Decomposition of Gender Income Gap in Rural Informal Micro-enterprises: An Unconditional Quantile Approach in the Handloom Industry

Bhabesh Hazarika
National Institute of Public Finance and Policy, New Delhi

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BHABESH HAZARIKA*

National Institute of Public Finance and Policy, New Delhi

Abstract

There exists a noteworthy gender income gap in the micro-entrepreneurial activities and typically the females earn lower than the males. While such gender income gap in wage employment is well-documented, well-documented, the aspect needs attention in the context of the micro-entrepreneurship, particularly in the informal sector. It is important to analyze how differently the gender difference in endowments affect the income of the male and the female micro-entrepreneurs. The present study, based on primary data, analyses gender income gap and its compositions throughout the income distribution of the handloom micro-entrepreneurs in Assam. On an average, the female micro-entrepreneurs earn 51 percent lesser than their male counterpart. The unconditional quantile decomposition reveals that the gender income gap increases along the income distribution. The differences in the productive characteristics (endowment effects) explain much of the income gap at the median level and beyond than the heterogeneous returns to such characteristics (discriminatory effects). The endowment effects related to education, financial literacy, risk attitude, SHGs membership, and technology adoption are found in favor of the male micro-entrepreneurs. The results suggest that poor management of entrepreneurial activities of the female results in wider gender gap throughout the income distribution. The study urges for policy prescriptions towards dissemination of technological, financial, and managerial know-how to make the females more organized towards addressing the gender income gap.

Keywords: micro-entrepreneurs; handloom; gender; income gap; unconditional quantile regression.

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*Author's affiliation: National Institute of Public Finance and Policy (NIPFP), New Delhi 110067. E-mail: bhabesh.hazarika@nipfp.org.in; hazbhabesh@gmail.com

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I. Introduction

There is a growing concern on the issue of gender differentials in returns to micro-entrepreneurship in recent years (Verrest, 2013). Literature suggests that the income of the female micro-entrepreneurs may be comparable to their male counterpart controlling for nature and types of activities. However, there still exists a noteworthy gender income gap, and typically the female micro-entrepreneurs earn lower than their male counterpart (Hundley, 2001; Leung, 2006; Alvarez et al., 2009; Fairlie and Robb, 2009; Lechmann and Schnabel, 2012). While the gender wage gap in the labor market is well-documented, little is known about the gender income gap in entrepreneurship and its compositions especially in the context of informal micro-enterprises (Lechmann and Schnabel, 2012).

The micro, small, and medium enterprises (MSMEs) in the informal sector play a crucial role in the Indian economy in reducing the regional disparities (MoMSME, 2017). The MSMEs tend to ensure more equitable income distribution by generating employment and income opportunities for the people at the lower end of income distribution. Similarly, efforts in terms of institutional training, technology promotion, and credit access have been made to uplift the entrepreneurial involvement of the females and their performances in the activities such as handloom, leathers, and food-processing. As a result, a sharp increase in the female-owned micro-entrepreneurship has been witnessed from 0.9 million in 2000-01 to 1.8 million in 2006-07 in the informal sector. Among them, 70.8 percent were operated in the rural areas with an employment size of 2.2 million in 2006-07 (MoMSMEs, 2017). Given the competitive market environment, a particular point of interest in this context is to what extent the female micro-entrepreneurs have performed as compared to their male counterpart. There is a need to analyze how differently the constraints such as the size of operation, low technology access, informality, credit, etc., affect the performance of the rural micro-entrepreneurs across gender.

The gender income gap and its policy related issues are often discussed in the context of wage employment (Chzhen and Mumford, 2011; Ahmed et al., 2015; Becolod, 2016). The gender differences in the productive characteristics (endowments) and market discrimination against the females are the two reasons for such gender wage gap. In a transitional economy, while the returns to productive characteristics tend to increase, there often remains a gender gap in the returns if the males and the females differ with respect to such characteristics (Magnani and Zhu, 2012; Chi and Li, 2014). In wage employment, the presence of employer discrimination also appears as another element of the gender wage gap (Deshpande and Sharma, 2016). Even after correction of these differences, there may be a gender income gap due to market discrimination against the females if employers have more autonomy in

payment decisions (Magnani and Zhu, 2012; Chi and Li, 2014). Therefore, if the employers' discrimination is significant, then the micro-entrepreneurial/self-employment activities must be able to reduce the gender gap. Contrary to this expectation, there is evidence for a larger gender income gap in the micro-entrepreneurship/self-employment as compared to wage employment (Leung, 2006; Alvarez et al., 2009; Lechmann and Schnabel, 2012). Such differential returns to micro-entrepreneurship become more puzzling especially when the market discriminations against the females do not play a key role in informal micro-entrepreneurship (Lechmann and Schnabel, 2012; Åstebro and Chen, 2014).

There exist a few studies which estimated and decomposed the gender income gap in the context of micro-enterprises/self-employment (Hundley, 2001; Leung, 2006; Fairlie and Robb, 2009; Lechmann and Schnabel, 2012). The differences in endowments such as human capital, industrial closure, and firm size appears crucial in explaining the gender income gap in self-employment (Hundley, 2001; Lechmann and Schnabel, 2012). Also, the different entrepreneurial motivations may also cause such gender income gap. While the males are more motivated by monetary benefits, the females are more concerned about non-monetary benefits (Koellinger et al., 2013; Åstebro and Chen, 2014; Hazarika & Goswami, 2016). However, the non-monetary benefits such as work-flexibility and career aspirations have no proper explanations towards the gender income gap in entrepreneurial activities (Lechmann and Schnabel, 2012). Though females often face consumer and credit market imperfections, there are no conclusive evidences on the effect of such market imperfections on the gender income gap particularly in the informal sector (Orser et al., 2006). Thus, there is opaqueness in addressing what explains the lower income for females and what remains unexplained even if the gender differences in productive characteristics are controlled in the context of informal micro-enterprises. Understanding of gender income gap assumes added importance as a higher income level of the females addresses not only greater gender inequality issue but also makes significant contributions to the household welfare (Hazarika and Goswami, 2016).

While the gender income gap in wage employment in the Indian labor market has been well-documented (Kijima, 2006; Azam and Sharif, 2011; Khanna, 2012), the literature on the issue in the informal micro-entrepreneurship is infrequent. A few studies show concerns over gender gap in entrepreneurship entry but not in income in the context of registered/formal sector and thus leaving the informal micro-entrepreneurship to infringe (Jodhka, 2010; Iyer et al., 2013; Deshpande and Sharma, 2016). The recent works of Deshpande and Sharma (2016) analyzed the income gap issue across different ethnic groups in India. In order to ensure the welfare effects of informal micro-entrepreneurship, it is important to understand not only the causes of the gender income gap but also the pattern of the gap across the entire income distribution (Matano and Naticchioni, 2016). Similarly, decomposition of the

income gap enables to understand the relative contributions of the characteristics in explaining why the female micro-entrepreneurs earn lesser than their male counterpart.

Considering the above perspectives, the present study attempts to explore and decompose the gender income gap in nonfarm informal micro-enterprises. For operational purposes, the study considers an under-researched context of handloom micro-enterprises in Assam, a state that is geographically and economically peripheral but strategically significant in North East India. Considering a single industry and a single occupation, the study wipes out the effects of industrial and occupational segregation. The industry is unorganized, informal, and rural-based (Bhagavatula et al., 2010; Bortamuly and Goswami, 2012; Bortamuly et al., 2014; Hazarika et al., 2016; Hazarika and Gowami, 2016). A substantial proportion of the females is found to own handloom micro-enterprises (Bortamuly et al., 2013, 2014; Hazarika and Goswami, 2014). Thus, it provides a suitable setting for analyzing the gender income gap within a rural and informal sector.

The study emphasizes on analyzing the effect of gender difference in productive characteristics such as human capital, social capital, and firm characteristics (endowments effects), and differential returns to these characteristics (differential returns effects) on income throughout the distribution. The novelty of the paper lies in (1) analysis of the gender income gap in informal micro-enterprises into endowment and differential returns effects in an under-researched context of the handloom industry; (2) Analysis of gender income gap throughout the income distribution; and (3) integration of the social capital aspects in income gap analysis.

