Impact of Social Networking on Income and Loan Repayment of Subsistence Women Entrepreneurs: Experimental Evidence from India

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Abstract

Subsistence entrepreneurs mitigate their financial and non-financial constraints by leaning on their social networks to generate social capital, which can provide them market access. However, social capital generated from interactions with local customers and other stakeholders in subsistence marketplaces may have limited roles in enhancing business outcomes such as income growth and loan repayments. P2P digital platforms such as WhatsApp groups that offer social networks breaching the geographical boundaries of a subsistence marketplace may be able to provide additional economic returns beyond what informal markets can generate. Using a field experiment of 819 subsistence women entrepreneurs in rural India, the authors show that social capital induced market access gained through membership of a WhatsApp group of peers and buyers increased income of the entrepreneurs by 4-5% and improved their loan repayment behaviour. However, the effects take time to show up and are statistically significant only after 6 months of the intervention, thus suggesting that social capital in a digital marketplace takes time to build and generate returns. These findings broaden our understanding of the role of social capital in hybrid marketplaces and can support policy development in the use of digital commerce as a public policy tool.

Key Words

Subsistence Women Entrepreneurs, Social Capital, P2P platform, Financial Wellbeing, Randomized Control Trial

1. Introduction

Subsistence entrepreneurs refer to individuals living in poverty and running subsistence enterprises for economic survival (Santos and Ferreira, 2017; Viswanathan et al., 2014; Alvarez & Barney, 2014). These entrepreneurs, typically more visible in informal workplaces of developing countries, are usually characterised by severe resource constraints (Tulus, 2009; Simba et al., 2023). Subsistence entrepreneurs have businesses with low productivity levels, low technology and skill intensity, and scarce accumulation possibilities for resources, including financial capital (Alimukhamedova, 2019), consequently limiting the expansion of their existing business or the establishment of new ventures. Though microfinance institutions have been bridging the gap of access to finance (Karlan & Murdoch, 2010), access to finance alone may not be sufficient for transforming a subsistence entrepreneur into a small or medium entrepreneur (Schoar, 2010; Viswanathan et al., 2009). Microcredit has been often found to have limited impact on business or developmental outcomes (Banerjee *et al.,* 2015). We contend that, besides financial access, another kind of resource viz. market access is important for the growth of subsistence entrepreneurs.

In a subsistence marketplace, low-income entrepreneurs lean on their community level social networks for resources such as access to informal markets for income generation and livelihood (Banerjee & Duflo, 2007; Viswanathan *et al*.; 2010; Gau *et al*., 2014; Viswanathan & Venugopal, 2015). Social capital, an asset created from social networks acts as the resource for a subsistence entrepreneur to facilitate market access (Adler & Kwon, 2002; Delacroix et al., 2019). However, though the social ties are intense from buyers in a subsistence marketplace, the customers being resource constrained and poor themselves might result in low quality social capital, which might not be able to improve business outcomes of subsistence entrepreneurs (Delacroix *et al*., 2019). Additionally, a lack of mobility (Kumbhar, 2013; Ghani et al., 2014) restricts subsistence entrepreneurs to a specific geographical region, leading to

lack of interaction to scale their social networks (Kumbhar, 2013). These challenges warrant reimagining the idea of social network for attaining better market access and in this context digital platforms can be considered as a superior tool (Rossotto *et al*., 2018).

Digital platforms are recognised as ideal tools for creating social assets or social capital (Delacroix et al., 2019; Blanchard, 2004; Ellison &Vitak 2015). Social capital emerging out of social media interactions through bridging and bonding can be beneficial for subsistence entrepreneurs as they are no more constrained by interactions in a specific geographical area. Thus, social capital created by digital social networks can be utilised by subsistence entrepreneurs to not only improve market access but also enhance the quality of market interaction, possibly culminating in higher sales, higher income, and lower probability of loan defaults. Digital platforms such as WhatsApp can emulate conditions of a physical subsistence marketplace providing flexibility, extended reach, trust building and peer networks, thereby facilitating greater market access (Bodker et al., 2020; Delacroix et al., 2019)). However, according to Viswanathan *et al.* 2012, there is limited empirical evidence on the role of social network as a resource for providing market access and better market interaction to support income generation of subsistence entrepreneurs. Considering the recent proliferation of digital social media platforms, we examine whether social capital induced from a social media network can provide improved market access and thereby increase the income and loan repayment ability of subsistence women entrepreneurs.

We use a randomized field experiment which is an empirical technique that allows researchers to draw causal conclusions (Chen *et al.* 2021). Using a Randomized Control Trial (RCT) of 819 subsistence women entrepreneurs from a rural region of India, we study the following research questions.

- *Research Question 1: Given access to financial capital, does social capital created by digital social networks improve the income and loan repayment behaviour of subsistence women entrepreneurs?*
- *Research Question 2: Is the impact of digital social networks on income and loan repayment behaviour of subsistence women entrepreneurs different over the short-term and medium-term horizons?*

For the implementation of the experiment, we partner with the Manndeshi 'Mahila Sahakari' Bank (i.e. Manndeshi Women's Cooperative Bank) in Maharashtra, India. All members of the bank have existing loans thus partially mitigating the previously discussed financial resource constraint. Given the homogeneity in financial access, we examine the impact of providing market access to the subsistence women entrepreneurs. Half of the sample of entrepreneurs (randomized by background characteristics) were provided a WhatsApp group membership that gave them access to potential buyers, distributors, and local entrepreneurs. This digital social network was curated by the bank to avoid any spill-over effects. The other half of the sample did not have access to this WhatsApp group. We collected data on the sample's income and loan repayment behaviour before and after the intervention (creation of the WhatsApp group).

