Credit Where Credit's Due: The Enabling Effects of Empowerment in Indian Microfinance

Abstract

We utilise primary data collected from a North Indian village in 2015 to 2016 and examine the impact of women's empowerment on their creditworthiness measured by the total annual loan amounts. Our key explanatory variable – an empowerment index – has been constructed using four individual-level factors -- economic, social, interpersonal and political. We find that more empowered women received greater cumulative loans. We have instrumented empowerment by the sex of the borrower's first child being male. It seems that in the male-dominated environment of North India, the 'luck' of giving birth to first child as a son helps a woman seize opportunities for empowerment. The village-level finding of empowerment is consistent with the result we obtain for the whole of North India using a separate and national dataset. We also show that for the rest of India education, but not empowerment, is an important determinant of loan volumes.

JEL Classification Nos: J16; C23; C36; G20; O17

Keywords: women's empowerment, microfinance, instrumental variable, India, Asia, principal component analysis.

1. Introduction

Creditworthiness has been an integral part of the women's empowerment narrative of microfinance since the introduction of the *Grameen* Bank model in Bangladesh in 1983. Millions of poor women have benefitted from microfinance throughout the world and, in the process, have also been empowered (Hashemi, Schuler, and Riley, 1996; Kabeer, 2001; Pitt and Khandker, 1996), although in some cases disempowerment has also taken place from failures to repay, over-indebtedness and loss of control over the loan (Garikipati, 2008; Goetz and Gupta, 1996; Guérin, Kumar, and Agier, 2013) By and large, the microfinance literature has viewed empowerment more of an outcome (see for instance, Kabeer, 1999, 2005; Mayoux, 1998) than a determinant of creditworthiness.

But there is no denying that empowerment is a process. It takes place over time by gaining independence and taking control of personal, social and financial decisions (Hashemi, Schuler, and Riley, 1996). While borrowing leads to greater empowerment (Mayoux, 1998), empowerment could also lead to further loans. So, empowerment is both a *cause of* and an *effect on* loan behaviours. Here, we focus on the former. We aim to analyse how female empowerment affects their volume of loans, by studying a primary field survey data from a village in the state of Haryana, Northern India in combination with data from India Human Development Survey (IHDS)[1].

For the benefit of discussion, we define the volume and sustenance of loans as measures of creditworthiness, although in the literature it is the eligibility of getting loans that is commonly viewed as creditworthiness. The question of empowerment being a determinant of creditworthiness is likely to be of special importance for regions like rural North India where women have been historically disadvantaged. The region systematically lags in every gender development metric (Government of India, 2015). Even the microfinance institutions (MFIs), which have proliferated in the rest of India, have struggled to build a female clientele in Northern India.

In such an environment, a key consideration for lenders is likely to be woman's independence, mobility, and control over their own resources. Local money-lenders and village

[1] India Human Development Survey (IHDS) is a nationally representative survey produced by the National Council of Applied Economic Research (NCAER), New Delhi, and the University of Maryland.

credit co-operatives (called co-operative societies) have the necessary background information on the borrowers - but MFIs do not. However, group lending (as in the *Grameen* model) ensures that the borrowers select their peers wisely considering their risk attitudes and financial independence.

We study female borrowers of three MFIs, a co-operative society and several local lenders in a randomly selected village of Haryana over two years (2015 and 2016). All loans were for production purposes. The village had no MFI before 2014. All three MFIs follow the *Grameen* model consisting of five-member groups. Upon completing 50 per cent of the repayment, a borrower becomes eligible to apply for a second loan, which is typically a bigger amount (Section 2 gives more details). We consider the total annual borrowing for each borrower. The MFIs vary in terms of the loan amount and the repayment cycle.

The borrowers are low-income women, all having children. They are engaged in activities like livestock rearing, pottery, candle making and other small informal businesses. We have collected data on their economic status, purchasing power, mobility, political awareness, attitude to domestic violence, and control over assets and income. These data are then used to construct an empowerment index using the principal component analysis (PCA) methodology (Sharaunga, Mudhara, and Bogale, 2016). We then regress the log of loan on the empowerment index, along with a set of controls. We find that the loan amount is positively and significantly related to the empowerment index.

However, the empowerment variable might be affected by the loans taken in the past or might be correlated with some of the control variables. We therefore instrument the empowerment variable. Our choice of instrument is the borrower's first child being a boy, which is entirely a random event. The child's sex should not directly affect the loan amounts that the mother would get in future. But in an environment where son preference is culturally ingrained, giving birth to a son can elevate a young woman's status within the household and help her gain some independence. This is the rationale we use to justify our instrument.

Our first stage regression of the two stage least square (2SLS) model shows that the first child's sex (male) is a strong determinant of mother's empowerment. The second stage instrument variable (IV) estimate shows that an exogenous increase in empowerment increases the loan amount. It also shows that the husband's income does not affect the loan outcomes of

the women. Therefore, we argue that empowerment has a positive *causal* effect on creditworthiness.

As said above, a child's sex can affect the mother's present social status. Indian households are known to exhibit son preference (Das Gupta et al., 2003; Dyson and Moore, 1983), and this preference is stronger in rural areas for reasons of bequest, religious traditions and marriage dowry (Bardhan, 1988; Das Gupta et al., 2003; Mutharayappa, 1997).[2] Women who have given birth to a girl may be ill-treated by their in-laws families (Jejeebhoy, 1997). Therefore, it is reasonable to expect that mothers of boys may be given some independence and control over their own lives.[3]

It is noteworthy that for our IV we have used the sex of the *first* child, but not the second or the third child, or even the total number of sons. The reason is to avoid possible gender manipulation. Sex selective abortion is believed to be widespread in India, but researchers show that this occurs predominantly with the second pregnancy onward, conditional on the first child being a girl (Das Gupta et al. 2003; Rosenblum, 2013). Aborting the first child is very rare and unlikely (Arnold, Choe, and Roy, 1998; Jha et al. 2011).[4]

Is our empowerment model too specific to be applicable elsewhere? We test the robustness of our methodology using the Indian Human Development Survey (IHDS) data of 2011-12, for North India[5] and the rest of India. Although the households covered by the IHDS survey are not comparable to the ones in our village survey, the dataset is very helpful for our purpose of studying empowerment because it contains both loan information and women's empowerment related information. However, it also has two major limitations. First, the loan information pertains to the household level, but not individual members of the household. Second, the data

[2] The sons also maintain family names and inherit family wealth (Das Gupta et al., 2003, Mutharayappa et al., 1997), and by the Hindu religious rules, males are responsible for performing various family rites, for instance in the event of death (Mutharayappa et al., 1997). Most importantly, by the Hindu social custom, at the time of marriage the groom's family receives dowry - a substantial transfer in the form of wealth (like gold, land, durable goods and cash) - from the bride's family. Therefore, having a male child strengthens the social status of the household (Dyson and Moore 1983). Anecdotes of respite from domestic abuse or forfeiting dowry claims after giving birth to a boy are quite common.

[3] There is no evidence to suggest that grown up boys could have been used as an implicit collateral.

[4] Abortions are generally expensive and dangerous (15 to 20 percent deaths are caused due to unsafe abortions) (Duggal, 2004, Jha et al. 2011) and could negatively affect the reproductive health of women. First child is also seen as god's gift in the region. So, abortion is deemed as an act against god wishes.

[5] North India consist of the following ten states: Haryana, Delhi, Rajasthan, Bihar, Uttar Pradesh, Himachal Pradesh, Punjab, Uttarakhand, Chandigarh and Jammu and Kashmir

give the total number of boys and girls in the family, but not their birth order, which means we cannot use the same IV. To address these limitations, we separate those households that are listed as female-headed, relying on the assumption that the head of the household is responsible for the loans. We then construct the empowerment index for this subsample using the same PCA method, as done from our village survey data. Since the first child's sex cannot be used as IV from this dataset, we use widowhood as the IV for empowerment, and we find that empowerment does have a *causal* effect on the amount of loans in North India, but not in the rest of India.