II. BACKGROUND OF THE HANDLOOM INDUSTRY IN ASSAM

India is the second largest textile producer in the world only after China. The share of the sector is about 10.0 percent of India's industrial production and 13.0 percent of the country's export earnings. The handloom industry contributed 11.0 percent of the total textile with an annual growth rate of 5.0 percent in 2015-16 (Ministry of Textile, 2017). However, the industry has experienced a significant fall in terms of the employment as well as the number of looms over the years. The number of handloom weaver has declined from 6.7 million in 1987-88 to 6.6 million in 1995-95, and further to 4.3 million in 2009-10 (NCAER, 2004, 2010). Such decline in the employment in the industry can be attributed to the market risks accrued from the powerloom and mill sector. Despite such decline in the total employment, the growth prospect of the industry is carried forward by the increase in the full-time workers during the last few decades. The proportion of the full-time worker has increased from 25.2 percent in 1995-96 to 42.6 percent in 2009-10 (NCAER 2004, 2010). The scenario is more so in Assam. From a gender perspective, while involvement of males on a full-time basis has declined, there is a drastic increase in employment among females on full-time basis. The number of females on full-time has increased by nearly 20 times

(688,457) in 2009-10 compared to 1995-96 (NCAER, 2004, 2010). However, entrepreneurial orientation in the handloom industry in the state is still unorganized, informal, and at an early stage. The Third Handloom Census of India reveals that only 26.0 percent of the total handloom households in the state have been involved in fully commercialized handloom activities against the national figure of 53.1 percent (NCAER, 2010). Though the females mostly engaged as the unskilled workers in the industry, over the years, they are the stabilization forces in the hour of crises and problems in the industry (Bortamuly et al., 2014). However, the female handloom workers do face some generic as well as gender-specific obstacles towards achieving business success.

The industry provides a suitable setting to study the issues such as the existence of gender income gap and the contributors towards such gap in the context of informal micro-entrepreneurship. Using female as a dummy in the income function for the industry, Bortamuly and Goswami (2012) found that the males earned more than their female counterpart. However, the study considered only the handloom workers. Moreover, it neither estimated nor decomposed the gender income gap.

Given the intensified market competition, the micro-entrepreneurs initiate different measures to produce competitive, cost-effective, and quality products. However, differences in the measures along with existing firm endowments may result in differential returns. For example, the female micro-entrepreneurs in the rural areas are more vulnerable due to limited access to credit, lack of financial know-how, and lower extent of modern technology usage (Hazarika et al., 2016). In other words, lack of organized work practices may leave the females with lower returns to the handloom activities. Apart from these, several other issues such as market access and entrepreneurial orientation may affect males and females differently resulting in different returns across gender. Thus, there is a need to study whether there exists gender income gap in the handloom micro-enterprises, and if it exists, then what is the pattern. It is also important to assess how the gender differences in different characteristics affect the gender income gap among the micro-entrepreneurs throughout the income distribution towards for policy prescriptions in addressing the existing income gap.

III. Methodology

A. Sampling strategy and the sample

The study is based on primary data collected from the handloom micro-entrepreneurs in six districts of Assam namely *Baksa, Dhemaji*, *Kamrup, Kokrajhar, Lakhimpur*, and *Udalguri* during January 2013 to June 2013. The study used a multi-stage sampling technique. Firstly, based on the proportion of the commercial handloom households to the total handloom households, all the 27 districts in the state were

distributed into three strata[1]. The first stratum included the districts with a higher proportion than the state's figure of 10.5 percent. The districts with a proportion close to the state's figure were included in the second stratum, and the districts with a lower proportion than the state's figure were included in the last stratum. Secondly, two districts from each stratum, two blocks from each district, and a minimum of two villages from each block were purposively selected based on the commercial concentration of handloom activities. Lastly, a list of handloom micro-entrepreneurs was prepared for each selected village before collection of the primary data and from the list so prepared, the respondents were randomly selected.

In the present study, a handloom micro-entrepreneur was defined as an individual who owns a micro-enterprise with a maximum of 10 wage employees or 10 operating looms in the survey year[2]. Those new enterprises which were yet to complete one year of operation were not included in the sample. A minimum of 10 percent of the total handloom micro-entrepreneurs in each village was selected resulting in a sample of 328 respondents. The respondents were interviewed face-to-face through a semi-structured interview schedule that lasted for half-an-hour. In the sample, the shares of the female and male were 68.6 percent and 31.4 percent respectively. The average age of the respondents was 34.6 years with an average educational attainment of 7.3 years of schooling.

Table 1 presents the average income of the micro-entrepreneurs across gender with respect to a few sample characteristics. The table reveals that the female micro-entrepreneurs had lower income with respect to each of the characteristics compared to the male micro-entrepreneurs. However, the females in the old-age group are found in a better position than the females in younger and middle-age groups. A female micro-entrepreneur who has credit access, possesses handloom training, adopts modern weaving technologies, and maintains bookkeeping earns considerably higher income than the females who do not possess such characteristics. It may be noted that though the income of the females has increased in absolute term as they become more organized in their activities, they still witness relatively lower returns compared to their male counterpart. The males in *Kamrup* and *Kokrajhar* districts earn more than double of what the females earn. In contrast, while gender gap is minimal in *Lakhimpur* and *Dhemaji* districts but the micro-entrepreneurs earn lower income in absolute term in both the districts which can be attributed less organized activities by the micro-entrepreneurs irrespective of their gender.

[1] Data for the stratification was used from Statistical Handbook of Assam, 2010 (Directorate of Economics and Statistics, 2011).

[2] An enterprise that does not exceed INR 2.5 million in terms of investment in plant and machinery is categorized as a micro-enterprise in Indian formal sector whereas the informal entrepreneurship covers all the enterprises which are not registered and are within the definitions for the formal sector (MoMSME, 2017). As the present study concerns with informal sector and a low capital intensive industry, the operational definition of handloom micro-enterprise is derived based on a few earlier studies (Honig, 1998; Hazarika et al., 2016).

Table 1. Gender income gap in handloom micro-entrepreneurship with respect to a few sample characteristics

Characteristics	Category	Male (103)	Female (225)	F/M	t-value	p-value
Age	Age < 30 years	72,897.22	35,023.89	48.05	5.56	0.001
	Age 30-45 years	71,790.91	41,128.32	57.29	5.06	0.001
	Age > 45 years	66,333.33	43,218.18	65.15	1.62	0.113
Education	Illiterate	53,562.50	33,111.04	61.82	2.33	0.022
	Primary	56,797.62	31,460.00	55.39	5.29	0.001
	High school	61,313.73	36,051.48	58.80	4.59	0.001
	Higher secondary	80,133.33	33,213.24	41.45	5.20	0.001
Availed training	No	70,615.73	36,105.56	51.13	7.19	0.001
	Yes	77,428.57	47,711.11	61.62	3.00	0.004
Bookkeeping exercise	No	41,459.46	32,316.98	77.95	3.06	0.003
	Yes	88,406.06	54,728.03	61.91	4.04	0.001
Weaving machines adopted	No	51,071.70	33,595.40	65.78	4.11	0.001
	Yes	93,240.00	52,812.90	56.64	4.88	0.001
Districts	Kokrajhar	77,676.67	38,236.73	49.23	4.88	0.001
	Udalguri	73,142.86	42,253.23	57.77	3.68	0.001
	Kamrup	100,904.80	43,562.50	43.17	4.22	0.001
	Baksa	89,500.00	56,075.00	62.65	2.03	0.051
	Dhemaji	31,718.75	27,451.32	86.55	1.02	0.313
	Lakhimpur	31,400.00	29,104.17	92.69	0.55	0.587

Notes: Figures in the parentheses represent sample size. F/M refers the ratio of females' income to males' income.

B. Analytical framework

Literature suggests that the derivation of the income variable is always a challenging task especially in the informal sector (Carter, 2011; Verrest, 2013). There is every possibility of under-reporting or over-reporting of the income by the informal micro-entrepreneurs. In order to overcome such problems, the present study considers the net annual income of the handloom micro-entrepreneurs instead of self-reported income. The net annual income for a micro-entrepreneur is derived by subtracting the production cost from the gross annual income (quantity of output multiplied by the price per annum).

The present paper analyzes the gender income gap among the handloom micro-entrepreneurs in two steps. Firstly, the income function for the micro-entrepreneurs is estimated at the mean and selected quantiles of the income distribution. Secondly, the gender income gaps at selected quantiles are estimated and decomposed into endowment effects (difference in the productive characteristics), and differential returns effects (differences in returns to the productive characteristics) following unconditional quantile decomposition method (Fipro et al., 2009).

