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Rural Craftsmanship, Employment Creation and Poverty Alleviation: The Case of the Bamboo Craftsmanship in Bangladesh

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(Abstract: More than 30 percent of total population in Bangladesh is extremely poor. Halving the existing poverty level as per the millennium development goals of the UN by 2015 is the major challenge of the country. The question arises as to how to eradicate extreme poverty quickly? Successful experience of the East Asian countries reveals that creation of employment opportunities in the non-farm industrial sector for the rural poor is instrumental to eradicate poverty. Due to stagnant large and medium scales industrial sector and sole dependence on agriculture sector for employment and income, Bangladesh suffers from huge unemployment and disguised unemployment, which has been further worsening due to high population growth rate. Since the long past, rural informal income generating activities, such as traditional bamboo craftsmanship, however, has created enormous employment and income opportunities in the country especially for the rural poor and distress women. Empirical studies though recognize the contribution of rural informal activities to poverty alleviation, seldom focuses on who are the craftsmen, how they produce and market their products. Using primary data collected from more than 200 bamboo craftsmen from four districts in Bangladesh, this study tries to examine the role of rural informal activities and characterizes who are the craftsmen. The study finds that bamboo craftsmen are mostly uneducated and inherited the skills and businesses from their parents. The study also finds that all of the workers in the bamboo industry are family members and nearly 50 percent of total workers in the bamboo sector are female. Thus, the traditional bamboo sector contributes enormously to the creation of employment opportunities for the rural women. Finally, based on the opinions of the craftsmen, the study recommends some suggestions for the development of the bamboo industry in Bangladesh.)

Key words: industrial cluster, industrial development, craftsmanship, bamboo
JEL classification: O14, O15, O18

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Introduction

According to the World Bank (2007), in 2004 more than 40 percent of the total population in Sub-Saharan Africa and more than 30 percent of the total population in South Asia were extremely poor. In order to halve the existing extreme poverty level as per the Millennium Development Goals of the United Nations, appropriate policies must be taken in these regions. Important question arises to policy makers and researchers: what policy might be instrumental to eradicate extreme poverty? The successful experience of East Asian countries reveals that the creation of employment opportunities in the non-farm industrial sector is instrumental to eradicate poverty and to attain sustainable economic growth (e.g., David and Otsuka, 1994; Hayami et al., 1998; Otsuka, 2006; Sonobe and Otsuka, 2006). East Asian experience is particularly important for poverty stricken highly densely populated country like Bangladesh, where agriculture is still the major employment providers and out of 130.03 million population, nearly 40 percent are poor (GOB, 2006). Thus, rapid employment creation in Bangladesh for the poor is imperative to reduce poverty and to attain sustainable economic growth.

In Bangladesh, around 52 percent of total labor force is already engaged in agriculture sector (GOB, 2006). Agriculture employment is however very seasonal and incidence of disguised unemployment is highly prevailed in the agriculture sector (Haque and Hussain, 1984). Further employment creation in the agriculture sector through modernization might not be feasible. In fact, the green revolution experience reveals that modernization of agriculture might shrinks employment opportunities in the agriculture sector (e.g., David and Otsuka, 1994). In Bangladesh, rapid employment creation in the industrial sector in the sort run also might be very difficult. At present only 14 percent of total labor force is engaged industrial sector (including small and cottage industry) and the overall contribution of this sector to GDP is below 11 percent (GOB, 2006). One of the mostly unexplored but seemingly very potential sectors is the endogenous rural informal sector, which have been playing very important role in income and employment creation for the rural poor in Bangladesh since the long past. In fact, the growth of the rural informal sector is considered as a remedy to reduce the income inequality in rural areas and also a major instrument in the reduction of rural poverty (Islam, 1999; Hossain, 2004). Empirical literature, however seldom pay attention to the problems and prospects of rural informal sector, even seldom asks simple questions like

are, how they produce and market their products and how informal activities create employment opportunities.

In this paper, attempts have been taken to explore the characteristics of the rural craftsmanship and their contribution to employment creation using primary data collected from 201 bamboo craftsmen from four districts in Bangladesh as a case. Bamboo craftsmen in rural Bangladesh are mainly family based. Using family members, particularly women, bamboo craftsmen produce numerous essential commodities, such as stools, mats, baskets, fishing traps and cages, poultry cages, ladder, as well as decorative items using locally available bamboo. Thousands of rural people including female are thus directly and indirectly engaged to the industry in collecting bamboo and producing and marketing the bamboo products. Thus, an empirical study on bamboo craftsmen might provide valuable insights into the development and contribution of bamboo industry to poverty alleviation and income generation to the rural poor.

The next section reviews relevant literature and advances several research objectives relating to education, experience, as well as marketing and operation size of the bamboo craftsmen. Sampling, data collection methods are described in Section 3. Descriptive statistics, tables and regression results are included in section 4. Section 5 includes major findings policy implications and conclusion.