Widowhood as an IV can be explained as follows. First, it is a random occurrence. Second, the absence of husband allows (and necessitates) a woman to be independent and to make strategic life choices[6]. That said, it is also true that widows in India are amongst the most vulnerable sections of society. Dreze and Srinivasan (1997) have shown that widows in India face severe intra-household discrimination. Therefore, expecting widowhood to contribute to empowerment is self-contradictory. Our argument is that when a widow suffers economic misfortune, we would expect them to take on greater consumption loans, but not non-consumption loans. The IHDS data contain information on consumption loans, as well as production, education and medical loans. We see that widows take a slightly larger amount of loan on average, but the difference between widows and non-widows is statistically insignificant. Therefore, we reconcile empowerment and vulnerability by arguing that probably widows are less likely to receive non-consumption loans. But amongst those women who get these loans, widows are likely to be more empowered than non-widows[7].

Indeed, our IV analysis shows that widowhood enables women to be more empowered and loans empowerment has a *causal* positive effect on non-consumption loans. This argument holds true for our North India subsample, which is consistent with our finding from the village data. We also show with the IHDS data that empowerment positively affects the probability of getting loans.

But can the same be said about the whole of India? To answer the above question, we run the exact same model for the rest of India, and the IV estimates show that empowerment does

[6] In our female-headed household sub-sample of the IHDS data, widows have control over the household resources and 96 percent of them reported supports received from their natal and/or in-law families.
[7] In fact, our IHDS data show that widows were more empowered regardless of they took loans or not.

not have a *causal* effect on the loan amount. In fact, it is education that becomes a strong determinant of loan amount. We also check that empowerment does not determine the women's access to loans in the rest of India. Although it seems puzzling, it can be explained in terms of the much higher status of women in Southern and North Eastern India. Thus, empowerment, as measured by our factors, is not critical for creditworthiness in the rest of India; instead, human capital is, as it should also be for a male borrower.

In sum, our paper makes the following contributions. First, we construct an empowerment index taking an array of factors into account both at a village level and regional levels. The index allows us to study empowerment as a *determinant* of creditworthiness. Second, while studying the individual contributions of the underlying factors of empowerment, we find that some factors like the women's control over assets, income and savings, their political awareness, and their attitude to domestic violence seem to be extremely important. Third, the empowerment process may be triggered by good luck (like giving birth to a son) or by personal tragedy (like widowhood). In the highly male-dominated environment of North India, either factor can help empower a woman and advance her creditworthiness. Elsewhere in India, human capital is much more critical for creditworthiness.

The paper is organised as follows. Section 2 describes the data and study area. Section 3 describes the construction of the empowerment index. Section 4 sets out the methodology for the paper. Section 5 reports the econometric results and Section 6 tests the robustness of the results. The concluding section discusses some limitations.

2. The study area and the data

The study covered a random sample of 211 women who were clients of three MFIs, a co-operative society, and several professional money lenders. The data were collected through two household surveys taken in 2015 and 2016 (see the timeline of the survey in Figure 1 in *Appendix*), in a village in the state of Haryana, North India (see the map in Figure 2 in *Appendix*). We collected information regarding income, loans, investment, health, household composition, education, employment, assets, and other variables. In addition, we held informal

discussions[8] and semi-structured interviews[9] to select the variables that constituted the empowerment index.

The village is 90 km away from the state capital, with 1143 households and a population of 6466, of whom 3420 are males while 3046 are females as per the Population Census 2011. Haryana is a relatively prosperous state with only 11% of the population living below the poverty line, but the state has the worst gender ratio in India - 879 girls for 1,000 males as compared to the national average of 917 girls for 1,000 males. The average literacy rate of Haryana is 76 %; male literacy stands at 84 % while female literacy is at 66 %, not far off from the national average. Hinduism is the main religion of the state with 87.46 % classified as Hindu. The state is also very agricultural with 65.12 % of of people living in rural areas. The village is in a fast-growing area with good transportation links and is endowed with a good irrigation system. The area is a low risk for natural disasters such as earthquake or floods.

The credit market of the village is served by three MFIs since 2014, named *SKS* (now known as Bharat Financial Inclusion Limited), *Utkarsh*, and *Janlaxmi*. Additionally, there are several moneylenders and a government supported co-operative society. The moneylenders, locally called *aadthis*, also double as traders in crops and agricultural inputs.

Most women in our sample are self-employed earning less than two dollars a day from their household businesses which are livestock farming, growing vegetables, garment making and other small businesses[10] (see Table 1). None of the businesses are registered with the government or have any permanent employees.

Table 1: Distribution of businesses owned by the borrowers in the sample

Business	%
Cultivation	12.80

[8] We attended weekly and monthly meetings of microfinance institutions and used them to discuss empowerment with the women participants.

[9] The interviews were done with 15 women representing various age groups at their houses in the presence of a local social worker who helped with translation and conversations. The permission to interview women was obtained from them as well as from the head of the village (*sarpanch*). Consent was taken in verbal form. The interviews followed a semi-structured approach, giving participants the flexibility to discuss issues important to them. All the clients approached agreed to be interviewed for this study.

[10] Our sample consist of self-employed women who have taken loans for productive purposes. Most businesses are home-based. We admit this may not be representative of the whole country. This is a limitation of our study.

Livestock	36.97
Garment making	11.37
Shops	17.54
Small informal businesses (pottery, candle, handicraft, basket making etc.)	9.95
Others[11]	9.00

All three MFIs use a version of the *Grameen* model. Borrowers are asked to form a group of five, and then the group members are expected to monitor each other's repayment as well as coordinate some activities (such as collection of repayment) to reduce the operational costs of the MFI. However, they all can receive, as well as repay, the loan at the same time (instead of taking turns). Eligibility to receive a second loan depends on both the individual and the group repayment record. As already noted, repayment of 50 percent dues makes one eligible for a second loan. The group is expected to meet every week or month (depending on their repayment cycle) for a short meeting when the members pay their dues and pledge honesty and timely repayment. We did not see any default or expulsion of a member from any group.

There is some difference between the MFIs in terms of the repayment cycle. The repayment cycle of *SKS* is weekly, which starts within a week of the loan disbursement. *Janlaxmi* and *Utkarsh* use a monthly cycle of repayment, which starts after a month of the loan disbursement. *SKS* and *Utkarsh* have similar loan products where a new borrower starts with a loan limit of Rs 15,000, which is then increased by an additional Rs 15,000 in the second loan cycle, and then by Rs 20,000 in the third loan cycle, and finally by Rs 30,000 in the fourth until to reach the overall cap of Rs 80,000[12]. For *Janlaxmi*, the first loan starts at Rs 30,000 and the second loan can go up to Rs 50,000. The repayment is collected by a loan officer during the weekly/monthly meeting of the group and a record is kept in individual borrower's passbooks.

The co-operative society and traders are very flexible with their loan amount and repayment cycle. Usually, a co-operative loan is to be paid back within six months with agreed instalments subject to some adjustments in difficult times, but failure to repay the loan on time invites higher interest charges on the outstanding amount and/or being barred from future loans. Loans

[11] Including joint investments with husbands, trading of pulses, utensils, chemicals etc.
[12] 1$= Rs 70 (September 2018)

from traders are highly flexible and their interest rates are usually the same as the MFIs. All loans are for productive purposes; some are predictably seasonal.

Table 2: Loan products offered by various lenders:

Lender	Repayment Schedule	Interest rate per annum	Repayment	Initial loan
SKS	Weekly and fixed repayment amount of Rs 335 over the course of 54 weeks/one year	18-22 %	Weekly	Rs 15000
Utkarsh	Monthly and fixed repayment amount of Rs 1480 over the course of 12 months /one year	18-22 %	Monthly	Rs 15000
Janlaxmi	Monthly and fixed repayment amount of Rs 1930 over the course of 12 months /one year	18-22 %	Monthly	Rs 30000
Co-operative Society	Flexible repayment amount paid within six months	15-22 %	Flexible	Varies
Traders/local lenders	Depends on the relationship and negotiation with the lender	20-50 %	Flexible	Varies

The study focuses on the creditworthiness of the women borrowers which is measured by the cumulative amount of loan taken each year. Therefore, the main dependent variable is the log of total loan taken at the time of the survey. The descriptive statistics of the participants at baseline are provided in Table 3. The average borrower in our sample is 31.77 years old who has completed 5.5 years of education and lived in the village for 12 years. In 2015, she had a total loan (from all sources) of Rs 30,540, earned an annual income of Rs 35,810, and saved Rs 690 in the last month. They also owned assets worth of Rs 101,560. In 2016, the average loan size fell to Rs 21,350, and the annual income increased to Rs 42,280 leading to a significant increase in the last month saving to Rs 1,209. The decline in the loan could be due to the possibility that some borrowers were reaching their MFI loan cap, and/or their optimal scale of business was reached and hence no further loan was needed.