Econometric Models for Income Function. The income functions are estimated through the ordinary least square (OLS) technique separately for the males (m) and the females (f) in the form of Mincerian equation (Mincer, 1958) and are given as below.

$$Y_{ij} = E\left[Y_{ij} \mid X_{ij}\right] = \beta_j X_{ij} + \delta_{ij}\ ; \qquad i \in 1, 2, 3, \cdots, n \text{ and } j \in m, f \qquad \cdots (1)$$

where '*Y'* denotes the natural logarithm value of annual income, '*X'* is the set of independent variables such as age, education, risk attitude, access to training, use of technology, etc., β is the vector of coefficients, and δ is the error term for group *j*.

Standard linear regression provides a conditional relationship between an independent variable and a dependent variable (e.g., income) at the mean. However, the effect of a variable on income is likely to change across individuals, and the standard OLS estimation ignores such heterogeneity (Koenker and Bassett, 1978; Fipro et al., 2009; Fortin et al., 2011). In order to get a more nuanced understanding of the effects of the variables throughout the income distribution, two alternatives techniques namely conditional quantile regression (Koenker and Bassett, 1978; Melly, 2005) and unconditional quantile regression (Fipro et al., 2009) can be estimated. Compared to the conditional quantiles regression, unconditional quantile regression is mathematically simple and allows estimation of the effect of a particular variable on overall income distribution (Fipro et al., 2009; Fortin et al., 2011). Following the literature (Firpo et al., 2009; Lechmann and Schnabel, 2012; Magnani and Zhu, 2012; Chi and Li, 2014), the present study uses unconditional quantile regression to analyze the income distribution (at different quantiles) of the handloom micro-entrepreneurs.

The unconditional quantile regression is based on the concepts of influence function (IF[3]) and recentered influence function (RIF)[4]. The linearization of RIF function is as below.

$$E\{RIF(Y, q_\tau)|X\} = X\beta_\tau \qquad \cdots (2)$$

Since the $RIF(Y, q_\tau)$ is not practically observed, its unknown components may be replaced by their sample estimates and accordingly, the RIF function can be expressed as below.

$$\widehat{RIF}(Y_i, \widehat{q_\tau}) = q_\tau + \frac{\tau - I(Y_i \leq \widehat{q_\tau})}{\hat{f}_Y(\widehat{q_\tau})} \qquad \cdots (3)$$

where $\hat{f}_Y$ is the Kernel density estimator and $\widehat{q_\tau}$ is the τ^{th} quantile sample.

[3] A robust tool of statistical or econometric estimation that represents the influence of an individual observation on a distributional statistic such as quantile (Fipro et al., 2009; Fortin et al., 2011).

[4] For technical details, see Fipro et al. (2009) and Fortin et al. (2011).

Decomposition Methods

The standard Oaxaca-Blinder (OB) model (Blinder, 1973; Oaxaca, 1973) is applied widely for decomposing gender gap only at mean level, but not across the distribution such as quantiles (Machado and Mata, 2005; Fortin, 2008; Firpo et al., 2009; Fortin et al., 2011). Mean decomposition provides little information about what happens throughout the distribution which limitation motivates a few literature to stress on distributional decomposition using conditional and/or unconditional quantile decomposition methods (Magnani and Zhu, 2012; Chi and Li, 2014; Ahmed and McGillivray, 2015; Deshpande and Sharma, 2016) [5]. The based on recentered influence factor (RIF), unconditional quantile decomposition method produce a detailed decomposition for any distributional statistic such as quantile, and the results are comparable with OB decomposition results (Fipro et al., 2009; Fortin et al., 2011). Thus, the present study uses unconditional quantile decomposition method to analyze the gender income gap among handloom micro-entrepreneurs and is specified as below.

$$\overline{RIF}(Y_m, \hat{q}_{m\tau}) - \overline{RIF}(Y_f, \hat{q}_{f\tau}) = (\bar{X}_m - \bar{X}_f)\hat{\gamma_\tau} + \{\overline{X_m}(\hat{\beta}_{m\tau} - \hat{\gamma_\tau}) - \overline{X_f}(\hat{\beta}_{f\tau} - \hat{\gamma_\tau})\} \quad \cdots (4)$$

where $\overline{RIF}(Y_m, \hat{q}_{m\tau})$ and $\overline{RIF}(Y_f, \hat{q}_{f\tau})$ are the dependent variables in the RIF-OLS, $\hat{q}_{m\tau}$ and $\hat{q}_{f\tau}$ are the marginal income distributions for male and female at τ^{th} quantile, $\hat{\beta}_{m\tau}$ and $\hat{\beta}_{f\tau}$ are the RIF-OLS estimated coefficients for male and female, and $\hat{\gamma_\tau}$ is the τ^{th} quantile pooled non-discriminatory income structure (Fipro et al., 2009). Endowment effects and differential returns effects at τ^{th} quantile are represented by $(\bar{X}_m - \bar{X}_f)\hat{\gamma_\tau}$ and $\{\bar{X}_m(\hat{\beta}_{m\tau} - \hat{\gamma_\tau}) - \bar{X}_f(\hat{\beta}_{f\tau} - \hat{\gamma_\tau})\}$ respectively. Similar to the OB model, further decomposition of differential returns effects into male's advantage $\{\overline{X_m}(\hat{\beta}_{m\tau} - \hat{\gamma_\tau})\}$ and female's disadvantage $\{\overline{X_f}(\hat{\beta}_{f\tau} - \hat{\gamma_\tau})\}$ is also possible (Magnani and Zhu, 2012).

Different studies have shown concern over possible selection bias in the detailed distributional decomposition (Chzhen and Mumford, 2011; Fortin et al., 2011; Nordman et al., 2011). In the present context, two likely sources may result in selection bias. Firstly, the handloom income is observed only when people involved in handloom micro-entrepreneurship. Secondly, both the males and the females may be motivated differently towards handloom micro-entrepreneurship. There exist a few studies which addressed the selection issue in decomposition across the income distribution (Chzhen and Mumford, 2011). However, there exists ambiguity on the use of selection correction mechanism in detailed distributional decomposition (Fortin et al., 2011; Nordman et al., 2011). Therefore, the present paper does not address the selectivity issues due to lack of credible mechanism.

[5] For a review of these methods, please see Fortin et al. 2011.

C. Choice of the Independent Variables

Based on literature, the present study considers a wide range of variables to analyze the gender income gap in informal micro-enterprises (Hundley, 2001; Leung, 2006; Alvarez et al., 2009; Fairlie and Robb, 2009; Bortamuly and Goswami, 2012; Lechmann and Schnabel, 2012; Åstebro and Chen, 2014; Chi and Li, 2014; Deshpande and Sharma, 2016). The variables considered cover three aspects namely human capital, social capital, and firm-specific. Age, education, training, financial literacy, and risk attitude are considered to capture the human capital aspects. Age of the respondents is taken as a proxy for handloom experience as the industry largely depends on imitation, and knowledge and skills spill over the generations (Bortamuly et al., 2013, 2014; Hazarika et al., 2016). Moreover, the squared term of age is included in the model to examine the presence of a U-shaped relationship between experience and income. Education is also specified in a similar way. Educational attainment and training are important not only for skill development but also in increasing one's ability to recognize the entrepreneurial opportunities and thereby the business success (Fairlie and Robb, 2009; Bortamuly and Goswami, 2012; Lechmann and Schnabel, 2012). Another aspect that reflects the financial practices and organized workings of a micro-entrepreneur is the maintenance of the bookkeeping (Hazarika et al., 2016). Bookkeeping helps the micro-entrepreneurs not only in estimating the cost structure and so thus the price but also in the intertemporal assessment of one's financial position. Thus, it can be used to judge how organized and well-managed the workings of a handloom micro-entrepreneur.

The attitude towards risk is often conceptualized in the literature on entrepreneurial performance (Cressy, 2006). It is often ar gued that the attitude towards risk has a positive effect on entrepreneurial performance. However, the aspect of risk attitude is very subjective and literature uses different dimensions towards defining and measuring the risk attitude at the individual level (Koellinger et al., 2013). For measuring the risk attitude, the present study uses one item 5 point Likert scale through "Are you generally a person who is fully prepared to take risks related to your enterprise?" The present measure is effective in a sample with a low level of formal education as the respondents often find it difficult to differentiate and understand the items in multi-item scales (Gardener et al., 1998).