2. Literature Review and Research Objectives

Altenburg and Meyer-Stamer's (1999) conjecture that in general rural industries in developing countries can be tracked back to a master craftsman who learned the techniques elsewhere and started production and trained family members, neighbors and employees. Later, family members, employees and neighbors started their business once they gathered relevant techniques and starting capital. As technology is very simple to imitate, requires low capital to start a business and as employment opportunity in the formal sector is very limited, very quickly the informal activity spreads in the locality through massive entrants by the imitators and thus emerge rural industrial cluster. Industrial cluster can be defined as "a geographical concentration or localization of enterprises producing similar or closely related goods in a small area" (Sonobe and Otsuka, 2006, Ch. 1, p. 4).

The literature on industrial clusters asserts that by developing industrial clusters, developing countries can achieve rapid industrial development. This is because industrial clusters can not only create substantial survival-type employment opportunities in the industrial sector, but also "seed-beds" for further industrial development by creating economies of agglomeration as Marshall (1920) originally pointed out (e.g., Sonobe and Otsuka, 2006; Schmitz and Nadvi, 1999; Nadvi and Schmitz, 1994; Tewari, 1999; Rabellotti, 1997; Altenburg and Meyer-Stamer, 1999; Weijiland, 1999; Visser, 1999; Schmitz, 1999; Nadvi, 1999). Empirical literature reveals that industrial clusters in both developed and developing countries are ubiquitous (e.g., Sonobe and Otsuka, 2006; Schmitz, 1999; Tewari, 1999). Majority of the industrial clusters in developing countries are, however, stagnant and perform poorly relative to what appears to be their growth

potential. For example, shoe industry in San Mateo Atenco, Mexico, furniture making in Sarchi in Costa Rica, metal and repair workshop in Takora, Peru (Altenburg and Meyer-Stamer, 1999) Eastland garments cluster in Kenya, vehicle repair and metal works cluster in Suame, Ghana and Garments cluster in Western Cape, South Africa (McCormick, 1999). Now question arises as to why industrial clusters tend to be stagnant even though industrial cluster inherently creates economies of agglomeration to the clustered producers?

According to Schumpeter (1912), industries develop through a series of innovations and imitations, where innovation is a new combination of human and physical resources that results in higher profit. Innovators' higher profit attracts new producers to enter the industry. By imitating innovations, the new producers reduce the innovators' profit. A reduction in profit influences innovators to adopt creative destruction activities through innovation. In this way, an industry develops over the time. Now the question arises as to who leads the innovation?

The existing literature on industrial cluster seldom examines empirically the characteristics of the innovative producers. An exception is Sonobe and Otsuka (2006) who analyzed the characteristics of the managers and producers from eight successful clusters in Taiwan, China and Japan. They develop an endogenous model of cluster-based industrial development. According to the model, in the process of development, a cluster usually faces three distinct stages: the initiation stage, quantity expansion stage and the quality improvement stage. In the initiation stage, a few innovative producers initiate an industry by producing low quality imitations of imported products mainly through trial and error basis. When the product and production processes are standardized in the new industry, new entrants massively enter and spontaneously form an industrial cluster. The formation of a cluster further enhances the economies of agglomeration, as is originally pointed out by Marshall (1920). It thus encourages further new entry. Therefore, the cluster expands in terms of the number of producers, who mainly imitate innovators and produce standardized imitated products with little or no qualitative upgrading. Sonobe and Otsuka (2006) termed this stage the "quantitative expansion" stage of the cluster.

Rampant imitation by the new entrants creates the problem of excessive supply of the cluster's main product, and thus reduces innovators' profit by reducing the product price. This might discourage innovative producers for further innovation. But, as the industrial cluster reduces innovation costs by bringing together a variety of skilled human resources and by knowledge spillovers, innovative producers might adopt further innovation to produce high quality differentiated products by adopting "multi-faceted" innovations (Sonobe and Otsuka, 2006), that is innovation ranging from finding a new source of input to exploring new marketing channels. To produce high-quality differentiated products, innovative producers need to use high quality materials and to employ high skilled workers. To appropriate the benefit of producing high quality products, producers need to use new marketing channels to reach the final buyers in order to differentiate high quality products from the imitated standardized products in the market. Multi-faceted innovation by the innovative producers leads the cluster to enter the quality improvement stage, where the entire cluster produces on average high quality products, and some of the innovative producers start to sell or export directly to the foreign traders, and thus enter the global value chain. It is important to note that without

any successful upgrading by the innovative producers, the cluster may just remain stagnant at the “quantity expansion stage” without any further development.

In characterizing innovative producers in all of the eight successful cases, Sonobe and Otsuka (2006) find that in general, highly educated producers lead the multifaceted innovations and produce high-quality products and thus tend to receive higher prices of their products. The finding of Sonobe and Otsuka (2006) highly supports the view that education enhances peoples ability to decode and understand information (Schultz, 1961, 1975; Becker, 1962, 1993). Information decoding and understanding abilities are important for facilitating development and for the adoption of new technologies (Nelson and Phelps, 1966,; Levine and Kawada, 1980; Easterlin, 1981, Romer, 1990; Abramovtiz, 1989; Acemoglu, 1996). In the growth literature it is also well known that human capital plays an important role in the economic growth process, because the level of human capital significantly influences the innovation and the creation of new technology, and the capability to absorb new technology from abroad (e.g., Barro, 1991; Romer, 1989, 1990, 1986; Mankiw, Romer and Weil, 1992; Grossman and Helpman, 1994; Lucas, 1993, 1988; Nelson and Phelps, 1966). The same will apply to the development of an enterprise and industrial cluster. The level of human capital of the producers influences the dynamic development of a cluster by influencing the capability to learn from outside sources, generate new ideas on trial and error basis, and thus the capability to innovate.