Though the concept of social capital generated by social network cuts across different types of income and ethnic groups (Malhotra *et al*., 2002), we restrict our study to rural women in India for the following reasons. Firstly, women are exposed to higher risks that frequently leave them in poor financial health (Hopley, 2003; Malone *et al*., 2009). Secondly, women have lower workforce participation than men (DeVaney *et al*., 1996; Schmidt and Sevak, 2006). Thirdly, due to lower income levels, women do not enjoy economic independence (Schramm & Harris, 2011) and are significantly impacted by exogenous shocks (Hendriks, 2019). Finally,

women face mobility challenges limiting their opportunities in the labour market (Kumbhar, 2013; Ghani *et al.*, 2014).

The findings of our field experiment provide insights on how networks formed on social media may provide a channel to augment market access in a digital economy. Our study shows that membership of a WhatsApp group leads to a 4-5% increase in income (depending on the estimation method) over the medium-term, but there is no income increase in the short run. This finding of a medium-term impact supports the literature that building of social network takes investment of time and is not transactional or a matter of immediate gratification (Adler& Kwon, 2002).

This paper's contribution to the literature is multi-fold. Firstly, using RCT and a unique setting of subsistence women entrepreneurs, we empirically test whether social network fostered by a digital social media platform (WhatsApp) can provide access to market, thereby enhancing income of subsistence women entrepreneurs. Secondly, we assess the impact of a digital social network on loan repayment ability of subsistence women entrepreneurs. Thirdly, we identify both short-term and medium-term effects on economic returns (income) and financial wellbeing (loan repayment ability), thereby demonstrating the sustainable benefits of digital social networks.

The paper is organised as follows. Section 2 lays the edifice of our research work in the theoretical framework of social capital and subsistence marketplace literature. In Sections 3 and 4 we explain the background and experimental design. Section 5 introduces the data and the empirical methodology. Section 6 presents our findings and discussion of results. Finally, we conclude with implications of our study in Section 7.

2. Theoretical framework: Subsistence Entrepreneurs, Social Media Networks and Market access induced growth

2.1 Subsistence Entrepreneurship and Social Capital

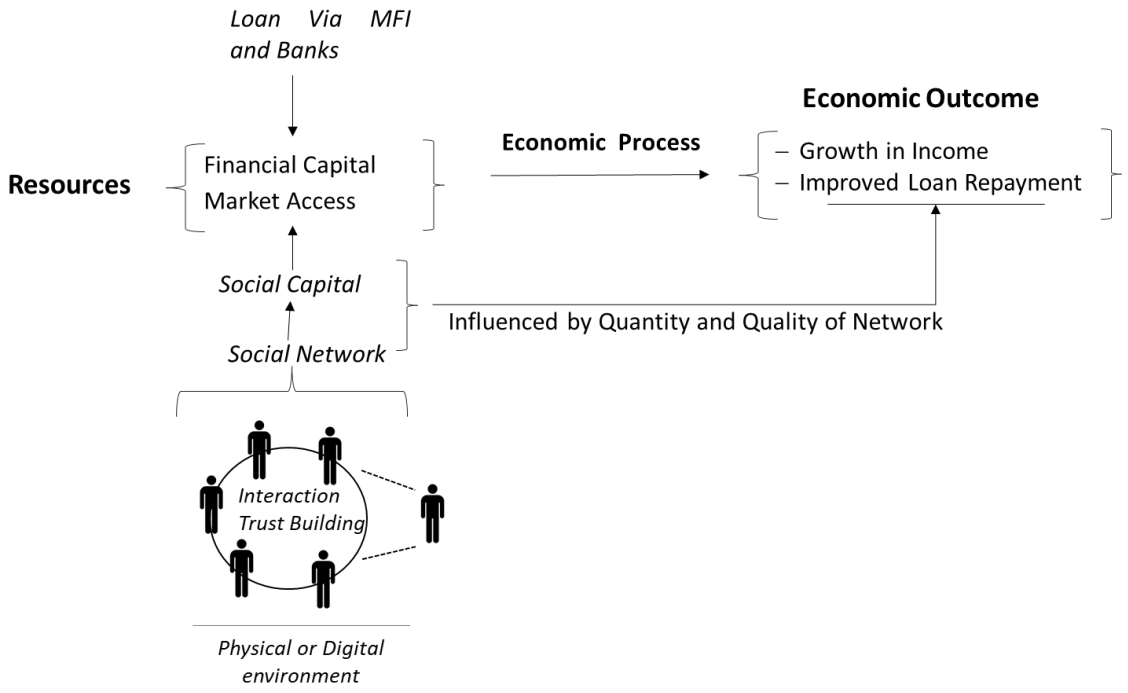
Subsistence entrepreneurship is necessity-based entrepreneurship that is mostly about managing "existential challenge" or "survival" (Fischer, 2013; Viswanathan et al.,2014). Apart from low education levels, limited managerial experience, lack of access to formal business networks and scarcity of financial capital (Marques, 2017; Alimukhamedova, 2019), subsistence women entrepreneurs are also constrained for access to markets for their products (Rumniska-Zimny, 2002; Jha et al., 2018). The subsistence marketplace's deficient financial and human capital resources are mitigated by building "social capital" facilitated through relationships and interactions among consumers and entrepreneurs (Adler & Kwon, 2002; Robison *et al*., 2002). Social capital refers to "the capacity of individuals to command scarce resources by virtue of their membership in networks or broader social structure" (Portes, 2000; Viswanathan et al., 2014). Social capital is derived out of nurturing relationships and networks, through deliberate actions and investment of time (Evans, 1996) and is leveraged to pursue the individual's interest (Baker, 1990). Social capital can be denoted as a long-lived asset which can be combined with other assets to provide an economic return (Adler& Kwon, 2002).