Table 2. Description and measurement of the independent variables

Variables	Description	Measurement units	Expected sign
ln(annual Income)	Annual income of the micro-entrepreneurs	Natural logarithm of annual income	
Female	Sex of the respondents	Binary: 1 for female and 0 for male	−
Age	Age of the respondents	In years	+
Age^2	Square term of age centered at mean	In years	−
Education	Educational attainment of the Respondents	In years	+
$Education^2$	Square term of education centered at mean	In years	−
Govt. training	Availed government training	Binary: 1 for availed and 0 for not	+
Bookkeeping	Maintain bookkeeping accounts	Binary: 1 for yes and 0 for not	+
Risk aversion	Attitude towards risk	5 point Likert: 1 for highly risk lovers to 5 for highly risk averse	−
Family labor	Available family member on part-time/full-time basis	In numbers	+
Network size	Size of social network of the micro-entrepreneur	In numbers	+
SGH membership	Member of an active SHG	Binary: 1 for yes and 0 for not	+
Technology	Installation of weaving machinery	Binary: 1 for yes and 0 for not	+
District	District name of the micro-entrepreneurs	Dummy*: Baksa, Dhemaji, Kamrup, Kokrajhar, Lakhimpur, and Udalguri*	

The present study also considers three social capital variables namely the availability of family member, the social network size, and membership of self-help groups (SHGs). Besides providing the emotional support, availability of family member as handloom workers not only reduces the labor cost but also reduces the moral hazard problems associated with the hired labor. The importance of social network is inevitable towards the business performance. Although a micro-enterprise is embedded to multiple network structure, the present study focuses on the personal network which is critical towards enterprise development and growth. The size of social capital, measured in terms of the number of people known to a micro-entrepreneurs who are involved in the handloom business, leads to dissemination of knowledge and information related to handloom business. Thus, it may importantly influence the performance of the micro-enterprise. Apart from its role as social capital in enhancing trust and social bonding, SHGs membership is critical for credit access especially in the rural areas where the formal credit facility is

often limited. Apart from these, the technology adoption is also modeled in the income function to assess to what extent the modern weaving technology[6] uplifts the performance of the handloom micro-entrepreneurs. Technology adoption realized through adoption of weaving machinery such as dobby and jacquard machines increases the overall productivity and hence the income. Table 2 presents the description and measurement of the variables.

IV. Results and Discussion

A. Descriptive statistics

The mean differences in variables across gender are tested through the group mean t-test and Pearson Chi^2 test (Table 3). The results show that there exist significant differences across the gender in all the aspects except age of the individuals. In terms of handloom experience, no significant difference is found across gender. Interestingly, the educational attainment is found significantly higher for the females than the males. This indicates that though the industry is female-intensive, low level of education compelled many male respondents to enter into the handloom business. Another explanation may be because of their early exposures due to the family business[7]. The females outnumber the males in availing the handloom related institutional training. It is not surprising as the industry is female-intensive and most of the institutional programs target the female handloom workers. However, the implementation of such programs needs to be assessed as only 20.7 percent of the respondents reported of being benefited by training. Apart from the institutional training, the respondents also acquire business training from their family (handloom as a family business) and through previous work experiences.

In terms of financial literacy, only 29.3 percent of the females maintained bookkeeping during the survey as compared to 64.1 percent of the males. Interestingly, outsourcing of bookkeeping activities is found absent due to the small scale of operation and/or the higher cost of outsourcing. Others simply made the transaction (payments and receipts for the handloom activities) through unwritten negotiations, and a few other argued in favor for not keeping transaction records because of less frequent transactions. Such gap indicates that the males are more organized and well-managed than the females. Thus, the males make better judgments about their financial priorities, and because of such practices, the micro-entrepreneurs have a better idea about their costs and benefits structure which ultimately helps in price negotiation.

[6] Often the technology adoption appears to be endogenous variable in income model. Following the literature, the endogeneity of the access to technology was examined considering 'technological awareness' and 'access to extension services' as instruments for weaving machinery adoption. However, no evidence of endogeneity of technology adoption is observed for the present sample (results are not presented, available upon request).

[7] In many families, handloom activities have been traditionally practiced and individuals get involved in different handloom related activities from their early days.

Table 3. Descriptive statistics of the independent variables those influence the income of the handloom micro-entrepreneurs

Variables	All (328)		Male (103)		Female (225)		Male Vs. Female			
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Differences@	Chi^2-value	t-value	p-value
ln(annual income)	10.592	0.614	10.943	0.687	10.432	0.503	0.600		7.565	0.001
Female	0.686	0.465	--	--	--	--	--			
Age	34.634	9.096	35.097	8.539	34.422	9.351	0.053		0.623	0.534
Age^2	82.525	99.173	72.278	92.339	87.216	102.004	-0.109		-1.267	0.206
Education	7.253	4.310	6.680	4.355	7.516	4.273	-0.137		-1.790	0.075
$Education^2$	18.521	19.911	19.170	19.934	18.224	19.938	0.034		0.399	0.690
Govt. training#	0.207	0.406	0.136	0.344	0.240	0.428	-0.189	4.657		0.031
Bookkeeping#	0.402	0.491	0.641	0.482	0.293	0.456	0.523	35.468		0.001
Risk aversion	2.351	0.053	2.049	0.094	2.489	0.062	-3.910		-3.945	0.001
Family labor	2.357	1.119	2.825	1.115	2.142	1.055	0.445		5.344	0.001
Network size	3.759	1.816	4.709	2.042	3.324	1.520	0.544		6.843	0.001
SHG membership	0.552	0.498	0.680	0.469	0.493	0.501	0.272	8.421		0.004
Technology#	0.341	0.475	0.485	0.502	0.276	0.448	0.312	13.841		0.001
Baksa#	0.098	0.297	0.117	0.322	0.089	0.285	0.065	9.886		0.079
Dhemaji#	0.165	0.371	0.155	0.364	0.169	0.375	-0.027			
Kamrup#	0.162	0.369	0.204	0.405	0.142	0.350	0.116			
Kokrajhar#	0.241	0.428	0.291	0.457	0.218	0.414	0.118			
Lakhimpur#	0.104	0.305	0.097	0.298	0.107	0.309	-0.023			
Udalguri#	0.232	0.423	0.136	0.344	0.276	0.448	-0.248			

Notes: Figures in the parentheses represent sample size of each group. # Mean values of the determinant represent the percentage of the sample size. @ The differences are normalized that assesses covariate overlapping between the male and female. It is derived as $\frac{(\bar{X}_m - \bar{X}_f)}{\sqrt{s_m^2 + s_f^2}}$ where S_m and S_f are the standard deviation of the determinants for each group.

Regarding the attitude towards risk, males were less risk-averse than the females. This is one of the key issues which may explain why the females earn lesser than that of the males. Moreover, significant differences are also found with respect to the use of modern weaving technologies in the workplace between males (27.6%) and females (48.5%). It is also observed that the extent of deployment of such machinery is greater in the male-owned micro-enterprises than the female-owned micro-enterprises.

In terms of social capital, the average network size for the males is found to be larger than that of the females. The cultural norms of restricted outside-home mobility may explain such gender difference in the network size in the rural areas. In terms of availability of family labor, the males are in an advantageous position than the females. Against the general trend of promoting the SHGs for uplifting the disadvantageous group of the females, the proportion of the males having a membership (68.0%) is significantly higher than the females (49.3%). Such variation in SHGs membership may also contribute towards the unequal income distribution across gender among the handloom micro-entrepreneurs.

B. Estimation of income function

Ordinary Least Square Results. Table 4 presents the OLS estimates with White's heteroscedasticity corrected the standard error. As mentioned earlier, the variables cover three categories such as human capital, social capital, and firm-specific characteristics. Accordingly, the OLS technique is applied to develop the human capital model, social capital model, and firm-specific model. Finally, the full model including all the variables was estimated. All the models were found significant at 1 percent level where the location effect was controlled using district dummies (Table 4).

The OLS results reveal the existence of gender income gap among the handloom micro-entrepreneurs. On an average, the female micro-entrepreneurs earn 51.0 percent lower income per annum than their male counterpart. While considering the differences in endowments and controlling for location-specific effects, the income gap reduces from 51.0 percent to 29.7 percent. The OLS technique was further estimated separately for the males and the females to examine the heterogeneity in the coefficients across gender (Table 5).