Although both urban and rural households are unthinkable without bamboo utensils, such as *Kula* (winnowing fan), *jhudi* (basket), traditionally bamboo craftsmen are mostly less educated and de-linked from formal training and development activities. Most of the craftsmen inherit the production techniques by generation without any further innovation in technology, production and product marketing. Banu (2008) asserts that much of the technology used in bamboo industry is primitive and has remained unchanged for more that thousand years. Craftsmen mainly employ their family members in production activities and sell their products in the locality by own. Massive unemployment further induces the producers to continue the business. To understand the bamboo craftsmanship more clearly, the following objectives have been set for the paper:

1. To examine the level of human capital of the traditional bamboo craftsmen.
2. To examine how the level of human capital affect the raw material price, employment structure, price of final products and product marketing of the craftsmen.
3. To identify major problems of the industry and way out from it.

3. Study Areas, Sampling and Data Collection

Bangladesh Public Administration Training Centre (BPATC) organizes four months long Foundation Training Course on regular basis for the entry level civil servants. There are almost 26 training modules in the Foundation Training Course. Village Study module is one of the important modules of Foundation Training Course, in which participants collect primary data and write a research report using structured questionnaire developed by Research and Development Department of BPATC. This paper is based on data information collected by the 40th Foundation Training Course participants. A total of 219 participants of 40th Foundation Training Course have

collected data on indigenous rural craftsmanship, such as handloom industry, coconut oil industry and bronze industry during 26-29 January, 2008 in 40 places of 31 districts in Bangladesh. This paper has used information only collected from 201 bamboo craftsmen from four districts: Rajbari, Bagerhat, Chittagong and Joypurhat. Table 1 presents the distribution of the sample craftsmen, and sex of the craftsmen by their districts.

The table shows that, out of 201 sample bamboo craftsmen, 39 locate in Afra/Jatrapur, Bagerhat, 49 locate in Fatikchari, Chittagong, 59 locate in Laxmikol, Rajbari and 54 locate in Pachbibi/Khonjonpur, Joypurhat. In Afra/Jatrapur, Bagerhat. A total of 45 sample craftsmen are female and rests are male. Producers in all four districts produce *kula* (*winnowing fan*), *jhudi* (basket), *chalani* (sieve), *dala* (tray), poultry and fish cage, fishing trap, cradle (baby bed) etc. Unfortunately, there is no clear information on how many persons are engaged in bamboo industry in the sample area.

Craftsmen were selected randomly. The data was collected on craftsmen's age, experience, prior occupations, education, total workers and product marketing channels. An effort was also taken to collect price of raw bamboo, price of final products and yearly total production (piece). Unfortunately, collected data on price of final products and total production are not 100 percent accurate, because most of the bamboo craftsmen do not maintain written records, and also because most of the craftsmen produce a variety of bamboo products and sell at different prices. Nonetheless, the paper tries to examine the average operation size and performance of bamboo craftsmen using yearly total sales revenue as an indicator.

4. Descriptive Tables and Figures

4.1 Contribution of Bamboo Industry and Characteristics of Sample Bamboo Craftsmen

It is well known that the traditional bamboo industry has created plenty low cost employment and earning opportunities in capital scarce and labor surplus countries like Bangladesh. Agricultural employment is seasonal in nature and in the slack seasons, alternative income opportunities needed to fulfill the basic needs of the rural wage class and surplus family labor (Haque and Hussain, 1984). The traditional bamboo industry has offered that alternative income opportunity to the rural wage laborers and surplus family workers. Table 2 presents total number of workers engaged in sample 201 bamboo production units and the percentage of female workers in 2007. According to the findings in Table 2, more than 670 workers are working in 201 bamboo production units, out of which nearly 50 percent are female workers. On an average more than three persons are employed per unit. It is important to mention here is that none of the sample bamboo craftsmen have any salaried worker. The workers are simply the family members of the craftsmen.

Bamboo industry has also created thousands of income opportunities in the upper stream of the production chain that is marketing. Thousands of people are engaged in

supplying raw bamboos and marketing bamboo products. The following case demonstrates the fact:

Mr. Jahangir Alam Zakir, a 39 years old bachelor degree holder, operates a bamboo selling enterprise “Juthi Enterprise”, which is located in M/1/C Marul Badda, Dhaka-1212. He is selling bamboo in Dhaka city for 11 years, besides north side of Rampura Bridge. In his enterprise, a total of 5 to 7 workers are working. Similar to him, nearly 16 bamboo suppliers are operating their business in Rampura Bridge area, according to the information provided by Mr. Zakir. Mr. Zakir informed that most of his buyers are apartment builders or construction companies. However, he also sometime sells to bamboo craftsmen. He collects bamboo through his agents resides in rural areas in different parts of Bangladesh. On the day of telephone interview (25 April, 2008), his sells revenue was Tk. 33000.