Table 3: Descriptive statistics

	2015		2016	
VARIABLES	Mean	SD	Mean	SD
Income and expenditure ('000 Rs)				
Loan taken in the year	30.54	13.77	21.35	9.591
Assets worth	101.6	51.42	110.8	44.99
Income of the respondent	35.81	12.38	42.28	10.03
Income of the household	124.4	29.24	134.7	25.09
Level of investment in business activities	39.21	30.71	24.08	8.766
Borrower's savings per month	0.692	0.474	1.209	0.831
Household consumption on food per month[13]	3.404	1.049	3.919	0.918
Average working hours per week	31.98	12.52	35.29	10.53
Expenditure on children education	0.695	2.433	0.725	2.426
Expenditure on health	16.38	12.41	15.20	7.611
Expenditure on entertainment in the last month[14]	1.012	0.356	1.000	0.292
Borrower's characteristics				
Age (years)	31.77	4.913		
Age at marriage	19.60	1.686		
Years in the village	12.14	4.968		
Education years	5.526	3.129		
No of sons	1.294	0.585		
No of daughters	1.147	0.571		
First child son	0.672	0.472		
Size of the household	5.014	0.771		
No of working members	2.28	0.53		
House Quality[15]	0.578	0.495		
Share of the lending institutions in loans				

[13] Consumption expenditure on food calculated by average monthly spending on rice, flour, milk and dairy products, pulses, vegetables, oil and spices.
[14] Expenditure on entertainment includes spending on cable TV, mobile, fairs, festivals, and picnics
[15] A binary variable distinguishing between dwellings that are designed to be solid and include cemented flooring and strong roof compare to houses without a strong floor or roof. (Good = 1, Bad = 0)

Cooperative	0.0758	0.265
Traders/local lenders	0.137	0.345
Janlaxmi	0.0711	0.258
SKS	0.474	0.501
Utkarsh	0.242	0.429
Borrower's caste		
Other Backward Castes (OBC)	0.308	0.463
General Caste	0.251	0.435
Schedule Caste/Schedule Tribes (SC/ST)	0.441	0.498

3. Empowerment index

Although women's empowerment is a much-researched topic in development economics, there is no universally agreed definition of the term (Malhotra and Schuler, 2005)[16]. For example, Sen (1993, as cited in Malhotra and Schuler, 2005) viewed empowerment as "altering relations of power which constrain women's options and autonomy and adversely affect health and well-being". Keller and Mbwewe (1991, as cited in Rowlands, 1995) defined it as "a process whereby women become able to organize themselves to increase their own self-reliance, to assert their independent right to make choices and to control resources which will assist in challenging and eliminating their own subordination".

We take the definition adopted by Kabeer (1999:437). According to her, "empowerment is the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them". The ability needs to improve on three inter-related dimensions: resources (access to and claims over material, human and social resources), agency (processes of decision making), and achievements (well-being outcomes). Following this conceptualisation, we consider the following four dimensions: economic, social, interpersonal and political.

[16] The literature has used several concepts like autonomy, power status and agency interchangeably (Malhotra and Schuler, 2005).

Economic empowerment: Economic empowerment alters the economic relationship between a woman and her immediate environment. Within the family unit, it reduces the extent to which women are financially dependent on other family members, and consequently may improve her status in the family along with increased inter-spousal consultations in household matters (Kabeer, 2001). Women's control over economic resources such as loans, income and savings contribute to the process of economic empowerment.

To assess women's agency vis-à-vis income, savings and loans we asked them about how much control they have over these resources. We also asked them about the freedom to participate in the labour market, and freedom to buy certain things such as cooking utensils (costing below Rs 5,000) and furniture or jewellery (costing above Rs 5,000)[17].

Clearly, economic empowerment is important in enlarging the set of economic options, but it alone may not necessarily improve a woman's life. A woman also needs confidence and social skills to translate the options into practical actions. Malhotra and Schuler (2005) argue that it takes at least three-pronged empowerment - social, political and economic - to enable real change in women's welfares.

Social empowerment: Mobility is a widely used indicator of women's empowerment. It is especially important in the highly male-controlled environments of North India. To assess women's mobility in the public domain, we asked whether the respondent was free to move within the village to visit temple or friends without her husband's permission. We also asked if she could travel alone outside the village for family-related matters or medical needs.

The concept of social empowerment is crucially linked to women's access to public spaces and mobility in the community and beyond. To develop and maintain their position within a community, women must be able to engage socially - for example by attending meetings and community events, and by forming their own network. This will improve their social trust, access to public information and abilities to influence the social norms, which ultimately yield strategic benefit for the society (Kabeer, 2001).

[17] The rupee limits were imposed after consulting with women to identify which level of asset ownership was sufficient for sustainable economic empowerment.

Interpersonal empowerment: Empowerment is a process of internal change, that focuses on a woman's sense of belief in her own decision-making abilities. Attitudes and perceptions reflect internal transformation and empower women from 'within' (Kabeer, Mahmud, and Tasneem, 2011). We asked questions on their attitude towards domestic violence and their ability to decide on family planning and children's (especially daughters') schooling, and to decide on sales/purchases of livestock. We asked a question regarding women's health to account for the physical condition needed for them to act upon the available opportunity. We also accounted for media exposure through access to TV and radio.

Political empowerment: Since there was an election held around the time of our first survey, we included some questions relating to political awareness. We asked them about their knowledge of the elected representative and if they had voted independently of their husband's preference. Political awareness is a proxy for women's understanding of their rights to fair wages and prices, social justice, and lawful treatments by the police or government officials.

Table 4 enlists the variables and corresponding data that will be used in our PCA to construct the empowerment index.

Table 4: Indicators of empowerment

Economic status/security	• Owns assets above Rs 10000 (Yes =1, No = 0) • Free to choose between staying home or participating in employment activities (Yes =1, No = 0)
Control over loan	• Full control (1) • Share loan with husband (0.5) • No control (0)
Control over income and savings	• Have control over their savings and income (Yes =1, No = 0)
Purchasing capacity	• Control over small purchases > Rs 5000 such as food, children products, cooking utensils and own clothes (Yes =1, No = 0) • Control over big purchases < Rs 10000 such as furniture/Jewellery (Yes =1, No = 0)

Decision making:	• Have a say in sale and purchase of livestock/ /housing equipment (Yes =1, No = 0) • Independent or have the majority control in taking decisions regarding child/daughter schooling, clothing, and food (Yes =1, No = 0)
Mobility	• Free to move around the village such as visit the temple or friends without husband's objection (Yes =1, No = 0) • Free to move outside village to doctors, relative or market, without husband's objection to going alone (Yes =1, No = 0)
Participation in public life	• Free to participate in the microfinance project/ attending meetings/ forming a group/ public life (Yes =1, No = 0)
Political awareness	• Know the name of their Sarpanch (Yes =1, No = 0) • Know the name of their MLA/MP (Yes =1, No = 0) • Voted in the election/will vote in the election (Yes =1, No = 0) • Independent of husband interference in the voting (Yes =1, No = 0)
Attitude towards domestic violence	• Is it wrong for a husband to beat his wife in any situation? (Agree =1, Disagree = 0)
Family Planning	• Independent to take fertility and parenting decisions (Yes =1, No = 0)
Media exposure	• Access to radio, TV, and other sources of media (Yes =1, No = 0)
Health self-evaluation	• Generally healthy (1) • Occasionally sick (0.5) • Poor Health (0)

Before we proceed to the PCA model of the index construction, we need to accept certain limitations of our methodology. First, admittedly empowerment is a latent construct and at best we can only get an approximate estimate relying on some key, but not all, aspects of empowerment. For example, a woman may have the freedom to work, but will still not be able to work if she lacks confidence or necessary skills. Economic empowerment, in this instance, does not translate into economic agency. Second, women's empowerment in certain context could also lead to disempowerment. For instance, social empowerment demands that women have greater visibility, mobility and engagement in their communities. Depending on the strength of cultural and religious norms in those communities, this could expose women to social hostility or even violence. Similarly, greater participation in economic activities by

women could discourage other family members - especially men - from working and burden the women with more economic responsibility as well as household responsibility. Therefore, an additional care is needed to construct an empowerment index or scale due to its multi-dimensionality since combining inappropriate variables to measure empowerment could lead to its incorrect and inefficient estimation. Third, cultural and behavioural norms are likely to vary across space and time. A measure that signifies empowerment in one region or culture may have little relevance or different meaning in another. This is particularly evident in the case of measuring freedom of mobility which is more relevant in a patriarchal religious context where women are expected to remain at home than in a western context. Thus, consistency and comparability remain an issue. This is not unique to empowerment, but common to all qualitative variables.

