Original Article

DETERMINANTS OF MODERN WEAVING TECHNOLOGY ADOPTION: A STUDY IN POCHAMPALLY IKKAT HANDLOOM INDUSTRY, TELANGANA, INDIA

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Abstract

The present study animated to investigate the effect of variables on modern weaving technology adoption decisions in the handloom industry. The primary data is collected with a semi-structured schedule and analyzed the factors influencing the target variable (modern technology adoption) by using a Binary logistic regression model. Results show that family labor, annual income, and pucca house played an important positive role, and age has a significant negative role in the adoption decision of both owners and contract weavers' households. Paper urges the government to provide pucca houses and access to credit to weavers to increase the technology adoption rate.

Keywords: Modern weaving technology adoption1; Binary logistic regression2; Jacquard loom3.

INTRODUCTION

Technology adoption is important for an organization or enterprise to continue the cost-effectiveness and quality enhancement of its products, which is essential for its survival and development in a competitive market condition.[1-2] The definition of the Handloom Reservation Act 1985, is "handloom means any loom other than power loom". The Indian handloom industry has a vital role in the Indian economy and is the second-largest employment provider after agriculture i.e. 3,523 thousand. India's share in the world's hand-woven fabric is 95%.[3] The Indian handloom industry is decentralized, dispersed, family-based, labor-intensive, eco-friendly and mainly concentrated in rural areas. Hence, it is important to adopt modern weaving technology in order to achieve quality production, cost-effectiveness, competitiveness, and balanced regional development.

The adoption of new technology in the handloom industry is expected to be an added advantage since the industry is a key employment provider to lower-income strata of many developing countries including India.[4-6]

The adoption of modern handloom technology strengthens the industry to withstand market competition.[5,7-8] The discontinuation of the Multi-Fiber Agreement (MFA) in 2005 by India, China, Bangladesh, Sri Lanka, and others has opened up new chances while presenting new provocations of more competition in international textile industries.[6,9] After one and half a decade since the discontinuation of MFA, it is instructive to prove how the handloom sector has proceeded in changing itself to the new business circumstances.

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A certain point of interest in this condition is the extent to which the handloom industry, which is generally tiny and small-scale, and disadvantaged in accessing finance and the market, have succeeded in overcoming the hurdles and challenges in adopting and deploying new handloom technology.

The adoption of technology and its impact on the development and performance of micro, small and medium enterprises (MSMEs) in India is quite considerable.[10-12] Most of the studies cover the organized and formal sector enterprises and describe how the Indian formal and organized MSMEs commenced the modernization procedure, particularly the adoption of information technology to encounter market competition and challenges through innovation. The adoption of technology by MSMEs in India is determined by the size of the firm, skill intensity, market share, innovative activities, and infrastructure.[8,13-15]

In an effort to progress a technological upliftment in the textile industry, the Government of India implemented the Technology Up-gradation Fund Scheme (TUFS) in 1999. The aim of the scheme is to give financial support to textile businesses for technology up-gradation that will increase their competitiveness in the market by raising productivity and quality while lowering costs and wastage throughout the value chain. The scheme is now changed to the Amended Technology Up-gradation Fund Scheme (ATUFS). With respect to the allowed machines' worth, the government will provide a 10% capital subsidy under this scheme, up to a maximum of ₹200 million.[7] In spite of numerous efforts for the up-gradation of technology, the Indian handloom industry is still backward in technology up-gradation. This is evident from the fact that in 2019-20, out of 2.7 million looms, only 40% of looms were technologically upgraded.[5,16]

On the other hand, lack of financial inclusion, lack of access to government credit, lack of capital, lack of training, lack of awareness, lack of infrastructure, separation from technology hubs, migration to another profession, and associated uncertainty and risk are the main constraints in adoption of technology in Indian MSMEs and hence required implementation of proper policies.[2,7-19] Some of the studies revealed the importance of the availability of government credit and subsidies in the exercise of adoption and spreading of technology.[8,15,20] Some of the factors such as family labor, years of experience, and housing status were not considered in existing studies. There is a need to analyze a comprehensive set of factors across human, infrastructural, access-related, and enterprise domains on the adoption of technology decisions. The current study was instigated by the necessity of analysis of what influences the adoption of technology in rural, informal, and nonfarm sectors in a developing country.