Thus, the entire bamboo industry contributes enormously to create employment and earning opportunities not only to the rural poor and female but also to the city dwellers. Another important feature of the bamboo craftsmanship is that opposite to formal sector industries, the producers entirely use local raw materials, such as bamboo and cane.

Our research findings however, reveal that bamboo industry, which has created enormous employment opportunities, has been shot to verge of extinction. In the next few tables I have tried to elaborate why traditional bamboo industry may extinct in the near future.

The first important problem is, new entry in the bamboo industry by new craftsmen is seldom taking place. Table 3 depicts the fact. Table 3 presents the location of the sample craftsmen and their business starting years. It shows that almost all of the sample craftsmen have started their business before 2000. Only less than seven percent of the sample craftsmen have started their business in 2000 or later. On an average a sample craftsmen operates for 25 years. Thus, new entry in the bamboo industry is not active. It means in the long run, the industry might not develop dynamically due to the lack of new entrants. Although it is not clear, but it might be the case that either the market saturation of the traditional low quality bamboo products, new employment opportunities in other sectors and the scarcity of raw bamboo have significantly afflicted new entry in the industry. Table 4 presents the price trends of raw bamboo in four sample districts.

Scarcity of raw bamboo is recently very severe in the industry. Almost all of the respondents in our survey mentioned that the supply of quality raw bamboo is increasingly becoming scarce. As a result, the unit price of raw bamboo is increasing dramatically over the years. Table 4, presents the price of raw bamboo per piece in 2005 and 2007 and also presents percentage change in price in 2007 compared to 2005. The Table shows that price of raw bamboo has been increasing over the years in all four sample districts. For example, In Bagerhat, on an average, the cost of a piece of raw bamboo in 2005 was less than 68 Tk. whereas in 2007 it has increased to nearly 100 Tk. The similar pattern in raw bamboo price can also be observed in other three sample districts. The last row of Table 4 shows that on an average, price of a piece of raw bamboo in all four sample districts was 47.7 Tk, in 2005. In 2007 it has increased to 72 tk. Thus, the price has increased by 34 percent in 2007 compared to 2005. It is reported that during field survey, almost all of the craftsmen requested to take actions to ensure availability of raw bamboo at low price. They suggested that government might help craftsmen to develop own bamboo farm by leasing govern

ownership on the government forest. The scarcity of raw bamboo has created enormous problem to the bamboo craftsmen. Probably, scarcity of raw bamboo is one of the major reasons for less new entry in the industry.

Table 5, which presents the age structure of the bamboo craftsmen, supports the findings of Table 3 that new entry is not very active in the industry. Table 5 shows that nearly 70 percent of the sample craftsmen are more than 40 and above years old and the rests are less than 40 years old. It reflects that bamboo craftsmanship have failed to attract new generation craftsmen.

The traditional bamboo craftsmen are not only old but they are mostly uneducated. Educational attainment of the sample craftsmen is presented in Table 6. The Table shows that nearly 60 percent of the sample craftsmen do not have any formal education. Only 30 percent of the craftsmen have five or equivalent years of schooling and the rests (11 percent) have six to ten years of schooling. Such low level of educational attainment of the sample craftsmen might have significantly reduced the innovation opportunities in the industry, because the level of human capital significantly influences the innovation and the creation of new technology, and the capability to absorb new technology from abroad. In our empirical model we tried to quantify to the role of education of the craftsmen on the size of operation, sales revenue and proportion of sales to trader.

Table 7 presents information on prior occupations of the sample craftsmen. The table shows that nearly 90 percent of the sample craftsmen have learnt the production techniques from their families. Probably, the craftsmen, as they are less educated and mostly de-linked from the formal training and development opportunities, simply imitate what they learnt from their family without any further innovation. Thus, the industry remains the same for thousands of years as is conjectured by Banu (2008).

4.2 Effects of Age, Years of Operation and Education of the Craftsmen on Sales Revenue, Raw Bamboo Price, Final Product Price and on Proportion of Sales to Traders

Discussions based on Tables 5, 6 and 7 reveal that most of the bamboo craftsmen are aged, not formally educated and 45 of the sample craftsmen are female. In the next few paragraphs, attempts have been taken to examine, how, age, sex, education and years of operation of the craftsmen affect sales revenue, raw bamboo price, final product price and proportion of sales to traders of the craftsmen.

Figure 1, presents how age of the craftsmen affects his sales revenue, raw bamboo price, price of final products and proportion of sales to traders. The figure shows that in general, after 40 to 49 years of his age, a craftsman earn lower amount of sales revenue, gets low final product price, collect raw bamboo at low price, and increases proportion of sales through traders. Thus, age and sales revenue, raw bamboo price, final product price are negatively correlated. Now, as young craftsmen are rarely entering business, traditional bamboo craftsmanship might face great problem due to aging craftsmen. It is mentioned earlier that on an average, a sample bamboo craftsman operating his business for 25 years. Figure 2 presents the relationship between business starting year and sales

revenue, price of raw bamboo, price of final products and proportion of sales revenue to traders.

