Do Information Networks Benefit Households with Female Heads?

Udichibarna Bose* University of Essex

Thankom Arun University of Essex

Shoba Arun Manchester Metropolitan University

Abstract

This paper fills a gap in the literature on gender bias in accessing financial assets and income generation activities by analyzing the influence of media and social networks on the financial returns of female-headed households. Empirical evidence suggests that media and social networks are effective tools for diminishing connectivity constraints, raising awareness, and influencing behaviors. Using the India Human Development Survey of female-headed households for the period 2011 to 2012, we find that media and social networks positively impact the financial returns of households. We also find that information networks have positive and significant impacts on the net income from financial investments in urban areas and net income from agricultural activities in rural areas. Following this, we further explore the mediating role of financial expertise among households and confirm its significance in understanding and using the information provided by media and social networks to make relevant financial decisions.

Keywords: Mass media, social networks, financial expertise, female-headed households

JEL codes: D14; G50; G51; G53

*corresponding author: ubose@essex.ac.uk. We are grateful to the editor, four anonymous reviewers and the copy-editor for their insightful comments and suggestions. We are thankful to the participants at Essex Conference on Financial Inclusion 2020, Conference on Financial Inclusion and Fintech (fif2019) in SOAS University of London, 13th International Conference on Public Policy and Management for their useful comments. We also acknowledge financial support from the UGC- UKIERI/British Council (grant number: 2016-17-064). Any remaining errors are our own.

1. Introduction

In emerging developing economies, complex social inequalities pose a severe challenge to information dissemination and financial capability, significantly affecting the financial decisions of female-headed households. Key studies on female household headship (e.g., Buvinic and Gupta, 1997; Chant, 1997; Rogan, 2013) have documented how gender disparities through triple burdens of poverty, gender discrimination, and absence of support influence households' access to resources. Recent studies have also shown how the continuing differential vulnerability of female-headed households because of limited mobility, connectivity (Chant, 2013), and access to protective social networks (Flato et al., 2017) jeopardizes women's engagement in the labor market and income generation activities.

Further, the empirical evidence suggests that harnessing the media and social networks can prove to be a useful tool in raising awareness and changing attitudes, especially when the target audience is large (Atkinson and Messy, 2013). Mass media (Berg and Zia, 2017) and social interactions (Duflo and Saez, 2003) offer a powerful platform for communicating educational information and influencing behavior. Abbaszadeh et al. (2019) found that communication through technological media, such as television, internet, blogs, mobile phone, radio, and search engines (Wei, 2009) has a significant influence on the economic, social, or political setting, leading to the development of society (Adams, 2006; Yang et al., 2017). Bönte and Filipiak (2012) also found that using public information sources (e.g., radio, television, newspaper, and internet) increases the probability of enhancing the financial instrument awareness. Meanwhile, Carpena et al. (2011) explored the influence of a comprehensive video-based education program in India and found that these programs made significant improvements in knowledge and awareness of financial products and services among the users. However, a gendered perspective on software production shows that although information technology creates opportunities for women, it reproduces gender inequalities in the broader

fabric of society (Arun and Arun, 2002). Meanwhile, Chant (2013) highlighted that in the modern age when technology can diminish mobility and connectivity constraints, women's prospects of benefiting from technology are commonly hampered because of a gendered "digital divide." Thus, targeting female-headed households using these information networks can help reduce poverty and produce more significant welfare benefits to families and society.

Further, Arun et al. (2016) found that social networks help improve household consumption in India, showing the potential of social mobility to induce overall well-being and improved welfare. In Botswana, Cassidy and Barnes (2012) determined that more socially networked households are likely to have a wider range of livelihood strategies, greater levels of other forms of social capital, and greater overall capital. Thus, media networks and social interactions play a crucial role in reducing informational barriers and improving individuals' financial decision making. However, the information diffusion through media and social networks also requires careful retrieval and selection of information and transformation of this information into knowledge. In this regard, financial expertise and skills among individuals play an important role as they help disentangle the relevant information provided by these information networks and utilize it to make more informed financial decisions. Several scholars, such as Frijns et al. (2014), Mandell (2008), and Weiner et al. (2005), highlighted the importance of financial expertise in motivating people to improve their financial literacy and behavior. Thus, in this paper, we focus on the impact of information channels, such as *mass media* and *social networks*, in influencing the financial decisions of female-headed households through the mediating role of financial expertise.

We use a unique, nationally representative survey from the India Human Development Survey (IHDS) conducted during 2011–2012 for the empirical analysis. Our study focuses on two information networks, namely, *media and digital networks* and *social networks*, as a source of learning to enhance the transmission/exchange of information among households. We

examine the impact of these two networks on the financial returns of female-headed households in both rural and urban sectors. Finally, we explore the mediating role of financial expertise in the relationship between information networks and financial decisions.

This study makes several relevant contributions to the literature. First, to the best of our knowledge, this is the first study that focuses on the mediating role of financial expertise in the relationship between information networks and financial returns of households. Second, we analyze the impact of information networks on households' financial decisions in an emerging economy, whereas most studies have focused on developed countries (Cole et al., 2011). Third, we investigate the direct relationship between information networks (e.g., *media networks* and *social networks*) and financial returns among the vulnerable groups of female-headed households in India's urban and rural sectors. We argue that the focus on female-headed households is well-suited for analyzing financial decision making as they are triply disadvantaged as heads of households (Buvinic and Gupta, 1997).

Our results, which remain consistent with several robustness tests, can be summarized as follows. First, we find a positive and significant impact of *media* and *social networks* on the financial returns of female-headed households. Second, we find that financial expertise mediates the link between information networks and financial returns among households. Finally, we find that *media* and *social networks* positively impact the net income from financial investments in urban areas and agricultural activities in rural areas through the mediating effect of financial expertise.

We structure the rest of the study as follows. Section 2 provides detailed background literature. Section 3 describes the data and research method used in the study. Section 4 presents the empirical findings and discussion. Section 5 provides a battery of robustness tests. Finally, Section 6 concludes the study.

2. Background literature

Making informed financial decisions and evaluating difficult financial choices remain a challenge for large parts of the world (Berg and Zia, 2017; Lusardi et al., 2010). Empirical evidence suggests that gender disparity significantly impacts broader macroeconomic outcomes, including social and economic development (Basu, 2021; Morrison et al., 2007; Sen, 2001; Stotsky, 2006). It has been evidenced that women face several barriers, mostly gender norms, such as low intra-household bargaining power and social norms in the adoption and usage of financial services (Doss, 2013; Duflo, 2012). Moreover, women who are head of the households may face discrimination in accessing jobs or resources because of their gender, social, or economic factors, which further affects their household's economic welfare. For example, recent evidence from Southeast Asia shows that a woman's role as a primary caretaker of the household in the absence of a consolidated patriarchal system has reinforced gender (dis)advantages and in such cases, access to networks is crucial (Quetulio-Navarra, 2017) to improve social capital. Similarly, Kuada (2009) determined that female entrepreneurs have more difficulties accessing bank financing but compensate by cultivating social relationships and using social capital as a resource-leveraging mechanism in the context of Ghana. However, Chant (1997) pointed out that addressing female- headed households as "the poorest of the poor" is misleading for female-headed households, especially in urban areas as the situation may differ in rural areas and across countries.

In India, Ghosh and Vinod (2017) showed that female-headed households are 8% less likely to access formal finance and 6% more likely to access informal finance than male-headed households. Subsequently, they found that education and wages are more relevant in explaining access to finance, whereas political and social factors help explain the use of finance. Meanwhile, Rajeev et al. (2011) documented that the incidence of indebtedness for female-headed households is 4%–10% higher than male-headed households in India. Further, Rajeev

and Bhattacharjee (2015) showed that female-headed households pay nearly 5% higher interest cost and have 7%–10% lower access to formal sources of finance than male-headed Indian households.

Thus, communicating messages to enhance financial awareness among households is crucial for the development of financial markets as households are important consumers of financial products, and these investments influence the scale and asset mix of finance (Honohan, 2008). In India, specifically, even after a massive supply-driven no-frills financial inclusion program under the *Pradhan Mantri Jan Dhan Yojana* (PMJDY), 76% of India's adult population do not fully understand the basic financial concepts (S&P, 2015). The Securities Exchange Board of India (SEBI) has been organizing investor education and awareness workshops to create awareness about financial products and the ecosystem. Further, SEBI articulated a media plan in 2011 to disseminate information on financial markets to the masses in English, Hindi, and 12 other regional languages through newspapers, television, and radio (Giz, 2013). The media networks, particularly television, is the most important one as it has the deepest penetration especially in rural areas of around 55% (Broadcast India Survey, 2018). Thus, it can be used to target a large population.