The Pochampally Ikkat handloom industry which is distributed across the erstwhile Nalgonda district plays a vital role in the Telangana handloom industry. More than 40% of the Telangana handloom industry is concentrated in the erstwhile Nalgonda district. [16] Pochampally Ikat design has won Intellectual Property Rights protection or Geographical Indication Certification in 2004 and it is the first traditional Indian craft to receive this status of geographical branding. However, the question arises as to why the adoption of modern weaving technology is low and what kind of factors determine the technology adoption decision in this district.

Modern handloom technologies are used to facilitate the different processes in handloom cloth production like the pre-loom processes and weaving process. The pre-loom processes are winding, warping, tie & dyeing, joining of yarn, etc. Different technologies are available in the pre-loom processes such as Asu Yantram, Yarn winding machines, Zari warping machines, etc. In the weaving process, the available technologies are the Ordinary loom, Pinjara loom, and Jacquard loom. The ordinary loom is the traditional one for weaving the cloth. The pinjara machine is the moderate weaving technology that facilitates zari line designs. The jacquard machine is the modern weaving technology used for intricate designs with zari. Of the respondents, 35% of the handloom workers installed at least one jacquard loom in their work premises.

In the current study, two types of handloom workers who are capable of adopting modern weaving technologies are examined. They are owners and contract weavers. The owners included both sub-master weavers and independent weavers. The sub-master weavers are those who produce cloth by engaging the contract weavers and/or allied workers. Independent weavers are those who involve in all the activities of production including weaving. Contract weavers are those who produce cloth by taking the wage on a piece (warp) rate basis. The analysis is done separately for owners, and contract weavers. The present study analyzes the factors determining the adoption decision of the owners, and contract weavers in the erstwhile Nalgonda District.

Operational framework

Theory and analytical model

The adoption of technology can be explained as a phase of making an option as the best way of action with regard to utilizing the available technology in the production process.[21-22] It can be recognized that a result of the adoption of technology can be perceived only after an individual makes two decisions (a) whether to adopt or not and if yes (b) to what extent. In the present study, the adoption of technology is related to the installation of jacquard machines (modern weaving technology) in handlooms. The jacquard machines are used in facilitating the zari designs through the network drafting in addition to the ikkat designs in the erstwhile Nalgonda district.

The theoretical framework for the determinants of the

adoption of modern technology in the handloom industry is based on the available literature. Personal factors of micro-entrepreneurs such as age, education, experience, family labor, etc. play a vital role in the adoption and deployment of technology.[8,15,23-31]

The access-related variables such as inaccessibility to credit are the main hurdle in the adoption of technology and its deployment in informal sectors.[15,28,21,26,29] The handloom industry is more prone to capital and credit limitations. The high initial investment would likely hinder the adoption of technology. In such circumstances, access to government credit may boost the adoption of technology in the handloom sector.

The infrastructure of household assets and complementary inputs motivate the adoption decision.[27,29] In the handloom industry, a pucca house is an important resource for the weaving operation, since the handloom industry is family-based and labor-based. Various studies found that organizational factors such as firm size impacts the adoption and extent of technology deployment.[19,20,22,32-35]

Existing literature on adoption shows that it is hard to elucidate the individuals' behavior during adoption through a single model. The current study is based on different factors which influence the adoption decision. The factors are classified as human variables, infrastructural variables, access-related variables, and firm variables.

Modern technology adoption includes risk, it is not an easy binary (yes or no) response. The decision of adoption needs to be analyzed in the conceptual framework. Studies frequently explain the methodology of adoption through a logistic regression model.[35,36] Both binary and multinomial logistic models are considerably used to describe the features related to adoption behavior. To explore the factors that determine the adoption decision, some of the researchers used the binary logit model,[8,37] and some other researchers used the multinomial logit model.[4,24,38-39] Hence, most of the studies used the logit models relating to the adoption of technology for analysis.