The results show that the educational attainment, access to institutional training, maintenance of bookkeeping, risk attitude, SHG membership, and use of modern weaving technologies have significant influences on the income of the micro-entrepreneurs (Table 4). The separate regressions reveal that the incomes of both the males and the females are influenced by the almost same set of variables (Table 5). Among them, the education, bookkeeping maintenance, and use of weaving machinery are found crucial in determining the income of the micro-entrepreneurs irrespective of gender.

Table 4. Ordinary Least Squares estimates for handloom income for pooled sample

Variables	Gender 1[#]		Gender 2[#]		Human capital		Social capital		Firm characteristics		Full	
	Coef.	RSE.	Coef.	RSE.	Coef.	RSE.	Coef.	RSE.	Coef.	RSE.	Coef.	RSE.
Constant	10.943***	0.068	11.236***	0.115	10.930***	0.184	11.069***	0.170	10.961***	0.119	10.477***	0.209
Female	-0.510***	0.075	-0.486***	0.066	-0.328***	0.064	-0.439***	0.073	-0.400***	0.065	-0.297***	0.064
Age					0.003	0.003					0.004	0.003
Age^2					0.001	0.001					0.000	0.000
Education					0.012*	0.007					0.036***	0.008
$Education^2$					0.001	0.001					0.002	0.002
Govt. training					0.127*	0.068					0.120*	0.064
Bookkeeping					0.371***	0.069					0.296***	0.066
Risk aversion					-0.090***	0.028					-0.084***	0.027
Family labor							0.006	0.027			-0.004	0.023
Network size							0.001	0.020			0.003	0.016
SHG membership							0.215***	0.056			0.157***	0.051
Technology									0.371***	0.067	0.234***	0.064
District dummy	No		Yes		Yes		Yes		Yes		Yes	
Sample	328		328		328		328		328		328	
F-value	45.800		27.090		20.550		18.530		27.400		20.620	
p-value	0.001		0.001		0.001		0.001		0.000		0.000	
R^2	0.149		0.314		0.440		0.314		0.376		0.529	
Root MSE	0.567		0.513		0.469		0.516		0.490		0.433	
Adjusted R^2	0.147		0.301		0.416		0.295		0.362		0.504	

Notes: Gender 1 and Gender 2 refers regression model with female dummy and with and without district fixed effect. Significant levels * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. RSE represents robust standard error.

Table 5. Ordinary Least Squares estimates for the income of the handloom micro-entrepreneurs across gender

Variables	Human capital		Social capital		Firm characteristics		Full	
	Male	Female	Male	Female	Male	Female	Male	Female
Constant	10.639***	10.501***	11.222***	10.103***	10.964***	10.232***	9.911***	9.942***
Age	0.003	0.004					0.005	0.004
Age^2	0.001	0.001					0.000	0.000
Education	0.003	0.031**					0.089***	0.022***
$Education^2$	0.001	0.001					0.007**	0.002
Govt. training	0.174**	-0.044					0.189*	0.120
Bookkeeping	0.292***	0.555**					0.430***	0.236***
Risk aversion	-0.097***	-0.035					-0.031	-0.077**
Family labor			0.017	-0.007			-0.002	-0.007
Network size			-0.028	0.018			-0.021	0.023
SHG membership			0.144	0.199***			0.101	0.151**
Technology					0.298**	0.354***	0.239**	0.200**
District dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	103	225	103	225	103	225	103	225
F-value	7.090	11.800	9.070	5.460	12.170	9.160	13.190	6.510
p-value	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
R^2	0.273	0.547	0.403	0.167	0.419	0.208	0.690	0.351
Root MSE	0.441	0.492	0.553	0.468	0.540	0.454	0.417	0.421
Adjusted R^2	0.232	0.487	0.352	0.136	0.382	0.186	0.632	0.301

Notes: Significant levels * $p < 0.10$; ** $p < 0.05$; *** $p< 0.01$. RSE represents robust standard error.

Contrary to the estimated literature, the relationship between the handloom experience and income of the micro-entrepreneurs is found not significant in the present study. This might be because of the collective effects of human capital, social capital, and economic aspects. Another explanation for such result might be the similar age and experience profiles of the micro-entrepreneurs irrespective gender. As expected, and in line with previous studies, the present study finds a positive and significant influence of educational attainment on the income of the handloom micro-entrepreneurs. Ceteris paribus, one year increase in schooling increases the income of the micro-entrepreneurs by 3.6 percent. Looking at the gender issue, the returns to educational attainment is higher for the males (8.9%) than the females (2.2%).

Maintenance of bookkeeping has a favorable effect on income of the micro-entrepreneurs. Ceteris paribus, micro-entrepreneurs who maintain bookkeeping earn 12.0 percent more than those who do not keep such records. In particular, the effect of bookkeeping maintenance is more important for the females as it enables one to review the firm activities and provides significant insights in making future entrepreneurial decisions. Looking at the gender differentials, the return to maintenance of bookkeeping is found to be higher for the males (43.0%) than the females (23.6%).

The influence of risk aversion attitude of the micro-entrepreneurs is found to be negative and significant on their income level. As a micro-entrepreneur, one needs to take financial, production, and marketing related decisions under uncertainty. The lower the risk-averse attitude, the greater will be the entrepreneurial success and hence a higher level of income. This is more so for the female micro-entrepreneurs as they are typically more risk-averse than their male counterpart that compels them to concentrate on a small scale of production and lower extent of using of modern technology or rely on the traditional techniques of production.

Among the social capital dimensions, the SHGs membership tends to increase the income of the micro-entrepreneurs. Ceteris paribus, the income of the micro-entrepreneurs who are members of SHGs earn 15.7 percent more than those who are not. Considering the gender aspects, while the influence of the SHGs membership is found positive and significant for the females, it is found to be not significant for the males. Apart from such relational embeddedness, SHGs also emerge as a source of credit in the micro-enterprise development especially among the females and the poor for whom the access to formal credit is limited. Thus, the SHGs membership provides the trust and confidence needed for accessing the credit in an informal credit market. Such access to credit and relational embeddedness help the micro-entrepreneurs towards investment in business expansion including technology adoption (Hazarika et al., 2016).

The influence of technology adoption is found to be positive and significant on income, and its return appears higher for the males than the females. Ceteris paribus, the use of weaving machines increases the income of the males and the females by 23.9 percent and 20.0 percent respectively. It is often found that most of the males produce high-valued silk products using dobby or jacquard machines.

The influence of handloom related institutional training is found to be positive and significant for the overall sample and the male sub-sample. Unexpectedly, its influence is found not significant in elevating the income of the female micro-entrepreneurs in the state. While most of the training programs target the female handloom workers, such non-significant results reestablish the needs for thorough evaluation of the implementation of such programs. Such programs should be made flexible to disseminate the benefits to the targeted people. Lack of infrastructure and effective market linkages also hinder the benefits of such programs. It is found that, even if the rural females are covered under such training programs, they are unable to deliver the desired outcome due to limited infrastructure and market linkages. Therefore, policies should be directed to ensure access to financial services and extension of the market linkage in the rural areas. Findings related to bookkeeping maintenance and technology usage have important implications in addressing the existing gender income gap. In most of these aspects, the males are found in a favorable position and thus seek policy measures to encourage the females towards technology adoption, financial literacy, and product diversification to minimize the income gap.

Distributional Regression Results

Table 6 presents the estimated unconditional marginal effects at selected quantiles (10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th}). It also presents the conditional estimates to check the robustness of the unconditional estimates. The results show similar patterns for both conditional and unconditional estimates indicating the unconditional estimates to be robust. Educational attainment, attitude towards risk, bookkeeping maintenance, SHGs membership, and use of weaving machinery appear important in determining the income of the micro-entrepreneurs throughout the distribution. The return to education is found to be similar throughout the distribution. While the influence of experience appears not significant in the standard OLS model, it is significant at the higher quantiles. Similarly, the return to maintenance of bookkeeping and use of weaving machinery tend to increase as one move to higher quantiles. Such heterogeneity in returns is disguised in a standard OLS estimation. The assessment of such heterogeneity across gender is imperative to get a clear picture on why the female micro-entrepreneurs earn lower than their male counterpart.