Over the last two decades, with the complexity of financial products at the micro-level, the understanding of household financial decision making and behavior is vital. In behavioral studies, empirical evidence shows that two critical psychological aspects that determine individuals' behavior regarding the use and acquisition of information are overconfidence and limited cognitive capabilities (Garcia, 2011). Halford and Savage (2010) extended the sociological analysis of the relationship between information and communication technology, on the one hand, and social inequalities, on the other hand, beyond that of the digital divide debate. The literature on informational cascades (Banerjee, 1992) explains why information obtained from peers may be an important factor in deciding investment decisions. Individuals

may want to maintain the same consumption level as what is expected in their social group, resulting in a "social multiplier" effect, that is, the aggregate impact of an intervention on a group is larger than the sum of its impacts on each individual's decision. The relational dimension of social interaction leads to higher care and mutual trust (Von Krogh, 1998), norms of cooperation (Coleman, 1990), and a sense of identification (Kramer et al., 1996). Bo et al. (2015) also found that social networks in China help increase entrepreneurial income in urban and rural sectors.

Further, several studies have investigated the effects of the media on political, social, and economic outcomes. Some of these studies have analyzed the impact of newspapers on politicians' accountability (Strömberg, 2004), and other works have focused on the effects of television on social behaviors. For example, Chong and La Ferrara (2008) analyzed the effect of the role models portrayed in TV programs on divorce in Brazil, and Paola and Scoppa (2014) highlighted the effects of media on consumer behavior, focusing on lottery games. Meanwhile, Bönte and Filipiak (2012) and Swain and Wallentin (2009) found that mass media and social networks help increase awareness of financial instruments.

Irrespective of the fact that information networks can enhance the quality of decision making among individuals, financial education must be anchored in an appropriate social and relational framework, as argued by Henchoz (2016). The financial education programs aim to improve overall financial knowledge and provide goal-orientated information only; thus, it may limit the success of the programs (Braunstein and Welch, 2002). Lührmann (2018) suggested that financial education enhances inter-temporal decision making and decreases narrow bracketing. Moreover, some studies have argued that financial experience makes people more receptive to financial education programs and, thus, helps improve their financial literacy and behavior (Frijns et al., 2014; Mandell, 2008). Hence, the influence of information networks, such as mass media and social networks, on households' financial behavior must be examined

as these platforms provide both vertical and horizontal connectedness and information, which further helps enhance financial awareness among the general population in developing countries.

3. Data and methodology

This study uses the 2011–2012 survey (wave II) of the IHDS,[1] which is a unique, nationally representative multi-topic survey of Indian households in 1,503 villages and 971 urban neighborhoods (Desai et al., 2010; Swaminathan et al., 2019). For this study's analysis, we relied on a sample of 37,964 female-headed households. The study does not discuss the analytical dimensions of female-headed households, particularly in poverty studies (see Fuwa, 2000). However, it used the "self-reporting" definition of "female-headed" as adopted in the data sources.

3.1 Information networks and financial behavior

Mass media and social networks offer broad outreach and potential persuasive tools for communicating messages and influencing behaviors. There is wide evidence of how persuasive communication can motivate and influence economic decisions (Della Vigna and Gentzkow, 2010). The studies link the effectiveness of persuasion through mass media to improved social outcomes (Jensen and Oster, 2009; La Ferrara et al., 2008) and productive financial outcomes (Berg and Zia, 2017). Besides, social networks influence economic outcomes (Fukuyama, 1995) and help individuals improve their access to financial services (Kumar et al., 2019). We argued that information networks benefit female-headed households by delivering educational messages, and the experience of social interactions helps boost self-confidence. Thus, we hypothesized that information networks (e.g., *social networks* and *media and digital networks*) help remove informational barriers and facilitate female-headed households to increase their

[1] Some recent papers using this dataset include Thorat et al. (2017) and Economic Survey of India (2017).

financial income.

We tested this hypothesis by studying the impact of information networks, such as *social networks* and *media, and digital networks*, on the financial returns of female-headed households. *Social networks* were proxied by households' attendance to public meetings and their memberships to at least one group: self-help groups, credit/savings group, social/ festival society, and development group/NGO. *Media and digital networks* were proxied by the regular use of a computer, newspaper, and television by the individuals of each household. The dependent variable of financial returns (Y_i) of households was measured using net income from two main sources: financial investments and agricultural activities.[2] Investing in financial securities helps ensure short- and long-term financial security by generating an additional income stream. Moreover, income from farming and agricultural activities play an instrumental role in household's food and economic security as most of the population in developing countries are engaged in agriculture. We calculated the dependent variables as the natural logarithm of net income from financial investments and the natural logarithm of net income from agricultural activities. The following model was estimated:

$$Y_{isd} = a_0 + a_1 social\ network_{isd} + a_2 media\ network_{isd} + a_3 control_{isd} + a_4\gamma_s + a_5\delta_d + e_i \quad (1)$$

We estimated these models using the ordinary least squares (OLS) method with state (γ_s) and district (δ_d) fixed effects, controlling for unobserved heterogeneity at state- and district-levels.[3] The model also included standard errors clustered at the household level as the observations over time might be correlated within households. The vector $control$ included

[2] Income from financial investments includes net income from interest on savings, sale of dividend shares, and any other capital gains, whereas the income from agricultural activities includes net income from agricultural farming.

[3] We also control for village dummies in separate estimations, and the results do not change. These results are available upon request.

different control variables at the household level that may affect the financial returns of households.[4] *Credit* identifies households that use credit issued by formal and semi-formal institutions, such as banks, microfinance, community groups, NGOs, self-help groups, government, and other credit programs. We expect this variable to have a positive sign, as households with increasing access to financial services such as lending and savings are more likely to invest in diversified income sources (Demirgüç-Kunt and Klapper, 2013). *Mobile use* identifies households in which adults use mobile phones. Gross et al. (2012) showed that ownership and use of mobile phones are important factors driving financial services. *Poor* indicates households whose per capita expenditure is below the poverty line, as defined by Tendulkar (2012). We expect this variable to have a negative effect on financial returns as poorer households have more difficulty accessing finance and diversify investments (Claessens, 2006). Similarly, households that have higher asset size are financially well-off; hence, they are more likely to increase their financial investments. We thus included *asset size* as a control variable measured as the log of total household assets; it is expected to impact financial returns positively.

Next, we included a variable to control for *education levels* of each household, categorized into four levels: secondary education or less, higher secondary education, bachelor's education, and above bachelor's education. Households with higher education levels are more likely to use financial services and obtain higher returns from their financial investments (Claessens, 2006). Thus, we expect this variable to have a positive sign. *Muslim* indicates households following the Muslim religion. Evidence shows that Muslims are less likely to borrow formally (Demirgüç-Kunt et al., 2013) and, thus, this is expected to be negatively associated with financial investments. *Age of the head* and *age squared* are included

[4] The correlation matrix of the explanatory variables is presented in Appendix Table A1, showing our variables do not suffer from high correlation.

as financial decisions are expected to first increase with the age of the head and then decline (Allen et al., 2016). *Urban* takes the value of 1 if a household belongs to an urban area from the 2011 census and equals 0 otherwise. The regional disparity must be considered as the use of financial services may vary across regions (Claessens, 2006). *Confidence in banks* indicates the strong confidence of households on the country's banking system to keep money safe. Research has shown that levels of confidence and trust influence financial decisions (Guiso et al., 2004, 2008). Thus, this variable is expected to be positively associated with a household's financial

returns.

3.2 Information networks and financial behavior in urban and rural sectors

Although women in urban areas enjoy some advantages over their rural counterparts, still a range of gender inequalities and injustices persist that constrain women's engagement in the labor market, income-generating activities, and human capital as well as inhibit the development of women's capabilities. Women also play a crucial role in agricultural and rural economies, but their contributions are seldom noticed (Malhan and Rao, 2017). Even though in the technology has the potential to diminish these constraints posed by physical limitations in the "digital age," women's connectivity with others is hampered by a gendered "digital divide" (Chant, 2013). Thus, we argued that the transmission of information and knowledge about new economic and political developments through mass media and social networks can help bridge knowledge gaps among women in both urban and rural sectors.

To study the influence of information networks on the financial behavior of female-headed households in both urban and rural areas, we constructed a regional dummy variable *urban* that takes the value of 1 if a household belongs to an urban area from the 2011 census and equals 0 otherwise (Deng et al., 2020). Equation (1) is then augmented by including interaction terms between *social* and *media networks* and this regional dummy:

$$Y_{isd} = a_0 + a_1 social\ network_{isd} * urban_{isd} + a_2 media\ network_{isd} * urban_{isd} + a_3 social\ network_{isd} + a_4 media\ network_{isd} + a_5 urban_{isd} + a_6 control_{isd} + a_7 \gamma_s + a_8 \delta_d + e_i \quad (2)$$

The interaction terms of *social network*urban* and *media network*urban* capture the impact of social and media networks on the financial returns of female-headed households in the urban sectors compared with rural sectors.