Developing a universal measure of empowerment is beyond the scope of this paper. We accept the limitations mentioned above. We have taken utmost care to develop an empowerment index based on a series of factors that are relevant to the region, which were uncovered through one-to-one conversations with women and our own knowledge of the North Indian reality. For example, our informal discussions also suggested that good health of a woman is also important for empowerment because she would otherwise be regarded as a family burden. We therefore included a separate question on health.

Principal Component Analysis. We use the statistical procedure of principal components to determine the weights for an index of the variables mentioned above. PCA is a multivariate statistical procedure used to reduce the number of variables in a data set into a smaller number of components so that variations in the data can be accounted with the greatest accuracy (Vyas and Kumaranayake, 2006). PCA transforms original variables into uncorrelated indices, where each component is a linear weighted combination of the original variables.

Using a set of variables (X_1 , X_2,…, X_n), m principal components can be expressed as

$$PC_1 = a_{11}X_1 + a_{12}X_2 + \ldots\ldots + a_{1n}X_n$$
$$PC_2 = a_{21}X_1 + a_{22}X_2 + \ldots\ldots + a_{2n}X_n$$
$$\ldots\ldots$$
$$PC_m = a_{m1}X_1 + a_{m2}X_2 + \ldots\ldots + a_{mn}X_n$$

where a_{ij} represents the weight for the *i*-th principal component and the *j*-th variable.

The variance for each principal component is measured by the eigenvalue of the corresponding eigenvector. All components are uncorrelated, and they are ordered in accordance with their additional information content, starting from the largest. The first principal component captures the largest amount of information that is common to all of the variables, subject to the constraint that the sum of the squared weights is equal to one (Filmer and Pritchett, 1998; Vyas and Kumaranayake, 2006). The second component explains additional but less variation in the original variables than the first component subject to the same constraint. The last component will account for the least amount of variations in the original variables. PCA works in such a way that variables with low standard deviation would carry a low weight. For instance, if every woman in our sample has a TV in her house; exhibiting no variation between household, then the variable would be zero weighted and would be of little use in estimating the index.

Table 5: Descriptive statistics of variables used in computing empowerment index

Variables	2015	Factor Score	2016	Factor Score
Small purchases	0.991	0.050	0.995	0.065
	(0.097)		(0.068)	
Big purchases	0.692	0.238	0.834	0.220
	(0.097)		(0.068)	
Mobility in the village	0.924	0.151	0.962	0.157
	(0.265)		(0.191)	
Mobility outside the village	0.275	0.122	0.374	0.143
	(0.448)		(0.485)	
Know the name of the village head	0.991	0.192	0.991	0.194
	(0.0971)		(0.0971)	
Voted in the recent election	0.919	0.466	0.924	0.449
	(0.273)		(0.265)	
Know the name of the MLA/MP	0.858	0.455	0.858	0.442
	(0.350)		(0.350)	
	0.0711	0.142	0.0806	0.134

Independent of husband interference in the voting	(0.258)		(0.273)	
Self-employed or participate in the labour market	0.995	0.173	0.995	0.196
	(0.0688)		(0.0688)	
Owns asset above INR 10000	0.858	0.310	0.858	0.322
	(0.350)		(0.350)	
Control over savings and income	0.976	0.365	0.976	0.388
	(0.152)		(0.152)	
Independent in taking household decision regarding food, children's education etc	0.883	0.123	0.967	0.112
	(0.323)		(0.180)	
Have a say in purchasing livestock and household equipment	0.708	0.254	0.664	0.226
	(0.455)		(0.474)	
Free to participate in the microfinance project/ attending meetings/ public life	0.915	0.014	0.924	0.031
	(0.218)		(0.210)	
Control over loan	0.614	0.038	0.654	0.0166
	(0.373)		(0.373)	
Media exposure	1		1	
	(0)		(0)	
Is wife beating justified in any situation?	0.566	0.244	0.573	0.243
	(0.339)		(0.339)	
Independent to take fertility and parenting decisions	0.0806	0.135	0.0806	0.146
	(0.225)		(0.225)	

Note: Factor scores are based on the first principal component. Standard deviation in parentheses.

The first principal component explains 17% of the variation in the variables used; this percentage is substantial but not overwhelming[18]. Table 5 presents the factor score from the first principal component which shows that our index gives more weight to economic status, control over savings, political awareness, attitude towards domestic violence and purchasing capacity regarding expensive items. Since every woman in our sample has access to TV/radio, the variable of media exposure would have no effect on our index. We will now examine how empowerment affects the amount of loan.

[18] Although the first principal component may well serve as a reasonable overall index, the question remains whether this component has all the relevant information (Filmer and Pritchett, 1998).

4. Methodology

To estimate the relationship between women's empowerment and their creditworthiness, a model in the following form is employed.

$$\ln(L_{it}) = \alpha + \delta_1 EMPOWERMENT_{it} + \delta_2 Y_{it} + \theta_t + \mu_i + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

where i = 1,2,…, 211, t =1,2.

Here, $\ln(L_{it})$ is the log of volume of loans for the i-th women in the sample at year t. *EMPOWERMENT* is the total empowerment score; Y_{ij} is a vector of the borrower's individual and household characteristics, such as age, education years, caste, and months with the lender, household size and source of the loan. μ_i is an individual specific unobservable effect, θ_t is year fixed effect and ε_{it} is an iid error term.

To identify which empirical methodology - pooling, fixed effects or random effects model - is most appropriate, we perform two statistical tests: the first is the Hausman specification test (Hausman, 1978) to compare the fixed effect and the random effect models; the second is the Lagrange Multiplier (LM) test (Breusch and Pagan, 1980) of the random effect model (see Table 15 in the Appendix for fixed effects and random effects estimates). A rejection of null hypothesis in the Hausman test statistic would imply that the random effects estimators are inconsistent and that fixed effects estimates are more appropriate. In our case, the Hausman specification test failed to reject null hypothesis ($\chi^2(5) = 10.21$) and suggests support for the random effects model. A LM test for the random effects model based on the OLS residuals can be used to assess whether the Panel GLS model is appropriate than the strict OLS model. The Lagrange multiplier failed to reject the null hypothesis allowing us to conclude that the random effects model is not appropriate. Therefore, we run a simple pooled OLS regression.

However, *EMPOWERMENT* can be dependent on the loan as well as other omitted variables. We address this potential endogeneity bias by adopting the IV approach and using sex of the first child as an instrument for empowerment. In the 2SLS IV approach, our first stage treats empowerment index as a dependent variable and use dummy variables for the first

child being son as an independent variable. In the second stage, we regress log of loan amount on the predicted value of empowerment index obtained from the first stage regression.

Indeed, our first stage regression shows that our instrument is a strong determinant of mother's empowerment. The second stage regression shows that (instrumented) empowerment increases the loan amount. Therefore, we can argue that empowerment has a positive *causal* effect on creditworthiness.