Table 6. Quantile regression estimates of the income of the handloom micro-entrepreneurs

Variables	10^{th} Quantile		25^{th} Quantile		50^{th} Quantile		75^{th} Quantile		90^{th} Quantile	
	Conditional	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional	Unconditional
Constant	9.961***	9.364***	10.099***	10.136***	10.313***	10.357***	10.478***	10.046***	10.650***	10.081***
Female	-0.408***	0.331***	-0.258***	0.354***	-0.262***	-0.105	-0.276***	-0.080	-0.304***	-0.144
Age	0.005	0.003	0.004	-0.010*	0.004	0.005	0.001	0.013**	0.001	0.029***
Age^2	-0.001	-0.001**	0.000	-0.001*	0.000	0.000	0.001**	0.000	0.001	0.001
Education	0.033***	0.021*	0.028***	0.013	0.026***	0.021*	0.026***	0.025*	0.053***	0.078***
$Education^2$	-0.001	0.003	0.000	-0.002	0.001	-0.001	0.002	0.000	0.006**	0.006
Govt. training	0.175*	0.186*	0.128	0.104	0.129	0.025	0.064	0.162	0.152	0.492**
Bookkeeping	0.258***	-0.131	0.187**	0.230*	0.277***	0.156*	0.352***	0.346***	0.415***	0.770***
Risk aversion	-0.075*	-0.061	-0.110***	-0.130**	-0.093**	-0.105**	-0.095***	-0.152***	-0.077*	-0.117
Family labor	-0.051	-0.033	-0.010	0.027	0.018	0.048	0.022	0.074*	0.014	0.050
Network size	-0.001	0.033	-0.025	0.036	-0.022	0.004	0.025	0.061**	0.011	-0.001
SHG membership	0.094	0.173**	0.132*	0.169*	0.188***	0.157**	0.156***	0.149	0.096	0.343**
Technology	0.194**	0.087	0.306***	0.415***	0.212**	0.269***	0.342***	0.498***	0.295***	0.494**
Pseudo	0.254		0.252		0.297		0.403		0.447	
R-squared		0.148		0.285		0.341		0.390		0.294

Notes: Significant levels * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 7: Unconditional quintal regression estimates of the income of the micro-entrepreneurs across gender

Variables	10th Quantile		25th Quantile		50th Quantile		75th Quantile		90th Quantile	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Constant	9.512***	9.572***	10.488***	9.950***	9.466***	10.009***	8.299***	10.032***	8.873***	8.936***
Age	-0.003	0.003	-0.012	-0.004	0.023**	0.000	0.011	0.009	0.020	0.031***
Age^2	-0.001	-0.001*	-0.003*	0.000	-0.001*	0.000	-0.001	0.000	0.001	0.001
Education	0.026	0.018	-0.028	0.008	0.080***	-0.002	0.108***	0.002	0.155**	0.073***
$Education^2$	-0.001	0.005*	-0.010	0.000	0.001	0.000	0.009	-0.001	0.018*	0.003
Govt. training	0.409	0.160	0.440	0.159*	0.400	-0.026	0.266	0.259*	-0.140	0.618*
Bookkeeping	-0.244*	-0.096	0.802***	0.083	0.384*	0.127	0.614***	0.215	0.374	0.866***
Risk aversion	-0.198	-0.009	-0.246**	-0.033	-0.139	-0.066	0.076	-0.277***	0.035	-0.219*
Family labor	-0.005	-0.058	-0.032	-0.003	0.083	0.000	0.142	0.076	0.094	0.085
network size	0.047*	0.020	0.032	0.025	-0.051	0.046	0.026	0.083**	0.058	-0.033
SHG membership	0.090	0.226**	0.315	0.077	0.150	0.182**	0.113	0.114	0.429	0.252
Technology	0.358	0.027	0.986**	0.124	0.549**	0.153	0.616***	0.424***	-0.006	0.556*
District dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	103	225	103	225	103	225	103	225	103	225
F-value	0.340	1.410	11.260	2.570	31.210	5.820	10.550	9.930	0.960	3.120
p-value	0.991	0.142	0.000	0.001	0.000	0.000	0.000	0.000	0.502	0.000
R^2	0.208	0.156	0.542	0.133	0.547	0.221	0.492	0.369	0.220	0.336
Root MSE	0.671	0.705	1.163	0.586	0.762	0.571	0.843	0.755	1.385	1.506

Notes: Significant levels * p < 0.10; ** p < 0.05; *** p< 0.01

Table 7 presents the marginal effects across gender at different quantiles. While the return to experience is found significant for the males at the median, it is significant for the females at the higher quantiles (90^{th}). The estimated return to maintenance of bookkeeping is found higher for the males at lower quantile than their female counterpart. In contrast, the bookkeeping maintenance tends to reduce the existing gender income gap at higher quantiles as indicated by the higher returns to the females at 90^{th} quantile. The SHGs membership is crucial for the females at the lower quantiles. More provisions for credit and other financial services would reduce the existing gender income gap as indicated by the higher returns for the female throughout the income distribution.

From the firm endowment perspective, the return to weaving machinery appears positive and significant for the males, and it is a higher return at the lower quantiles than at the median. For the females, the estimated OLS return to machinery was to be 23.4 percent which appears as 12.4 percent at the 25^{th} quantile, 42.4 percent at the 75^{th} quantile, and 55.6 percent at the 90^{th} quantile in unconditional quantile estimation. Also, the returns at higher quantiles (75^{th} and 90^{th}) are higher for the females than the males. It implies that the income of the females rises more with the greater extent of machinery deployment.

Gender Income Gap among the Handloom Micro-entrepreneurs

The summary statistics show that the female micro-entrepreneurs earn per annum 51.0 percent (INR 32,650.82) lower than their male counterpart. On an average, the males earn INR 71,541.75 per annum while the same stood at INR 38,890.89 for the females from different handloom activities. For a better understanding of the existing gender income gap, the Kernel density estimates across gender are presented in Figure 1. The estimates reveal a larger proportion of the males to be in the higher income levels. The two-sample Kolmogorov-Smirnov test[8] (p-value = 0.001) rejects the null hypothesis that the income of the males and the females follow the same distribution. The test thus confirms the existence of gender income gap among the handloom micro-entrepreneurs along the distribution.

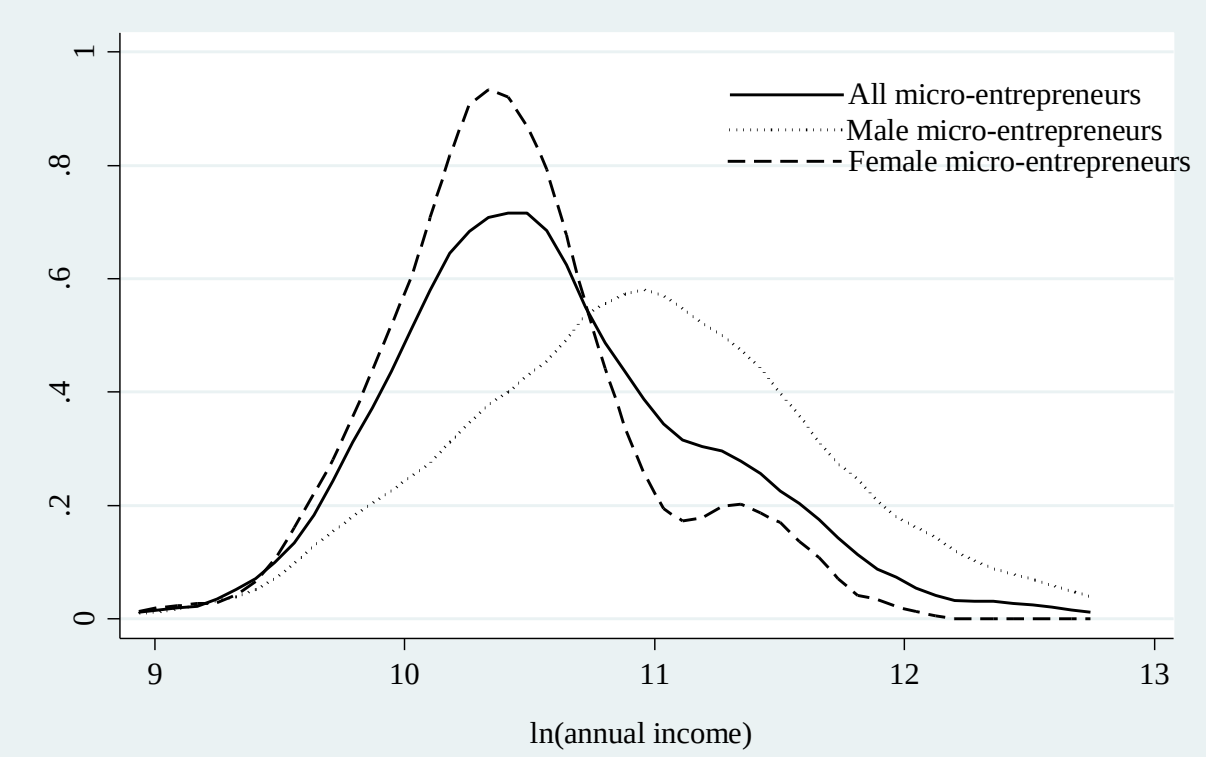
Decomposition of Income Gap

The OB decomposition results indicate that the females earn 51.0 percent lower annual income than the males at mean level, which is mostly attributed to the differences in the endowments across gender. After addressing such endowment differences, the income gap decreases to 29.7 percent. At mean, the