Figure 2 shows that the craftsmen who have started their business earlier, that is craftsmen with higher years of operation, tend to earn higher sales revenue, collect high priced raw bamboos, sell products with higher price and more likely to sell through traders. On the other hand, new relative new craftsmen tend to have lower sales revenue, receive low product price, use low priced raw bamboo, and mostly sells by own. These might be the case because, craftsmen who are operating for long years tend have more capital, and less likely to face the problem of capital constraint compared to new craftsmen. It is found that none of the sample craftsmen have received any loan facilities from any formal lending institutes, such as bank. As formal loan facilities are not available to the craftsmen and as reinvestment of earnings is the major way to expand the size of operation, craftsmen who have started earlier tend to be bigger compared to others.

Findings in Table 6 show that nearly 60 percent of the sample craftsmen do not have any formal education. To see the effect of formal education of the craftsmen on sales revenue, raw bamboo price, final product price and proportion of sells to traders, Figure 3 has been developed. In Figure 3, sample craftsmen are divided into two groups: not formally educated and formally educated and then sells revenue, raw bamboo price, final product price and proportion of sells to traders are compared. The figure shows that formally educated craftsmen receive higher product price, buy high priced raw bamboo, though they receive less revenue and sell less to the traders compared to uneducated craftsmen. Although I do not have exact information why formally educated craftsmen earn less sells revenue, however, my assumption is probably educated craftsmen are the part timer in the business. They might also engage in other activities, such as agriculture and operates small shops. As a result, although formally educated craftsmen receive higher product price and use high priced raw bamboo, they tend to keep their operation size smaller (low sells revenue).

Figures 1, 2 and 3 have depicted one to one relationships, and thus are not free from influences of other influential variables. To control the influences of other variables, we need to estimate the influence of age, education and years of operation empirically. In the next section I have developed a simple regression model to estimate the effect of age education and years of operation on sales revenue, raw bamboo price, price of final products and on proportion of sales to traders.

4.3 Regression Analysis

In this section, an attempt has taken to estimate empirically the role of craftsmen's age, years of operation and education on sales revenue, raw bamboo price, price of final product and proportion of sales to traders after controlling for other variables, such as sex of the craftsmen years of prior experience and years of operation. I also examine traders' performance with a view to testing the hypotheses specified in Section 2, followed by a discussion of the estimated results.

4.3.1 Model Specification

Our intension is to examine empirically the role of age, education and years of operation of the craftsmen on their operation size, raw bamboo price, final product price and proportion of sales to traders. It can be examined by estimating following the function:

$$Y_{jt} = \theta_0 + \theta_1 \{Age\}_{jt} + \theta_2 \{Square\ of\ Age\}_{jt} + \lambda_1 \{Years\ of\ Schooling\ Dummies\}_j + \theta_3 \{Male\ dummy\}_j + \theta_4 \{Business\ starting\ year\}_j + \theta_{4j} \{Dummy\ for\ prior\ affiliation\ with\ the\ Business\ starting\ year\}_j + \varphi_{jt} + \zeta_j$$

where Y_j is a vector of dependent variables, which includes natural log of yearly sales revenue, natural log of per piece raw bamboo price, natural log of per piece final product and proportion of sales to traders. Variable φ is the individual level random effect and ζ is the error term with white-noise properties. θ is the scalar parameter and λ is the vector of the parameter. Finally, j and t stand for individual producer and year respectively. Since the variable *proportion of sales to traders* ranges among 0 to 100,

I have applied random effect GLS estimation process to estimate functions explaining yearly sales revenue, per piece raw bamboo price and final product price. The only reason behind this is that if I use fixed effect estimation process, four of the time invariant variables that are sex, years of schooling dummies, business starting year and dummy for prior affiliation with the industry will be eliminated. That's why I have applied random effect GLS estimation process to estimate sales revenue, raw material and final product price functions. I have used two limits tobit to estimate the function that explains proportion of sales to traders, because the variable ranges between 0 to 100. In the two limits tobit estimation process the dependent variable, which is proportion of sales to traders, is censored 0 at the minimum and 100 at the maximum.

Table 8 presents estimated functions explaining natural log of yearly sales revenue, natural log of per piece raw bamboo price, per piece final product price and percentage sales to traders. The table shows that in the estimated sales revenue function only age and sex of the craftsmen are significant. Importantly, the sign of coefficients of age and square of age reveal that initially sales revenue increases with the increase age, however after a certain age sales revenue starts to decline. Probably, after a certain age older craftsmen turns too old to manage things efficiently and thus sales revenue starts to decline after a certain age. Thus the relationship between age and sales revenue is non-linear, in which the sales revenue increase with the increase in age of the craftsmen and later sales revenue declines after a certain age. Similar to the estimated sales revenue function, the age variable is also significant in the estimated functions explaining raw per

piece raw bamboo price, per piece final product price and holds the relationship is exactly the same.

Dummy for years of schooling is only positive and significant in the function explaining natural log of per piece price of final product. According to the estimated function, sample craftsmen, who have completed six to nine years of schooling, receive more than 50 percent higher price per piece final product compared to others.