For subsistence entrepreneurs, social networks constitute social assets and when appropriately channelised, can provide market access and other scarce resources, thereby positively impacting economic well-being (Viswanathan *et al*., 2009; Delacroix *et al*., 2019). Thus, social capital offers the theoretical edifice for the emergence of subsistence economy structures and subsistence entrepreneurs), who pursue livelihood initiatives by entrepreneurship for survival. However, social capital generated by the social network of subsistence women entrepreneurs might be of less desirable quality- as most social network members in a subsistence marketplace are resource-constrained and poor (Delacroix et al., 2019). *Digital social media and social capital*

Digital platforms can overcome the twin deficiencies of the social networks generated in a subsistence marketplace. The term "platform" broadly consists of "a set of digital frameworks for social and marketplace interactions", which "structures economic and social activity" (Kenney & Zysman, 2016). Digital social media platforms drive collaborative exchange, extend connections, and enable trust, fostering social capital (Bodker *et al.,* 2020; Zinnbauer,2007; Ellison &Vitak, 2015;). The social media networks can augment the business of a subsistence entrepreneur in two ways

- Digital social media networks can possibly reduce cost and entry barriers for micro-entrepreneurs (Goldfarb and Tucker, 2019; Delacroix *et al.,* 2019). Subsistence entrepreneurs with less technical and digital knowledge could start/ expand business on the existing platforms including social media websites (Zaheer *et al.,* 2019).
- Social capital induced by digital social networks which are beyond the geographical boundaries of a subsistence marketplace, enhances the quality of market access. This happens through higher-quality information sharing, better distribution practices, negotiations, and discussions with other members of the social media network (Scuotto *et al*., 2017). Figure 1 shows our conceptual framework that underpins the subsequent empirical analysis. When appropriately channelled, social capital provided by the social media network can provide market access that becomes scalable and cost-efficient (Adler and Kwon, 2002; Leanna and Van Buaren, 1999). The social media network can thus widen the market, which otherwise would have been less profitable and non-scalable for a subsistence entrepreneur. In this way, social capital emerging from the social network can complement other resources like financial capital, and the greater market access thus realised translates into economic outcomes such as higher income and improved loan repayment behaviour.

Figure 1: Conceptual Model of Social Capital and Economic Outcome



Source: Authors' creation, based on conceptual framework, adapted from Robison *et al*., 2002; Adler& Kwon, 2002; Viswanathan *et al*., 2014.

3. Background and Experimental Design

Our empirical study was conducted in collaboration with the Manndeshi Mahila Sahakari Bank (henceforth, MDMSB), which operates out of Maharashtra state of India. This cooperative bank was started in 1997 with a mission to enhance the socio-economic status of women entrepreneurs. MDMSB provides financial products such as loans and deposits and has disbursed loans to more than 200,000 women micro-entrepreneurs since its inception. The bank has a balance sheet of around $10 million across 8 branches in Maharashtra.

Field experiments have become the gold-standard for studying causal impact of interventions, and numerous studies have used this technique for drawing causal inferences that are hard to extract from secondary or observational data (Duflo *et al.*, 2007; Banerjee *et al.*, 2015; Chen

et al., 2021). We conducted our field experiment at MDMSB's branch in Kamothe[1]. Since all members of the bank are given loans, we are able to control for the usual heterogeneity in access to financial capital. All the participants in the study were account holding customers and had utilised the joint liability group (JLG) lending product (i.e. an individual loan with group guarantee). Our sample consists of 819 bank customers who are subsistence women entrepreneurs engaged in non-farm business activities such as retail trade, tailoring, catering, cottage/ home industry (making incense sticks, condiments, bags etc.). The participants have an average age of 39 years, have high school education with similar socio-economic backgrounds. Their average monthly balance (prior to the intervention) was INR 8508[2], whereas the average value of loans sanctioned to them was INR 26,000.

Our field experiment involved a randomized control trial (RCT), where we randomly assigned about half of the 819 participants to the treatment group that were given a digital market access. The treatment group participants (originally intended to be 410, but 1 dropped out later) were on-boarded on a "Manndeshi Udyojika Group" (Manndeshi women entrepreneurs' group) i.e. a WhatsApp group of peers along with more than 40 distributors and retailers from across the nearby cities of Mumbai, Pune and Thane. The primary objective of the WhatsApp group membership is to facilitate engagement with distributors in order to create new market access and thereby allowing the subsistence entrepreneurs to grow their business. The entrepreneurs could use the group to post information about their products and prices with a view to attracting more sales. Additionally, this social network opens up the possibility of cooperating with other local entrepreneurs to create new products, envisage new business opportunities and improve the distribution efficiency.

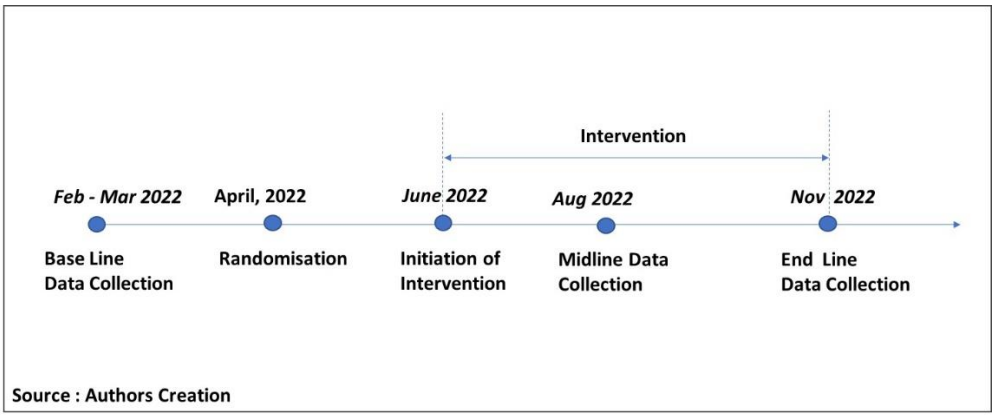
[1] **K**amothe is a settlement in the district of Raigad, Maharashtra and has a population of 250,000 people. The district of Raigad has a population of around 2.6 million (as per 2011 census) within an area of 7,152 square kilometres.

