrained, except when those firms are state-owned, or rely on internal sources of financing, or more innovative, suggesting that government ownership, internal source of financing, firms targeting local sales and with some form of innovation promote greater financial access for new or small firms who tend to be more financially constrained.

Examining the relationship for different proportions of female entrepreneurs in a firm, the paper finds that firms with more than 60% of female entrepreneurs are more constrained in terms

of accessing finance while firms below 50% women-leaders are less constrained. Our empirical estimates suggest that small firms are more constrained relative to medium size firms. Also firms those who have majority female-ownership and who rely on internal funds are less constrained, while female entrepreneurs with reliance on non-bank funding or informal sources of finance tend to be more constrained. However, there is no significant effect when it comes to financing from banking institutions as they tend to discriminate less on the basis of gender.

Given that female entrepreneurship can have important implications for inclusive finance and inclusive growth, reducing such bias can help enhance female entrepreneurship. Our results in this paper point to the importance of removing barriers to entrepreneurship development; particularly more innovative projects can allow better financial access of women as innovation and financing can move together helping overcome any room for gender discrimination and thereby improve women entrepreneurship and achieve greater financial inclusion.

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Table 1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Female ownership	9224	0.15	0.36	0	1
Small firm	9281	0.34	0.47	0	1
Medium Firm	9281	0.44	0.50	0	1
Large Firm	9281	0.23	0.42	0	1
Capital city	9281	0.06	0.23	0	1
Main business city	9281	0.81	0.39	0	1
Percent owned by private	9281	99.17	7.33	0	100
Percent owned by foreign	9281	0.50	6.01	0	100
Percent owned by govt.	9281	0.15	2.78	0	99
Internal_borrowed	9281	12.54	10.33	1	43
Bank_borrowed	9281	13.27	14.04	1	41
Non bank_borrowed	9281	3.10	5.96	1	21
Informal_borrowed	9281	4.11	7.85	1	27
% of national sales	9281	92.75	21.96	0	100

TABLE 2: Ordered Logit Regressions: Access to Finance and Female Owned Firms

All data are considered from World Bank Enterprise Surveys. *Access to finance* is the dependent variable coded from 1 to 4 with higher numbers representing greater difficulties in accessing finance. Female-owned is a dummy representing if a firm is female owned or not. Firm (small) and firm (medium) denote firm size. Official capital city denote if the firm is in the official capital city. Main business city denotes if the firm is in the main business city or not. Robust Standard Errors are in parenthesis.

	(1)	(2)	(3)	(4)	(5)
Female-owned	-0.243*** (0.0591)	-0.222*** (0.0592)	-0.214*** (0.0599)	-0.210*** (0.0605)	-0.145** (0.0667)
Firm (Small)		0.294*** (0.0517)	0.299*** (0.0521)	0.256*** (0.0543)	0.351*** (0.0573)
Firm (Medium)		0.162*** (0.0473)	0.170*** (0.0477)	0.157*** (0.0485)	0.207*** (0.0508)
Official cap. city			-0.632*** (0.0881)	-0.598*** (0.0907)	-2.401*** (0.161)
Main bus. city			-0.192*** (0.0498)	-0.192*** (0.0524)	-0.318*** (0.0604)
Industry fixed effect	No	No	No	Yes	Yes
State fixed effect	No	No	No	No	Yes
Observations	9,188	9,188	9,188	9,188	9,188

TABLE 3: Ordered Logit Regressions: Access to Finance and Percentage Female Owned

All data are considered from World Bank Enterprise Surveys. *Access to finance* is the dependent variable coded from 1 to 4 with higher numbers representing more difficulties in accessing finance. Percent Female-owned is the percentage of the firm owned by females. Firm (small) and firm (medium) denote firm size. Official capital city denote if the firm is in the official capital city. Main business city denotes if the firm is in the main business city or not. Robust Standard Errors are in parenthesis.

	(1)	(2)	(3)	(4)	(5)
Percent female-owned	0.0130*** (0.00184)	0.0128*** (0.00191)	0.0128*** (0.00192)	0.0125*** (0.00200)	0.00998*** (0.00221)
Firm (Small)		0.100 (0.150)	0.125 (0.153)	0.194 (0.166)	0.327* (0.171)
Firm (Medium)		0.173 (0.130)	0.194 (0.131)	0.201 (0.135)	0.134 (0.137)
Official cap. city			-0.280 (0.200)	-0.297 (0.205)	0.336 (0.277)
Main bus. city			0.0755 (0.127)	0.0590 (0.137)	-0.193 (0.168)
Indus. fixed effect	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	1,236	1,236	1,236	1,236	1,236

TABLE 4: Ordered Logit Regressions: Access to Finance and Percentage Female Owned

All data are considered from World Bank Enterprise Surveys. *Access to finance* is the dependent variable coded from 1 to 4 with higher numbers representing more difficulties in accessing finance. Percent Female-owned variables different dummies that take the value 1 or 0 depending on the extent of female ownership. Firm (small) and firm (medium) denote firm size. Official capital city denote if the firm is in the official capital city. Main business city denotes if the firm is in the main business city or not. Robust Standard Errors are in parenthesis.