The coefficient of male dummy is positive and significant in the estimated functions explaining natural log of yearly sales revenue and natural log of per piece raw bamboo price. According to the table, on average male craftsmen receive 40 percent higher sales revenue, and use 50 percent more costly raw bamboo compared to female craftsman. The reason might be that in a male dominated society probably access to high quality raw bamboo and facilities to sell products at a higher price by carrying goods from door to door are easier for a male craftsman compared to a female craftsman. Thus, female craftsmen tend to operate small plants compared to male craftsmen.

In case of estimated function explaining percentage sales to traders', the age variable is negative and significant and square of age is positive and significant. Thus, young craftsmen tend to sell less to traders', however, older craftsmen are more likely to sell to traders. This is probably because; if a craftsman does not sell his products to traders then only option is left for him is to sell products directly to the consumers by carrying door to door. Compared to an older craftsman, it is easier for a young craftsman to carry products from door to door. As selling directly to the consumer ensures higher price, young and energetic craftsmen tend to sell less to traders. Interestingly, dummies for education appear negative. The possible reason might be that as educated craftsmen tend to operate small business, they are more likely to sell directly to the consumers in the locality rather than selling to traders.

5.0 Major Findings, Policy Recommendations and Conclusion

In Bangladesh, the contribution of rural bamboo craftsmen in creating income and employment opportunities for the rural poor and distress women is enormous. Since the long past, hundreds of poor and distress women are working in this industry. This study, using primary data collected from 200 bamboo craftsmen from four districts in Bangladesh, tried to characterize who the craftsmen are, how they produce and market their products. It is depicted in the paper that most of the bamboo craftsmen have inherited the technology from their parents and new entry in the industry is seldom taking place. Almost all of them produce similar products, such as stools, mats, baskets, fishing traps and cages, poultry cages and ladder. Majority of craftsmen have no formal education or training and most of them are aged with average age above 40 years. Probably, low level of human capital of the bamboo craftsmen hinders the progress of the industry. The paper empirically found that age and starting year of the craftsmen significantly influence raw bamboo price, final product price, sales revenue and percentage sell to traders.

Based on the findings and collected data the paper suggests following recommendations for further development of the bamboo industry in Bangladesh:

1. The level of human capital is alarmingly low among the sample bamboo craftsmen. Most of them inherit the business and use the same technology for thousands of years. As the level of human capital determines the innovation capability and thus the dynamic growth pattern of an industry, massive formal education and training must be introduced in rural Bangladesh for rapid industrial growth. Government as well as NGOs and donor agencies can take immediate initiative in this respect.
2. A total of 90 percent of the sample craftsmen suggest for introducing loan facilities for them and also urged to protect them from local money lenders (*Mohajon*) Thus, both government (e.g., PKSF, BRDB)) and non-government micro loan providers should be encouraged to provide loan to the rural bamboo craftsmen.
3. It is found that out of 201 craftsmen, of 15 craftsmen are homeless. The homeless rural craftsmen should be given priority while distributing *khas land* (government owned land) and also homeless craftsmen might be given priority in government's rehabilitation programme for the homeless (e.g., Ashrayan project).
4. A total of 95 percent sample craftsmen suggest ensuring smooth supply of high quality bamboo at a lower price. They also urged concerned agencies to help them to develop their own bamboo farm. Although it is a matter of further in-depth research, however, ownership can be provided to the bamboo craftsmen in managing government owned forest, which might ensure the supply of raw bamboo to the craftsmen.
5. Nearly 70 percent of the craftsmen urged to help them in product marketing. They suggests that by taking necessary initiatives it might be possible to export high value added bamboo crafts and show pieces in developed countries. Government, donor agencies and NGOs can take initiatives in this respect.

5.1 Conclusion

For thousands of years, traditional bamboo industry in rural Bangladesh is supplying necessary items for daily livelihoods. The industry has been contributing enormously in creating employment and income opportunities to the rural poor. The bamboo industry thus associated with the everyday life of Bangladeshi. The industry is however, primitive and using traditional technology for thousands of years without any further innovation. This paper tries to characterize the bamboo craftsmen and examines employment pattern, female employment, production and marketing channels of the bamboo craftsmen. It is found that low level of human capital, lack of training and finally scarcity of raw bamboo have been threatening the survival of the thousands year old bamboo industry in Bangladesh. Based on the findings, the paper emphasizes that to revive the bamboo industry and assist the craftsmen to produce higher value added export quality products government, donor agencies and NGOs should impart education and training to the

craftsmen. Moreover, interest free loan and assistance to product marketing and access to raw bamboo must be ensured.