[2] INR refers to Indian Rupee. 1 INR = $82.2 as on 31st March 2023.

The remaining 410 participants were assigned to the control group with no digital market access. The MDMSB representatives, functioned as administrators of the WhatsApp group and ensured only the participants we had assigned to the treatment group were present there, thus eliminating any spill-over effects to the control group. During the study period, no changes were done in the bank's interest rate on savings or lending or in its collection process, nor were the participants of either group given any other kind of training or intervention.

Pre-intervention base-line data was collected during February and March 2022, while the randomisation exercise was conducted during April 2022. The WhatsApp group commenced in May and mid-line data was collected in July 2022 (on information pertaining to May, June and July) and end-line data was collected in October 2022 (on information pertaining to August, September and October). Base-line data consists of background as well as outcome variables, while mid-line and end-line data comprised of only outcome variables. We compare short-term (mid-line) and medium-term (end-line) effects to study the intervention's sustainability and dynamic impact i.e. whether it strengthens or tapers off.

Figure 2: Timeline of the Randomized Control Trial



4. Data and Variables

The study leverages anonymised borrower data obtained from MDMSB's Core Banking System (CBS) for recording the outcome variables (that are based on financial transactions) as well as some of the control variables (socio-economic characteristics). We also collaborated with MDMSB to conduct a base-line primary survey for collecting additional background profile variables which were not captured in the CBS. Thus, the control variables were collected partly from the CBS and partly through a survey at the base-line, while the outcome variables were collected from the CBS at base-line, mid-line and end-line.

Outcome Variables: Rise in income and timely debt repayments lead to improved financial wellbeing (Joo & Grable, 2004) of the subsistence entrepreneur, wherein financial wellbeing is the ability to meet expenses, including debt repayment, and have enough income to feel financially secure (Muir et al., 2017). We measure financial wellbeing based on two outcome variables as shown in Table 1. The first outcome variable is income enhancement, measured as average balance in the deposit account that is used for regular transactions (Bachas et al., 2020) which we refer to as *average transactional account balance.*[3]

Table 1: Outcome Variables

Impact Studied	Variable	Description
Income Increase	Average transactional account balance. (3 months average monthly balance in the transaction account)	Increase in income gets reflected in average monthly balance increase in the transactional account (INR)
Loan repayment Behaviour	Loan Repayment Index (Score for Timely Repayment of Loan)	Timely loan repayment behaviour is a critical dimension of responsible financial behaviour. Based on timely EMI (equated monthly instalments) payments over a period of previous 3 months, the participants have been grouped in 5 categories Timely repayment for all 3 months - 5 Timely repayments for 2 months – 4 Timely repayments for 1 month – 3 Timely repayments for 0 months – 2 Overdue more than 30 days in 3 months – 1

[3] Average monthly balance = $\sum_{t=1}^{30} Daily\ balance\ in\ account_t$ / 30

Our second outcome variable records loan repayment behaviour which is measured by providing a score to the timeliness of loan repayments, which we refer to as *loan repayment index*.

Control Variables:

Past studies have identified financial literacy (Engström & McKelvie, 2017; Lusardi, 2008; Siekei *et al*., 2013) and entrepreneurial orientation (Kumar *et al*., 2018; Kaunda, 2013) as important individual level factors which affect the income generation and loan repayment behaviour. In the context of subsistence entrepreneurs, these variables may hold special significance and therefore we included them as control variables. Financial literacy is the ability to apply basic financial knowledge about interest and interest compounding in transactional financial choices and make decisions regarding loans (Lusardi & Tufano, 2015). We calculated financial literacy (FL) scores (see Appendix 1 for details) from the information collected from a survey of the borrowers at the baseline and the score ranges from 0 to 5. The FL scale is adapted from Ćumurović and Hyll (2019). Entrepreneur orientation (EO) is an individual's attitude towards entrepreneurship (Basso et al., 2009; Bolton & Lane, 2012) and is collected from the base-line survey using 19 questions on a Likert Scale (following Santos, (2020); see Appendix 2 for details of the measure). The EO measure takes values ranging from 1 to 5 (see Appendix 3 for scales of measurement).

Following the literature, we also include standard demographic variables such as Age (age of the borrower) and Family Size (number of members in family) which are likely to affect the borrowing and repayment decisions (Kaunda, 2013; Jote,2018). Information on both these variables are collected from the bank's CBS.

Intervention Variable: The intervention is measured as a dummy variable, viz. Treatment (taking values 1 or 0 depending on whether the individual was assigned to the treatment group

i.e. provided access to the WhatsApp group or was assigned to the control group). Sample summary statistics are presented in Table 2.

Table 2: Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Income	819	8508	291.41	8001	8999
Loan Repayment Index	819	3.3	1.08	1	5
Financial Literacy	819	3.978	.96	1	5
Entrepreneurial Orientation	819	3.10	1.246	1	5
Age of Respondent	819	39.34	10.91	21	58
Family Size of Respondent	819	4.02	1.39	1	6

To ensure that the treatment effect can be solely attributed to the study's intervention, we measure and balance covariates at the individual level between the treatment and control groups at base-line (Ivers et al., 2012; Bhutoria & Vignoles, 2018; Bulte et al; 2017). We ensure balancing at the individual level for both the control as well as outcome variables by using an independent sample t-test of mean differences.