The utility obtained from the modern handloom weaving technology adoption may differ across individuals (i) at a specific time (t). According to the estimated utility hypothesis, an adopter's decision is influenced by her/his utility maximization attitude. If he/she finds the estimated utility of adoption of modern weaving technology (U1i) is higher than the estimated utility of non-adoption (U0i), then the latent random variable A*i = (U1i - U0i) > 0. The noticeable result of this probability process can be as follows, i.e.,

$$A_i = \begin{cases} 1, if\ U_{1i} > U_{0i}\ (the\ modern\ technology\ is\ adopted) \\ 0, if\ U_{1i} < U_{0i}\ (the\ modern\ technology\ is\ not\ adopted) \end{cases} \quad (1)$$

$$Uti = \beta iFi(Fti, Ati, Inti, Hti) + €ti;\ t = 1 \text{ or } 0;\ \text{and } i = 1,2,3,..,N \quad (2)$$

Where, t, t = 1 if modern weaving technology is adopted, or t = 0 if it is not adopted; Ui is the underlying utility function which lines liking of the ith respondent; Bi is the vector of coefficients, Fti is firm variables; Ati is access-related variables; Inti is infrastructure variables; Hti is human variables, and €ti is the error term.

The factors of technology adoption in the handloom industry are studied with the following binary logistic model in which the predicted variable (modern weaving technology adoption) is bifurcated as adoption or non-adoption. Presuming Pi is the likelihood that the modern weaving technology is adopted, 1-Pi implies the likelihood of non-adopting modern weaving technology. Hence, the logit model for the current analysis is described as:

$$P_i = \left[\frac{P_i}{1-P_i}\right] = MTA_i$$
$$= \beta_1 + \beta_2 Age_i + \beta_3 Edu_i + \beta_4 Exp_i + \beta_5 FL_i + \beta_6 FS_i + \beta_7 OT_i + \beta_8 AI_i + \beta_9 AGC_i + \beta_{10} PH_i + \beta_{11} CM_i + €_i \quad (3)$$

Where, MTAi is1 if modern weaving technology is adopted, and 0 if not adopted; Agei is the age of the ith respondent; Edui is the education of ith respondent; Expi is the working experience of ith respondent; FLi is the family labor involvement in ith respondent's house; FSi is the firm size of the ith respondent in numbers; OTi is the owner type of the ith respondent, 1 for Master weaver, 0 for the independent weaver; AIi is the average annual income from weaving activity of the ith respondent in thousand rupees (INR); AGCi is access to government credit of the ith respondent, 1 for yes, 0 for no; PHi is having a pucca house of the ith respondent, 1 for yes, 0 for no, CMi is having a membership in weavers cooperative societies of the ith respondent, 1 for yes, 0 for no; and €I is an error term.

Table 1 shows the variables used in the analysis of variables that influence the adoption of modern weaving technology by handloom households. Python programming language is used for the analysis of primary data.

Table 1: Variables used in the model and their hypothesized relationship

Variables	Description	Measurement unit	Hypothesis relation
Target variable			
Modern weaving	Adoption of modern	1 for Yes, 0 for	

technology adoption (dummy)	weaving technology by the handloom households	Otherwise	
Human variables			
Age	Age of the household head	Years	-
Education	Education of the household head	Years	+
Experience	Working experience of the household head	Years	+
Family labour	Involvement of family members in handloom work	Numbers	+
Firm variables			
Firm size	Number of looms	Numbers	+
Owner type (dummy)	Sub-master weavers and Independent weavers	1 for Sub-master weaver, 0 for Independent weaver	+
Annual income	Income of handloom household from handloom works	INR (000's)	+
Access-related variables			
Access to government credit (dummy)	Access to government credit	1 for Yes, 0 for No	+
Cooperative membership (dummy)	Membership in weavers' cooperative society	1 for Yes, 0 for No	+
Infrastructure variables			
Pucca house (dummy)	House status is solid and permanent	1 for Yes, 0 for No	+