3.3 Mediating role of financial expertise

In this section, we study the mediating role of financial expertise in influencing the financial behavior of female-headed households. Financial expertise factors heavily into most definitions of financial literacy, which requires decision-making skills. However, we cannot assess financial literacy unless we test it, and making successful financial decisions is at the very heart of money management. Financial competence has become more essential as financial markets offer more complex choices and because the responsibility of making informed financial decisions related to savings and investments has shifted from government onto individuals. Individuals engage in many financial transactions that require careful consideration of interest rates and comparison of alternatives, and those who have better financial knowledge can avoid losses and costly decisions.

Lusardi and Tufano (2015) found that debt literacy is related to the financial experiences that people have had as financial experiences can affect financial knowledge. Frijns et al. (2014) also found that people with more financial experiences acquire more financial knowledge through self-education or by becoming more receptive to financial education programs. Mass media and social networks play a crucial role in communicating educational messages, creating awareness, and changing attitudes. However, through these networks, the information must be transformed into knowledge and knowledge into judgment

and action. Thus, we argued that financial expertise helps households recognize the value and better utilize information on financial matters provided by media and social networks to make more informed and profitable financial decisions.

To test this hypothesis, following Frijns et al. (2014) and Lusardi and Tufano (2015), we defined financial experience based on individuals' reported experiences with traditional saving, investing, and payment activities for each household. Although we cannot measure their intensity or frequency, we can identify the transactions and financial products in which individuals of each household have engaged. Next, we constructed a dummy variable for *financial expertise*, which takes the value of 1 if individuals in a household have invested in at least three or more financial products, such as mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society, or post office account in the past five years suffering no large amount of losses and equals 0 otherwise.[5] Thus, financial expertise refers to households having experiences with various financial products and making successful financial decisions by avoiding losses and higher costs. To test the mediating effect of financial expertise in the relationship between information networks and household financial returns, we employed Baron and Kenny's (1986) methodology for testing mediation hypotheses, which is widely used in the recent literature (Levin and Cross, 2004; Lin et al., 2016; Mehmetoglu, 2018). Baron and Kenny's (1986) approach consists of four distinct steps to establish complete mediation, as Mehmetoglu (2018) explained.

Step 1: Regress Y on X to estimate path c, which must be statistically significant, implying an effect to be mediated.

$$Y = B_0 + cX + e \tag{3}$$

[5] We also use an alternative definition of "financial expertise" where the dummy takes the value of 1 if individuals in a household have invested in at least two or more financial products (e.g., mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society, or post office account in the past five years without suffering any large amount of losses) and equals 0 otherwise. The results using this definition are both quantitatively and qualitatively similar to the main results and are reported in Appendix Table A2.

Step 2: Regress M on X to estimate path a, which must be statistically significant, providing evidence of a relationship between the independent and mediator variable.

$$M = B_0 + aX + e \quad (4)$$

Step 3: Regress Y on M (by controlling for X) to estimate path b, which must be statistically significant. X is controlled for as Y, and M may be correlated because X causes both. This estimation provides us with path c′ as well:

$$Y = B_0 + bM + c'X + e \quad (5)$$

Step 4: Path c′ must be zero, a situation indicating that the magnitude of path c′ is reduced to 0 after controlling for the mediator.

If all four abovementioned steps are met, one can claim that M completely mediates the relationship between X and Y.

4. Findings and discussion

4.1 Summary statistics

The summary statistics for all dependent and independent variables are presented in Panels A and B of Table 1, respectively. Columns 1–4 report mean, variance, minimum, and maximum values, respectively, for the whole sample of female-headed households. This is followed by the mean values of households with and without financial expertise (Columns 5 and 6) and households in urban and rural sectors (Columns 8 and 9) with their respective p-values (Columns 7 and 10) associated with t-tests for the means of the corresponding variables.

As shown in Columns 5 and 6, a significant difference exists between the mean values of all variables between households with and without financial expertise at a 1% level. Households with financial expertise are more likely to have higher financial returns, better information networks, higher access to credit, and better financial and education levels than households without financial expertise. Next, we focused on households in urban and rural sectors in Columns 8 and 9. Again, we found significant differences between all variables at

the 1% level. Urban households have higher (lower) financial (agricultural) income, higher media networks, and better financial and education levels than rural households. The following sections provide formal regression tests on the above relationships between information networks and different household decisions.

4.2 Information networks, financial expertise, and financial behavior

This section focuses on the impact of two information networks, namely *social network* and *media network*, on female-headed households' financial returns and the mediating role of financial expertise in facilitating financial decisions. Table 2 reports the estimated results from Equation (1) and the results for the mediation test carried out through four conditions. We report the results for the outcome variables of "net income from financial investments" in Columns 1–3, "net income from agricultural activities" in Columns 4–6, and "financial expertise" in Column 7.

To begin with, we found a positive and significant effect of both *social networks* (coefficient of 0.031) and *media networks* (coefficient of 0.054) on net income from financial investments (Column 1). The economic magnitudes imply that one standard deviation increase in *social networks* (0.50) and *media networks* (0.36) increases the net income from financial investments by 1.6% and 1.9%, respectively. Next, we found a positive and significant effect of *social networks* (coefficient of 0.349) and *media networks* (coefficient of 0.424) on net agricultural income in Column 4. Again, economic magnitudes show one standard deviation increase in *social* and *media networks*, which increases net agricultural income by 17.5% and 15.3% with regard to the two variables, respectively.

Considering the mediating role of financial expertise, we found that all four conditions for the mediation effect are satisfied. First, we found that *social and media networks* each have a positive and significant impact on households' net income from both financial investments and agricultural activities (Columns 1 and 4). Second, we found that *social and media networks*

positively and significantly affect the mediator, that is, financial expertise (Column 7). Third, financial expertise has a positive and significant impact on the net financial returns of households (Columns 2 and 5). Fourth, *social and media networks'* positive and significant effect disappears once we control for the positive and significant effects of financial expertise (Columns 3 and 6). The regression results effectively passed all four tests for mediation; therefore, we can say that the impact of social and media networks on the households' net financial returns is positive because information networks enhance the financial expertise of households.

Concerning the control variables in Equation (1), households with higher access to *credit* and *mobile use* are more likely to increase their financial returns. *Poor* households have lower financial returns. Further, with an increase in *asset size*, households can increase their financial returns. Higher *education* attainment mostly has a positive effect on their financial returns, and *Muslim* households have lower financial returns. Finally, households with *older* heads and higher *confidence in banks* are more likely to increase their financial returns.

Overall, the results show an important role of media and social networks in improving the net financial income of female-headed households. This evidence adds to the findings of Bönte and Filipiak (2012) who determined that social networks and daily use of information sources (e.g., radio, television, newspaper, and internet) influences the investment behavior of households. Further, we find evidence of the mediation effect of financial expertise on households' financial returns, implying that financial expertise helps households utilize the information disseminated through media and social networks to take informed financial decisions.

4.3 Information networks, financial expertise, and behavior in urban and rural sectors

This section analyses the impact of *media* and *social networks* on female-headed household's financial returns and the mediating role of financial expertise in urban and rural

sectors. Table 3 provides the results for Equation (2) and mediation test carried out through four conditions. We report the results for the outcome variables of "net income from financial investments" in Columns 1–3, "net income from agricultural activities" in Columns 4–6, and "financial expertise*urban" in Column 7. The main variables of interest are *social network*urban*, *media network*urban,* and *financial expertise*urban* which capture the impact of information networks and financial expertise on households' financial returns in urban sectors compared with rural sectors.

To begin with, we found a positive and significant effect of the interaction terms *social network*urban* (coefficient of 0.135) and *media network*urban* (coefficient of 0.065) on net income from financial investments in Column 1. The economic magnitudes show that one standard deviation increase in *social* and *media networks* increases net income from financial investments by 6.8% and 2.3%, respectively, among female-headed households in urban sectors versus rural sectors. Next, we found a negative and significant effect of the interaction terms *social network*urban* (coefficient of −0.239) and *media network*urban* (coefficient of −0.984) on net income from agricultural activities in Column 4. The economic magnitudes show that one standard deviation increase in *social* and *media networks* increases the net agricultural income by 11.9% and 35.4%, respectively, among female-headed households in rural versus urban sectors.

Considering the mediating role of financial expertise, we again found that all four conditions for the mediation effect were satisfied. First, we found that the coefficients of the interaction terms *social network*urban* and *media network*urban'* have a significant impact on net income from financial investments and agricultural activities of households (Columns 1 and 4). Second, we found that *social network*urban* and *media network*urban* each has a positive and significant effect on the interaction coefficient of the mediator, *financial expertise*urban* (Column 7). Third, the coefficient of the interaction term *financial*

*expertise*urban* has a positive (negative) and significant impact on the net income from financial investments and agricultural activities (Columns 2 and 5). Fourth, the significant effects of the interaction terms *social network*urban* and *media network*urban* disappear once we control for the significant effect of the interaction term *financial expertise*urban* (Columns 3 and 6). The regression results effectively passed all four tests for mediation; hence, we can say that the significant impacts of *social and media networks* on the net financial returns of the households in urban and rural sectors existed because information networks influence the financial expertise of households in both urban and rural areas.