Table 3: Base-line Characteristics

			Total Respondents: 819 Control Group: 410 Treatment Group: 409
Variable	**Treatment Group Mean**	**Control Group Mean**	**Difference**
Loan Repayment Index	3.340	3.263	- 0.076 (0.076)
Income (in INR)	8497.38	8519.47	22.09 (20.363)
Financial Literacy	4.024	3.931	- 0.093 (0.067)
Entrepreneurial Orientation	3.085	3.117	-0.031 (0.0871)
Age of Respondent	39.29	39.37	0.075 (0.763)
Family Size of Respondent	4.034	3.990	- 0.044 (0.098)

Robust Standard Error in parenthesis ***P Value < 1%, ** P value <5% , * P value < 10%

The results shown in Table 3 confirm homogeneity across the treatment and control groups which means that they can be considered as statistically similar so that the impact of the intervention on the treatment group can be observed without any sample selection bias.

5. Estimation Methodology

First, we use a t-test to compare the outcomes of the treatment group with those of the control group using the mid-line and end-line data. If the sample is allocated to control and treatment groups using perfect randomization, a t-test of significance of the difference of post-intervention means of outcomes between treatment and control groups (without considering covariates) should suffice (Duflo *et al.*, 2007). However, inclusion of relevant covariates enhances the robustness of the treatment effects (Bhutoria & Vignoles, 2018). Therefore, in the next step, we estimate a single difference equation using Ordinary Least Square (OLS) as follows (Karlan and Valdivia, 2011):

$$Y_{it} = \alpha + \beta_1 D^T + \eta\, Y_{i0} + \delta_k \sum_{k=1}^{n} x_i^k + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Y_{i1} = Outcome variable post-intervention

D^T = A dummy variable that takes the value 1 if the borrower belonged to a treatment group

Y_{i0} = Outcome variable at baseline.

x_i^k = Vector of the individual-level covariates

α = Intercept, ε_{it} = Error term

Our coefficient of interest for the impact of the intervention is β_1 that measures the difference between the treatment and control groups in the outcome Y and gives an unbiased estimate of the average treatment effect of being assigned to a treatment group. Single difference estimator can be considered as a comparison of the post-intervention outcomes, with controls for individual level covariates as well as base-line value of the outcome variable.

Since we have outcome measures from both the baseline and the follow-up rounds, we also use a difference-in-difference (DD) estimator. The double difference estimator comes from the following equation (Karlan and Valdivia, 2011):

$$Y_{it} = \alpha + \beta_2\ TIME^T + \beta_3 D^T\ \ + \beta_1\ \ TIME^T D^T + \delta_k\ \ \sum_{k=1}^{n} x_i^k\ \ + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

In equation 2, in addition to variables described in equation 1, we have $TIME^T$ which takes the value 0 for the base-line period and 1 for the follow-up period (mid-line or end-line). β_1 is now the coefficient of interest, i.e. it estimates the average treatment effect on the outcome Y. β_2 and β_3 are the time and group dummies respectively. Since we have do a randomization and achieve pre-intervention balancing between control and treatment groups, the single and the double difference estimators should provide an unbiased estimate of the impact of the intervention (Karlan and Valdivia, 2011). We also do a robustness check using probit regression instead of OLS to account for the discrete nature of the loan repayments index.

6. Results and Discussion

6.1 Effects of the Intervention on Income and Loan Repayment

In this section, we report the impact of the intervention based on a test of differences in the post treatment outcomes, single difference estimates and difference-in-differences estimates and compare the results. First, we conduct the t-test of mean differences (Table 4). The results show that access to the digital P2P platform has a positive and significant impact on income at the end-line. With reference to the control group, there is an average increase of INR 490.83 or 5.7% in income for the treatment group. Loan repayment behaviour also showed a positive and statistically significant improvement as (the loan repayment index improves by 1.178). In the case of mid-line however, we note that there are no significant improvements in income and loan repayment.

Now we estimate single difference regressions with covariates (Panel A, Table 5), without covariates (Panel B, Table 5) and without covariates except Y_{i0} (Panel C, Table 5). We observe that the coefficient for the treatment dummy is positive (at p < 1%) for average transactional account balance as well as loan repayment index at the end-line. The single difference estimate (Table 5) mimics the t-test results obtained earlier, as the coefficient of the intervention dummy is 0.055 (Panel B, Table 5) in the results without covariates indicating a 5.5% improvement in the monthly bank balance. The coefficient of the intervention dummy for loan repayment is 1.17 (Panel B, Table 5) which closely matches the results from the t-test. Once we include all the covariates (Panel A, Table 5), the impact on average transactional account balance is still significant. Even though the effect reduces to 3.9% but it is statistically significant and the impact on loan repayments is still 1.17. Since the loan repayment index offers a case of discrete dependent variable, we also cross-checked the findings with a probit regression instead of OLS estimation and found similar results (see Appendix 4).

Table 4: T–test of mean differences

Variable	**Monthly Bank Balance** **(1)**	**Loan Repayment Index** **(2)**
	Base-line	
Treatment	8497 (14.41)	3.263 (0.054)
Control	8519 (14.38)	3.339 (0.052)
Difference	-22.08 (20.36)	-0.0690 (0.079)
	Mid-line	
Treatment	8497 (14.41)	3.34 (0.05)
Control	8518 (14.36)	3.28 (0.05)
Difference	- 21.21 (20.35)	0.054 (0.075)
	End-line	
Treatment	9041.65 (20.99)	4.23 (0.037)

Control	8550.81 (15.63)	3.05 (0.05)
Difference	490.83*** (26.16)	1.178*** (0.063)

Standard Error are in parenthesis. ***P Value < 1%, ** P value <5%, * P value < 10%

Moving to the double difference estimates (Panel A, Table 6), the results are similar to single difference estimation i.e. the treatment effect for average transactional account balance is 3.8% and for loan repayments is 1.1. However, at mid-line, for both single difference and double difference estimations, the impact on average transactional account balance and loan repayment is not statistically significant. Thus, we note that our results for the impact of the intervention on average monthly bank balance and loan repayment at end-line remain consistent across the three empirical techniques.