Sampling strategy and data

The present study approach is quantitative and descriptive. The study is based on both primary and secondary data. The primary data was collected from 1575 handloom households in the erstwhile Nalgonda district in which the Pochampally Ikkat handloom industry is distributed. In the first step, we selected three revenue divisions in which the handloom households concentrated. Then we selected randomly four mandals from the Bhongir division, four mandals from the Nalgonda division, and one mandal from the Suryapet division. From each mandal, we selected randomly two villages from each mandal. After that, we selected randomly 30% of handloom households from each village. Selected mandals are Chandur Mandal, Pochampally Mandal, Ramannapet Mandal, Narayanpur Mandal, Alair Mandal, Mothkur Mandal, Narketpally Mandal, Suryapet Mandal, and Thipparthy Mandal. The data is collected through a semi-structured schedule from randomly selected handloom households from May 2021 to January 2022. In addition, in-depth information was collected through focus group discussions on different aspects of the handloom industry.

Results and Discussions

Descriptive statistics

Table 2: Descriptive statistics of variables used in the analysis of the adoption of modern handloom weaving technology by owners' households

Variables	Overall Mean (n=471)	Adopters mean (n=208)	Non-adopters mean (n=263)
Target variable			
Weaving technology	0.44 (0.50)	-	-
Human variables			
Age	53.18 (9.53)	44.52 (4.44)	52.64 (6.93)
Education	7.79 (3.91)	7.36 (3.92)	7.12 (4.04)

Experience	23.15 (8.91)	20.42 (6.94)	26.34 (8.81)
Family labor	2.25 (0.62)	2.44 (0.73)	2.03 (0.35)
Firm variables			
Firm size	14.60 (10.49)	22.78 (12.07)	8.38 (6.02)
Owner type	0.74 (0.44)	0.90 (30)	0.62 (0.49)
Annual income	1710.76 (1206.06)	2639.22 (1039.30)	958.11 (715.93)
Access-related variable			
Access to government credit	0.15 (0.36)	0.36 (0.48)	0.05 (0.21)
Cooperative membership	0.30 (0.46)	0.18 (0.39)	0.40 (0.49)
Infrastructure variable			
Pucca house	0.39 (0.49)	0.78 (0.42)	0.25 (0.44)

Source: Primary data

Table 3: Descriptive statistics of variables used in the analysis of the adoption of modern handloom weaving technology by contract weavers

Variables	**Mean (n=1104)**	**Adopters mean (n=341)**	**Non-adopters mean (n=763)**
Target variable			
Weaving technology	0.31 (0.46)	-	-
Human variables			
Age	56.05 (9.45)	46.16 (3.49)	56.97 (6.07)
Education	6.06 (3,88)	7.79 (3.76)	5.51 (4.03)
Experience	26.42 (10.09)	20.38 (5.68)	27.03 (9.18)
Family labor	2.02 (0.34)	2.00 (0.24)	1.95 (0.27)
Firm variables			
Annual income	192.74 (76.15)	286.28 (58.35)	150.70 (28.16)
Access to government credit	0.02 (0.13)	0.14 (0.35)	0.03 (0.18)
Access-related variable			
Cooperative membership	0.49 (0.50)	0.28 (0.45)	0.58(0.49)
Infrastructure variable			
Pucca house	0.25 (0.43)	0.39 (0.49)	0.12 (0.32)

Source: Primary data

Tables 2 and 3 illustrate the descriptive statistics of the variables used in the analysis of the determinants of the adoption of modern weaving technology by the owners and the contract weavers respectively in the erstwhile Nalgonda district. The rate of adoption of modern technology by owners and contract weavers is 44% and 31% respectively. The average age of the head of the handloom household is greater than 50. Less than 40 years age group weavers in the owners and contract weavers are 7% and 3% respectively, whereas in the more than 60 years age group, owners are 5%, and contract weavers are 24%. It shows that most of the owners are in the age group of 40 to 60, in the contract weavers are also in the same age group as well as nearly one-fourth of the contract weavers are senior citizens and they are still working.