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Table 1: Distribution of the Sample Craftsmen by Location in 2007

Districts	Bagerhat	Rajbari	Chittagong	Joypurhat	Total
Male	39	38	25	54	156
Female	0	11	34	0	45
Total	39	49	59	54	201

Source: Survey, January, 2008

Table 2: Workers Composition by District in 2007

	Total worker	Percentage of Female
Bagerhat	169	35.5
Chittagong	212	42.5
Rajbari	133	78.2
Joypurhat	159	49.1
Total	673	49.3

Source: Survey, January, 2008

Table 3: Distribution of the Sample Respondents by Districts and Years of Starting the Business (Percentages are in the parentheses)

Starting Year	Bagerhat	Rajbari	Chittagong	Joypurhat	Total
Before 1975	11	14	9	16	50 (24.9)
Between 1975 to 1984	22	15	15	14	66 (32.8)
Between 1985 to 1999	6	13	30	22	71 (35.3)
In 2000 or later	0	7	5	2	14 (6.9)
Total	39 (19.4)	49 (23.4)	59 (29.4)	54 (26.9)	201 (100)

Source: Survey, January, 2008

Table 4: Raw Bamboo Price Per Piece and Its Change Over the years

Place	2005	2007	Percentage Change in Price of Raw Bamboo
Bagerhat	67.6	97.8	+ 30.9
Rajbari	50.8	82.3	+ 38.3
Chittagong	23.7	33.9	+ 30.1
Joypurhat	56.4	89.3	+ 36.8
Overall	47.7	72.9	+ 34.6

Source: Survey, January, 2008

Table 5: Age Structure of the Sample Bamboo Craftsmen by Place in 2007 (Percentages are in the parentheses)

Age structure	Bagerhat	Rajbari	Chittagong	Joypurhat	Total and Percentage
Less than 30	0	8	3	10	21 (10.4)
30 to 39	8	10	10	14	42 (20.9)
40 to 49	17	13	21	13	64 (31.8)
50 to 59	14	13	12	12	51 (25.4)
60 and above	0	5	13	5	23 (11.4)

Source: Survey, January, 2008

Table 6: Educational Qualification of the Sample Craftsmen in 2007

	Bagerhat	Rajbari	Chittagong	Joypurhat	Total and Percentage
No formal education	19	33	38	25	115 (57.2)
Upto class V	14	13	16	19	62 (30.8)
Class VI to X	6	2	5	9	22 (10.9)
SSC	0	1	0	1	2 (1.0)

Source: Survey, January, 2008

Table 7: Information on Prior Occupations of the Sample Craftsmen by District in 2007 (Percentages are in parentheses)

Prior occupation	Bagerhat	Chittagong	Rajbari	Joypurhat	Total
Associated with bamboo industry through family	37 (94.9)	44 (74.6)	44 (89.8)	53 (98.2)	178 (88.6)
Agriculture/day labor	2 (5.1)	5 (8.5)	4 (8.2)	1 (1.8)	12 (5.9)
Other (student, housewife)	0	10 (16.9)	1 (2.0)	0	11 (5.5)
Total	39 (100.0)	59 (100.0)	49 (100.0)	54 (100.0)	201 (100)

Source: Survey, January, 2008

Table 8: Estimated Functions Explaining the Yearly Sales Revenue Price of Raw Bamboo (Per Piece), Price of Final Product (Per Piece) and Percentage Sales to Traders

Dependent variables	ln (Yearly sales revenue)	Ln(Per piece raw bamboo price)	ln (Per piece final product price)	Percentage sales to traders
Estimation method	Random effect GLS regression			Two-limit Tobit
Age (year)	0.07** (2.30)	0.04* (1.67)	0.08*** (3.48)	-4.98*** (-2.48)
Age square	-0.001* (1.68)	-0.001 (-1.54)	-0.001** (-2.47)	0.05** (2.44)
Dummy for years of schooling five years or below (yes=1)	-0.06 (-0.38)	0.11 (0.82)	0.17 (1.29)	-13.4* (-1.71)
Dummy for years of schooling six to nine years (yes=1)	-0.13 (-0.40)	0.15 (0.71)	0.53*** (2.48)	-8.6 (-0.73)
Dummy for years of schooling up to ten years (yes=1)	-0.05 (-0.14)	-0.16 (-0.28)	-0.26 (-1.08)	-58.7 (-1.63)
Male dummy (yes=1)	0.40** (2.32)	0.50*** (3.46)	0.09 (0.67)	1.31 (0.15)
Business starting year	0.01 (0.76)	0.01 (1.40)	0.01 (1.18)	-1.13** (-2.28)
Affiliation dummy (if previously worked in the industry before starting own business=1)	0.30 (1.45)	0.26 (1.38)	0.11 (0.66)	2.88 (0.24)
Constant	-7.52 (-0.37)	-17.5 (-1.23)	-14.9 (-1.08)	2420.8** (2.39)
Sample size	348	404	404	404
No. of left and right censored Observations				Left: 91 Right: 96

z and t values are in the parentheses. ***, ** and * denotes significance level 1 percent, 5 percent and 10 percent level respectively.