Overall, we found that the information distribution through *media* and *social networks* is useful in influencing female-headed households' financial behavior in both urban and rural sectors. Specifically, we see that the influence of information networks on financial returns is more vital for female-headed households in urban than rural sectors. Meanwhile, the effect of information networks on agricultural income is stronger for female-headed households in rural than urban sectors. Besides, we found that the mediating effect of financial expertise enhanced this significant relationship between information networks and financial behavior among households in both urban and rural sectors.

4.4 Addressing endogeneity: Instrumental variable method

In this section, we checked the robustness of our results using an alternative estimation technique of instrumental variables, that is, two-stage least squares (2SLS) method. We argued that the positive association of information networks (e.g., mass media and social networks) on financial returns cannot be interpreted as a causal effect of information networks on financial behavior because of endogeneity concerns in the OLS results that may be because of reverse causality or omitted variables. For example, households interested in making financial investments may access more mass media, or their interaction with social networks may increase because they seek more information about different potential investments. Further,

demand for more media and social networks may also be driven by the underlying factors that influence financial behavior, such as high income and education, which are associated with higher financial participation and with a higher demand for information networks (e.g., Internet) (Coneus and Schleife, 2010). To address these endogeneity concerns arising from unobservable factors and reverse causality, we used the 2SLS method.

To solve endogeneity, we required observed instruments strongly correlated with the information networks but uncorrelated with the error term.[6] Because of the lack of appropriate instruments available in the current dataset (wave II of IHDS) used in the study, we merged this dataset with the previous survey (wave I of IHDS) as the panel structure is useful in finding appropriate instruments. The first round of IHDS (wave I) was completed during 2004–2005, whereas the second round of IHDS (wave II) was conducted during 2011–2012 with 83% of wave I households being resurveyed in wave II.[7] The respondents were asked the same questions about the use of mass media and social networks in both waves I and II of the IHDS surveys.[8] Hence, social and media networks were instrumented using their own lagged values from the previous survey (wave I of IHDS). The motivation for using lagged instruments for media and social networks comes from Gadarian (2010) and Manchin and Orazbayev (2018) who also used lagged instruments for media exposure and social networks from previous surveys. Generally, lagged variables (which are often referred to as "internal" instruments) are distributed independently of the error process; they are sufficiently correlated with the included endogenous regressors. Hence, they are frequently used as instruments in the literature (Bose et al., 2019, 2021; Iqbal and Daly, 2014).

[6] We show the first-stage instrumental variable (IV) estimates and their respective diagnostic statistics in Appendix Table A3.
[7] In 2012, 83% of the wave I households were resurveyed: 90% in rural areas and 72% in urban areas.
[8] Note that we do not use the merged dataset from IHDS waves I and II for the main analysis in the study as wave I does not include information about households' financial investments/experiences, which is must to construct the variable of "financial expertise."

We checked the validity and relevance of the instruments for media and social networks by using several diagnostic tests. Firstly, we reported Kleibergen–Paap test, a test of underidentification distributed as chi-square under the null of underidentification. Next, we reported the Anderson–Rubin and Stock–Wright LM statistics that are weak-instrument-robust inference tests, distributed as F-test and chi-square, respectively, under the null that coefficients of the endogenous regressors in the structural equation are jointly equal to 0, and the overidentifying restrictions are valid. Finally, the Hansen J statistic is used as a test of the overidentifying restrictions, distributed as chi-square under the null of instrument validity. The p-values for all these statistics are reported in Table 4.

Table 4 shows the results of 2SLS estimations. In Panel A (Columns 1 and 3), the results validate a positive and significant effect of *media* and *social networks* on the net income from the financial and agricultural activities of female-headed households. Next, in Panel A (Columns 2 and 4), we found that the significant effects of social and media networks disappear once we control for the significant effects of financial expertise on net financial returns of households, confirming the mediating role of financial expertise. In Panel B (Columns 1 and 3), we found a significant coefficient of the interaction term *media network*urban* on net financial income of female-headed households and significant coefficients of the interaction terms *social network*urban* and *media network*urban* on the net agricultural income of female-headed households. Finally, in Panel B (Columns 2 and 4), the interaction terms *social network*urban* and *media network*urban* are barely significant once we control for the significant coefficient of the interaction term *financial expertise*urban*. The remaining control variables maintain their significance and expected signs.

Regarding the instrumental variable (IV) diagnostics, the Kleibergen–Paap statistics reject the null hypothesis that the equation is underidentified. Meanwhile, the Anderson–Rubin and Stock–Wright statistics, which are the weak-instrument-robust inference tests, do not reject the

null hypothesis that the coefficients of the excluded instruments are jointly equal to 0. Finally, the Hansen J statistic of the overidentifying restriction also shows that the instruments are valid. In sum, the results conclude that the findings of this study are robust to an alternative estimation technique.

5. Conclusions

This study moves beyond mere economic determinants of financial behavior and conceptualizes how access to different information networks affects financial decision making. We study the impact of two information transmission channels, namely *social* and *media networks*, on the net financial returns of female-headed households in India. We further explore the mediating role of financial expertise in influencing the relationship between information networks and financial decision making of female-headed households in both urban and rural sectors.

The results show significant effects of information networks on households' net income from financial and agricultural investments in urban and rural sectors, through the mediating role of financial expertise. These results confirm that both information networks are crucial and offer a unique and cost-effective channel of reaching a wider population with educational messages that help improve households' knowledge and skills. The stronger the social capital, the more likely the individuals are to access information, assets, and local incentives to function effectively, improving the condition of participants within the household and society. Further, households with financial expertise successfully utilize the information through media and social networks that help them make informed and profitable financial decisions. In line with the Beijing Platform for Action (1995), Loiseau and Nowacka (2015) highlighted media's potential, particularly social media, in achieving gender equality by combating discrimination, countering gender stereotypes, and raising awareness of women's rights.

Our empirical results have important policy implications, particularly in the current phase

of digital financial inclusion reforms in India and elsewhere. It shows that the more focused use of information networks can improve the financial expertise and financial behavior of female-headed households. Information networks of *media* and *social networks* have the power to capture the attention of the masses, unlike any other medium, and provide policymakers with a useful tool to deliver carefully designed educational messages on social, financial, and health issues. These networks, particularly, can empower women both individually and collectively, which can lead to better awareness and financial well-being. However, these tools' effectiveness also depends on how well the information from these educational messages is transformed into successful financial decisions.

References

Abbaszadeh, M., Alizadeh Aghdam, M. B., Pourhosein, R., Nasrolahi Vosta, L., 2019. Technological Media and Development: A Systematic Mapping Study and Research Agenda, *Information Technology and People* 32(3), pp. 478-515.

Adams, D. M., 2006. Media and Development in the Middle East, *Transformation* 23(3), pp. 170-186.

Allen, F., Demirgüç-Kunt, A., Klapper, L., Soledad, M., Peria, M., 2016. The Foundations of Financial Inclusion: Understanding Ownership and Use of Formal Accounts, *Journal of Financial Intermediation* 27, pp. 1-30.

Arun, S., Annim, S., Arun, T., 2016. Do All Networks 'Work'? The Mediating Role of Social Networks on Consumption Expenditure in India. *Sociology*, 50(3), pp. 522-541.

Arun, S., Arun, T., 2002. ICTs, Gender and Development: Women in Software Production in Kerala, *The Journal of International Development* 14(1), pp. 39-50.

Atkinson, A., Messy, F. A., 2013. Promoting Financial Inclusion through Financial Education: OECD/INFE Evidence, Policies and Practice, *OECD Working Papers on Finance, Insurance and Private Pensions* No. 34.

Banerjee, A., 1992. A Simple Model of Herd Behavior, *Quarterly Journal of Economics* CVII, pp. 797-817.

Baron, R. M., Kenny, D. A., 1986. The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations, *Journal of Personality and Social Psychology* 51, pp.1173-1182.

Basu, B., 2021. Do Institutional Norms Affect Behavioral Preferences: A View from Gender Bias in the Intra-Household Expenditure Allocation in Iran, *Economic Modelling* 97, pp. 118- 134.

Berg, G., Zia, B., 2017. Harnessing Emotional Connections to Improve Financial Decisions:

Evaluating the Impact of Financial Education in Mainstream Media, *Journal of the European Economic Association* 15(5), pp. 1025-1055.

Bo, Z., Jinyan, H., Chenchen, F., 2015. Social Network, Information Acquisition and Households' Entrepreneurial Income: An Empirical Research Based on Perspective of Urban- rural Differences in China, *Economic Review* 02.

Bose, U., Filomeni, S., Mallick, S., 2021. Does Bankruptcy Law Improve the Fate of Distressed Firms? The Role of Credit Channels, *Journal of Corporate Finance* 68, 101836.