Empirical results

Tables 4 and 5 exhibits the variables determining the adoption of modern weaving technology by the owners' households and contract weavers' households in the erstwhile Nalgonda district. The outcomes are based on a binary logit model by using 1 for the adoption of

technology, and 0 for the non-adoption of technology as the predicted variable. The tables explore the probability of adopting modern technology by handloom households. By exponential of the estimated coefficient value, we get the odds ratio, which exhibits how much the odds increase/decrease multiplicatively (predicted variable) with one unit change in the predictor variables.

It is observed that the increase in the age of the handloom worker plays a vital role in adopting modern weaving technology. Age has a P-value of 0 (Tables 4 and 5) for both the owners and contract weavers at a 1% level of significance. The estimated coefficients of age indicate a notable negative influence on the adoption of new technology. The chance of choosing a weaving technology decreases by 0.94% or a factor of 0.7241 (Table 3) for every year increase in the age of the owner, and it decreases by a factor of 0.6879 or 0.55% (Table 5) for every year increase in the age of contract weavers. This indicates that, if the age of the handloom worker increases, their elderliness does not initiate them to adopt new technology. They tend to be more cautious regarding the cost of modern technology and fear of return and losses from new technology. Similar outcomes were also found in the studies on the adoption of modern weaving technology in Assam;[8] the adoption of land protection practices in Niger;[40] the adoption of hybrid cocoa in Ghana.[41]

The influence of education on the technology adoption by the owner is not showing a significant influence (Table 4). It indicates that education is not an effective factor in the adoption of technology. The alike outcomes were found among the contract workers in the Assam handloom industry,[8] and in other research.[28-29] In the case of contract weavers, the likelihood of technology adoption increases with the increase in their education. The probability of adoption of new technology by the contract weaver increases by 0.22% or a factor of 1.1626 (Table 5) for every one-year increase in schooling. It specifies that education motivates to learn new things, and techniques and also adopt new technology. Similar outcomes were found among the farmers in Kenya relating to the adoption of improved natural resources management;[30] relating to sustainable agricultural practices in Tanzania;[25] among the industry owners in Assam;[8] and among small retailers.[34]

Table 4: Estimations of Binary logit model for determinants of modern weaving technology adoption by owners

Variable	Coefficient	Odds Ratio	Marginal effect	Std. Error	z-Statistic	Probability	95% Confidence interval	
Age	-0.3229	0.7241	-0.0094	0.055	-5.870	0.000***	-0.431	-0.215
Education	-0.1036	0.9016	-0.0030	0.086	-1.207	0.227	-0.272	0.065
Experience	0.1345	1.1440	0.0039	0.037	3.634	0.001***	0.062	0.207
Family labor	3.0560	21.2428	0.0933	1.521	2.010	0.044**	0.076	6.036
Firm size	0.5296	1.6982	0.0154	0.135	3.936	0.000***	0.266	0.793
Cooperative membership	-8.7407	0.0002	-0.2538	1.954	-4.474	0.000***	-12.570	-4.911
Owner type	4.0179	55.5860	0.1167	1.706	2.355	0.019**	0.673	7.362
Annual income	-0.2589	0.7719	-0.0075	0.790	-0.328	0.743	-1.807	1.289
Access to government credit	2.8149	16.6923	0.0817	0.714	3.943	0.000***	1.416	4.214
Pucca house	0.0020	1.0020	0.0001	0.001	3.602	0.000***	0.001	0.003
Intercept	6.8445			2.976	2.300	0.021**	1.011	12.678
Pseudo R^2	0.8568							
Log – Likelihood	-46.017							
LL – Null	-321.27							
LLR p - value	0.00							
ROC	0.8389							
Number of observations	471							

Note: ***1%, ** 5%, and *10% levels of significance is considered.