Now we need to explain our choice of the instrument. Whether the first child is a boy or a girl is purely a random event and could not directly affect the loan amounts the mother would get many years later. Can the *first* child's sex be manipulated through sex-selective abortion, given that India, and North India particularly, show strong son preference? The answer to this question, based on overwhelming evidence, is 'no'. Das Gupta et al. (2003) and Rosenblum (2013) show that the chance of sex-selective abortion arises predominantly with the second pregnancy onward, when the first child was a girl. Aborting the first pregnancy is very rare and unlikely (Arnold, Choe, and Roy, 1998; Jha et al. 2011), not to mention the health consequences associated with it. Moreover, in rural Haryana first child is also seen as God's gift and terminating pregnancy would be regarded as a sin. But the second or third child's gender selection is not uncommon. Because of this risk of non-randomness arising with later children, we took only the first child (being boy) as our instrument, and not total number of sons. In fact, when we tried total number of sons as an alternative instrument, we saw no relationship between the instrument and empowerment.

Now what would be the economic explanation for the significantly positive relationship between giving birth to a boy (as first child) and empowerment? We argue that in the male-dominated culture of North India, where women are ill-treated for giving birth to a girl for the costly future implications of dowry (among other reasons), the luck of giving birth to a son would elevate a young woman's status within the household (Jejeebhoy, 1997). She might be granted significant freedom in decision making and control over basic resources in her life. These are important steps in gaining independence and self-confidence in later life.

We may also argue that the luck of giving birth to two or three sons does not improve things dramatically, because the pathway to empowerment already opened due to the first son; gaining further empowerment has nothing to do with having additional sons. That is the reason the total

number of boys does not work as an instrument. Similarly, giving birth to a boy after a girl does not also help much either, because it can only prevent deterioration of the woman's status. Likewise, giving birth to a girl after a boy may not be a great misfortune, given that the family already got a son they value so much. Thus, the first child being a boy is crucial.

Is it possible that a boy could be an implicit collateral or loan guarantor and thus can directly influence the loans? This is not plausible on several grounds. First, the loans are also very short term, which cannot be renegotiated for delayed repayment from a son's future income. In any case, MFIs or cooperative societies, who are the dominant sources of loan in our sample, do not follow such exploitative policies. Second, the average woman's age is about 32 years and the age at which she had her first child was 21. So, having an eleven years old son cannot help her secure a bigger loan even from a very exploitative moneylender[19].

5. Results

Our OLS and IV estimates are reported in Table 6. We see that both models show significant positive effects of empowerment on the loan amount. The underlying first stage regression of the IV model, presented in Table 11 in *Appendix,* show that the first-born son leads to 1.33 unit increase in women's empowerment and the relationship is significant at 1% level. Therefore, it is seen that having a first-born son contributes directly to women's experiences of empowerment. The number of education years completed also have a positive and significant relationship with empowerment.

The IV estimates show that for a unit increase in empowerment score, the loan amount is expected to increase by 12.8 percent (Column 2, Table 6)[20]. The number of education years completed has a negative impact on the amount of loan - probably because microfinance is usually taken by less educated women and higher educated women are more likely to work in regular salaried jobs. The positive and significant coefficient of upper caste suggests that caste phenomena are strong in the region and upper caste women are expected to get a higher loan amount. Husband's income does not appear to have any effect on the loan amount which

[19] To test the validity of this argument, we have regressed the loan amount on the interaction of the first-child dummy and mother's age. The interaction term is insignificant.
[20] We found no evidence of reverse causality with loan amount having no effect on the level of empowerment.

suggests women own status determines their loan outcomes[21]. We find that the number of working members, house quality (as a proxy for income), average hours worked per week and years in the village do not affect the amount of loan. The coefficients of the loan sources other than SKS MFI (which is the base category) are negative. Women involved in livestock and other business activities such as joint investments with husbands, trading of pulses, utensils, and chemicals have a higher loan amount compared to the women engaged in agriculture activities.

Table 6: Pooled OLS and IV estimation model

	(1)	(2)
VARIABLES	OLS	IV
Empowerment	0.035*	0.128***
	(0.021)	(0.045)
Education years	-0.008	-0.033**
	(0.013)	(0.015)
Months with the lender	0.122***	0.119***
	(0.034)	(0.035)
Months with the lender square	-0.001	-0.001
	(0.001)	(0.001)
Years in the village	-0.008	-0.011
	(0.007)	(0.007)
No. of working members	0.068	0.056
	(0.056)	(0.059)
Upper Caste	0.115	0.160**
	(0.073)	(0.078)
House quality	-0.010	-0.018
	(0.063)	(0.061)
Average hours worked per week	0.001	-0.001
	(0.003)	(0.003)
Log of husband's income	0.199	0.099

[21] We found that wife's income is a strong determinant of the loan amount without changing our main results, but for endogeneity reasons, we have not included it in our final regression.

	(0.125)	(0.112)
Source of the loan		
Utkarash	-0.077	-0.122*
	(0.051)	(0.064)
Janlaxmi	0.206***	0.132
	(0.075)	(0.096)
Moneylenders	-0.123	-0.151
	(0.127)	(0.112)
Co-operative Society	0.141	0.113
	(0.181)	(0.175)
Income generating activities		
Livestock	0.094	0.167
	(0.094)	(0.105)
Making cloths	0.018	0.077
	(0.143)	(0.139)
Shops	0.017	0.066
	(0.129)	(0.124)
Small informal business	-0.043	0.023
	(0.118)	(0.135)
Other activities	0.188	0.250**
	(0.120)	(0.126)
Year	-1.325***	-1.311***
	(0.228)	(0.236)
Constant	1.459***	2.107***
	(0.550)	(0.614)
R square	0.292	0.283
Cragg-Donald Wald F statistic		86.94
Observations	422	422

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Column 1 presents the pooled OLS estimates and Column 2 presents the IV estimates of regression using log of loan amount as a dependent variable. We use agriculture as a base group for income generating activity dummies and SKS microfinance as the base group for the loan source dummies.

Column (1) of Table 6 presents the pooled OLS estimates that shows a positive impact of empowerment on the loan amount. In Column (2), after instrumenting for empowerment, the estimates show a similar pattern, with IV estimates bigger than the pooled OLS estimates. These results, together with the good performance of our instrument in general, suggest that more empowered women sustain bigger loans. The IV estimates are considerably larger than the pooled OLS estimates, suggesting that the uncorrected OLS model would have underestimated the true effect of empowerment on women's creditworthiness.

We also test for the relevance of the instrument in the first-stage regression. Staiger and Stock (1997) proposed a rule of thumb declaring the instruments weak when the first stage *F* statistic is less than 10. The F-statistic from the first-stage is sufficiently large, suggesting that our IV is powerful. Another approach, by Stock and Yogo (2005) is to reject the null hypothesis of weak instruments when the Cragg and Donald (1993) F-statistic exceeds a given threshold. In our case, we reject the null hypotheses of the weak instrument since Cragg-Donald F statistic (86.94) exceeds the threshold of 16.38 at 10%. By these criteria, we have a good instrument in the first-born son.

As an aside issue, we wanted to check which component of the empowerment index has bigger effect on the loan amount. For this purpose, as a separate exercised we have regressed the loan amounts on the individual components of empowerment, instead of the empowerment index (see Table 12 in the *Appendix*). We find that economic, political and interpersonal factors have a positive and significant relationship with loan amount, whereas social factors have no effect.

6. North Indian data: Robustness checks and supporting evidence

An important question is: How robust is our empowerment methodology? Can this be applied to a larger dataset, and check that the insight we got from our village data tally with North India as a whole? To answer these questions, we examine the IHDS data for 2011-12 for North India and the rest of India (see Table 9 in the *Appendix* for summary statistics). The IHDS data contain very similar empowerment related information on adult women. Therefore, it presents a clear scope for testing our model.

However, there are two issues. First, the IHDS data contain the credit information at the household level, which does not help to identify the female borrowers. Therefore, we create a subsample of only female-headed households. Using this subsample, we then create a similar empowerment index using PCA (see Table 10 in the *Appendix*). Since the data also has information on women who did not take any loans, we can also estimate the probability of getting a loan. Second, IHDS data do not report the birth order of the child. Hence, we cannot use the first child's sex as an IV for empowerment. Instead, we use widowhood as an instrument.[22] We also use the Heckman two-step procedure to correct for self-selection bias (discussed in *Appendix B*).