Bose, U., MacDonald, R., Tsoukas, S., 2019. Policy Initiatives and Firms' Access to External Finance: Evidence from a Panel of Emerging Asian Economies, *Journal of Corporate Finance* 59, pp. 162-184.

Braunstein S., Welch, C., 2002. Financial Literacy: An Overview of Practice, Research and Policy, *Federal Reserve Bulletin* 11, pp. 445-457.

Broadcast India Survey, 2018. Link: http://barc-research.com/bi-survey-18/

Buvinic, M., Gupta, G. R., 1997. Female-Headed Households and Female-Maintained Families: Are They Worth Targeting to Reduce Poverty in Developing Countries, *Economic Development and Cultural Change* 45(2), pp. 259-280.

Bönte, W., Filipiak, U., 2012. Financial Literacy, Information Flows, and Caste Affiliation: Empirical Evidence from India, *Journal of Banking and Finance* 36, pp. 3399-3414.

Carpena, F., Cole, S. A., Shapiro, J., Zila, B., 2011. Unpacking the Causal Chain of Financial Literacy, *World Bank Policy Research Working Paper* No. 5798.

Cassidy, L., Barnes, G. D., 2012. Understanding Household Connectivity and Resilience in Marginal Rural Communities through Social Network Analysis in the Village of Habu, Botswana. *Ecology and Society* 17(4), pp. 11.

Chant, S., 1997. Women-Headed Households: Poorest of the Poor? Perspectives from Mexico, Costa Rica and the Philippines, *IDS Bulletin* 28(3), pp. 26-48.

Chant, S., 2013. Cities Through a “Gender Lens”: A Golden “Urban Age” for Women in the Global South?, *Environment and Urbanization* 25(1), pp. 9-29.

Chong A., Ferrara, E. L., 2008. Television and Divorce: Evidence from Brazilian Novelas, *Journal of European Economic Association* 7 (2–3), pp. 458-468.

Claessens, S., 2006. Access to Financial Services: A Review of the Issues and Public Policy Objectives, *The World Bank Research Observer* 21, pp. 207-240.

Cole, S., Sampson, T., Zia, B., 2011. Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets?, *Journal of Finance* 66(6), pp. 1933-1967.

Coleman, J. S., 1990. *Foundations of Social Theory*, Belknap Press of Harvard University Press, Cambridge, MA.

Coneus, K., Schleife, K., 2010. Online but Still Divided–Inequality in Private Internet Use in Germany, *ZEW Discussion Paper* No. 10-042.

DellaVigna, S., Gentzkow, M., 2010. Persuasion: Empirical Evidence, *Annual Review of Economics* 2, pp. 643-669.

Demirgüç-Kunt, A., Klapper, L., Randall, D., 2013. Islamic finance and Financial Inclusion: Measuring Use of and Demand for Formal Financial Services among Muslim Adults, *World Bank Policy Research Working Paper* No 6642.

Deng, T., Wang, D., Hu, Y., Liu, S., 2020. Did High-Speed Railway Cause Urban Space Expansion? Empirical Evidence from China's Prefecture-Level Cities, *Research in Transportation Economics* 80, pp. 100840.

Desai, S. B., Dubey, A., Joshi, B. L., Sen, M., Shariff, A., Vanneman, R., 2010. *Human Development in India: Challenges for a Society in Transition*. New Delhi: Oxford University Press.

Doss, C., 2013. Intrahousehold Bargaining and Resource Allocation in Developing Countries, *The World Bank Research Observer* 28(1), pp. 52-78.

Duflo, E. 2012. Women Empowerment and Economic Development, *Journal of Economic Literature* 50(4), pp. 1051-1079.

Duflo, E., Saez, E., 2003. The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment, *Quarterly Journal of Economics* 118(3), pp. 815-842

Economic Survey, 2017. Government of India, Ministry of Finance, Department of Economic Affairs.

Flatø, M., Muttarak, R., Pelser, A., 2017. Women, Weather, and Woes: The Triangular Dynamics of Female-Headed Households, Economic Vulnerability, and Climate Variability in South Africa, *World Development* 90, pp. 41-62.

Frijns, B., Gilbert, A., Tourani-Rad, A., 2014. Learning by Doing: The Role of Financial Experience in Financial Literacy, *Journal of Public Policy* 34(1), pp. 123-154.

Fukuyama, F., 1995. *Trust*, New York: Free Press

Fuwa, N., 2000. A Note on the Analysis of Female Headed Households in Developing Countries. *Technical Bulletin. Faculty of Horticulture, Chiba University* 54, pp. 125-138.

Gadarian, S. K., 2010. The Politics of Threat: How Terrorism News Shapes Foreign Policy Attitudes, *The Journal of Politics* 72(2), pp. 469-483.

Garcia, M. J. R., 2011. Financial Education and Behavioral Finance: New Insights into the Role of Information in Financial Decisions, *Journal of Economic Surveys*, pp. 1-24.

Ghosh, S., Vinod, D., 2017. What Constrains Financial Inclusion for Women? Evidence from Indian Micro data, *World Development* 92, pp. 60-81.

Giz, 2013. Investor Awareness, Education and Protection in India: Situation Analysis & Assessment, GIZ GmbH Report.

Gross, M. B., Hogarth, J. M., Schmeiser, M. D., 2012. Use of Financial Services by the

Unbanked and Underbanked and the Potential for Mobile Financial Services Adoption, *Federal Reserve Bulletin.*

Guiso, L., Sapienza, P. Zingales, L., 2004. The Role of Social Capital in Financial Development, *American Economic Review* 94, pp. 526-556.

Guiso, L., Sapienza, P. Zingales, L., 2008. Trusting the Stock Market, *The Journal of Finance* 63, pp. 2557-2600.

Halford, S., Savage, M., 2010. Reconceptualizing Digital Social Inequality, *Information, Communication & Society* 13(7), pp. 937-955.

Henchoz, C., 2016. *Sociological Perspective on Financial Literacy: A Critical Examination of Three Assumptions Underlying Financial Literacy Programmes*, In: Aprea C. et al. (eds) International Handbook of Financial Literacy, Springer.

Honohan, P., 2008. Cross-country Variation in Household Access to Financial Services, *Journal of Banking and Finance* 32(11), pp. 2493-2500.

Iqbal, N., Daly, V., 2014. Rent Seeking Opportunities and Economic Growth in Transitional Economies, *Economic Modelling* 37, pp. 16-22.

Jensen, R., Oster, E., 2009. The Power of TV: Cable Television and Women's Status in India, *Quarterly Journal of Economics* 124, pp. 1057-1094.

Kramer, R. M., Brewer, M. B., Hanna, B. A., 1996. Collective Trust and Collective Action: The Decision to Trust as a Social Decision, in Kramer R. M. and Tyler T. R. (eds), *Trust in Organizations: Frontiers of Theory and Research*: 357389, Sage, Thousand Oaks, CA.

Kuada, J., 2009. Gender, Social Networks, and Entrepreneurship in Ghana, *Journal of African Business* 10(1), pp. 85-103.

Kumar, N., Raghunathan, K., Arrieta, A., Jilani, A., Chakrabarti, S., Menon, P., Quisumbing, A. R., 2019. Social Networks, Mobility, and Political Participation: The Potential for

Women's Self-Help Groups to Improve Access and Use of Public Entitlement Schemes in India, *World Development* 114, pp. 28-41.

La Ferrara, E., Chong, A., Duryea, S., 2008. Soap Operas and Fertility: Evidence from Brazil, *Inter-American Development Bank Working Paper* 633.

Levin, D. Z., Cross, R., 2004. The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer, *Management Science* 50(11), pp.1477-1490.

Lin, H., Zeng, S., Liu, H., Li, C., 2016. How do Intermediaries Drive Corporate Innovation? A Moderated Mediating Examination, *Journal of Business Research* 69, pp. 4831-4836.

Loiseau, E., Nowacka, K., 2015. Can Social Media Effectively Include Women's Voices in Decision-Making Processes, *OECD Development Centre*.

Lührmann, M., Serra-Garcia, M., Winter, J., 2018, The Impact of Financial Education on Adolescents' Intertemporal Choices, *American Economic Journal: Economic Policy* 10(3), pp. 309-332.

Lusardi, A., and Tufano, P., 2015. Debt Literacy, Financial Experiences, and Overindebtedness, *Journal of Pension Economics and Finance* 14(4), pp. 332-368.

Lusardi, A., Mitchell, O. S., Curto, V., 2010. Financial Literacy Among the Young, *Journal of Consumer Affairs* 44(2), pp. 358-380.

Malhan, I. V., Rao, S., 2017. Knowledge Intensive Agriculture for Attaining Sustainable Development Goals: Role of Indian Women, *International Federation of Library Associations* IFLA WLIC 2017.

Manchin, M., Orazbayev, S., 2018. Social Networks and the Intention to Migrate, *World Development* 109, pp. 360-374.