	(1) (Less than 50%)	(2) (More than 60%)	(3) (Between 50% and 60%)
Percent female-owned	-0.278** (0.121)	0.512*** (0.169)	0.268 (0.424)
Firm (Small)	0.467*** (0.168)	0.421** (0.169)	0.540*** (0.165)
Firm (Medium)	0.178 (0.137)	0.162 (0.138)	0.204 (0.137)
Official cap. city	0.369 (0.280)	0.423 (0.275)	0.437 (0.277)
Main bus. city	-0.177 (0.168)	-0.167 (0.167)	-0.157 (0.168)
Indus. fixed effect	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Observations	1,236	1,236	1,236

TABLE 5: Ordered Logit Regressions: Access to Finance, Percentage Female Owned and private/public ownership of firms

All data are considered from World Bank Enterprise Surveys. *Access to finance* is the dependent variable coded from 1 to 4 with higher numbers representing more difficulties in accessing finance. Percent Female-owned is the percentage of the firm owned by females. Private ownership denotes percent of the firm owned by private individuals. Foreign ownership represents percent owned by foreign individuals. Government ownership represents percent owned by government. Firm (small) and firm (medium) denote firm size. Official capital city denote if the firm is in the official capital city. Main business city denotes if the firm is in the main business city or not. Robust Standard Errors are in parenthesis.

	(1)	(2)	(3)
Percent female-owned	-0.00459 (0.0640)	0.0100*** (0.00221)	0.0101*** (0.00221)
Firm (Small)	0.346** (0.171)	0.339** (0.171)	0.337** (0.172)
Firm (Medium)	0.151 (0.137)	0.140 (0.138)	0.144 (0.138)
Private Ownership (%)	-0.0201 (0.0225)		
Female owned*Private	0.000148 (0.000640)		
Official cap. city	0.324 (0.279)	0.320 (0.279)	0.350 (0.278)
Main bus. city	-0.198 (0.167)	-0.198 (0.168)	-0.198 (0.168)
Foreign Ownership (%)		0.0247 (0.0474)	
Female owned*Foreign		1.03e-05 (0.00115)	
Govt. Ownership			0.301*** (0.100)
Female owned*Govt.			-0.0464*** (0.0179)
Indus. fixed effect	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes
Observations	1,236	1,236	1,236

TABLE 6: Ordered Logit Regressions: Access to Finance, Percentage Female Owned and source of capital financing

All data are considered from World Bank Enterprise Surveys. *Access to finance* is the dependent variable coded from 1 to 4 with higher numbers representing more difficulties in accessing finance. Percent Female-owned is the percentage of the firm owned by females. Internal funds denote the % of working capital financed from internal funds. Bank financed represent the % of working capital borrowed from banks. Non-bank financed represents % of working capital financed from non-bank institutions. Finally, informal finance represents % of working capital financed from informal sources like acquaintances, relatives, friends etc. Firm (small) and firm (medium) denote firm size. Official capital city denote if the firm is in the official capital city. Main business city denotes if the firm is in the main business city or not. Robust Standard Errors are in parenthesis.

	(1)	(2)	(3)	(4)
Percent female-owned	0.0165*** (0.00334)	0.00653** (0.00310)	0.00778*** (0.00236)	0.00791*** (0.00236)
Internal funds	0.0408*** (0.0115)			
Female owned*Internal	-0.000492** (0.000207)			
Firm (Small)	0.358** (0.171)	0.337* (0.173)	0.313* (0.172)	0.316* (0.171)
Firm (Medium)	0.139 (0.137)	0.144 (0.139)	0.114 (0.138)	0.125 (0.138)
Official cap. city	0.459 (0.280)	0.387 (0.278)	0.341 (0.281)	0.332 (0.282)
Main bus. city	-0.242 (0.170)	-0.191 (0.169)	-0.210 (0.170)	-0.214 (0.171)
Bank financed		-0.00560 (0.00809)		
Female owned*Bank		0.000250 (0.000152)		
Non-bank financed			-0.0435** (0.0172)	
Female owned*Non-Bank			0.000795** (0.000378)	
Informal finance				-0.0374*** (0.0131)
Female owned*Informal				0.000598** (0.000285)
Indus. fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Observations	1,236	1,236	1,236	1,236

TABLE 7: Ordered Logit Regressions: Access to Finance, Percentage Female Owned and percent of sales

All data are considered from World Bank Enterprise Surveys. *Access to finance* is the dependent variable coded from 1 to 4 with higher numbers representing more difficulties in accessing finance. Percent Female-owned is the percentage of the firm owned by females. % sales represent percent of National sales. Firm (small) and firm (medium) denote firm size. Official capital city denote if the firm is in the official capital city. Main business city denotes if the firm is in the main business city or not. Robust Standard Errors are in parenthesis.

Percent female-owned	0.0215*** (0.00658)
% sales	0.0101*** (0.00384)
Female owned*sales	-0.000129* (7.00e-05)
Firm (Small)	0.277 (0.172)
Firm (Medium)	0.0965 (0.138)
Official cap. city	0.348 (0.281)
Main bus. city	-0.180 (0.167)
Indus. fixed effect	Yes
State fixed effect	Yes
Observations	1,236