Admittedly, the IHDS households are not *prima facie* comparable with our village survey households because IHDS borrowers are head of the household unlike the borrowers in our survey data. However, as Table 6 shows, the husband's income does not affect the wives' loans. Therefore, we can say that there is some similarity between the borrowers of the two datasets regarding the responsibility of the loan. Above all, both samples provide rich information on underlying factors of empowerment.

We now need to justify our choice of widowhood as an IV. First, it is a random and exogenous event, and it could not possibly have a direct effect on the amount of loans. One may argue that a widow would be in greater need of loans than a non-widow female. Based on Dreze and Srinivasan (1997) we also know that widows are amongst the most vulnerable women in India. However, *vulnerability* would lead to greater consumption loans, but not non-consumption loans. But amongst those women who get non-consumption loans, widows are likely to be more empowered. Second, the absence of husband allows a woman to be independent and to make strategic life choices. For this reason, women who do get bigger loans are likely to be more independent and empowered.

In other words, the process of empowerment may be triggered by misfortune and tragedies, as it may be with good luck, like giving birth to a son. There is no unique pathway to empowerment. Both good and bad lucks can help a woman take the road to empowerment.

The IHDS data contain information on the largest loan which could be of several types of

[22] We find widowhood has a positive association with empowerment (see Table 13 and 14 in the Appendix).

needs – consumption, production, education, medical, home building/improvement and marriage. From these, we exclude consumption and marriage. Production loans are typically short-term working capital credit. Education, home improvement and medical loans are somewhat related to production as well, because human capital is an important input for self-employment and home is also commonly used as a production base. Therefore, it is appropriate to include all these loans into a single non-consumption loan.

Table 7 below presents the IV results on the probability of taking any loan. Empowerment has a positive effect on the probability only in North India; the rest of India shows no effect. The results also suggest that households with better house quality (a proxy for income) are less likely to participate in the credit market. Upper caste female-headed households are less likely to participate in the credit market in the rest of India while caste does not have any effect in North India. Similarly, ration card only affects the probability of participation in the credit market in the rest of India. On the other hand, larger (female-headed) households and those keeping livestock are more likely to take loans in North India while no effect in the rest of the country. The Wald test confirms that the use of IV is justified for North India. However, in the rest of India sample, a probit model would have sufficed, although the results did not change.

Table 7: IV estimates for the probability of loan taken based on the IHDS data

	(1)	(5)
VARIABLES	NORTH	REST
Empowerment	0.125*	0.019
	(0.076)	(0.073)
Education years	-0.017	-0.009
	(0.013)	(0.009)
Age	-0.004	-0.010**
	(0.006)	(0.005)
Urban area	-0.009	0.014
	(0.140)	(0.093)
Upper Caste	-0.186	-0.228***
	(0.115)	(0.079)

Remittance receive from	0.213	-0.021
non-resident	(0.167)	(0.126)
Livestock	0.265**	0.132
	(0.119)	(0.090)
Size of the household	0.110***	0.006
	(0.037)	(0.031)
Land ownership	-0.061	0.132
	(0.124)	(0.106)
Ration Card	-0.098	0.346***
	(0.147)	(0.118)
House Quality	-0.278**	0.443***
	(0.114)	(0.084)
Occupations		
Cultivation	0.426	-0.040
	(0.513)	(0.259)
Allied Agriculture	0.488	-0.595
	(0.813)	(0.540)
Agriculture wage labour	0.403	0.020
	(0.527)	(0.256)
Non-agriculture wage	0.361	-0.020
Labour	(0.508)	(0.243)
Petty shop	0.780	-0.074
	(0.528)	(0.266)
Salaried job	0.295	-0.163
	(0.506)	(0.234)
Pension or rent	0.275	-0.416
	(0.515)	(0.258)
Others	0.199	-0.177
	(0.515)	(0.252)
Constant	-0.490	-0.402
	(0.597)	(0.341)
Observations	736	1478

Wald test of exogeneity	4.37**	0.01

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10. All the variables here are described in Table 10 in the *Appendix*. The result from the first stage is in Table 13 in the *Appendix*. We use professional and organised business occupational group as the base group for the occupations dummy.

To address a potential selection bias in the loan amount model, we use the Heckman (1979) two-step model that conditions the second stage estimates on the first stage participation in the loan market. Table 8 below presents the IV results of the (second stage) effect of empowerment on the amount of the loan taken. We find that for one unit increase in the empowerment score, the loan amount is expected to increase by 33 percent in North India while having no effect in the rest of India. The coefficient of education is positive and significant for the rest of India while it shows no effect in North India. Larger households and those which receive remittances from a non-resident have a higher loan amount in North India. Loans taken from a formal source such as a bank or credit group increases the loan amount in the North and the rest of India. Caste does not seem to have any effect on the loan amount.

That empowerment has positive and significant effects in North India directly support our village level finding. Empowerment matters for businesses in environments where males are in a controlling position[23]. For the rest of India, where women enjoy much better status, our indicators of empowerment (which we identified through our in-person surveys in the North) do not capture enough variations in women's creditworthiness. It is more likely that in the rest of India female borrowers may be seen similarly creditworthy as male borrowers. Empowerment is of a lesser concern there, instead the borrower's human capital is much more important.

Table 8: IV estimates of loan based on IHDS data

	(1)	(2)
VARIABLES	NORTH	REST
Empowerment	0.337**	-0.252

[23] In Northern India, conservative culture and social norms may discourage women to become economically self-sufficient (as showed by Ahmed & Sen (2018) in Bangladesh). In this environment, highly empowered women who have the capacity to challenge the societal norms are more likely to start businesses, absorb higher credit and have a greater control over the business decisions.

	(0.146)	(0.163)
Education years	-0.00382	0.0745***
	(0.0293)	(0.0145)
Age	-0.00585	0.0324***
	(0.0147)	(0.00815)
Urban	-0.212	0.193
	(0.217)	(0.159)
Upper Caste	-0.270	0.181
	(0.276)	(0.194)
Remittance Received	0.730**	0.141
	(0.312)	(0.222)
Livestock	0.452	-0.497***
	(0.297)	(0.158)
Size of Household	0.202***	-0.0348
	(0.0589)	(0.0557)
Land Ownership	0.124	-0.0342
	(0.185)	(0.231)
Source of Loan		
Formal Loan	0.907***	0.475**
	(0.330)	(0.192)
Family Loan	-0.229	-0.560***
	(0.172)	(0.146)
Ration Card	0.0581	-0.485
	(0.243)	(0.284)
Purpose of Loan		
House Loan	0.258	0.766***
	(0.262)	(0.167)
Medical Loan	-1.015***	0.126
	(0.303)	(0.230)
Education Loan	-0.515	0.0654
	(0.438)	(0.238)
Occupations		
Cultivation	2.378***	0.163

	(0.474)	(0.456)
Allied Agriculture	1.964***	1.152
	(0.564)	(1.195)
Agriculture wage labour	2.182***	-0.144
	(0.559)	(0.432)
Non-agriculture wage labour	1.963***	-0.441
	(0.474)	(0.431)
Petty shop	3.238***	0.00622
	(0.692)	(0.426)
Salaried job	1.365***	-0.0263
	(0.374)	(0.428)
Pension or rent	1.647***	0.905*
	(0.412)	(0.508)
Others	1.581***	-0.0968
	(0.406)	(0.457)
Mills	3.800***	-2.947***
	(1.221)	(0.755)
Constant	3.540***	11.74***
	(1.358)	(1.164)
Observations	302	544
Cragg-Donald Wald F statistic	132.17	33.691
R-squared	0.319	0.267

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All the variables here are described in Table 10 in the *Appendix*. The results from the first-stage are in Table 14 in the *Appendix*. We use professional and organised business occupational group as the base group for the occupations, dummy for informal loan as the base group for the source of loan and dummy for productive loan as the base group of purpose of loan. The F-statistic from the first-stage and Cragg and Donald (1993) F-statistic shows that we have a good instrument as widowhood.

7. Discussion and conclusion

Using primary data collected from a village in North India over two periods, and the IHDS data for all India this paper examines the impact of women's empowerment on their creditworthiness measured in terms of cumulative loan amount taken over time. An index for

empowerment was created using four dimensions of empowerment: economic, social, interpersonal and political. Although empowerment is an elusive concept and an ideal index is beyond the scope of the paper, we took great care (through a detailed questionnaire and in-person interviews) to capture the critical observable factors underlying empowerment.