Mandell, L., 2008. *The Financial Literacy of Young American Adults: Results of the 2008 National Jump$tart Coalition Survey of High School Seniors and College Students*. Seattle, WA: University of Washington and the Aspen Institute.

Mehmetoglu, M., 2018. medsem: A Stata Package For Statistical Mediation Analysis, *International Journal of Computational Economics and Econometrics* 8(1), pp. 63-78.

Morrison, A., Raju, D., Sinha, N., 2007. Gender Equality, Poverty and Economic Growth, *World Bank Policy Research Working Paper* No. WPS4349.

Paola, M. D., Scoppa, V., 2014. Media exposure and Individual Choices: Evidence from Lottery Players, *Economic Modelling* 38, pp. 385-391.

Quetulio-Navarra, M., Znidarsic, A., Niehof, A., 2017. Gender Perspective on the Social Networks of Household Heads and Community Leaders after Involuntary Resettlement, *Gender, Place and Culture* 24(2), pp. 225-246.

Rajeev, M., Bhattacharjee, M., 2015. Access to Financial Services: Are Poor Excluded: A Case Study of India. Norwegian Institute of International Relations, *NUPI Working paper* 808, Norway.

Rajeev, M., Vani, B. P., Bhattacharjee, M., 2011. Credibility of Equal Access To Credit: Does Gender Matter?, *Economics and Political Weekly* XLVI(33), pp. 76-79.

Rocco, L., Suhrcke, M., 2012. Is Social Capital Good for Health? A European Perspective, Copenhagen, *WHO Regional Office for Europe*.

Rogan, M., 2013. Alternative Definitions of Headship and the Feminisation of Income Poverty in Post-Apartheid South Africa**,** *Journal of Development Studies* 49, pp. 1344-1357.

Sen, A., 2001. Many Faces of Gender Inequality, *Frontline* 18(22). Standard and Poor (S&P) Global Financial Literacy Survey, 2015.

Stotsky, J. G., 2006. Gender and its Relevance to Macroeconomic Policy: A Survey, *IMF Working Paper* No. WP/06/233.

Stromberg, D., 2004. Radio's Impact on Public Spending, *Quarterly Journal of Economics* 119(1), pp. 189-221.

Swain, R. B., Wallentin, F. Y., 2009. Does Microfinance Empower Women? Evidence from

Self Help Groups in India, *International Review of Applied Economics* 23(5), pp. 541-556.

Swaminathan, H., Sharma, A., Shah, N. G., 2019. Does the relationship between income and child health differ across income groups? Evidence from India, *Economic Modelling* 79, pp. 57-73.

Tendulkar, 2012. Press Note on Poverty Estimates 2009-10. Government of India, Planning Commission, Government of India: New Delhi.

Thorat, A., Vanneman, R., Desai, S., Dubey, A., 2017. Escaping and Falling into Poverty in India Today, *World Development* 93, pp. 413-426.

Von Krogh, G., 1998. Care in Knowledge Creation, *California Management Review* 40(3), pp. 133-53.

Wei, R., 2009. The State of New Media Technology Research in China: A Review and Critique, *Asian Journal of Communication* 19(1), pp. 116-127

Weiner, R., Baron-Donovan, C., Gross, K., Block-Leib, S., 2005. Debtor Education, Financial Literacy and Pending Bankruptcy Education, *Behavioural Sciences and Law* 23, pp. 347- 366.

Yang, C. C., Holdena, S. M. and Carter, M. D. K., 2017. Emerging Adults' Social Media Self-Presentation and Identity Development at College Transition: Mindfulness as a Moderator, *Journal of Applied Developmental Psychology* 52(1), pp. 212-221.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Whole sample			**Financial expertise**	**No financial expertise**		**Urban sectors**	**Rural sectors**	
Panel A: Dependent variables	*Mean*	*Variance*	*Min. value*	*Max. value*	*Mean*	*Mean*	*p-value*	*Mean*	*Mean*	*p-value*
Net income from financial investments (log)	0.13	1.04	0	13.22	0.30	0.11	0.000	0.21	0.09	0.000
Net income from agricultural activities (log)	4.83	25.13	0	16.21	4.85	4.61	0.012	1.16	6.71	0.000
Panel B: Independent variables	*Mean*	*Variance*	*Min. value*	*Max. value*	*Mean*	*Mean*	*p-value*	*Mean*	*Mean*	*p-value*
Social networks	0.47	0.25	0	1	0.66	0.45	0.000	0.35	0.53	0.000
Media networks	0.84	0.13	0	1	0.97	0.83	0.000	0.96	0.79	0.000
Financial expertise	0.09	0.08	0	1	-	-	-	0.13	0.07	0.000
Credit	0.29	0.21	0	1	0.42	0.28	0.000	0.31	0.25	0.000
Mobile use	0.80	0.16	0	1	0.95	0.78	0.000	0.90	0.75	0.000
Poor	0.17	0.14	0	1	0.04	0.18	0.000	0.11	0.20	0.000
Asset size	2.60	0.30	0	3.50	2.98	2.56	0.000	2.93	2.45	0.000
Secondary	0.50	0.25	0	1	0.37	0.51	0.000	0.43	0.53	0.000
Higher sec.	0.10	0.09	0	1	0.15	0.10	0.000	0.12	0.09	0.000
Bachelor	0.10	0.09	0	1	0.22	0.09	0.000	0.18	0.06	0.000
Above bachelor	0.07	0.06	0	1	0.15	0.06	0.000	0.13	0.04	0.000
Muslim	0.12	0.10	0	1	0.08	0.12	0.003	0.16	0.10	0.000
Age	44.72	171.12	17	99	46.81	44.52	0.000	45.21	44.49	0.000
Squared age	2171.17	1554619	289	9801	2335.78	2155.14	0.000	2200.5	2157.5	0.002
Urban sector	0.32	0.22	0	1	0.46	0.30	0.000	-	-	-
Conf. on banks	0.90	0.09	0	1	0.90	0.90	0.636	0.89	0.91	0.000
Number of observations		37,964			3,317	34,647		12,078	25,886	

Notes: The table presents mean, variance, minimum, and maximum values in Columns 1–4,respectively, for the whole sample of female-headed households. In Columns 5 and 6, we report means for households with and without financial expertise, respectively. In Columns 8 and 9, we report means for urban and rural households, respectively. "Financial expertise" is a dummy, which takes the value of 1 if individuals in a household have invested in at least three or more financial products, such as mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society, or post office account in the past five years without suffering any large amount of losses and equals 0 otherwise. "Urban" is a dummy that takes the value 1 if a household belongs to an urban area from the 2011 census and equals 0 otherwise.