[8] The two-sample Kolmogorov-Smirnov test compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, Poisson, or exponential. The Kolmogorov-Smirnov Z-statistic is computed from the largest difference (in absolute value) between the empirical and theoretical cumulative distribution functions. It gives the goodness-of-fit test about the observations for a specified distribution.

differences in endowments explain for nearly 41.9 percent of the income gap, and the remaining 58.1 percent gap remains unexplained. Figure 2 presents the raw, conditional, and unconditional income gaps at selective quantiles of the distribution. The raw gap emerged to be 0.34 at the 25th percentile. It indicates that the income of the males is 34 log points higher than that of the females at the 25th percentile. Moreover, the gap is unevenly distributed all along the percentiles, and it tends to increase from lower quantiles to the upper quantiles. The gap increases up to 90th percentile (0.69 log point) revealing a glass ceiling gender gap. Both the conditional and unconditional distributions also indicate the existence of glass ceiling gap among the handloom micro-entrepreneurs.

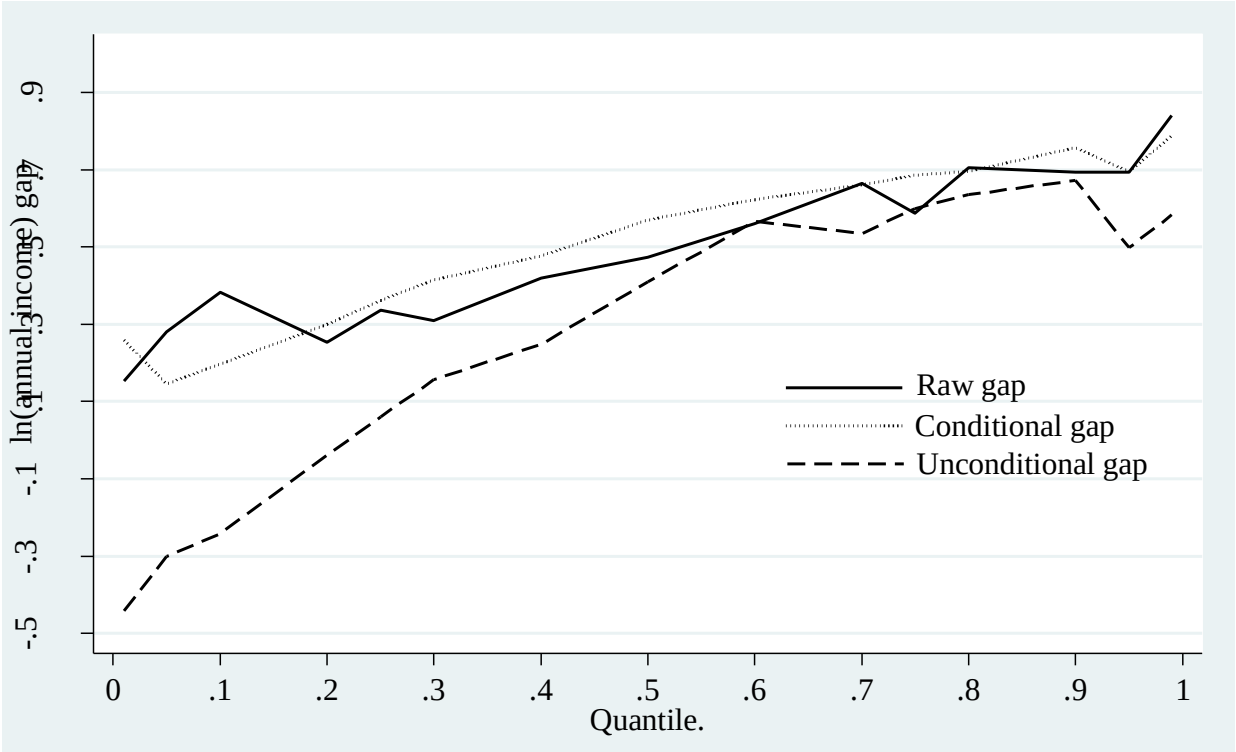
Figure 1: Kernel density estimates of ln(annual income) distribution by gender



The unconditional quantile decomposition shows that the estimated gap has been widening from -0.442 log points at the 10th quantile to 0.410 log points at the 50th quantile, and further to 0.583 log points at the 90th quantile. It is the differences in the productive characteristics (endowment effect) that contribute most to the gap than the heterogeneous returns to such characteristics (differential returns effects) in the upper quantiles. It indicates that, even after taking care of the endowment differences, there still exists a substantial income gap throughout the distribution due to the heterogeneity in returns to the endowments across gender. Results also suggest that the differences in endowments are in favor of the

males. Conversely, differential returns effect becomes low for the females as they move towards higher quantiles of the distribution.

Figure 2. Gender ln(annual income) gap among handloom micro-entrepreneurs



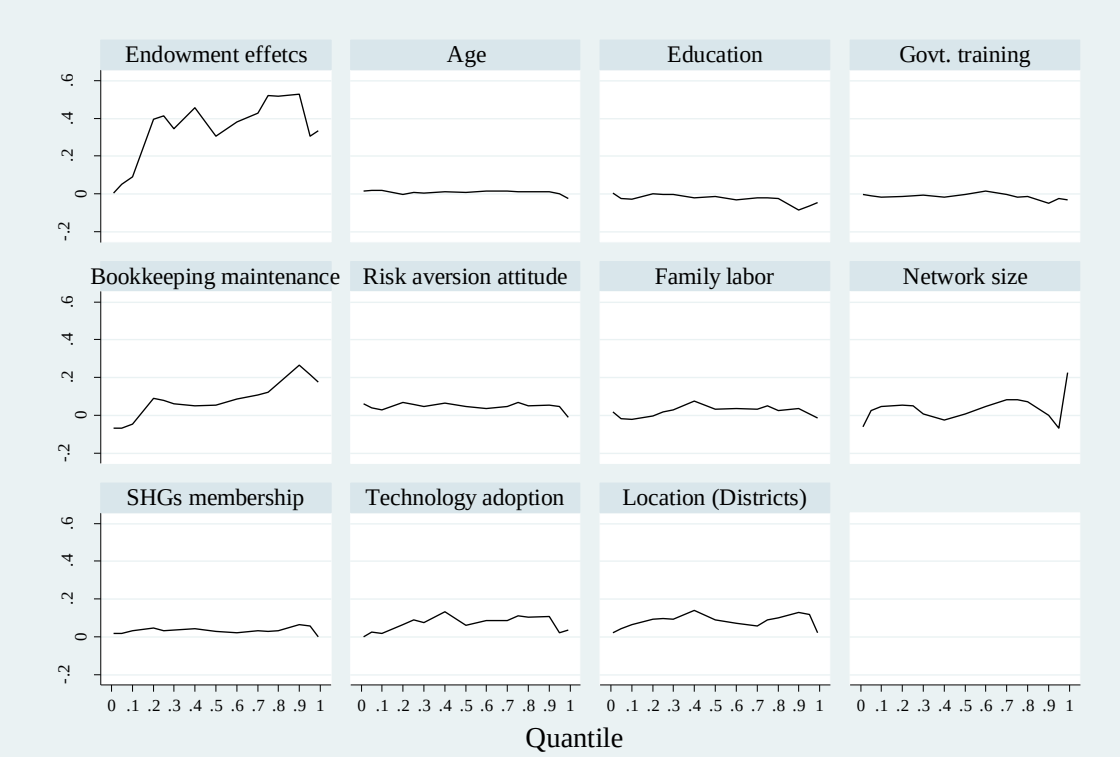
Detailed Decomposition of the Endowment Effects