Our findings have some policy implications. First, one critical view of microcredit is that it does not reach the women who need it most. Our analysis shows that a more empowered woman gets more loans, regardless of her family wealth. Therefore, we argue that there is a need to decouple empowerment from microcredit either by policies focusing on empowering more women or by increasing the access of microcredit to lowly empowered women.

Second, our empowerment index shows that some variables such as women's economic status, their control over savings, political awareness, attitude towards domestic violence and purchasing capacity regarding expensive items are more important than other variables in determining women's empowerment. Hence, diverting resources to improve the outcome of these variables would increase the empowerment of women.

Third, although we see that giving birth to a son helps a woman to be on track for empowerment, by no means we advocate son preference. Instead, we recommend investing in resources for promoting gender equality and reducing gender discrimination in jobs, education, politics, and sports. Recent progress in education for girls and the government sponsored social campaign for promoting gender equity (*Beti Bachao, Beti Padhao* -- Save a girl child, Educate a girl child) are showing good results (Government of India, 2018).

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Appendix A: Tables and Figures

Figure 1: Timeline of the surveys

Jan 2015

|_____|_____|_____|_____|

Oct 2015-Dec 2015 — Collection of the first round

Dec 2016-Feb 2017 — Second round

Figure 2: Location of the village

Source: Google Map

Table 9: Descriptive Statistics of variables used in IHDS

Variable	Description	Obs	Mean	Std.Dev.
Log of loan	Log of the amount of loan	888	10.231	1.437
Loan taken	Dummy if taken any loan	2273	.394	.489
Loan Amount	Loan amount in rupees	2273	30988	167775
Empowerment	Empowerment score	2269	.006	2.254
Education years	Number of education years completed	2273	3.832	4.447
Age	Age	2273	42.864	8.501
Urban area	Dummy if living in urban area	2273	.328	.47
Upper Caste	Dummy if belong to upper caste	2273	.285	.451
Land owner	Dummy if own any land	2273	.317	.465
Ration Card	Dummy if have ration card	2273	.888	.315
Remittance receive from non-resident	Dummy if any remittance received from a non-resident	2273	.422	.494
House Quality	Dummy for the quality of the house (good or bad)	2273	.650	.477
Size of the household	Number of people living in the house	2273	3.769	1.816
Livestock	Dummy if own any form of livestock	2273	.36	.48
Widow	Dummy if the client is a widow	2273	.577	.494
Productive loans	Dummy if loan taken for productive purposes such as business or agriculture	896	.249	.433
Education Loans	Dummy if loan for educational purpose	896	.100	.301
House Loans	Dummy if loan for improving the house	896	.295	.456
Medical Loans	Dummy if loan for medical purpose	896	.345	.476
Formal loans	Dummy if the loan is taken from formal source such as	896	.405	491

	banks			
Informal Loans	Dummy if loan from Informal sources such as money lenders	896	.198	.398
Family Loans	Dummy if loan from family and friends	896	.397	.49
Occupations				
Cultivation		2269	.163	.369
Allied Agriculture		2269	.005	.073
Agriculture wage labour		2269	.113	.316
Non-agriculture wage labour		2269	.193	.394
Petty shop		2269	.061	.24
Salaried job		2269	.246	.431
Pension or Rent		2269	.094	.292
Others		2269	.107	.309
Independent/organized business		2947	0.02	0.13

Table 10: **Descriptive statistics of variables used in computing empowerment index for IHDS**

Variables	Mean	Standard deviation	Factor Score
Have the most say in cooking	0.891	0.311	0.1271
Have the most say in purchasing expensive items	0.596	0.491	0.3266
Have the most say in decision regarding child sickness	0.743	0.437	0.2839
Have the most say in decision regarding marriage of the child	0.591	0.492	0.3241
Have the most say in decision regarding work	0.710	0.454	0.1811
Have the most say in decision when fall sick	0.726	0.446	0.2852
Have the most say in decision regarding buying land	0.550	0.498	0.3406

Have the most say in decision regarding wedding expensive	0.646	0.478	0.3285
Can visit health centre without permission	0.362	0.481	0.2751
Can visit friends without permission	0.384	0.486	0.2614
Can visit shops without permission	0.417	0.493	0.2395
Can go short distance without permission	0.308	0.462	0.2857
Have the most say in number of children to have	0.516	0.500	0.2248
Have access to media	0.602	0.490	0.0174
Economic Status (currently working)	0.405	0.491	0.1404
Member of Mahila Mandal (women group)	.0708	0.256	0.0386
Member of self-help group	0.152	0.359	0.0430
Member of credit/saving group	0.082	0.274	0.0265
Member of political organisation	0.009	0.095	0.0319
Health self-evaluation	0.803	0.336	0.0302

An empowerment index (similar to the original index) was constructed using the data from IHDS as part of robustness check. This index consists of variable capturing various dimensions of empowerment such as mobility, participation level in public and political life, purchasing capacity, media exposure, family planning and economic status. The first principal component explains 33% of the variation in the variables used.

Table 11: First stage regression using empowerment as a dependent variable.

	(1)
VARIABLES	OLS
Dummy of first-born son	1.333***
	(0.174)
Education years	0.249***
	(0.029)

Months with the lender	-0.018
	(0.061)
Months with the lender square	0.000
	(0.002)
Years in the village	0.048***
	(0.016)
No. of working members	-0.058
	(0.221)
Upper Caste	-0.235
	(0.202)
House quality	0.317**
	(0.135)
Average hours worked per week	0.009
	(0.006)
Log of husband's income	0.368
	(0.177)
Source of the loan	
Utkarash	0.481***
	(0.154)
Janlaxmi	0.741***
	(0.205)
Traders	0.075
	(0.204)
Co-operative Society	0.255
	(0.227)
Income generating activities	
Livestock	-0.483***
	(0.182)
Making cloths	-0.513**
	(0.211)
Shops	-0.232
	(0.223)
Small informal business	-0.339

	(0.260)
Other occupations	-0.742***
	(0.249)
Year	0.238
	(0.322)
Constant	-2.904***
	(0.665)
Observations	422
R-squared	0.442

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Impact of various empowerment components on the loan amount

VARIABLES	(1)	(2)	(3)	(4)
Empowerment (Economics, Social,	0.335**	0.957	0.413***	0.273***
Political and Interpersonal)	(0.134)	(0.676)	(0.157)	(0.105)
Education years	-0.016	-0.024	-0.049**	-0.018
	(0.013)	(0.024)	(0.020)	(0.013)
Months with the lender	0.119***	0.142***	0.127***	0.110***
	(0.033)	(0.041)	(0.035)	(0.033)
Months with the lender square	-0.001	-0.002*	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Years in the village	-0.005	-0.032	-0.014*	-0.006
	(0.007)	(0.022)	(0.007)	(0.007)
No. of working members	0.020	0.024	0.114**	0.070
	(0.069)	(0.111)	(0.057)	(0.062)
Upper Caste	0.149*	-0.025	0.157*	0.119
	(0.084)	(0.137)	(0.085)	(0.073)
House quality	-0.079	-0.098	0.023	-0.024
	(0.073)	(0.100)	(0.071)	(0.063)