Experience has a profound influence on the adoption of modern weaving technology by the owners. However, experience has very little effect on contract weavers. The probability of adoption of technology increases by 0.39% or a factor of 1.1440 (Table 4) for every one-year increase in the experience of the owner. It indicates that the experience motivates them to adopt new technology for getting more benefits. The outcome is in line with the study in Assam

among handloom households.[15]

The influence of family labor contribution is showing a significant positive influence on the chance of adoption of modern technology in handloom households. For an increase in a family member's involvement in the handloom work, the odds of adoption of weaving technology increase by a factor of 21.2428 or 9.33% (Table 4) in the case of owners and by a factor of 26.8536 or 11.44% (Table 5) in case of contract weaver. The handloom industry is mainly family-based and labor-based. It requires skill and hard labor in every process of production. In the past decade, the number of handloom workers decreased by 19% from 4.33 million to 3.52 million.[16,5] Youth are not interested in taking the handloom as a profession due to the involvement of hard labor and low income.[42] If the involvement of youth increases in the handloom, then there is a possibility of an increase in the adoption of technology. The increase in family members' involvement in the handloom work motivates them to adopt modern technology thereby increasing the per capita income. Similar outcomes were found among the farmers in the adoption of system technologies;[28] sustainable agricultural management;[30] Jatropha adoption, and continuation.[23]

Table 5: Estimations of Binary logit model for determinants of f modern handloom weaving technology adoption by contract weavers

Variable	Coefficient	Odds Ratio	Marginal effect	Std. Error	z-Statistic	Probability	95% Confidence interval	
Age	-0.3740	0.6879	-0.0055	0.055	-6.800	0.000***	-0.482	-0.266
Education	0.1506	1.1626	0.0022	0.82	1.838	0.066*	-0.010	0.311
Experience	0.0864	1.0902	0.0030	0.053	1.626	0.104	-0.018	0.191
Family labor	3.2904	26.8536	0.1144	1.048	3.139	0.002***	1.236	5.345
Annual income	1.4756	0.2286	0.0219	0.594	2.485	0.013***	2.639	0.312
Cooperative membership	2.7426	15.5247	0.0407	1.972	1.391	0.164	-1.122	6.608
Access to government credit	2.0387	7.6807	0.0302	0.615	3.315	0.001***	0.833	3.244
Pucca house	0.0860	1.0899	0.0013	0.12	7.321	0.000***	0.063	0.109
Intercept	-3.9050			3.213	-1.215	0.224	-10.202	2.392
Pseudo R2	0.8767							
Log – Likelihood	-56.98							
LL – Null	-684.41							
LLR p - value	0.00							
ROC	0.8436							
Number of observations	1104							

Note: *** 1%, ** 5%, and * 10% levels of significance considered.

The firm size has a significant positive influence on the adoption of weaving technology by the owners. The chance of adoption of technology increases by a factor of 1.6982 or 1.54% (Table 4) for every unit increase in the firm size. It implies that the large owners are willing to take a risk in the adoption of new technology. The homogeneous results were found among handloom households on the adoption of weaving technology,[15] on the technology adoption in Indian garment manufacturing firms,[19] and in other research.[20,30,25]

Owners are classified as sub-master weavers and independent weavers. In the erstwhile Nalgonda district, the sub-master weavers are the large owners, and they are involved in all the production processes with or without engaging the allied workers except the weaving process. They produce the cloth by engaging the contract weavers on a piece-rate basis. The independent weavers are the weavers who are involved in all the production processes including the weaving process. The probability of adoption of new technology by a sub-master weaver is 25.38% (Table 4) less compared to an independent weaver. It indicates that independent weavers are more prone to adopt modern

technology compared to sub-master weavers.