Table 5: Impact of WhatsApp Group on Outcomes - Single Difference Regression

Total Respondents: 819
Control Group: 410
Treatment Group: 409

Panel A: With Covariates				
	Mid-line		**End-line**	
Variable	**Average transactional account balance (1)**	**Loan Repayment Index (2)**	**Average transactional account balance (3)**	**Loan Repayment Index (4)**
Treatment	0.000 (0.0002)	-0.019 (0.0206)	0.0579*** (0.001)	1.174*** (0.064)
Y_{i0}	0.993 (0.004)	0.968*** (0.015)	1.005 (0.024)	0.0089 (0.044)
Age of Respondent	-0.0001 (0.0001)	-0.0126 (0.0125)	0.0002** (0.0001)	0.004 (0.002)
Family Size of Respondent	0.0000 (0.0001)	-0.009 (0.007)	-0.001 (0.001)	0.036 (0.022)
Financial Literacy	-0.0001 (0.0001)	0.013 (0.013)	0.0006 (0.001)	0.007 (0.038)
Entrepreneurial Orientation	-0.0006 (0.0001)	-0.014 (0.013)	0.0001 (0.001)	0.056 (0.039)
Observations R Square	819 0.98	819 0.926	819 0.77	819 0.31
Panel B: Without Covariates				

Variable	Average transactional account balance	Loan Repayment Index	Average transactional account balance	Loan Repayment Index
Treatment	0.000 (0.002)	-0.019 (0.021)	0.058*** (0.003)	1.174*** (0.062)
Y_{i0}	0.993 (0.0041)	0.961*** (0.001)	1.007*** (0.004)	0.057 (0.028)
Observations R Square	819 0.98	819 0.96	819 0.76	819 0.30

Panel C: Without Covariates and Y_{i0}

Variable	Average transactional account balance	Loan Repayment Index	Average transactional account balance	Loan Repayment Index
Treatment	-0.002 (0.002)	0.054 (0.076)	0.055*** (0.003)	1.179*** (0.062)
Observations R Square	819 0.0013	819 0.006	819 0.30	819 0.30

*Notes: Models 1 and 2 are for mid-line impact (3 months from intervention); models 3 and 4 are for end-line impact (6 months from intervention). Average transactional account balance, Loan Repayment Behaviour are the two outcome variables. Specifications reported are with and without covariates (Age, family size, Entrepreneurial Orientation and Financial Literacy). Single difference regressions are estimated using OLS method. Standard errors are in parentheses. *** p< 0.01, **p<0.05, *p<0.1*

Table 6: Impact of WhatsApp Group on Outcomes - Double Difference Regression

Total Respondents: 819
Control Group: 410
Treatment Group: 409

Panel A: With Covariates

	Mid-line		End-line	
Variable	Average transactional account balance (1)	Loan Repayment Index (2)	Average transactional account balance (3)	Loan Repayment Index (4)
Treatment	-0.0001 (0.0034)	-0.0219 (.0719)	0.038*** (0.004)	1.102*** (0.088)
Group	-0.0024 (0.0022)	0.0482 (0.050)	-0.0024 (0.0027)	0.060 (0.062)
Time	-0.0001 (0.0024)	0.024 (0.050)	0.0036 (0.0027)	-0.207*** (0.062)
Age of Respondent	-0.0001 (-.00007)	-0.0026 (0.0016)	0.0002** (0.00008)	-0.0007 (0.002)
Family Size of Respondent	0.0006 (.0006)	-0.0161 (0.0129)	-0.0009 (0.0007)	0.0122 (0.016)
Financial Literacy	-0.0017 (0.0010)	0.1082*** (0.0217)	-0.0014 (0.0011)	0.0557** (0.026)
Entrepreneurial Orientation	0.0006 (0.0008)	0.5962*** (0.0168)	0.0007 (0.0008)	0.337*** (0.021)

Observations	1638	1638	1638	1638
R square	0.005	0.55	0.16	0.34
Panel B : Without Covariates				
Treatment	0.001	-0.0219	0.0377***	1.102***
	(0.0034)	(0.107)	(0.004)	(0.098)
Group	-0.0025	0.0764	-0.0025	0.076
	(0.023)	(0.0757)	(0.0027)	(0.069)
Time	-0.0000	0.0243	0.0035	-0.207
	(0.0024)	(0.0756)	(0.0026)	(0.069)
Observations	1638	1638	1638	1638
R square	0.001	0.001	0.16	0.17

*Notes: Models 1 and 2 are for mid-line impact (3 months from intervention); models 3 and 4 are for end-line impact (6 months from intervention). Average transactional account balance, Loan Repayment Behaviour are the two outcome variables. Specifications reported are with and without covariates (Age, family size, Entrepreneurial Orientation and Financial Literacy). Double difference regressions are estimated using OLS method. Standard errors are in parentheses. *** p< 0.01, **p<0.05, *p<0.1*

Our results suggest that social capital can be transformed into increase in income, as evidenced by the increase in monthly bank balances at the end-line. The improvement in loan repayment index is possibly a result of this increase in income, indicating an improvement in loan repayment behaviour. We provide empirical evidence to show that in the short-run there is no change in any of the outcome variables due to the intervention but there are medium-run improvements, indicating that social capital takes time to build. This finding lends support to the insight from existing literature that social capital matures over a period of time through intentional investment in forging the relationships (Westlund and Bolton, 2003). Since the intervention we study here is presence on a WhatsApp group, there is a consequent requirement of investing time on the group to realize its benefits. Our findings support the idea that social capital can be built without direct provision of physical capital (Westlund and Bolton, 2003).