Figure 1: Yearly Sales Revenue (thousand Tk), Bamboo Price (per piece Tk), Product Price (per piece Tk.) and Proportion of Sales to Traders by Age Structure of the Craftsmen in 2007

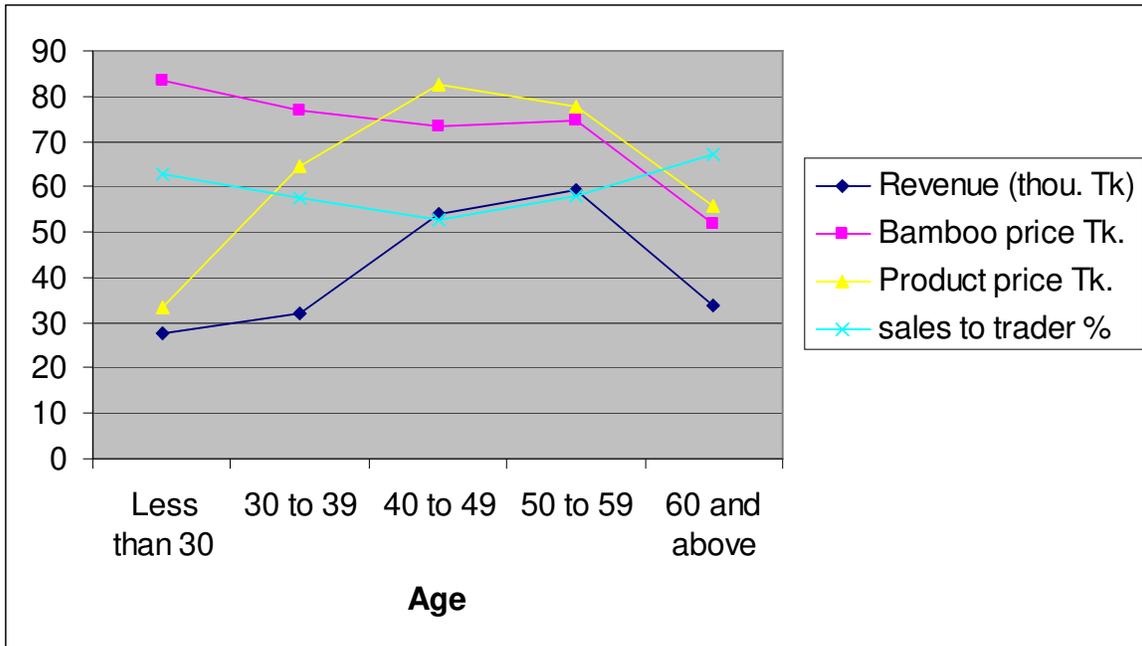


Figure 2: Yearly Sales Revenue (thousand Tk), Bamboo Price (per piece Tk), Product Price (per piece Tk.) and Proportion of Sales to Traders by Business Starting Years in 2007.

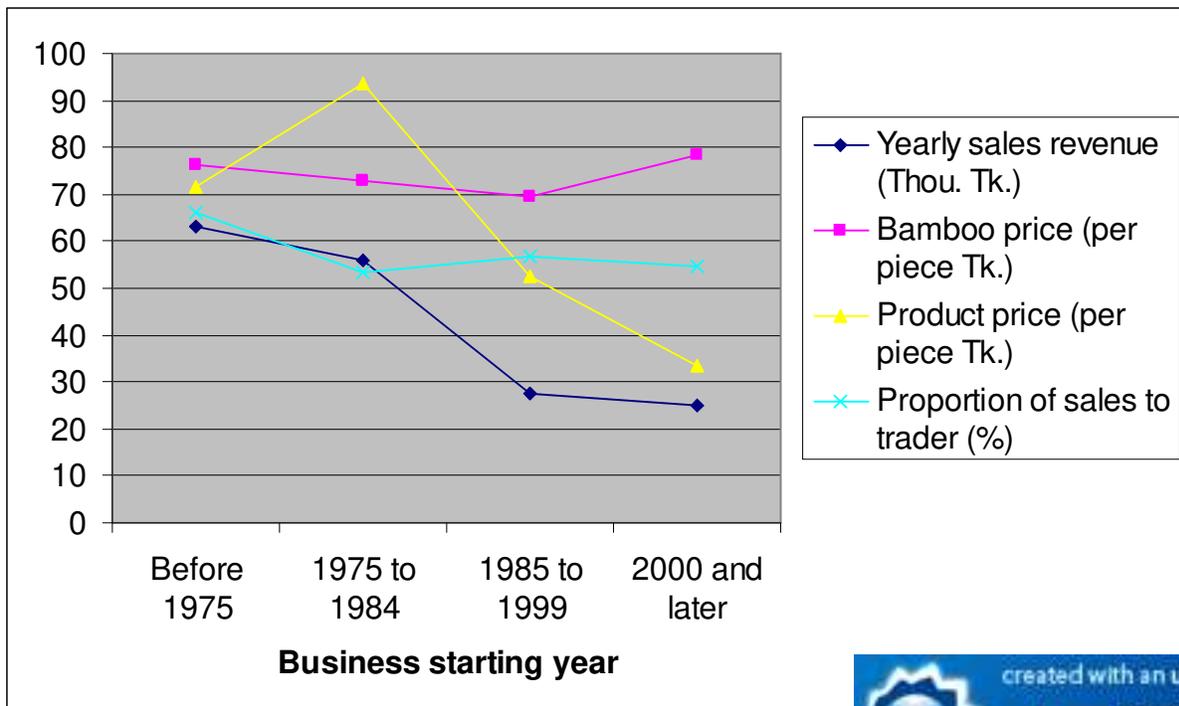


Table 3: Sale Revenue (Thousand Tk.) Raw Bamboo Price, Price of Final Product and Proportion of Sales to Traders by Educational Status of the Producers in 2007