Having a pucca house by the handloom household increases the choice of modern technology by 8.17% by the owner, and 3.02% by the contract weaver compared to not having the pucca house. Pucca house is one of the basic infrastructures for the handloom industry in particular for the installation of the jacquard looms because the moisture in the house makes it difficult to operate the looms. It indicates that the pucca houses motivate the handloom households to adopt modern technology. The connected results were found among the farmers.[25,29,26]

Having membership in the weavers' cooperative society is showing a negative influence on the adoption of new technology on the contract weavers, and is insignificant to the owners. All the existing weavers' cooperative societies are established long years ago, and no new cooperative societies are established. Most of the weavers' cooperative membership holders are elders, and there is no scope for taking membership in old established cooperative societies for the younger. It is revealed that age has a negative influence on the adoption of new technology. Having membership in the weavers' cooperative society is in line with the age.

The results show that access to government credit is showing a significant influence on the adoption of technology by owners, but it is insignificant to the contract weavers. Access to government credit in the erstwhile Nalgonda district is only 15% (Table 2) and 2% (Table 3) for owners and contract weavers respectively. The adoption of technology increases capital expenditure and revenue expenditure. Similar outcomes were found in other research.[28] The results specify that the adoption of technology is related to the latest and augmented trade practices.[19] If access to government credit increases the handloom households, the chance of adoption of technology by them also may be increased.

Profit or income is the main motivator for every business or profession. The results show that annual income has a significant positive influence on the adoption of recent technology by handloom households. For every thousand rupees (INR) per annum increase in the earnings from the handloom-related work, the odds of adoption of current technology increase by a factor of 1.002 or 0.01% (Table 3) in the case of owners, and by a factor of 1.0899 or 0.13% (Table 5) in case of contract weavers. The increase in income or profit increases the preserves and curiosity in learning new technology and risk-taking ability. The alike results were found in other studies.[14,15] The annual income of the handloom households' difference between adopters and non-adopters of the modern weaving technology from the handloom activities in the owners is nearly 1700 thousand INR. The gross margins per loom per annum of the modern weaving technology adopters and non-adopters are 164 thousand INR and 121 thousand INR. It shows that adopters are earning nearly 36% more gross margin per loom per annum compared to non-adopters. The annual income of the adopters and non-adopters in the contract weavers is 320 thousand INR and 156 thousand INR respectively. Modern weaving technology adopters are earning 107% more income per loom compared to non-adopters (Tables 2 and 3).

Conclusion

Productivity gains for businesses are the foundation of economic expansion. Therefore, one of the main challenges for policymakers in eradicating poverty is understanding how and when technological advancement takes place.[43] The main objective of every business or profession is to gain more profits or income. The piece rate of the product which is produced with the use of modern technology is very high compared to traditional technology due to the heavy and innovative design pattern. Income is one of the determinants of modern weaving technology as well as the outcome of modern weaving technology adoption. The results reveal the annual incomes of the adopters in both owners and contract weavers are more compared to non-adopters. The aim of this paper is to know which impulses and barriers drive modern weaving technology adoption, and suggest measures to increase the technology adoption rate which increases the income.

The outcomes show that the rate of adoption of modern weaving technology by both the owners and contract weavers is low. The level of education, family labor, access to government credit, having a pucca house, and annual income are the main motivators in the adoption of modern weaving technology by handloom households. The paper urges the state authority to take initiations to increase the level of education in the weavers' families which is one of the motivators in the adoption decision of the handloom households to enhance the technology adoption rate. Same as, the paper requests the government to facilitate more access to formal credit to handloom households to increase the adoption rate which led to the enhancement of income of the handloom households.

The paper further impulses the government to provide better infrastructure at subsidized rates to increase the technology adoption rate in handloom households. The handloom industry is a family-based industry and it requires hard labor. Family support in handloom activities is important and it motivates the technology adoption decision. At the same time, age has a negative influence on the technology adoption decision of handloom households. But the weavers are migrating to other professions, and the youth is not interested in this profession due to low income and involvement of hard labor.[42] This paper furthermore requests the state authority to take measures to stop the migration of the weavers and encourage the youth to take this profession by providing modern weaving technology i.e. jacquard looms at a subsidized rate, and permit for semi-automation of looms. We leave the exploration of the effect

of modern weaving technology for future research.

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