Table 1: Summary statistics for all variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variables:	Net income from financial investments			Net income from agricultural activities			Financial expertise
Financial expertise	-	0.081***	0.075***	-	0.158**	0.162**	-
		(2.84)	(2.63)		(2.03)	(2.04)	
Social networks	0.031**	-	0.024*	0.349***	-	0.062	0.042***
	(2.52)		(1.94)	(7.02)		(1.27)	(13.44)
Media networks	0.054***	-	0.022	0.424***	-	0.067	0.019***
	(5.23)		(1.27)	(6.72)		(0.87)	(6.20)
Credit	0.022*	0.021*	0.025*	1.220***	1.271***	1.020***	0.021***
	(1.75)	(1.66)	(1.95)	(23.87)	(25.11)	(19.48)	(5.88)
Mobile use	0.015	0.013	0.012	0.684***	0.686***	0.917***	-0.004
	(1.44)	(1.22)	(1.19)	(9.89)	(9.89)	(12.98)	(-1.26)
Poor	-0.053***	-0.050***	-0.051***	-0.386***	-0.337***	-0.390***	-0.021***
	(-5.56)	(-5.21)	(-5.35)	(-6.06)	(-5.28)	(-5.95)	(-8.31)
Asset size	0.124***	0.101***	0.100***	0.601***	0.494***	0.251***	0.077***
	(9.65)	(8.48)	(8.46)	(9.19)	(7.57)	(3.72)	(22.40)
Secondary	0.028***	0.030***	0.032***	0.257***	0.303***	0.252***	-0.014***
	(2.63)	(2.85)	(3.07)	(4.37)	(5.15)	(4.14)	(-4.80)
High sec.	0.004	-0.002	0.001	0.468***	0.471***	0.482***	0.014**
	(0.18)	(-0.08)	(0.03)	(5.42)	(5.43)	(5.41)	(2.37)
Bachelor	0.126***	0.118***	0.127***	0.189**	0.079	0.045	0.058***
	(4.61)	(4.33)	(4.50)	(2.09)	(0.89)	(0.50)	(8.32)
Above bachelor	0.118***	0.109***	0.120***	0.155	0.042	0.134	0.074***
	(3.63)	(3.37)	(3.58)	(1.49)	(0.42)	(1.30)	(8.55)
Muslim	-0.039***	-0.036***	-0.045***	-0.705***	-0.699***	-0.516***	-0.021***
	(-2.94)	(-2.74)	(-3.44)	(-9.94)	(-9.91)	(-7.32)	(-5.06)
Age	-0.002	-0.002	-0.002	0.235***	0.235***	0.230***	0.001
	(-0.96)	(-0.89)	(-0.82)	(22.96)	(22.95)	(21.79)	(1.06)
Squared age	0.001	0.001	0.001	-0.002***	-0.002***	-0.002***	-0.001
	(1.10)	(1.06)	(0.99)	(-19.42)	(-19.45)	(-18.29)	(-0.65)
Urban sector	0.043***	0.036***	0.036***	-5.368***	-5.485***	-5.767***	0.006
	(3.03)	(2.65)	(2.70)	(-96.03)	(-102.84)	(-109.78)	(1.51)
Conf. on banks	0.074***	0.074***	0.073***	0.298***	0.288***	0.671***	-0.001
	(3.40)	(3.38)	(3.34)	(3.84)	(3.72)	(8.69)	(-0.17)
Observations	37,923	37,923	37,923	33,668	33,668	33,668	37,934
R-squared	0.089	0.089	0.087	0.387	0.378	0.340	0.118
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the regression results from the OLS method with state and district fixed effects. The dependent variables are net income from financial investments (log) and net income from agricultural activities (log). *Social networks* are proxied by households' attendance to public meetings and their memberships to at least one group, such as self-help groups, credit/savings group, social/ festival society, and development group/NGO. *Media and digital networks* are proxied by the regular use of computer, newspaper, or television by the individuals of each household. *Financial expertise* is a dummy that takes the value of 1 if individuals in a household have invested in at least three or more financial products, such as mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society, or post office account in the past five years without suffering any large amount of losses and equals 0 otherwise. The p-values refer to the test of equality between households with and without financial expertise. Robust t-statistics are reported in the parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 2: Information networks, financial expertise, and financial returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variables:	Net income from financial investments			Net income from agricultural activities			Financial expertise*Urban
Financial expertise*Urban	-	0.150***	0.145**	-	-0.597***	-0.594***	-
		(2.62)	(2.50)		(-4.03)	(-3.91)	
Social networks *Urban	0.135***	-	0.018	-0.239***	-	-0.050	0.064***
	(4.70)		(1.59)	(-3.79)		(-0.57)	(20.29)
Media networks*Urban	0.065***	-	0.030	-0.984***	-	-0.068	0.068***
	(4.66)		(1.32)	(-5.85)		(-0.85)	(20.07)
Financial expertise	-	0.164***	0.158***	-	0.184*	0.101	-
		(3.26)	(3.13)		(1.86)	(1.05)	
Social networks	0.126***	-	0.119***	0.318***	-	0.037	0.014***
	(4.52)		(4.54)	(3.40)		(0.56)	(8.53)
Media networks	0.012	-	0.011	0.859***	-	0.549***	0.064***
	(0.92)		(0.50)	(5.39)		(8.49)	(21.63)
Credit	0.024*	0.020	0.027**	1.233***	1.255***	1.020***	0.014***
	(1.85)	(1.62)	(2.20)	(24.28)	(24.77)	(19.51)	(5.15)
Mobile use	0.014	0.013	0.017	0.692***	0.691***	0.900***	-0.001
	(1.38)	(1.24)	(1.64)	(9.97)	(9.99)	(12.76)	(-0.05)
Poor	-0.051***	-0.050***	-0.049***	-0.372***	-0.365***	-0.403***	-0.014***
	(-5.39)	(-5.21)	(-5.16)	(-5.84)	(-5.73)	(-6.17)	(-6.48)
Asset size	0.127***	0.104***	0.070***	0.523***	0.537***	0.320***	0.059***
	(9.70)	(8.69)	(6.56)	(7.57)	(8.21)	(4.71)	(19.68)
Secondary	0.027**	0.029***	-0.014	0.289***	0.301***	0.204***	0.001
	(2.52)	(2.74)	(-1.33)	(4.92)	(5.14)	(3.34)	(0.41)
High sec.	0.005	0.001	0.012	0.439***	0.456***	0.489***	0.015***
	(0.25)	(0.05)	(0.59)	(5.07)	(5.27)	(5.49)	(3.44)
Bachelor	0.127***	0.117***	0.144***	0.068	0.064	0.176*	0.027***
	(4.66)	(4.28)	(5.20)	(0.77)	(0.73)	(1.91)	(5.83)
Above bachelor	0.118***	0.108***	0.129***	-0.016	-0.027	0.351***	0.037***
	(3.66)	(3.34)	(3.96)	(-0.16)	(-0.27)	(3.31)	(6.40)
Muslim	-0.038***	-0.035***	-0.030**	-0.698***	-0.701***	-0.554***	-0.004
	(-2.84)	(-2.65)	(-2.44)	(-9.83)	(-9.88)	(-7.89)	(-1.53)
Age	-0.002	-0.002	-0.002	0.233***	0.233***	0.236***	0.001**
	(-0.91)	(-0.84)	(-0.94)	(22.80)	(22.82)	(22.33)	(2.42)
Squared age	0.001	0.001	0.001	-0.002***	-0.002***	-0.002***	-0.001**
	(1.07)	(1.01)	(0.99)	(-19.26)	(-19.31)	(-18.84)	(-2.01)
Urban sector	0.077***	0.020	-0.001	-4.415***	-5.416***	-5.570***	0.011***
	(4.00)	(1.45)	(-0.04)	(-26.66)	(-96.22)	(-57.28)	(3.76)
Conf. on banks	0.072***	0.073***	0.079***	0.278***	0.293***	0.643***	0.004
	(3.30)	(3.35)	(3.82)	(3.58)	(3.78)	(8.33)	(1.09)
Observations	37,923	37,923	37,923	33,668	33,668	33,668	37,934
R-squared	0.090	0.089	0.070	0.386	0.385	0.343	0.107
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the regression results from the OLS method with state and district fixed effects. The dependent variables are net income from financial investments (log) and net income from agricultural activities (log). *Social networks* are proxied by households' attendance to public meetings and their memberships to at least one group, such as self-help groups, credit/savings group, social/ festival society, and development group/NGO. *Media and digital networks* are proxied by the regular use of computer, newspaper, or television by the individuals of each household. *Urban* is a dummy that takes the value 1 if a household belongs to an urban area from the 2011 census and equals 0 otherwise. *Financial expertise* is a dummy that takes the value of 1 if individuals in a household have invested in at least three or more financial products, such as mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society, or post office account in the past five years without suffering any large amount of losses and equals 0 otherwise. The p-values refer to the test of equality between households with and without financial expertise. Robust t-statistics are reported in the parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3: Information networks, financial expertise, and returns in urban and rural sectors.

Dependent variables:	(1) Net income from financial investments	(2) Net income from financial investments	(3) Net income from agricultural activities	(4) Net income from agricultural activities
Panel A:				
Financial expertise	-	0.091**	-	0.341***
		(2.51)		(25.57)
Social networks	0.319**	0.038	0.303***	0.020
	(2.28)	(0.72)	(4.58)	(0.32)
Media networks	0.339**	0.121	0.172**	0.089
	(2.08)	(0.39)	(2.09)	(01.05)
Observations	37,923	37,806	33,616	33,616
Kleibergen-Paap	0.000	0.000	0.000	0.000
Anderson-Rubin	0.000	0.000	0.000	0.000
Stock-Wright	0.000	0.000	0.000	0.000
Hansen J	0.190	0.149	0.603	0.432
Panel B:				
Financial expertise*Urban	-	0.313**	-	-0.534***
		(2.32)		(-3.50)
Social networks*Urban	0.110	0.653	-0.516**	-0.115
	(0.13)	(0.94)	(-2.12)	(-1.27)
Media networks *Urban	1.960**	0.162*	-0.498**	-0.115
	(2.10)	(1.79)	(-2.02)	(-1.17)
Financial expertise	-	0.264***	-	0.230***
		(3.11)		(3.81)
Social networks	0.125**	0.120***	0.466***	0.020
	(2.16)	(6.16)	(2.82)	(0.30)
Media networks	0.083**	0.092	0.741***	0.420***
	(2.32)	(1.36)	(7.11)	(4.71)
Observations	37,879	37,873	33,623	33,616
Kleibergen-Paap	0.003	0.000	0.005	0.000
Anderson-Rubin	0.000	0.000	0.000	0.000
Stock-Wright	0.000	0.000	0.000	0.000
Hansen J	0.435	0.721	0.140	0.627
Controls	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes

Notes: The table reports the two-staged least squares (2SLS) estimations with state and district fixed effects. The dependent variables are net income from financial investments (log) and net income from agricultural activities (log). *Social networks* are proxied by households' attendance to public meetings and their memberships to at least one group, such as self-help groups, credit/savings group, social/ festival society, and development group/NGO. *Media and digital networks* are proxied by the regular use of computer, newspaper, or television by the individuals of each household. *Urban* is a dummy that takes the value 1 if a household belongs to an urban area from the 2011 census and equals 0 otherwise. *Financial expertise* is a dummy that takes the value of 1 if individuals in a household have invested in at least three or more financial products, such as mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society, or post office account in the past five years without suffering any large amount of losses and equals 0 otherwise. The p-values refer to the test of equality between households with and without financial expertise. Robust t-statistics are reported in the parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The *Kleibergen–Paap* is a test of underidentification, distributed as chi-square under the null of underidentification. The *Anderson–Rubin* and *Stock–Wright LM statistic* are weak-instrument-robust inference tests, distributed as F-test and chi-square respectively, under the null that coefficients of the endogenous regressors in the structural equation are jointly equal to zero, and the overidentifying restrictions are valid. *Hansen J statistic* is a test of the overidentifying restrictions, distributed as chi-square under the null of instrument validity. The remaining specifications, which are not reported for brevity, are identical to those in Tables 2−3.