Digital platforms have become important tools for managing relationship across diverse/ heterogeneous individuals (note that other than the subsistence entrepreneurs, distributors and retailers were also part of the group), who build social capital and can provide market access which in turn enhances income. Possibly the diversity also points to the ability of digital platform to enhance the quality of social capital. Our study supports the argument

that digital social media platforms can be used for broadening networks and enhancing quality of social capital (Smith *et al*., 2017).

. *6.2 Heterogeneous Treatment Effects*

We examine here the heterogeneity of treatment effects, to explore if the intervention's impact is similar across all respondents or if certain base-line characteristics matter in accentuating the effects (Chen *et al.* 2021). In the single difference estimation, we interact the treatment dummy with age, family size, financial literacy (FL) and entrepreneurial orientation (EO). Heterogeneity in treatment effects is studied for the end-line alone since treatment effects at mid-line were found to be statistically insignificant earlier. The results for the impact on income (average transactional account balance) are reported in Table 7. We observe that there is no variation in the intervention's impact across characteristics such as family size, financial literacy, and entrepreneurial orientation. In case of Age, the interaction term is positive and statistically significant only at the 10% level. We also test the heterogeneity in treatment effects using double difference regressions and find similar results as in the single difference regressions, except for Age (see Table 8). The interaction term between Age and the treatment dummy is positive and statistically significant at the 1% level, implying that higher the age higher is the propensity to increase income as a result of the WhatsApp group membership. In other words, the younger entrepreneurs are able to make the most of the digital market access, probably due to their higher technological savviness compared to their older peers.

In the case of loan repayments, we tested the treatment heterogeneity with respect to control variables but none of the interaction coefficients (of the treatment dummy with the control variables) were statistically significant and hence the results are not reported. Thus, we conclude that the treatment effect for loan repayment may be homogenous across individuals.

Table 7: Test of Treatment Heterogeneity – Impact on Average Transactional Account Balance (End-line Results) using Single Difference Regression

Total Respondents: 819
Control Group: 410
Treatment Group: 409

Variable	**Age heterogeneity (1)**	**Family Size heterogeneity (2)**	**Financial Literacy heterogeneity (3)**	**Entrepreneurial Orientation heterogeneity (4)**
Treatment	0.046*** (0.006)	0.059*** (0.005)	0.044*** (0.007)	0.053*** (0.004)
Yio	1.001*** (0.0248)	1.005*** (0.0248)	1.003*** (0.0248)	1.007 *** (0.0248)
Age of Respondent	0.0000 (0.0001)	0.0002** (0.0001)	0.0002** (0.0001)	0.0002** (0.0001)
Family Size of Respondent	-0.0007 (0.0006)	-0.0005 (0.0008)	0.0007 (0.0006)	0.001 (0.001)
Financial Literacy	0.0007 (0.0006)	0.001 (0.001)	-0.0008 (0.0012)	0.001 (0.001)
Entrepreneurial Orientation	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	- 0.001 (0.001)
Interaction of Treatment with Control Variables				
Treatment X Age	0.0002* (0.0001)	-	-	-
Treatment X Family Size	-	-0.000 (0.001)	-	-
Treatment X FL	-	-	-0.003* (0.002)	-
Treatment X EO	-	-	-	-0.001 (0.001)
Observations	819	819	819	819
R Square	0.77	0.77	0.77	0.77

*Notes: The dependent variable is Average Monthly Bank Balance. Each of the models 1, 2, 3 and 4, we test for heterogeneity in the treatment effect across age, family size, Financial Literacy and Entrepreneurial Orientation. Estimations are done using OLS method. Standard errors are in parentheses. *** p< 0.01, **p<0.05, *p<0.1*

Table 8: Test of Treatment Heterogeneity – Impact on Average Transactional Account Balance (End-line Results) using Double Difference Regression

Total Respondents: 819
Control Group: 410
Treatment Group: 409

Panel A: With Covariates

Variable	**Age heterogeneity (1)**	**Family Size heterogeneity (2)**	**Financial Literacy heterogeneity (3)**	**Entrepreneurial Orientation heterogeneity (4)**
Treatment	0.029*** (0.008)	0.06 (.007)	0.038*** (0.004)	0.061*** (0.006)

Group	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Time	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)
Age of Respondent	-0.0000 (0.0001)	0.0002 (0.0001)	0.0002 (0.0001)	0.0002 (0.0001)
Family Size of Respondent	0.0009 (.0006)	0.0007 (0.0007)	-0.0009 (0.0007)	-0.0009 (0.0006)
Financial Literacy	-0.001 (0.001)	-0.001 0.001)	-0.0023* (0.0012)	-0.001 (0.001)
Entrepreneurial Orientation	0.0005 (0.0008)	0.0006 (0.0008)	0.0006 (0.0008)	0.0009 (0.0009)
Interaction of Treatment with Control Variables				
Treatment X Age	0.0007*** (0.0002)			
Treatment X Family Size		-0.0006 (0.015)		
Treatment X FL			0.004 (0.002)	
Treatment X EO				-0.001 (0.002)
Observations	1638	1638	1638	1638
R Square	0.31	0.31	0.31	0.31

*Notes: The dependent variable is Average Monthly Bank Balance. Each of the models 1, 2, 3 and 4, we test for heterogeneity in the treatment effect across age, family size, Financial Literacy and Entrepreneurial Orientation. Estimations are done using OLS method. Standard errors are in parentheses. *** p< 0.01, **p<0.05, *p<0.1*

7. Conclusion and Policy Implications

Despite improvement in the access to financial capital, subsistence entrepreneurs have shown limited advancement in their business outcomes (Banerjee *et al.* 2015). Previous studies have shown that social capital can lead to an increase in income, but very few papers have explicitly explored the role of social capital in facilitating market access to increase business growth, particularly for subsistence entrepreneurs (Delacroix *et al*., 2019; Westlund & Bolton, 2003). Our study showed how a digital social network (WhatsApp group) can facilitate market access for subsistence women entrepreneurs and aid in enhancing their income levels and loan repayment. We performed a Randomized Control Trial (RCT) of 819 subsistence women entrepreneurs from a rural region of India. We provided the treatment group access to a different market through a WhatsApp group of peers, retailers and distributors. The evidence

from our RCT showed that social capital, created by digital social network, results in increase in income as well as improvements in loan repayment behaviour of women subsistence entrepreneurs.