Average hours worked per week	-0.002	0.002	-0.000	-0.001
	(0.003)	(0.004)	(0.003)	(0.003)
Log of husband's income	0.060	0.142	0.162	0.128
	(0.126)	(0.158)	(0.115)	(0.120)
Source of the loan				
Utkarash	-0.058	-0.149	-0.111	-0.080
	(0.066)	(0.138)	(0.077)	(0.063)
Janlaxmi	0.091	0.406*	0.136	0.221**
	(0.111)	(0.232)	(0.104)	(0.106)
Traders	-0.167	0.241	-0.197	-0.120
	(0.124)	(0.262)	(0.129)	(0.111)
Co-operative Society	0.109	0.407	0.020	0.165
	(0.187)	(0.277)	(0.193)	(0.180)
Income generating activities				
Livestock	0.082	0.108	0.170	0.165
	(0.104)	(0.165)	(0.109)	(0.109)
Making cloths	-0.089	0.040	0.013	0.152
	(0.144)	(0.225)	(0.144)	(0.157)
Shops	-0.045	-0.112	0.107	0.014
	(0.144)	(0.233)	(0.132)	(0.127)
Small informal business	-0.087	-0.056	0.040	-0.050
	(0.140)	(0.235)	(0.146)	(0.126)
Other occupations	0.123	0.084	0.240*	0.278**
	(0.139)	(0.237)	(0.127)	(0.135)
Year	-1.403***	-1.494***	-1.348***	-1.232***
	(0.252)	(0.341)	(0.244)	(0.244)
Constant	0.624	0.028	0.559	0.809
	(0.661)	(1.182)	(0.667)	(0.580)
R-squared	0.277	0.182	0.278	0.274
Observations	422	422	422	422

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Column 1 of Row 1 shows the effect of economic empowerment on loan amount. Column 2 of Row 1 shows the effect of social empowerment on loan amount. Column 3 of Row 1 shows the effect of political empowerment on loan amount. Column 4 of Row 1 shows the effect of interpersonal empowerment on loan amount. We use agriculture as a base group for income generating activity dummies and SKS microfinance as the base group for the loan source dummies.

Table 13: Result from the first-stage regression using empowerment as a dependent variable in the loan amount model.

	(1)	(2)
Empowerment	North India	Rest of India
Education years	0.0963***	0.0239
	(0.0184)	(0.0235)
Years in place	0.0512***	-0.0163
	(0.00879)	(0.0133)
Urban area	0.187	0.00977
	(0.184)	(0.245)
Upper Caste	0.835***	0.380
	(0.166)	(0.253)
Remittance receive from	-1.235***	-0.752***
non-resident	(0.172)	(0.242)
Livestock	-1.511***	-0.0800
	(0.173)	(0.232)
Size of HH	-0.284***	-0.264***
	(0.0360)	(0.0536)
Landowner	0.341**	-0.693***
	(0.163)	(0.264)
Ration Card	0.272	-0.490
	(0.198)	(0.404)
Source of loan		
Formal loan	-0.331	-0.445*
	(0.211)	(0.265)
Family loan	-0.257	-0.342

	(0.165)	(0.268)
Purpose of loan		
House Loan	0.171	0.278
	(0.202)	(0.246)
Medical Loan	-0.386**	0.414
	(0.191)	(0.275)
Education Loan	-0.0111	0.523
	(0.330)	(0.319)
Occupations		
Cultivation	-0.0162	0.941
	(0.667)	(0.627)
Allied Agriculture	-0.0672	1.411
	(1.030)	(1.607)
Agriculture wage labour	-0.455	0.768
	(0.693)	(0.615)
Non-agriculture wage labour	0.130	0.806
	(0.666)	(0.595)
Petty shop	-2.069***	0.426
	(0.678)	(0.666)
Salaried job	0.617	0.471
	(0.655)	(0.593)
Pension or rent	1.017	0.462
	(0.681)	(0.696)
Others	1.000	0.366
	(0.681)	(0.655)
Mills	-7.698***	-2.275***
	(0.373)	(0.682)
Widow	1.244***	1.035***
	(0.187)	(0.240)
Constant	5.787***	3.743***
	(0.858)	(1.057)
Observations	312	564

R-squared	0.751	0.221

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Column 1 shows the estimate from North India, Column 2 shows the estimate from rest of India. The results shows that widowhood has a positive association with empowerment. We use professional and organised business occupational group as the base group for the occupations, dummy for informal loan as the base group for the source of loan and dummy for productive loan as the base group of purpose of loan.

Table 14: Result from the first-stage regression using empowerment as a dependent variable from the selection model.

	(1)	(2)
VARIABLES	NORTH	REST
WIDOW	1.793***	1.261***
	(0.197)	(0.141)
Education years	0.004	0.015
	(0.017)	(0.014)
Age	-0.001	-0.019**
	(0.009)	(0.007)
Urban area	0.263	0.138
	(0.188)	(0.141)
Upper Caste	-0.078	0.051
	(0.155)	(0.119)
Remittance receive from	-0.643***	-0.734***
non-resident	(0.187)	(0.142)
Livestock	-0.132	-0.233*
	(0.164)	(0.135)
Size of the household	-0.193***	-0.132***
	(0.046)	(0.045)
Land ownership	0.002	-0.451***
	(0.170)	(0.155)
Ration Card	0.079	0.104
	(0.201)	(0.173)

House Quality	0.348**	-0.122
	(0.153)	(0.127)
Occupations		
Cultivation	0.172	0.881**
	(0.686)	(0.384)
Allied Agriculture	0.149	0.030
	(1.098)	(0.786)
Agriculture wage labour	0.295	0.943**
	(0.709)	(0.379)
Non-agriculture wage	0.556	0.766**
Labour	(0.677)	(0.364)
Petty shop	0.094	0.710*
	(0.707)	(0.403)
Salaried job	0.269	0.468
	(0.677)	(0.358)
Pension or rent	0.057	0.346
	(0.690)	(0.391)
Others	0.041	0.089
	(0.689)	(0.387)
Constant	-0.966	0.284
	(0.803)	(0.514)
R-squared		
Observations	736	1,478

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Column 1 shows the estimate from North India, and Column 2 shows the estimate from rest of India. We use professional and organised business occupational group as the base group for the occupations dummy.

Table 15: Fixed effects and random effects model

	(1)	(2)
VARIABLES	FE	RE
Empowerment	0.262	0.040*
	(0.164)	(0.020)

Months with the lender	0.203***	0.120***
	(0.041)	(0.027)
Months with the lender square	-0.002**	-0.001
	(0.001)	(0.001)
Years in the village	0.137	-0.007
	(0.359)	(0.007)
Average hours worked per	-0.007	0.000
week	(0.008)	(0.003)
Education years		-0.009
		(0.011)
No. of working members		0.088
		(0.067)
Upper caste		0.107
		(0.071)
Utkarash		-0.076
		(0.074)
Janlaxmi		0.205*
		(0.121)
Traders		-0.142
		(0.104)
Co-operative Society		0.165
		(0.126)
House quality		-0.002
		(0.061)
Income generating activities		
Livestock		0.095
		(0.099)
Making cloths		0.008
		(0.122)
Shops		0.001

		(0.112)
Small informal business		-0.051
		(0.127)
Other occupations		0.187
		(0.121)
year	-2.241***	-1.309***
	(0.439)	(0.144)
Constant	4,515.143***	2,639.582***
	(881.018)	(290.067)
Breusch and Pagan Test		1
Hausman Test	10.21	10.21
Observations	422	422
R-squared	0.308	

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is log of loan amount. Column 1 shows the fixed effect estimates and column two shows the random effect estimates.

2.9 Appendix B: Identification Strategy for IHDS data

The model consists of the following equations:

$LOAN_i = 1\left(x_{3i}b_3 + \varepsilon_{i3} > 0\right)$….. Selection equation (1)

E$MP_i = x_{2i}b_2 + a_2 WIDOW_i + \varepsilon_{i2}$ …… Empowerment equation (2)

$ln(LA_i) = x_{1i}b_1 + a_1 EMP_i + \varepsilon_{i1}$ ….. Loan amount equation (3)

Loan amount equation is the equation of interest where $ln(LA_i)$ is the log of the loan amount borrowed by women *i*. EMP_i is a potentially endogenous variable, x_i represents the vector of other control variables, and ε_i is the error term. The second equation is a projection for the endogenous variable EMP_i using $WIDOW_i$ as an instrument variable. Selection equation estimates the probability of participating in the credit market where $LOAN_i$ equals one if the women has taken a loan and zero otherwise.

The estimation strategy of this model can be summarized as follows. In Step 1, we estimate the likelihood of participating the credit market. In Step 2, we compute the Inverse Mills Ratios (IMR) and plug it in the loan amount equation to be estimated by 2SLS along with WIDOW as an instrument. The coefficient of IMR is significant for North India and the whole of India implying that selection bias is prevalent in the model while, the insignificant coefficient of IMR in the rest of India sample suggests that selection bias is not important for this group.