Table 4: Robustness: Instrumental variable (2SLS) regressions.

Appendix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.00															
2	0.08	1.00														
3	0.08	0.05	1.00													
4	0.23	0.12	0.09	1.00												
5	0.05	0.36	0.12	0.13	1.00											
6	-0.01	-0.21	-0.11	-0.09	-0.23	1.00										
7	0.03	0.53	0.21	0.14	0.56	-0.36	1.00									
8	0.05	0.03	-0.08	-0.01	0.01	0.06	-0.08	1.00								
9	0.02	0.11	0.05	0.03	0.12	-0.06	0.16	-0.34	1.00							
10	-0.01	0.13	0.12	0.03	0.14	-0.11	0.25	-0.33	-0.11	1.00						
11	-0.02	0.11	0.11	0.05	0.12	-0.10	0.24	-0.26	-0.09	-0.09	1.00					
12	-0.08	-0.05	-0.04	-0.06	0.01	0.01	-0.01	0.02	-0.04	-0.04	-0.03	1.00				
13	-0.03	-0.03	0.05	0.01	-0.05	-0.05	0.09	-0.15	0.02	0.08	0.11	-0.06	1.00			
14	-0.05	-0.05	0.04	-0.01	-0.07	-0.04	0.06	-0.14	0.02	0.07	0.10	-0.05	0.99	1.00		
15	-0.17	0.21	0.10	-0.06	0.18	-0.11	0.41	-0.10	0.04	0.17	0.17	0.10	0.03	0.02	1.00	
16	-0.05	0.01	0.02	0.02	0.02	-0.01	-0.01	0.01	0.01	-0.01	0.02	-0.01	-0.02	-0.01	-0.02	1.00

Notes: 1 = Social networks, 2 = Media networks, 3 = Financial expertise, 4 = Credit, 5 = Mobile phone use, 6 = Poor, 7 = Asset size, 8 = Secondary education, 9 = Higher secondary education, 10 = Bachelor education, 11 = Above bachelor education, 12 = Muslim religion, 13 = Age of head, 14 = Squared age of head, 15 = Urban sector, and 16 = Strong confidence in bank.

Table A1: Correlation matrix for all control variables

Panel A:	(1)	(2)	(3)	(4)	(5)
Dependent variables:	Net income from financial investments		Net income from agricultural activities		Financial expertise
Financial expertise	0.077***	0.074***	0.230***	0.370***	-
	(5.45)	(5.31)	(4.54)	(7.20)	
Social networks	-	0.021*	-	0.034	0.086***
		(1.67)		(0.71)	(17.60)
Media networks	-	0.026	-	0.063	0.048***
		(1.44)		(0.82)	(9.27)
Observations	37,923	37,923	33,668	33,668	37,934
Panel B:	(1)	(2)	(3)	(4)	(5)
Dependent variables:	Net income from financial investments		Net income from agricultural activities		Financial expertise*Urban
Financial expertise*Urban	0.099***	0.106***	-0.970***	-0.951***	-
	(3.35)	(3.49)	(-10.45)	(-10.09)	
Social networks*Urban	-	0.022*	-	-0.019	0.113***
		(1.91)		(-0.21)	(20.05)
Media networks *Urban	-	0.015	-	-0.032	0.183***
		(0.68)		(-0.40)	(25.13)
Observations	37,923	37,923	33,668	33,668	37,934
Controls	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the regression results from the OLS method with state and district fixed effects. The dependent variables are net income from financial investments (log) and net income from agricultural activities (log). *Social networks* are proxied by households' attendance to public meetings and their memberships to at least one group, such as self-help groups, credit/savings group, social/ festival society, and development group/NGO. *Media and digital networks* are proxied by the regular use of computer, newspaper, or television by the individuals of each household. *Urban* is a dummy that takes the value 1 if a household belongs to an urban area from the 2011 census and equals 0 otherwise. *Financial expertise* is a dummy that takes the value of 1 if individuals in a household have invested in at least three or more financial products, such as mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society, or post office account in the past five years without suffering any large amount of losses and equals 0 otherwise. The p-values refer to the test of equality between households with and without financial expertise. Robust t-statistics are reported in the parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A2: Alternative definition of "financial expertise."

Dependent variables:	(1)	(2)	(3)	(4)
	Net income from financial investments		Net income from agricultural activities	
Panel A:				
Social networks				
Lagged social networks	0.109***	0.089***	0.016**	0.010***
	(13.58)	(11.93)	(2.22)	(4.56)
SW F test	0.000	0.000	0.000	0.000
SW chi-square test	0.000	0.000	0.000	0.000
Observations	37,923	37,806	33,616	33,616
Media networks				
Lagged media networks	0.117***	0.039***	0.018***	0.006***
	(20.22)	(8.56)	(3.07)	(10.55)
SW F test	0.000	0.000	0.000	0.000
SW chi-square test	0.000	0.000	0.000	0.000
Observations	37,923	37,806	33,616	33,616
Panel B:				
Social networks*Urban				
Lagged social networks	0.028***	0.042***	0.018**	0.005**
	(3.55)	(5.95)	(2.12)	(2.41)
SW F test	0.000	0.000	0.000	0.000
SW chi-square test	0.000	0.000	0.000	0.000
Observations	37,879	37,873	33,623	33,616
Media networks*Urban				
Lagged media networks	0.028***	0.010*	0.013***	0.007*
	(10.60)	(1.53)	(3.24)	(1.86)
SW F test	0.000	0.000	0.000	0.000
SW chi-square test	0.000	0.000	0.000	0.000
Observations	37,879	37,873	33,623	33,616

Note: The table reports first-stage regressions for the instruments of information networks. *Social networks* and *media networks* are instrumented by their own lagged values. The *Sanderson–Windmeijer (SW)* chi-squared and F statistics are underidentification and weak identification tests, respectively. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Also, see notes to Tables 2−3.

Table A3: First-stage estimations of instrumental variable regressions.

Variables	Definitions
Income from financial investments	Natural logarithm of net income from interest on savings, sale of dividend shares and any other capital gains.
Income from agricultural activities	Natural logarithm of net income from agricultural farming
Social networks	Dummy takes value one if households attend public meetings and have memberships to at least one group such as self-help groups, credit/savings group, social/ festival society, and development group/NGO, and zero otherwise.
Media networks	Dummy takes value one if the individuals of each household regularly use computer, newspaper, and television, and zero otherwise.
Financial expertise	Dummy takes the value of one if individuals in a household have invested in at least three or more financial products such as mutual funds, stocks and bonds, fixed deposits, pension fund and gold, bank savings or current account, credit society or post office account in the past five years without suffering any large amount of losses, and zero otherwise.
Credit	Dummy takes value one if households use credit issued by formal and semi-formal institutions such as banks, micro finance, community group, NGO, self- help group, government and other credit programmes, and zero otherwise.
Mobile use	Dummy takes one if adults in a household use mobile phones, and zero otherwise.
Poor	Dummy takes value one if households' per capita expenditure is below the poverty line as defined by Tendulkar (2012), and zero otherwise.
Asset size	Natural logarithm of total household assets.
Secondary education	Dummy takes value one if individuals in a household have secondary education or less, and zero otherwise.
Higher secondary education	Dummy takes value one if individuals in a household have higher secondary education, and zero otherwise.
Bachelor's education	Dummy takes value one if individuals in a household have bachelor's education, and zero otherwise.
Above bachelor's education	Dummy takes value one if individuals in a household have above bachelor's education, and zero otherwise.
Muslim	Dummy takes value one for households with Muslim religion, and zero otherwise.
Age	The number of years since birth of the household head.
Urban sector	Dummy takes value one if a household belongs to an urban area from census 2011, and zero otherwise.
Confidence on banks	Dummy takes value one if a household have a great deal of confidence on banks to keep money safe, and zero otherwise

Note: The table reports the definition of key variables used in the regression analysis.

Table A4: Definitions of variables.