The detailed decomposition of the endowment effects is presented in Figure 3. The coefficients refer to the contribution of each characteristic to the endowment effect. The gender differences in bookkeeping and use of weaving machine explain the major part of the endowment effects at the upper quantiles of the distributions. These two variables collectively account for 37.23 percent, 44.14 percent, and 71.08 percent of the endowment effects at 50^{th}, 75^{th}, and 90^{th} quantiles respectively. It suggests that the differences in the bookkeeping maintenance and technology adoption have widened the income gap at the upper end of the distribution. In order to achieve a more equitable distribution across gender, it to enhancement the financial literacy and technology adoption for the females is necessary for the rural informal sector. Though bookkeeping maintenance uplifts the income of females, a significant proportion of them does not maintain the same. Such low level of financial literacy of the females can be explained by their poor formal education and lack of financial knowledge. They are also found to be reluctant to take higher risk, reluctant to approach for external credit, and less competent in identifying handloom business opportunities. Similarly, a greater investment in weaving machinery will enable females towards

increasing firm productivity as well as product diversification. Hence, a higher level of income can be realized which further reduces the gender income gap.

Differences in the network size and SHGs membership are also contributing to the gender income gap at the lower quantiles. These two aspects collectively account for 86.99 percent and 19.72 percent of the endowment effects at 10^{th} and 25^{th} quantiles respectively. The risk aversion attitude emerges as another important issue in widening the gender income gap in the lower quantiles. Similarly, market distance also contributes towards the endowment effects throughout the distribution. Overall, the female micro-entrepreneurs are found to be poorly organized in handloom activities. Therefore, efforts should be made towards dissemination of the technological, financial, and managerial know-how as these could lead to a better entrepreneurial performance, thereby lessening the gender income gap.

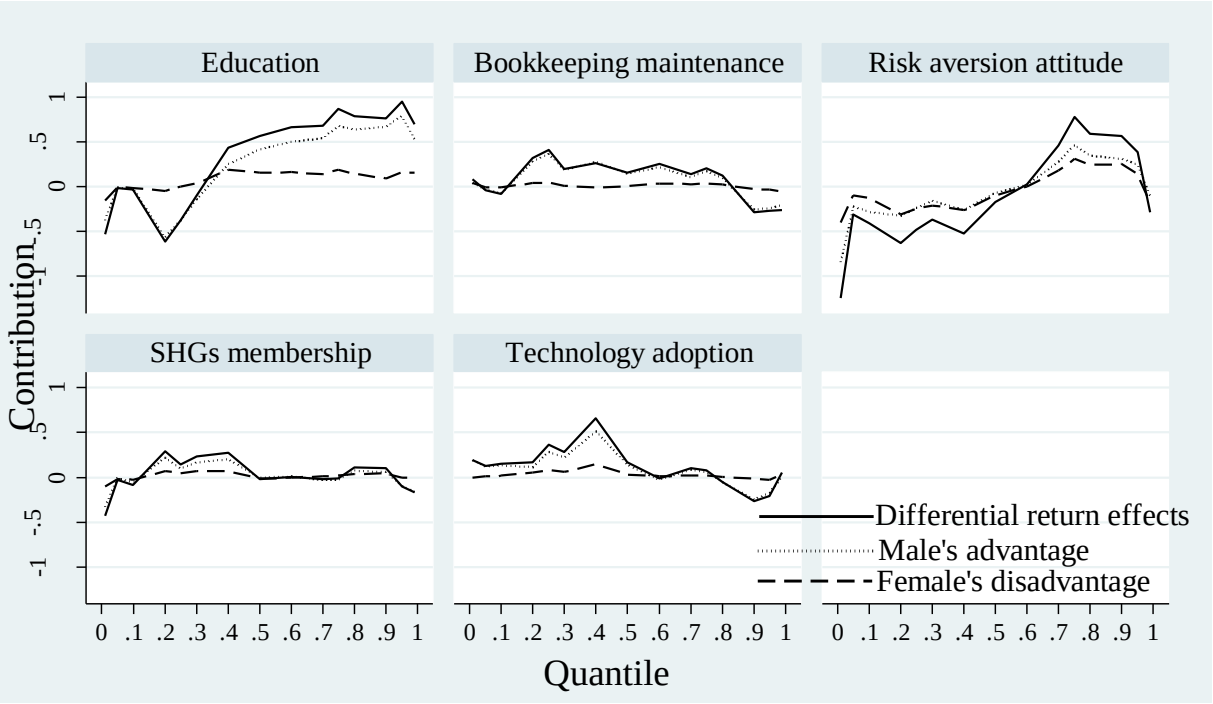
Figure 3. Contribution of the individual characteristics to endowment effects throughout the income distribution



Detailed Decomposition of the Differential Returns Effects

The detailed decomposition of the differential returns effects reveals that there exists heterogeneity in contributions of the variables in the differential returns effects throughout the income distribution[9]. The regression results reveal the importance of education, bookkeeping maintenance, risk aversion, SHGs membership, and use of the weaving machinery in influencing the income of the micro-entrepreneurs. Also, these variables together explain a major part of the endowment effects in the gender income gap. Therefore, the present study emphasizes on analyzing the extent of differential returns effects (unexplained part) with respect to these five variables. As mentioned in the methodology, the differential returns effects can further be decomposed into male's advantage and female's disadvantage[10]. Figure 4 presents the contributions of the male's advantage and female's disadvantage to the differential returns effects for these five variables.

Figure 4. Differential returns effects by selected variables throughout the income distribution



Female's disadvantage in bookkeeping maintenance has contributed to the differential returns effects as indicated by its positive coefficients. The larger negative coefficients of risk aversion attitude in lower quantiles of the income distribution indicate that the females are penalized more by not bearing the risk of

[9] It should be noted that though the recommendations of Gardeazable and Ugidos (2004) are followed in the present study to tackle the omitted category problem for categorical variables, the discriminatory coefficients of the determinants other than the continuous are somewhat arbitrary (Jann 2008; Magnani and Zhu, 2012).

[10] In order to overcome the problem of omitted category in detailed decomposition for categorical variables, the present study follows the procedure presented in Jann (2008).

investment in technology, product diversification, etc. on the other hand, the difference in the returns to education is found to be stable throughout the income distribution. Overall, the coefficients indicate that the discrimination observed in the income distribution is due to the gender-based advantages of the male micro-entrepreneurs.

V. CONCLUSIONS

The present study analyzes the gender income gap along with the income distribution among the handloom micro-entrepreneurs in Assam. The RIF unconditional quantile regression shows evidence of a substantial gender income gap throughout the distribution in the handloom industry. The study further decomposes the estimated income gap into endowment effects and differential returns effects and also attempts to understand the causes of endowment effects and differential returns effects of the existing income gap.

The decomposition shows that the endowment effects contribute more to the gender income gap at the upper quantiles of the income distribution indicating the existence of gender differences in the productive characteristics. Gender differentials with respect to bookkeeping maintenance and use of weaving machinery need to be addressed to reduce the gender income gap. In contrast, the differential returns effects contribute more at the lower end of the income distribution indicating that even if the differences in endowments are controlled, there still exists a substantial income gap at lower quantiles. However, as females move towards the upper quantiles, the extent of differential returns effects tends to decline. Overall, the differences in the endowments are in favor of the males. Use of weaving machinery and practicing the bookkeeping maintenance by the male micro-entrepreneurs than their female counterpart has led to the income gap throughout the income distribution. Thus, policy prescriptions should be directed towards dissemination of the technological, financial, and managerial know-how to increase the entrepreneurial skills of the females. They should be encouraged towards technology adoption and product diversification so that they can reap the benefits of economies of scale and thereby reducing the income gap.

The study has a few limitations. Instead of cross-sectional data, a set of panel data could have delivered more nuanced understanding on the dynamics of gender income gap. Though handloom micro-enterprises do exist in the urban areas, the issue of the rural-urban income gap is not addressed in the present study. Nevertheless, the study contributes to the literature by providing insights on income gap in informal micro-entrepreneurship with respect to the endowment and differential returns effects in an under-researched context of the handloom industry. It also gives a more nuanced understanding of a distributional gender gap considering a few less pronounced characteristics such as on maintenance of bookkeeping and SHGs membership.

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