The insights from our field experiment suggest that for subsistence entrepreneurs, digital social media platforms may provide a channel to build social capital and augment market transactions in a digital economy. By generating opportunities, digital P2P platforms can facilitate the benefits of a sharing economy, which otherwise would be unprofitable and unsustainable for subsistence entrepreneurship. Our findings also indicate that it takes time to bring about an increase in income as well as to improve financial wellbeing, thereby alluding to the fact that information assimilation and building social capital in new networks takes investment of time and is not transactional or does not yield immediate gratification.

Our study has a few limitations. It was conducted in the state of Maharashtra alone and therefore enhancing the geographical coverage of the study would help in factoring cultural and social heterogeneity across regions. Secondly, a long-term study using RCT could add more value in terms of the scalability and sustainability of research findings. The study has important policy implications. For marginalised entrepreneurs, such as micro or nano entrepreneurs, non-schematic intervention (non-fund based), such as access to micro, small and medium enterprise (MSME) marketplaces in a digital economy can generate significant benefits. For instance, the recently launched Open Network for Digital Commerce (ONDC), an initiative of the Government of India that provides a digital commerce platform connecting MSMEs and small traders is a significant step in that direction. It will enable subsistence entrepreneurs to migrate to a hybrid economy wherein goods fulfilment can be done physically while order placement is done digitally. Expansion of such digital marketplaces have the potential to transform the businesses of subsistence entrepreneurs in the developing world.

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Appendix 1: Financial Literacy Questionnaire

A. You had INR 100 in a savings account and the interest rate was 5% per year. After 5 years, how much would you have in the account if you left the money to grow?
B. If you have sales of INR 100, and purchases is of INR 75, what is your profit?
C. If 1 person makes 5 chapatis (flat bread) in 1 hour, how many chapatis can 5 people make in 1 hour?
D. If the price of a vada (dumpling) is INR 20 and price of a pav (bun) is INR 5, what is the price of a vada-pav (a popular snack of the region)?
E. If you have a shop which you don't use, will you rent it out?

Source: Adapted from Ćumurović and Hyll (2019)

Appendix 2: Entrepreneurial Orientation Definition

Variable	Definition
Risk taking Ability	Taking bold action by venturing into the unknown, borrowing heavily and/or committing significant resources to ventures in uncertain environments.
Innovation	Predisposition to creativity and experimentation through introduction of new products and services as well as technological leadership via R and D in new processes.
Proactiveness	An opportunity-seeking, forward-looking perspective characterised by new products and services ahead of the competition and acting in anticipation of future demand"
Perseverance	Perseverance also involves sustaining goal-oriented actions and energy levels even when confronted with obstacles.
Passion	A set of intense positive feelings that are consciously accessible and experienced by those involved in entrepreneurial activities linked with roles entrepreneurs consider significant. Passion is an intense positive emotion with a motivational effect that encourages entrepreneurs to overcome obstacles and remain involved in business project.

Source: Adapted from Bolton & Lane, 2011; Cardon et al., 2009; Santos et al., 2020.

Appendix 3– Entrepreneurial Orientation Scale

Risk Taking	*I like to venture into the unknown and make risky decisions.*
	I am willing to invest a great deal of time and/or money into something that can give high returns.
	I tend to act boldly in risky situations.
Innovativeness	*I often like to try new and unusual activities.*
	In general, I prefer a strong emphasis on innovative approaches rather than previously tested and used approaches.
	I prefer, when I learn something new, to try to do it my way than to do it like everyone else does.
	I am in favour of trying out new approaches to problem solving rather than using methods that others often use.
Proactivity	*I usually act in anticipation of future problems, needs or changes.*
	I tend to plan projects in advance.
	I would rather get up and put projects in motion than sit around waiting for someone else to do it.
Passion	*I have a passion for finding good business opportunities, developing new products or services, exploiting business applications and creating new solutions for existing problems and needs.*
	I am passionate about the process of gathering the financial, human and social resources (e.g. contacts and partnerships) needed to create a new business.
	I have a passion for envisioning, growing and expanding my business.
	I am passionate about what I do, and, when I am away from my business, I cannot wait to return.
Perseverance	*I have achieved goals that took me some time to reach.*
	I have overcome setbacks to meet major challenges.
	I always finish what I start.
	Setbacks do not discourage me.
	In many complex situations, I persist in achieving my goals despite seeing others give up.

Source: Adapted from Bolton & Lane, 2011; Cardon et al., 2009; Santos et al., 2020.

Appendix 4: Impact of WhatsApp Group on Loan Repayment Index - Single Difference Regression (Probit Analysis)

Variable	**Midline (1)**	**Endline (2)**
Treatment	-0.019 (0.0206)	1.464*** (0.086)
Y_{i0}	0.968*** (0.015)	0.033 (0.045)
Age of Respondent	-0.0126 (0.0125)	0.004 (0.003)
Family Size of Respondent	-0.009 (0.007)	0.050* (0.027)
Financial Literacy	0.013 (0.013)	0.009 (0.046)
Entrepreneurial Orientation	-0.014 (0.013)	0.058 (0.048)
Observations	819	819